Hart Engineering Corporation

SUBMITTAL:
11378-07

PROJECT: 9950. - Veolia/Taunton WWTP Improvements Phase 2 **DATE: 01/26/2024**

SUBMITTAL: 11378-07 - Blower - O&M Manual
REVISION: 0
STATUS: Eng
SPEC #: 11378

TO:
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Item	Revision	Description	Status	Date Sent	Date Returned
11378-07	0	Single Stage Centrifugal Blowers - O&M Manual	Eng	01/26/2024	
Notes:					

Additional Notes:

Status Codes
1-APP – No Exceptions Taken
2-ANR – Make Corrections Noted
3-R&R – Revise and Resubmit
4-REJ – Rejected
5-IPO – For Information Purposes Only
6-NRR – Not Required for Review
ENG – Submitted to Engineer

Sincerely,
Hart Engineering Corporation

_____ DATE: 01/26/2024

Next Turbo Americas
Kansas City, Missouri

OPERATION AND MAINTENANCE DATA

Aeration Blowers and Controls

Project:
Taunton Wastewater Treatment Facility
Improvements Phase 2

Specification:
11378 - Single-Stage Centrifugal Air Blowers

Equipment	Blower Tag	Blower S/N	Panel Tag
Blower 1	BTB-6101	22.0989	CP-6101
Blower 2	BTB-6201	22.0990	CP-6201
Blower 3	BTB-6301	22.0991	CP-6301
Blower 4	BTB-6401	22.0992	CP-6401
Master Control Panel			CP-6000

OPERATION AND MAINTENANCE DATA

Aeration Blowers and Controls

Project

Taunton WWTF Phase II

Specification

11378

Tags

BTB-6101 CP-6101

BTB-6201 CP-6201

BTB-6301 CP-6301

BTB-6401 CP-6401

CP-6000

OPERATION AND MAINTENANCE DATA

Aeration Blowers and Controls

Project

Taunton WWTF Phase II

Specification

11378

Tags

BTB-6101 CP-6101

BTB-6201 CP-6201

BTB-6301 CP-6301

BTB-6401 CP-6401

CP-6000

Taunton WWTF PHASE II

General Contractor

Hart Companies
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Manufacturer

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824 Woodswether Rd, East
Kansas City, MO 64105
PH: (816) 588-6054

Table of Contents

NexTurbo

Next Turbo Americas
Kansas City, Missouri

BLOWER O&M

Warranty

1. Next Turbo Americas (NTA) warrants that all new unused Products supplied by NTA are free from defects in workmanship and in materials as of the time and place of delivery by NTA and that all services furnished by NTA are performed properly under applicable industry standards as of the time and place of performance ("Warranty").

2. Unless otherwise agreed, NTA warranty is limited for a period of sixty (24) months from the initial benefical use of Products (as promptly communicated by the Purchaser in writing within five days of its occurrence) or sixty-six (30) months from the date of delivery or beneficial use, whichever occurs first.

3. Subject to the provision of article 2, NTA shall honor any original Purchaser's warranty claim on warranted Products only if Purchaser notifies in writing to NTA a detailed claim. Defects shall be claimed within five (5) days from the Delivery Date; in case of latent defects, notice shall be given within 5 (five) days from its discover, under penalty of expiration.

4. NTA reserves the right to inspect allegedly defective Products at Purchaser's premises. In case of NTA breach of warranty, the sole and exclusive remedy therefore, if the claim is founded, shall be at NTA's option *(i)* repair or modify the Products by NTA's employee or third parties who are expressly and in writing authorized by NTA; or *(ii)* replace the Products.

5. In case of warranty claims with respect to the quality of any services rendered by NTA (including repair under warranty), the sole and exclusive remedy therefore if the claim is founded, shall be the performance of the same service by NTA free of charge to the Purchaser.

6. The reparation, modification or replacement of the Products in accordance to article 4 will extend the Warranty for the following 12 (twelve) months from the initial date of operation of the Products after the repair, modification or replacement. However it is understood that, in no event, the Warranty could last beyond 18 (eighteen) months from the date of the accomplishment of the reparation, modification or replacement needed. Electrical connections and lifting capabilities are by others and not part of the warranty.

7. NTA shall be relieved of all its warranty obligations in the event repairs not previously authorized by NTA are carried out by persons who are not employees of NTA or who are not expressly entrusted by NTA with the repairs. The warranty shall not apply to any claim resulting in whole or the part from any of the following: *(i)* natural wear and tear; *(ii)* modifications to the Products made by third parties or resulting from the installation or attachment of parts or components not made by NTA; *(iii)* Purchaser's failure to comply with NTA operating and maintenance instructions; *(iv)* use of the Products for purposes other than those for which they were destined; *(v)* operation of the Products under extraordinary conditions of which NTA had not been informed in writing when the order was placed; *(vi)* inaccurate or incomplete information supplied by the Purchaser affecting the design, specifications, use or operation of the Products.

8. NTA makes no warranty with respect to parts, accessories, or components manufactured by others. The warranty applicable to such items is that offered by their respective manufacturers and will be passed through NTA to the original user.

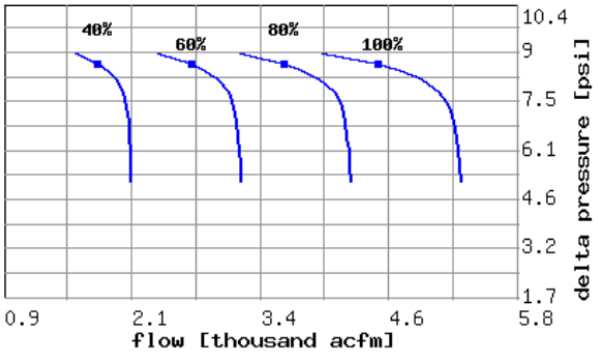
9. To ensure compliance with the warranty and indemnity obligations provided in this T&C, NTA grants to have executed an insurance coverage for Third Party Liability and Product Liability.

Design Details

Project:	Taunton Wastewater Treatment Facility Improvements Phase 2
Country of installation:	USA
City of installation :	Taunton, MA
Plant address :	825 West Water Street Taunton, MA 02780
End-user name :	Veolia Water North America - Northeast, LLC
Engineering company :	BETA, Inc
Contractor :	Hart Companies
Blower type :	GTB-T20XY
Compressor Control :	Discharge Diffuser & Inlet Guide Vanes
Motor brand/model:	Nidec (US Motors); Frame: 447TSD; Enclosure: TEFC with D-flange
Motor Size:	200 HP rated at 60 Hz, 460 VAC
Motor RPM:	~3,600
Motor configuration:	Flange mounted (B5)
Number of Units:	4
Max. Power at design conditions:	188.4 HP
Installation pressure	14.7 psia (1.013 bara)
Discharge pressure design:	23.4 psia (1.613 bara)
Design differential pressure:	8.7 psig (0.6 barg)
Rise-to-surge	0.5 psig
Inlet filter pressure drop design:	0.15 psig
Design inlet air temperature:	95°F at 50%rH
Max discharge temperature:	193°F
Design airflow:	4200 SCFM (14,7psia - 68°F – 36%rH) 4500 ACFM at 14.7 PSI, 95°F, 50% rH = 7646 m3/h (1.013bar – 35°C – 50%rH
Air volume turndown:	40-100%
Cone discharge flange	NPS 14”
Discharge volute position:	Vertical UP

Preliminary Performance Curves

Performance curves of selected compressor



for delta pressure of 8.7 psi and airflow of 4500 acfm

The diagram to the left shows the compressor curves at the different discharge diffuser positions, covering the defined performance map.

Extended Performance curves (for chosen temperatures)

Note: Curves are based on the blower design conditions of table 11378-2.3.A

Next Turbo Americas
Kansas City, Missouri

Performance Data

Project:	Taunton Wastewater Treatment Facility Improvements Phase 2
Compressor type:	GTB-T20XY
Regulation type:	Discharge Diffuser & Inlet Guide Vanes
Number of Units:	4
Motor Size:	200 HP rated at 60 Hz, 460 VAC
Cone diffuser	NSP 14“ ANSI flanged
Max discharge temperature	193°F
Impeller Speed	~21,302 rpm
Motor Speed	~3,600 rpm

Designed For

Inlet Pressure (P0):	14.7 psia
Outlet Pressure (P2):	23.4 psia
Max Inlet Temperature:	94°F
Relative Humidity (rH):	50%
Airflow:	4,200 SCFM
Filter Loss (Ploss):	0.15 psig

PAINTING SPECIFICATION

Prepared by:	GF	Date:	09/11/2015
Last revision:	GF	Date:	30/10/2020

Blower

Surfaces of compressor and equipment excl. armatures, all galvanized parts and stainless Supplier parts. Corrosion class of paint supplier: C3 according to ISO 12944.Suitable for temperatures up to 250°F (120°C).

1.1 Pre-Treatment

Cleaning by sandblasting to obtain metallic radiance of surface according to ISO 8501-1, quality: SA 2 ½. If sandblasting is not possible: Mechanical cleaning according to ISO 8501-01, quality ST3

1.2 Primer

2 x Corrosion protective primer, two component epoxy bases. Product manufacturer: PPG Univer S.p.A, type: Epoxy primer H2O

Type of bond: Epoxy-polyamid with vinyl modification

Pigmentation: organic and inorganic pigments and anticorrosive pigments

Film thickness: min. 90 - 110 micrometer Dry film thickness (DFT)

Color: grey / RAL 7035.

If the primer film is thinner than 50 micrometers, or if spots of corrosion are visible, or the adhesion is insufficient, the area must be cleansed again to ST3, and a new coating of primer must be applied.

1.3 Finishing Coat

2 x Topcoat, bi-component polyurethane finish. Product manufacturer:
TIXOPOL PPG Univer S.p.A,

Type of bond: Hydroxylated polyester resin

Film thickness: min. 90 - 100 micrometer Dry film thickness (DFT)

Color: RAL 5015 (sky blue) – to be approved see note below

Total film thickness (primer + finishing coat): min. 180-micrometer Dry film thickness (DFT)

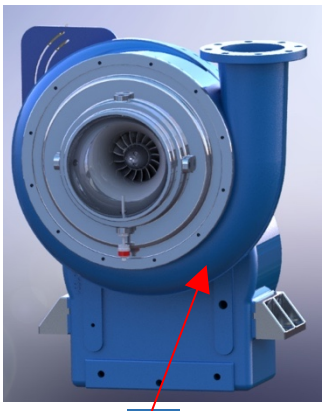
NOTE: Owner may choose to keep the Next Turbo standard topcoat color mentioned above or choose a color here: https://www.ralcolorchart.com

Drive Motor

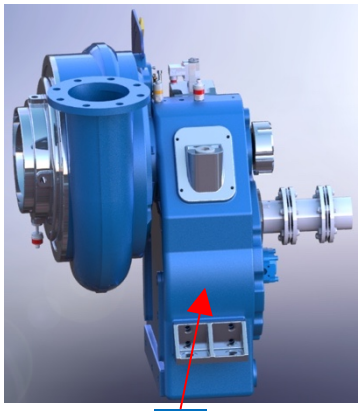
Electrical motors are painted according to manufacturer standards.

Component description

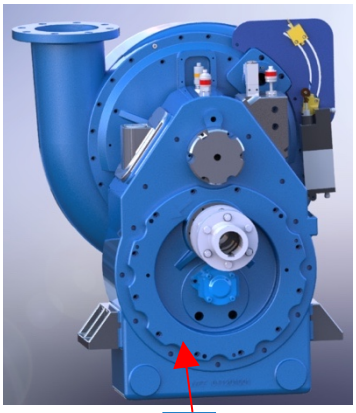
Casing



1



2



3

The blower castings are made from heat treated and machined material type nodular cast iron GJS400-15, design: 95 psi, 392ºF. The blower volute is of vertical split design in order to ease assembly and disassembly and to increase serviceability, i.e. extraction of the discharge diffuser plate.

List of castings:

1 Volute Casing

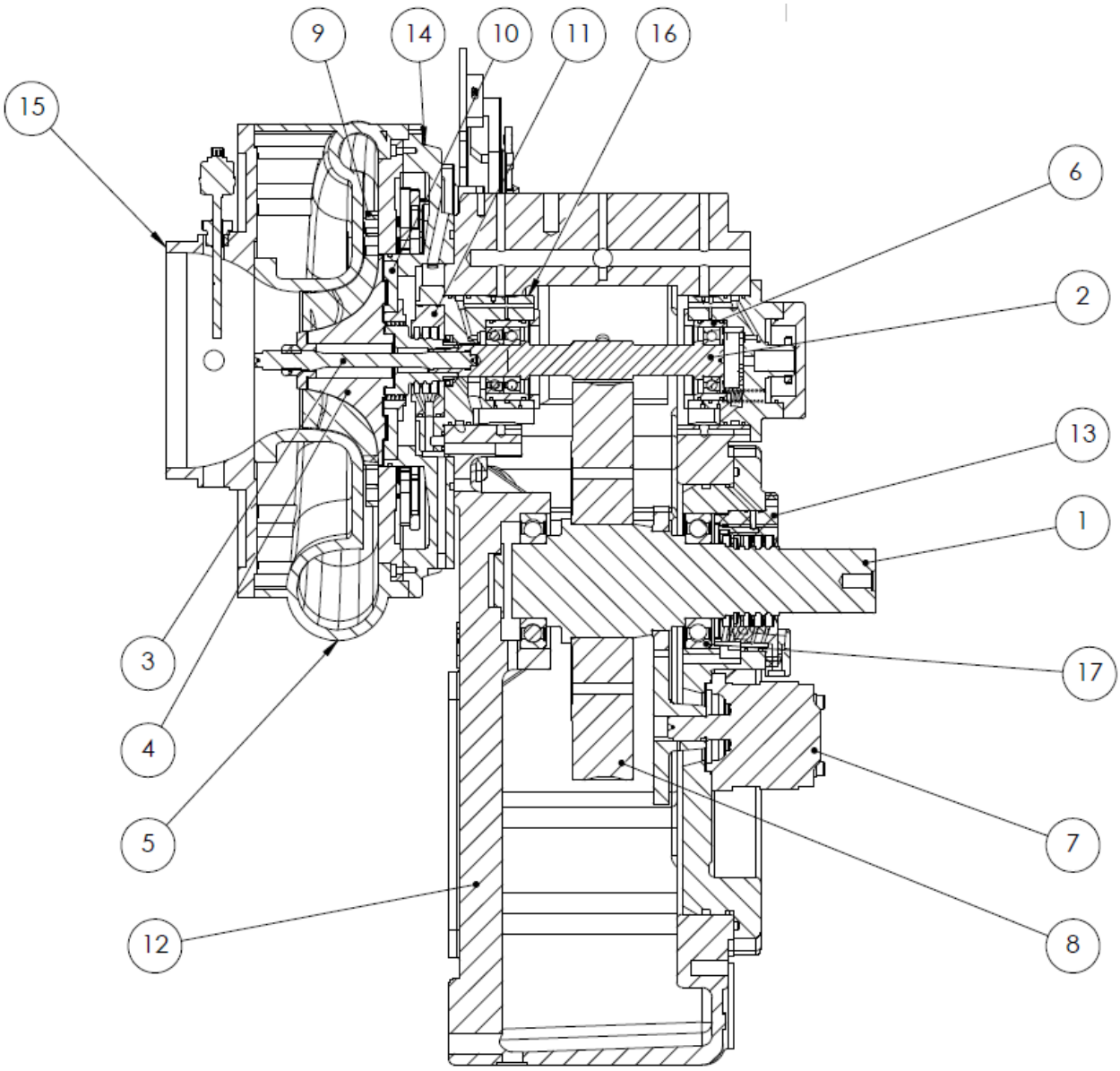
2 Gearbox Casing

3 Gearbox cover casing

Baseplate

1 The blower, console, motor and filter/silencer are mounted on a compact beam design baseplate. The compact baseplate is fixed on the floor via mechanical anchor bolts. The motor is flanged and coupled with the blower via a flexible coupling. The baseplate is steel welded type Steel S275JR.

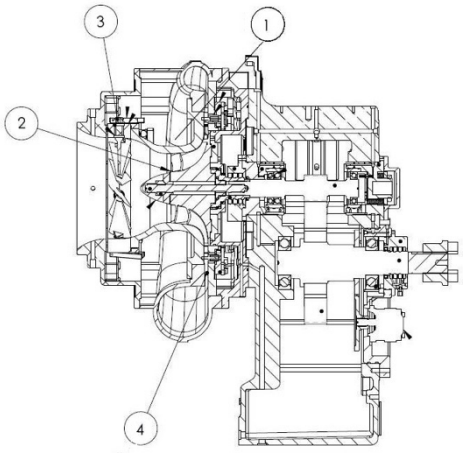
Core Blower



1	Pinion shaft	**9**	Impeller	**17**	Diffuser bushing
2	Slow shaft	**10**	Impeller hub	**18**	Bearing fast shaft (set)
3	Bull gear	**11**	Impeller nose	**19**	Bearing slow shaft (set)
4	Bearing housing blower side	**12**	Impeller central screw	**20**	Oil pump
5	Bearing housing motor side	**13**	Impeller special nut	**21**	IGV vanes
6	Air seal labyrinth	**14**	Diffuser vanes	**22**	IGV lever
7	Oil seal labyrinth fast shaft	**15**	Diffuser lever	**23**	IGV blade
8	Oil seal labyrinth slow shaft	**16**	Diffuser link	**24**	IGV bearing

Main parts and function:

The Blower is a single stage blower, equipped with a capacity regulation system of type X with discharge diffuser vanes and inlet guide vanes type “Y”. The medium (air) is entering into the blower where indicated in the illustration below.

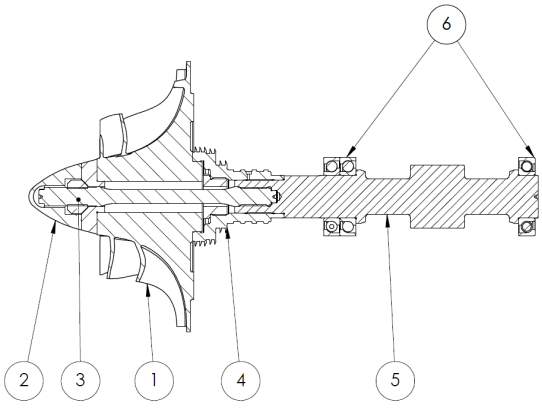


1	Volute casing
2	Impeller
3	Inlet guide vanes
4	Diffuser vanes

Functions of components:

- **Inlet guide vanes:** Pre-rotates the air towards the impeller in order to optimize power consumption.
- **Volute casing:** The air is collected in the volute ring and guided into the discharge conus shaped diffuser, as indicated.
- **Impeller:** The air is passing to the impeller, in which its kinetic energy (air speed) is increased in a rotational direction.
- **Discharge diffuser vanes:** After the impeller, the air is passing along the set of variable diffuser vanes, which is adapting the airflow vector and therefore the relative airspeed to match the capacity requirements; essentially moving the blower characteristic curve along the capacity axis.

Rotor shaft/Impeller

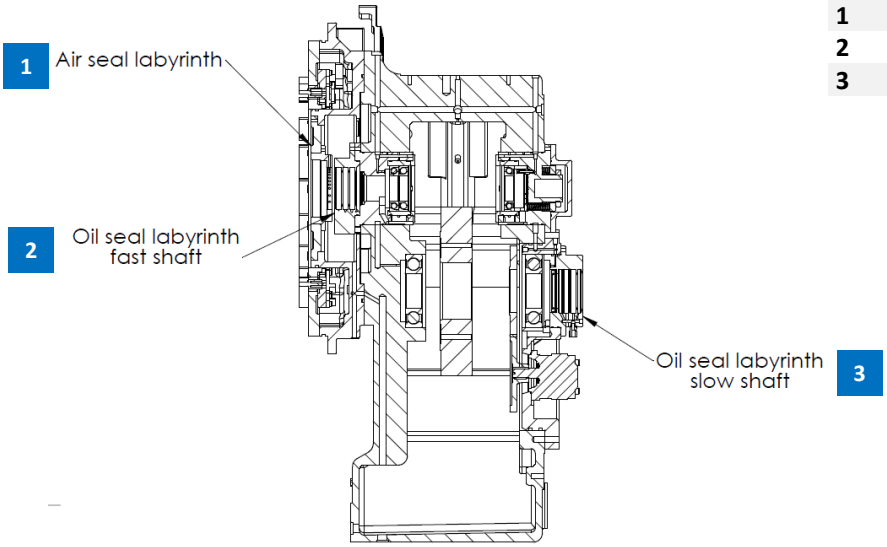


1	Impeller
2	Impeller nose
3	Impeller screw
4	Impeller hub
5	Pinion shaft
6	High speed bearings

The design of the rotor/ impeller system is an overhung design, with the impeller positioned at the end of the pinion shaft. The operation area is between the first and the second critical speed with sufficient buffer. The impeller is of material aluminum DIN3.1924 AlCu2MgNi, milled out of a solid forged raw material, the rotor is of material high tensile steel 16NiCrS4. The impeller is fitted to the rotor drive with hydraulically tensioned central screw and related rotor nut.

The rotor/ impeller is dynamically balanced during production. Only certified trained service personnel with the required special tooling should conduct the disassembly.

Air and Oil Sealing



1	Air seal labyrinth
2	Air seal labyrinth fast shaft
3	Air seal labyrinth slow shaft

Two types of sealing are present in the blower: the air sealing is of non-contact labyrinth type and made out of aluminum alloy. The oil sealing ring is made of aluminum alloy. The sealings are designed to prevent air and oil leakages out of the blower, thus guaranteeing oil free, efficient compression.

Clearances between the labyrinth and impeller lead to contact free operation; only minor running-in-wear might occur. The chambers of the sealing ring collect the lubricant and drains it back into the gearbox.

Diffuser Vanes and Inlet Guide Vanes

1

2

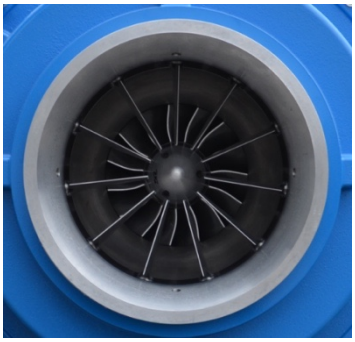
1	Diffuser 100% open
2	Diffuser 45/40% open
3	Inlet guide vanes 100% open
4	Inlet guide vanes 45% open

The regulation system type is with variable discharge diffusers. Airflow regulation between 100% to 40% where 100% is max designed airflow. Figure “1” with diffuser vanes open, Figure “2” with diffuser vanes close.

The variable diffuser vanes are made of brass alloy Cu3Zn2 and are aerodynamically shaped and designed to obtain the highest efficiency over the entire operating range.

The variable diffuser vanes are mounted in lubricated ball bearings.

The diffusers blades are driven by electrical actuator with limit switches, local position indicator and remote position transmitter. The actuator is powered by the local control panel which is to constantly monitor the diffuser position and adjusts the airflow according to the process requirements.



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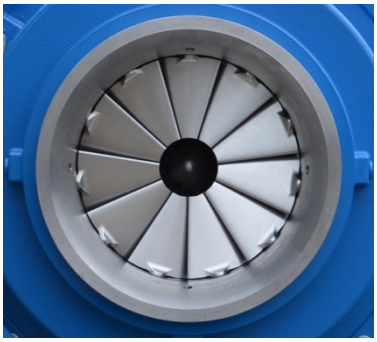


4

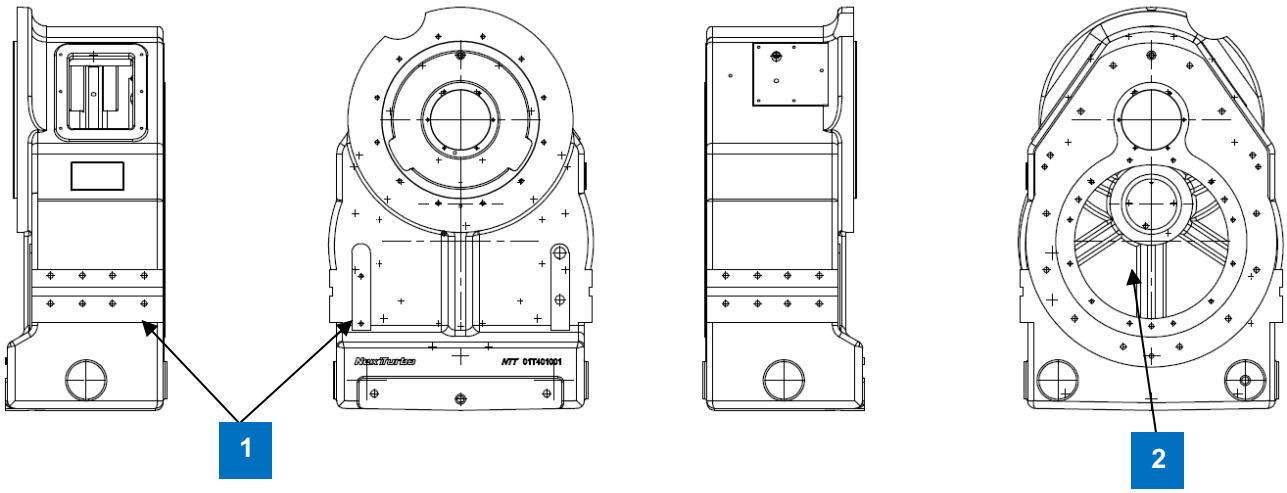
The IGV (Inlet guide vanes) is pre-rotating the air within a regulation between 100 to 40%.

The guide vanes are mounted in permanently lubricated sealed ball bearings, which is totally oil and grease free as well as being maintenance free.

The IGV is driven by electrical actuator with limit switches, local position indicator and remote position transmitter. The actuator is powered by the local control panel which is to constantly monitor its position and adjusts the angle according to actual conditions (inlet air temperature, differential pressure across the blower and diffuser position)

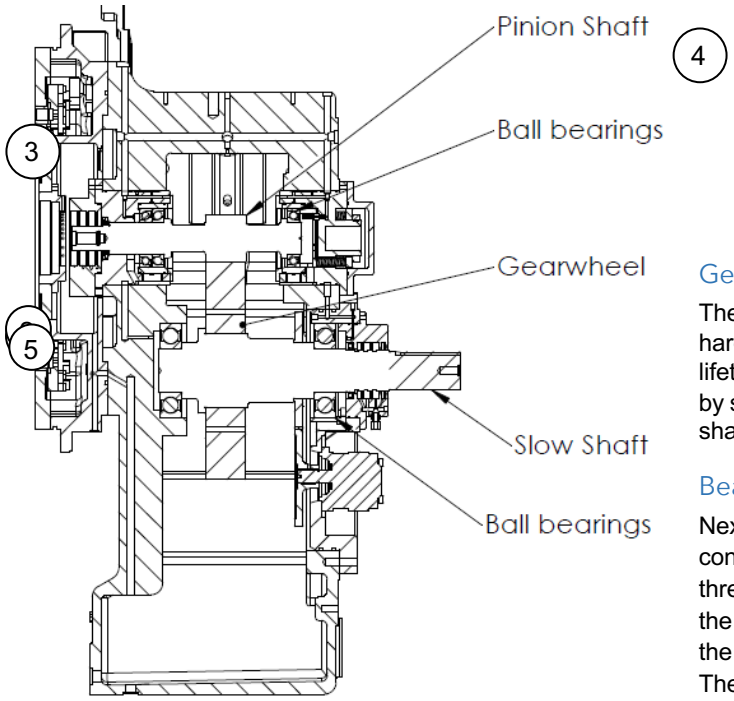
The inlet guide vanes are made of Ergal (aluminum alloy), milled from solid and aerodynamically shaped and designed to obtain the highest efficiency over the entire operating range

Gearbox



1	Main gearbox
2	Gear cover

In the Next Turbo gearbox, the pinion shaft bearing housings are located in the same casting. This design is increasing the centering precision of the bearings. The castings are made by Nodular cast iron EN-GJS400, design: 6.5 bar, 200℃, heat treated and machined. Figure 2 shows a dedicated opening for mounting of the complete slow shaft assembly.



1	Gearwheel
2	Slow shaft
3	Ball bearings fast shaft
4	Pinion shaft
5	Ball beatings slow shaft

Gearwheels and Shaft

The gearwheels are made of high tensile steel 16NiCrS4, hardened and precision ground in order to assure a long lifetime in heavy duty conditions. The input shaft is made by steel 34CrNiMo6 and the bull gear is shrunk on the slow shaft.

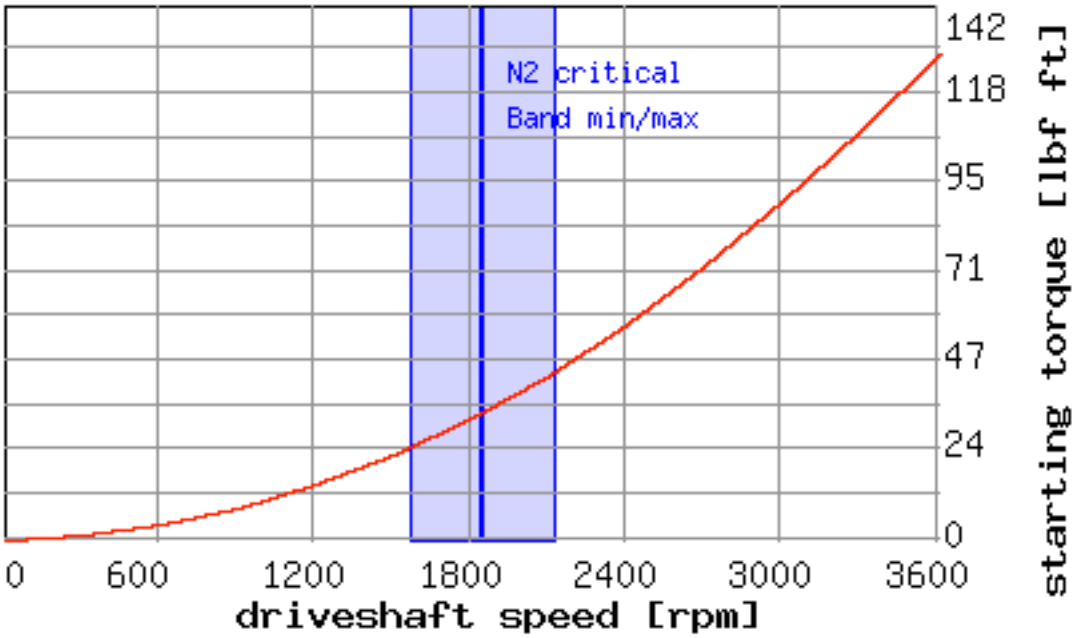
Bearings

Next Turbo utilizes only high precision hybrid angular contact ball bearings. The fast shaft is supported by two or three bearings, one or two behind the impeller and one on the opposite end. Two deep groove ball bearings support the slow shaft coupled with the motor shaft, one per side. The high-speed bearings are located in bearing housing with integrated oil spray channels.

Oil lubrication system

A mechanical oil pump driven by the slow shaft circulates the required lubricant to the bearings spray system and to the gearwheels.

Speed-Torque Curve



The starting torque curve is calculated using the following highest torque requirement conditions:

- Airflow turndown: 40%
- Actual Airflow: 1451 acfm
- Pressure rise: 8.7 psi(g)
- Barometric pressure: 14.7 psi(a)
- Temperature: -0.4 °F
- Relative humidity: 20%
- **Resulting maximum torque: 129 lbf*ft**
- **N2 critical: 1844 rpm**
  - Band min: 1567 rpm
  - Band max: 2121 rpm
- Polar moment of inertia Ip: 1.04 lbm*sec2*ft
- GD2: 4.17 lbm*sec2*ft

Next Turbo Americas
Kansas City, Missouri

Efficiency Optimization Using Inlet Guide Vanes And Variable Diffuser Vanes

Next Turbo type XY blowers have the capability of turndown from 100 to 40% of capacity utilizing inlet guide vanes (IGV) and variable diffusers (VD) in concert.

The use of only inlet guide vanes or variable diffuser vanes may be utilized to control airflow, but maximum efficiencies are achieved through a 2-point control algorithm applied to machines equipped with a combination of inlet guide vanes and variable diffusers (IGV/VD). Next Turbo uses variable diffuser vanes to control airflow and inlet guide vanes to control efficiency optimization.

Inlet Guide Vanes - The inlet guide vanes are located immediately in front of the impeller. These vanes serve to pre-rotate the air entering the impeller, reducing the amount of work actually done by the impeller and hence the power draw of the blower. The pre-rotation angle of the vanes is the result of the 2-point control algorithm built into the PLC CPU of each LCP. The algorithm constantly monitors the inlet air temperature, differential pressure across the blower and discharge diffuser position. In cases where the blower is operating below design head condition as a result of lower back pressure or lower inlet air temperature, this can reduce the work done (shaft HP) to match the work required and hence increase the blower's operating efficiency. Pre-rotation of air by the inlet guide vanes will actually reduce the power draw during periods of "off-design" operating conditions.

Variable Diffusers - Variable diffusers are a series of aerodynamic vanes around the discharge of the impeller that essentially act as an

extension of the impeller blades. The variable diffusers alter the radial component of the velocity of the air existing the impeller. Thus, rather than throttling, like the inlet guide vanes, the variable diffusers actually alter the flow direction of the air exiting the impeller. As a result, compressor efficiency is not significantly affected across the turndown range.

The direction of rotation, aerodynamic shape and spacing of the vanes are such that the capacity of the machine can be varied from 100% to approximately 40% with virtually no decrease of efficiency.

SPARE PARTS

Spare Parts supplied per 11378-3.05		
Item	**Quantity**	**Replacement**
Complete set of all bearings for blowers	1 set	Once a year
Complete set of o-rings, gaskets, and seals for the blowers	1 set	As needed
Actuator for Inlet Guide Vanes	1	As needed
Actuator for Variable Diffuser Vanes	1	As needed
One set of oil filter cartridges for each unit	4	As needed
One set of primary inlet air filters for each unit	4 set	As needed

Recommended Spare Parts		
Item	**Quantity**	**Tag**
Inlet Air Temperature Transmitter	1	TT100
Oil Temperature Transmitter	1	TT200
Surge Detector	1	PSH200
Actuator End Switches	Qty 2 VDV Qty 2 IGV	ZSO100 / ZSC101 ZSO104 / ZSC105

22.0989 Taunton – Special Tools List

Blower type GTB-T20XY

- Hydraulic Tensioner
- Hydraulic Tensioner Insert
- Impeller Extractor
- M8 eyebolts
- M10 eyebolts
- M12 eyebolts
- M16 eyebolts
- Various sizes of centering rods
- Various sizes of dismounting screws, nuts, and washers

DATA SHEET

MOTOR DATA SHEETS

Three Phase Induction Motor - Squirrel Cage

Customer	:	NEXT TURBO AMERICAS LLC
Sales document	:	134813788 - 10
Product line	:	W22 - Nema Premium Efficiency
Catalog #	:	Z20036ET3Q111522

Frame	:	445/7TSD	Locked rotor time	:	14 s (hot) 25 s (cold)
Output	:	200 HP (150 kW)	Temperature rise[4]	:	80 K
Poles	:	2	Duty cycle	:	Cont.(S1)
Frequency	:	60 Hz	Ambient temperature	:	-20 °C to +40 °C
Rated voltage	:	460 V	Altitude	:	1000 m.a.s.l
Rated current	:	219 A	Degree of protection	:	IP55
L. R. Amperes	:	1424 A	Cooling method	:	IC411 - TEFC
LRC (p.u.)	:	6.5	Mounting	:	F-2
No load current	:	45.0 A	Direct of rotation[1]	:	Both
Rated speed	:	3570 rpm	Noise level[2]	:	81.0 dB(A)
Slip	:	0.83 %	Vibration class	:	B
Rated torque	:	294 ft.lb	Starting method	:	Softstarter - current limitation
Locked rotor torque	:	210 %	Coupling	:	Direct
Pull up torque	:	175 %	Approx. weight[3]	:	2117 lb
Breakdown torque	:	230 %	Painting plan	:	203A
Insulation class	:	F	Color	:	RAL 5009
Service factor	:	1.15	Efficiency level	:	Nema Premium
Moment of inertia (J)	:	44.6 sq.ft.lb	Design	:	B

Output	Start	25%	50%	75%	100%	125%
Efficiency (%)	-	92.2	95.0	95.4	95.4	95.1
Power factor	0.36	0.67	0.86	0.89	0.90	0.87

Load type: -

Load torque: -

Load inertia (J=GD²/4): -

	Drive end	Non drive end
Bearing type	6314-C3	6314-C3
Lubrication interval	4000 h	4000 h
Lubricant amount	27 g	27 g
Lubricant type	MOBIL POLYREX EM	

Foundation loads

Maximum traction : 722 lb

Maximum compression : 2839 lb

Notes:

CERTIFIED
WEG MOTORES
Certified document.
Not subject to changes.

Losses at normative operating points (speed;torque), in percentage of rated output power

P1 (0,9;1,0)	P2 (0,5;1,0)	P3 (0,25;1,0)	P4 (0,9;0,5)	P5 (0,5;0,5)	P6 (0,5;0,25)	P7 (0,25;0,25)
4.8	3.5	3.0	2.7	1.5	1.0	0.5

Standards

Specification	: MG1 - Part 10	Vibration	: MG1 - Part 7
Tests	: MG1 - Part 12	Tolerance	: MG1 - Part 12
Noise	: MG1 - Part 9		

This revision replaces and cancels the previous one, which must be eliminated.

(1) When viewed from the drive end.

(2) Measured at 1m and with tolerance of +3dB(A).

(3) Approximate weight subject to changes after manufacturing process.

(4) At the rated point.

These are average values based on tests with sinusoidal power supply, subject to the tolerances stipulated in NEMA MG 1-12.

Rev.	Summary of changes	Performed	Checked	Date

Performed by	yasmim	281025/2022	
Checked by	AUTOMATICO	Page	Revision
Date	24/11/2022	1/2	2

DATA SHEET

Three Phase Induction Motor - Squirrel Cage

Customer : NEXT TURBO AMERICAS LLC

Sales document : 134813788 - 10

Product line : W22 - Nema Premium Efficiency

Catalog # : Z20036ET3Q111522

Thermal protection

ID	Application	Type	Quantity	Switching temperature
01	Winding	PT100 - 3 Wires	2 x Phase	-
02	Drive end	PT100 - 3 Wires	1 x Bearing	-
03	Non drive end	PT100 - 3 Wires	1 x Bearing	-

Space heater information

Voltage: 110-127/200-240 V
Output: 117-156/115-166 W

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WEG MOTORES
Certified document.
Not subject to changes.

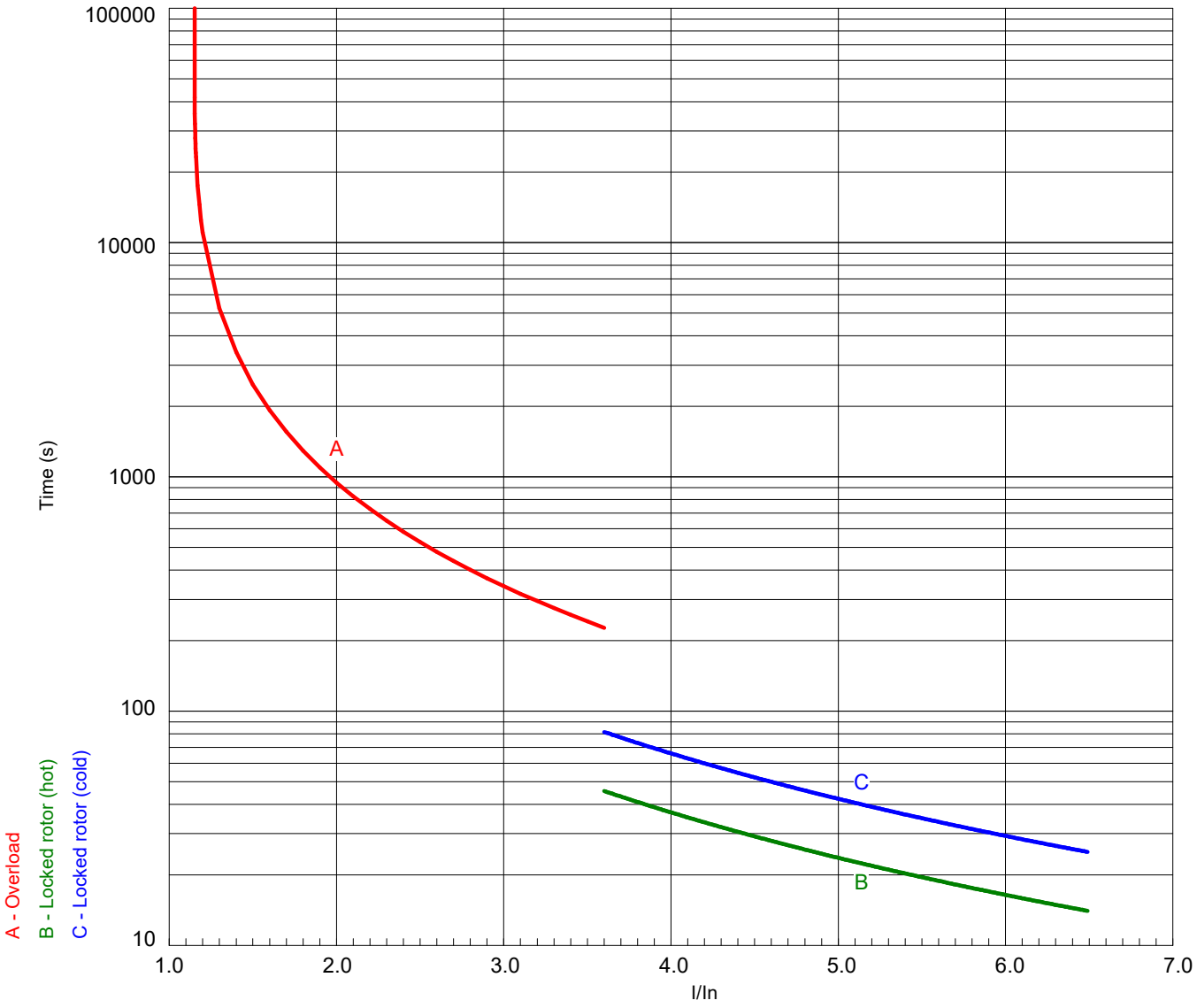
Rev.	Summary of changes	Performed	Checked	Date

Performed by	yasmim		281025/2022	
Checked by	AUTOMATICO		Page	Revision
Date	24/11/2022		2/2	2

THERMAL LIMIT CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:	NEXT TURBO AMERICAS LLC
Sales document	:	134813788 - 10
Product line	:	W22 - Nema Premium Efficiency
Catalog #	:	Z20036ET3Q111522



Performance	:	200 HP (150 kW) 460 V 60 Hz 2P 445/7TSD			
Rated current	:	219 A	Moment of inertia (J)	:	44.6 sq.ft.lb
LRC (p.u.)	:	6.5	Duty cycle	:	Cont.(S1)
Rated torque	:	294 ft.lb	Insulation class	:	F
Locked rotor torque	:	210 %	Service factor	:	1.15
Breakdown torque	:	230 %	Temperature rise	:	80 K
Rated speed	:	3570 rpm	Design	:	B
Heating constant	:	45.8 min			
Cooling constant	:	137.4 min			

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Rev.	Summary of changes	Performed	Checked	Date

Performed by	yasmim		281025/2022	
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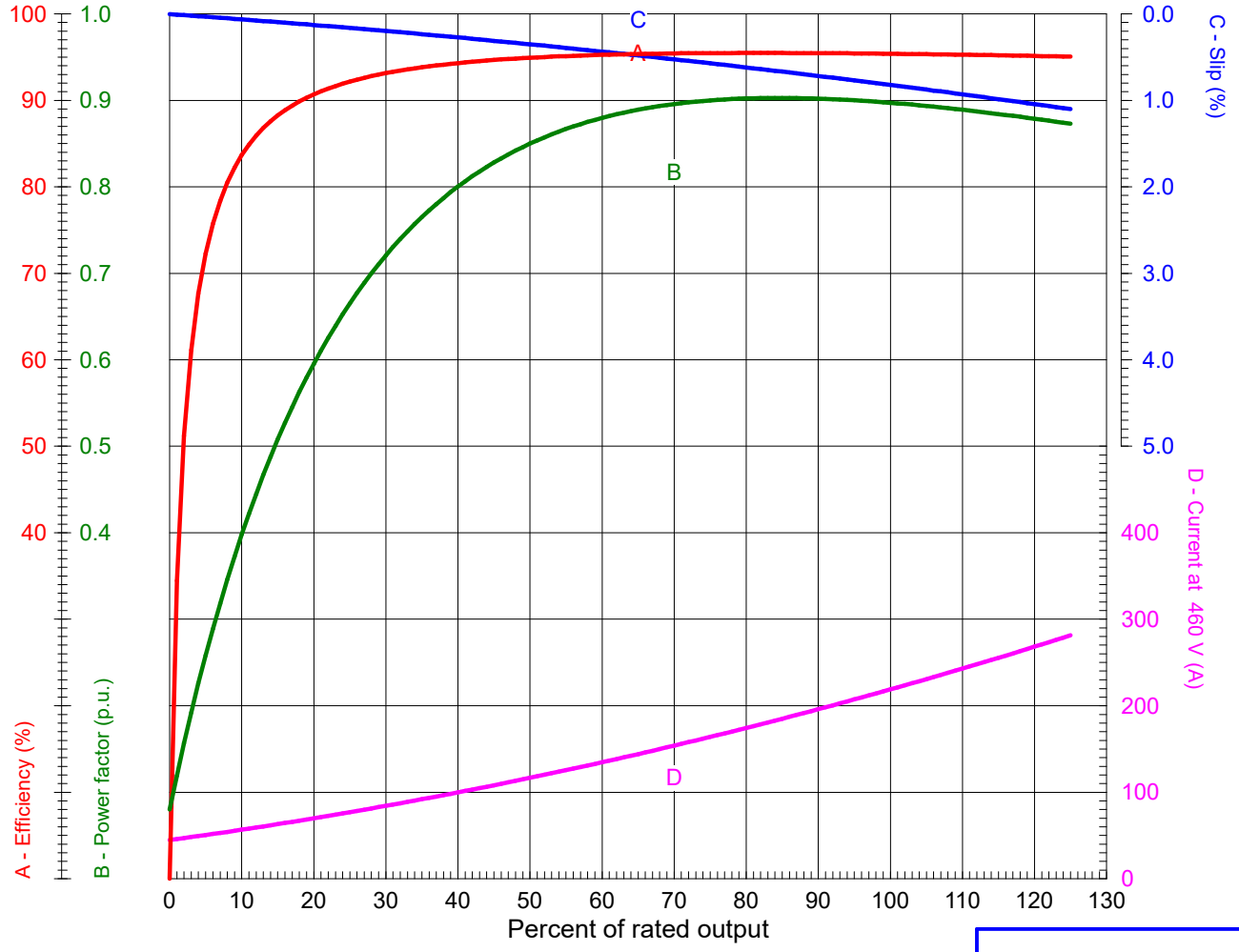
LOAD PERFORMANCE CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	: NEXT TURBO AMERICAS LLC		
Sales document	: 134813788 - 10		
Product line	: W22 - Nema Premium Efficiency	Catalog #	: Z20036ET3Q111522



CERTIFIED
WEG MOTORES
Certified document.
Not subject to changes.

Performance	: 200 HP (150 kW) 460 V 60 Hz 2P 445/7TSD		
Rated current	: 219 A	Moment of inertia (J)	: 44.6 sq.ft.lb
LRC (p.u.)	: 6.5	Duty cycle	: Cont.(S1)
Rated torque	: 294 ft.lb	Insulation class	: F
Locked rotor torque	: 210 %	Service factor	: 1.15
Breakdown torque	: 230 %	Temperature rise	: 80 K
Rated speed	: 3570 rpm	Design	: B

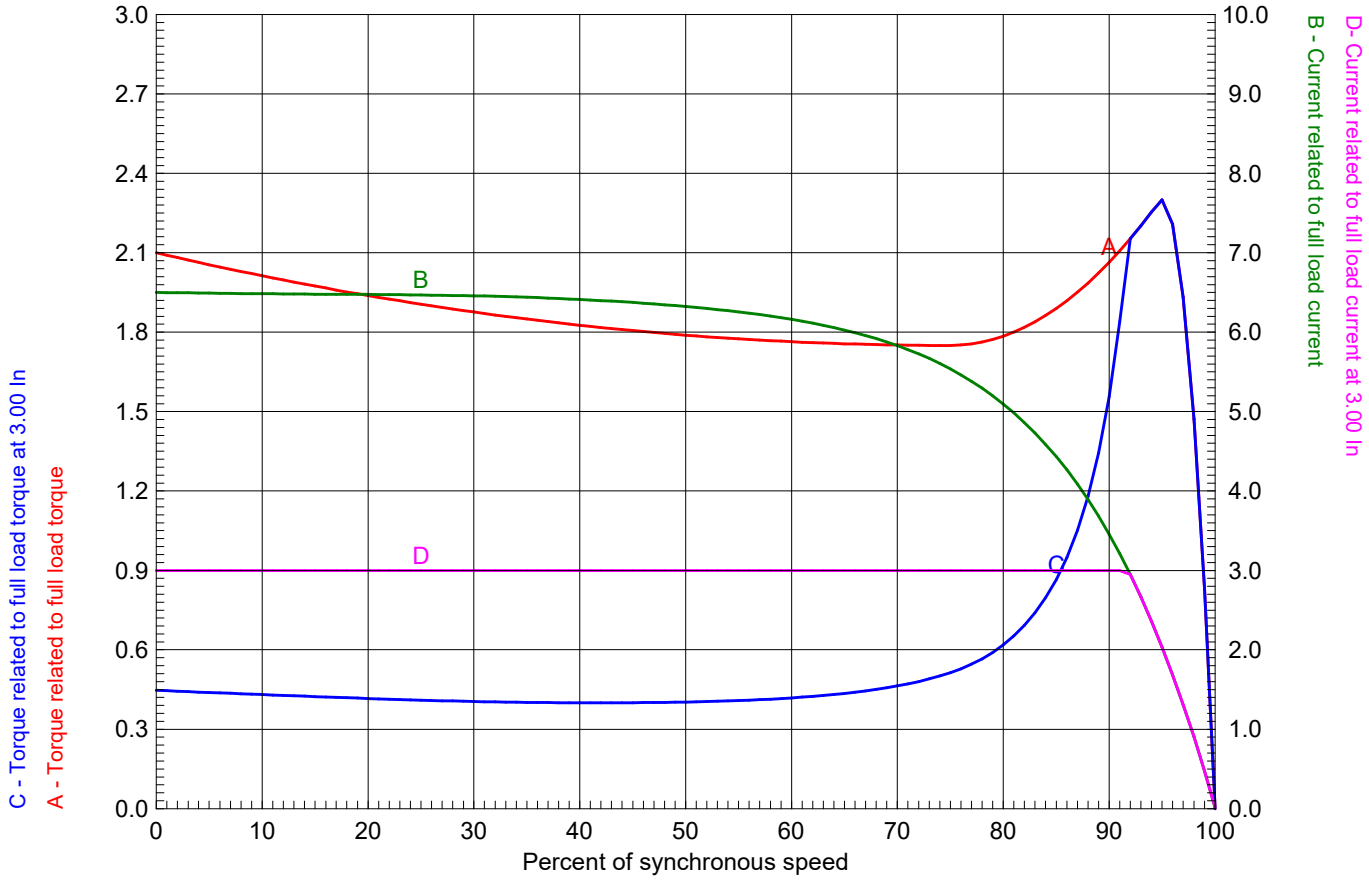
Rev.	Summary of changes	Performed	Checked	Date

Performed by	yasmim		281025/2022	
Checked by	AUTOMATICO		Page	Revision
Date	24/11/2022		1/1	2

TORQUE AND CURRENT X SPEED CURVE

Three Phase Induction Motor - Squirrel Cage

Customer	:	NEXT TURBO AMERICAS LLC
Sales document	:	134813788 - 10
Product line	:	W22 - Nema Premium Efficiency
Catalog #	:	Z20036ET3Q111522



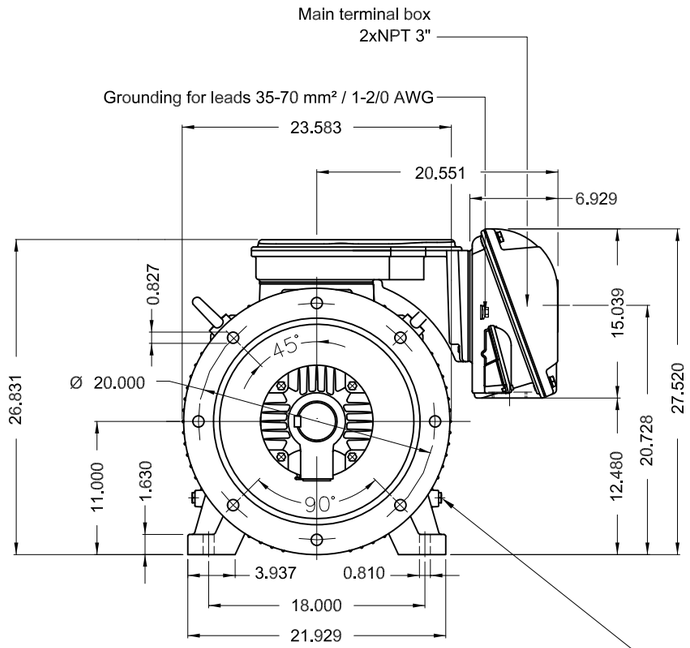
CERTIFIED
WEG MOTORES
Certified document.
Not subject to changes.

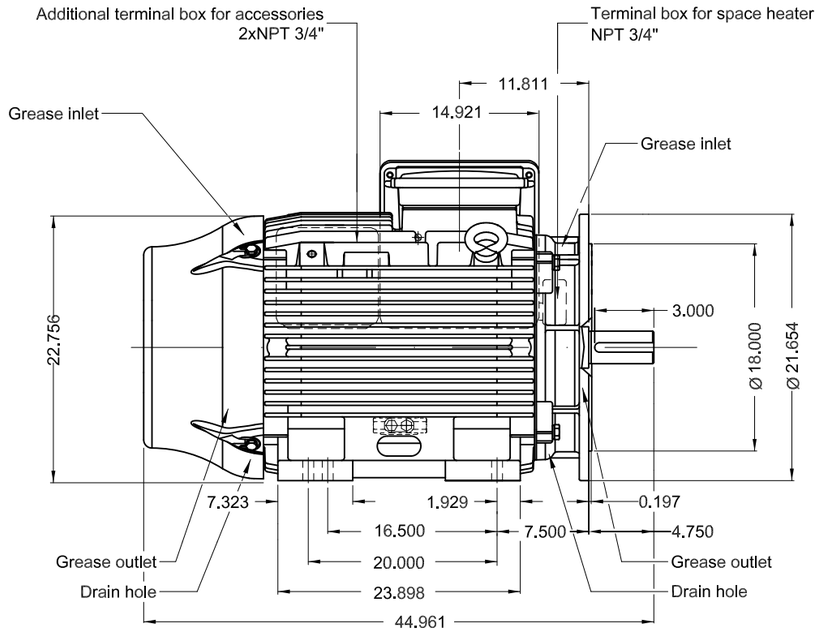
Performance	:	200 HP (150 kW) 460 V 60 Hz 2P 445/7TSD			
Rated current	:	219 A	Moment of inertia (J)	:	44.6 sq.ft.lb
LRC (p.u.)	:	6.5	Duty cycle	:	Cont.(S1)
Rated torque	:	294 ft.lb	Insulation class	:	F
Locked rotor torque	:	210 %	Service factor	:	1.15
Breakdown torque	:	230 %	Temperature rise	:	80 K
Rated speed	:	3570 rpm	Design	:	B

Locked rotor time 100%	:	14 s (hot) 25 s (cold)
Allowable run up time 100%	:	11 s (hot) 20 s (cold)
Locked rotor time SS	:	66 s (hot) 117 s (cold)
Allowable run up time SS	:	53 s (hot) 94 s (cold)
Load inertia (J=GD²/4)	:	44.61 sq.ft.lb

Rev.	Summary of changes	Performed	Checked	Date

Performed by	yasmim		281025/2022	
Checked by	AUTOMATICO		Page	Revision
Date	24/11/2022		1/1	2

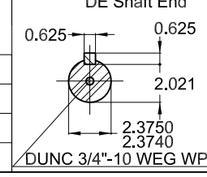




Grounding for leads 25-185 mm² / 3AWG-350MCM

Winding thermal protection - PT100 (2 per phase - 3 wires)
Space heaters 110-127 V / 200-240 V
Bearings thermal protection - PT100 (1 per bearing - 3 wires)
Color RAL 5009
Painting plan 203A
Mounting NEMA F-2
Mounting B35L(E)

DE Shaft End



DUNC 3/4"-10 WEG WPR-7339

200 HP 02 Poles 60 Hz | A

NEXT TURBO AMERICAS LLC

ECM	LOC	SUMMARY OF MODIFICATIONS	EXECUTED	CHECKED	RELEASED	DATE	VER
		For Approval	PIRWBUSER	NHAMMOUD	NHAMMOUD	27.09.2022	00

EXECUTED	PIRWBUSER	THREE PHASE W22 MOTOR - NEMA PREMIUM EFF	1310785126
CHECKED	NHAMMOUD	FRAME 445/7TSD IP55 TEFC	WDD 00
RELEASED	NHAMMOUD		
REL. DATE	27.09.2022	WEG DULUTH Product Engineering	SHEET 1 / 1

ZME A3

Dimensions in inches

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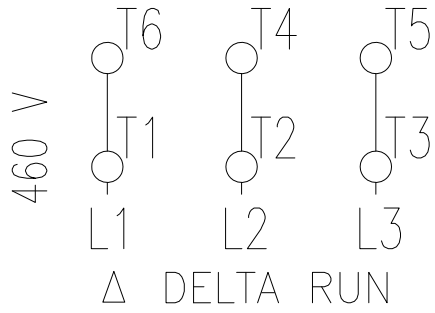
THIS IS AN UPDATED REVISION, THE PREVIOUS ONE MUST BE DISREGARDED.



		ORIGINAL ISSUE	JESSICA	DIEGO	CASTELLA	28.08.2014	00
ECM *ECM*	LOC *LOC*	RESUMO MODIFICAÇÃO *SUMMARY OF MODIFICATIONS*	EXECUTADO *EXECUTED*	VERIFICADO *CHECKED*	LIBERADO *RELEASED*	DATA *DATE*	VER *VER*

EXEC. /*EXECUTED*	JESSICA	LOW VOLTAGE - CONNECTION DIAGRAM	460/6
VERIF. /*CHECKED*	DIEGO	460V	NEMA 00
LIBER. /*RELEASED*	CASTELLA	MOTOR WITH 06 CABLES	
DATA LB /*REL DT*	28.08.2014	WMO JARAGUÁ DO SUL VENDAS TÉCNICAS	FOLHA /*SHEET* 1 / 1

A4

Manual geral de instalação, operação e manutenção de motores elétricos

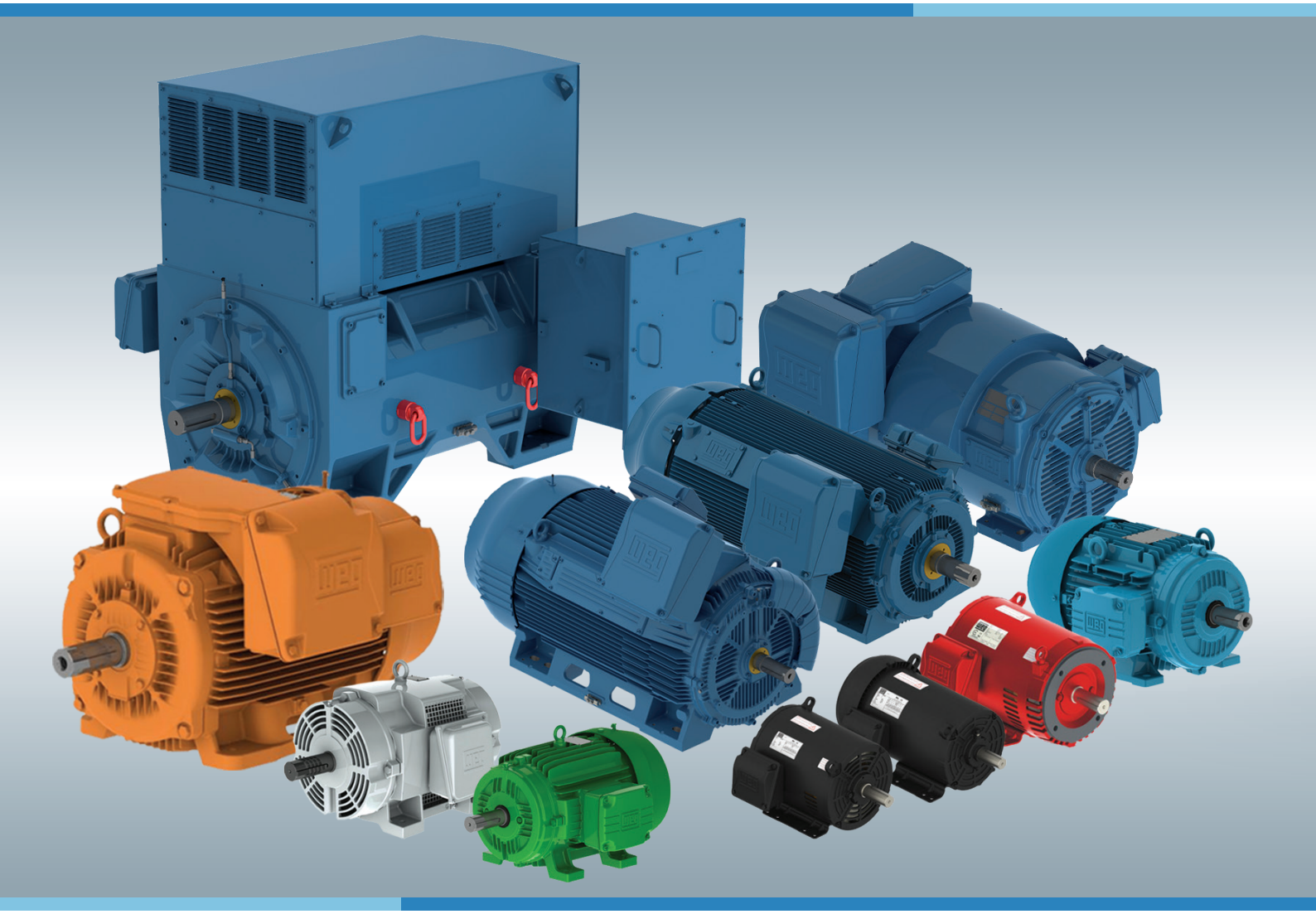
PT

Installation, operation and maintenance manual of electric motors

EN

Manual general de instalación, operación y mantenimiento de motores eléctricos

ES



Motors | Automation | Energy | Transmission & Distribution | Coatings

INSTALLATION, OPERATION AND MAINTENANCE MANUAL OF ELECTRIC MOTORS

This manual provides information about WEG induction motors fitted with squirrel cage, permanent magnet or hybrid rotors, low, medium and high voltage, in frame sizes IEC 56 to 630 and NEMA 42 to 9606/10.
The motor lines indicated below have additional information that can be checked in their respective manuals:

- Smoke Extraction Motors;
- Electromagnetic Brake Motors;
- Hazardous Area Motors.

These motors meet the following standards, if applicable:

- NBR 17094-1: Máquinas Elétricas Girantes - Motores de Indução - Parte 1: trifásicos.
- NBR 17094-2: Máquinas Elétricas Girantes - Motores de Indução - Parte 2: monofásicos.
- IEC 60034-1: Rotating Electrical Machines - Part 1: Rating and Performance.
- NEMA MG 1: Motors and Generators.
- CSA C 22.2 N°100: Motors and Generators.
- UL 1004-1: Rotating Electrical Machines - General Requirements.

If you have any questions regarding this manual please contact your local WEG branch, contact details can be found at www.weg.net.

TABLE OF CONTENTS

1. TERMINOLOGY

Balancing: the procedure by which the mass distribution of a rotor is checked and, if necessary, adjusted to ensure that the residual unbalance or the vibration of the journals and/or forces on the bearings at a frequency corresponding to service speed are within specified limits in International Standards.
[ISO 1925:2001, definition 4.1]

Balance quality grade: indicates the peak velocity amplitude of vibration, given in mm/s, of a rotor running free-in-space and it is the product of a specific unbalance and the angular velocity of the rotor at maximum operating speed.

Grounded Part: metallic part connected to the grounding system.

Live Part: conductor or conductive part intended to be energized in normal operation, including a neutral conductor.

Authorized personnel: employee who has formal approval of the company.

Qualified personnel: employee who meets the following conditions simultaneously:
- Receives training under the guidance and responsibility of a qualified and authorized professional;
- Works under the responsibility of a qualified and approved professional.

Note*: The qualification is only valid for the company that trained the employee in the conditions set out by the authorized and qualified professional responsible for training.*

2. INITIAL RECOMMENDATIONS

Electric motors have energized circuits, exposed rotating parts and hot surfaces that may cause serious injury to people during normal operation. Therefore, it is recommended that transportation, storage, installation, operation and maintenance services are always performed by qualified personnel.
Also the applicable procedures and relevant standards of the country where the machine will be installed must be considered.
Noncompliance with the recommended procedures in this manual and other references on the WEG website may cause severe personal injuries and/or substantial property damage and may void the product warranty.

For practical reasons, it is not possible to include in this Manual detailed information that covers all construction variables nor covering all possible assembly, operation or maintenance alternatives.
This Manual contains only the required information that allows qualified and trained personnel to carry out their services. The product images are shown for illustrative purpose only.

For *Smoke Extraction Motors*, please refer to the additional instruction manual 50026367 available on the website www.weg.net.

For brake motors, please refer to the information contained in WEG 50021973 brake motor manual available on the website www.weg.net.

For information about permissible radial and axial shaft loads, please check the product technical catalogue.

The user is responsible for the correct definition of the installation environment and application characteristics.

During the warranty period, all repair, overhaul and reclamation services must be carried out by WEG authorized Service Centers to maintain validity of the warranty.

2.1. WARNING SYMBOL

Warning about safety and warranty.

2.2. RECEIVING INSPECTION

All motors are tested during the manufacturing process.
The motor must be checked when received for any damage that may have occurred during the transportation. All damages must be reported in writing to the transportation company, to the insurance company and to WEG. Failure to comply with such procedures will void the product warranty.
You must inspect the product:

- Check if nameplate data complies with the purchase order;
- Remove the shaft locking device (if any) and rotate the shaft by hand to ensure that it rotates freely. The shaft might not rotate freely in WMagnet and WQuattro motors, due to alignment torque from the magnets. It might be necessary to use a lever;

When rotating the shaft, it is necessary to certify that the terminals are insulated to eliminate the risc of electric shock from induced voltage.

- Check that the motor has not been exposed to excessive dust and moisture during the transportation.

Do not remove the protective grease from the shaft, or the plugs from the cable entries. These protections must remain in place until the installation has been completed.

2.3. NAMEPLATES

The nameplate contains information that describes the construction characteristics and the performance of the motor. Figure 2.1 and Figure 2.2 show nameplate layout examples.

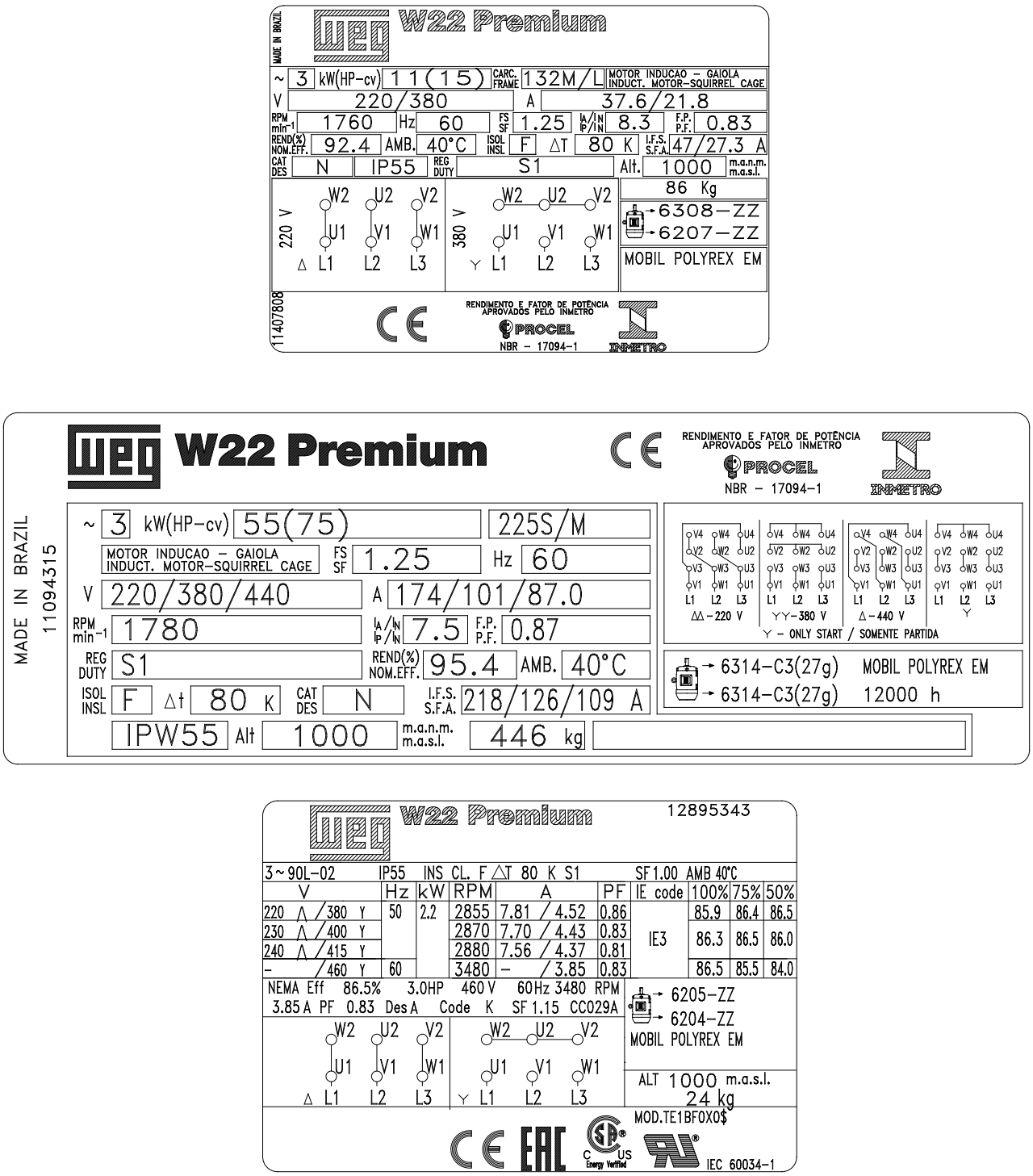
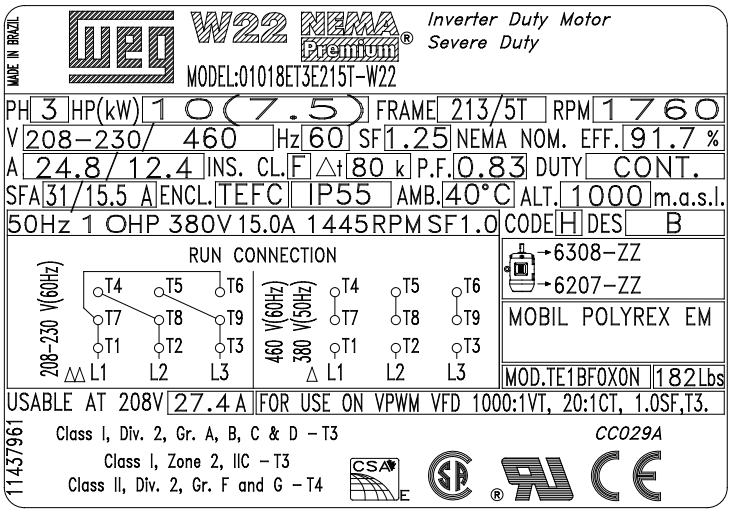
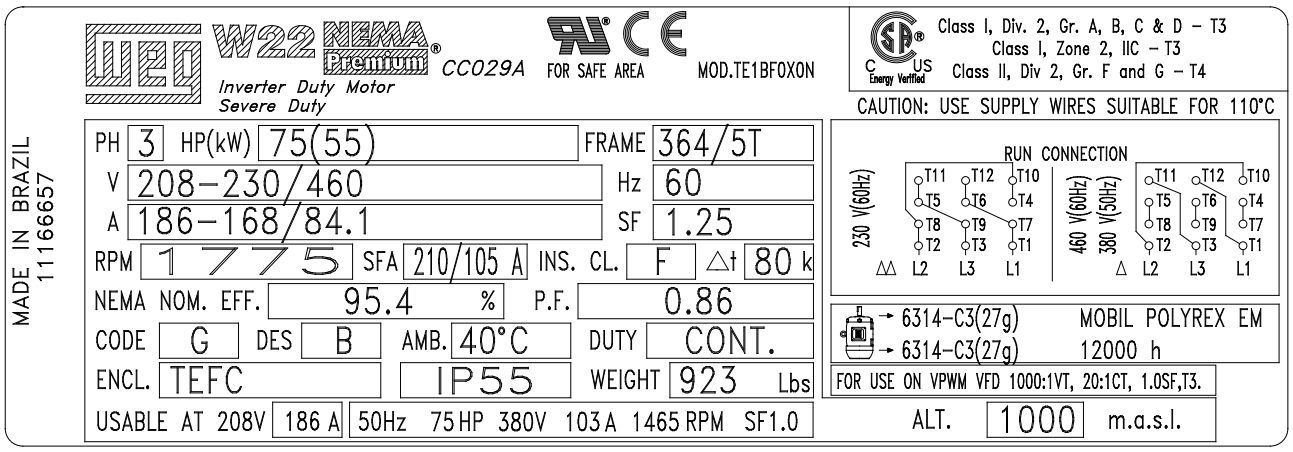


Figure 2.1 *- IEC motor nameplate*

ENGLISH

Figure 2.1 *- IEC motor nameplate*





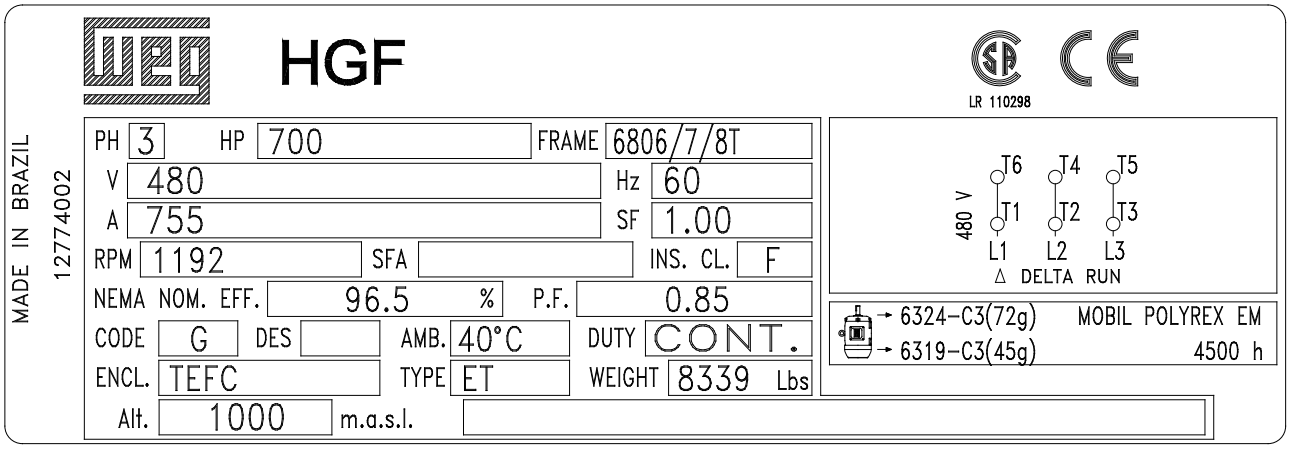


Figure 2.2 - *NEMA motor nameplate*

ENGLISH

3. SAFETY INSTRUCTIONS

The motor must be disconnected from the power supply and be completely stopped before conducting any installation or maintenance procedures. Additional measures should be taken to avoid accidental motor starting.

Professionals working with electrical installations, either in the assembly, operation or maintenance, should use proper tools and be instructed on the application of standards and safety requirements, including the use of Personal Protective Equipment (PPE) that must be carefully observed in order to reduce risk of personal injury during these services.

Electric motors have energized circuits, exposed rotating parts and hot surfaces that may cause serious injury to people during normal operation. It is recommended that transportation, storage, installation, operation and maintenance services are always performed by qualified personnel.

Pacemaker users and unqualified personnel shall not open WMagnet and WQuattro motors, because high energy magnets are used.

Always follow the safety, installation, maintenance and inspection instructions in accordance with the applicable standards in each country.

4. HANDLING AND TRANSPORT

Individually packaged motors should never be lifted by the shaft or by the packaging. They must be lifted only by means of the eyebolts, when supplied. Use always suitable lifting devices to lift the motor. Eyebolts on the frame are designed for lifting the machine weight only as indicated on the motor nameplate. Motors supplied on pallets must be lifted by the pallet base with lifting devices fully supporting the motor weight.
The package should never be dropped. Handle it carefully to avoid bearing damage.

Eyebolts provided on the frame are designed for lifting the machine only. Do not use these eyebolts for lifting the motor with coupled equipment such as bases, pulleys, pumps, reducers, etc..

Never use damaged, bent or cracked eyebolts. Always check the eyebolt condition before lifting the motor.

Eyebolts mounted on components, such as on end shields, forced ventilation kits, etc. must be used for lifting these components only. Do not use them for lifting the complete machine set.

Handle the motor carefully without sudden impacts to avoid bearing damage and prevent excessive mechanical stresses on the eyebolts resulting in its rupture.

Do not handle the motors by the polymeric components: fan cover, terminal box and / or terminal box cover.

To move or transport motors with cylindrical roller bearings or angular contact ball bearings, use always the shaft locking device provided with the motor.
All HGF, W50 and W60 motors, regardless of bearing type, must be transported with shaft locking device fitted.
Vertical mounted motors with oil-lubricated bearings must be transported in the vertical position. If necessary to move or transport the motor in the horizontal position, install the shaft locking device on both sides (drive end and non-drive end) of the motor.

4.1. LIFTING

Before lifting the motor ensure that all eyebolts are tightened properly and the eyebolt shoulders are in contact with the base to be lifted, as shown in Figure 4.1. Figure 4.2 shows an incorrect tightening of the eyebolt.
Ensure that lifting machine has the required lifting capacity for the weight indicated on the motor nameplate.

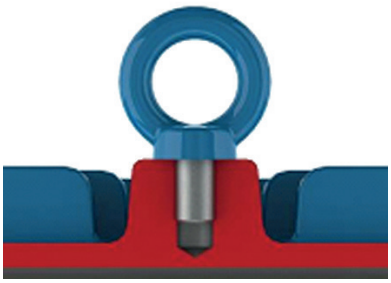


Figure 4.1 *- Correct tightening of the eyebolt*

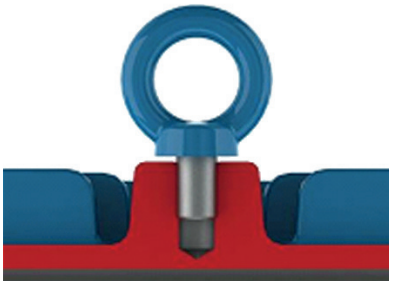


Figure 4.2 *- Incorrect tightening of the eyebolt*

The center-of-gravity may change depending on motor design and accessories. During the lifting procedures the maximum allowed angle of inclination should never be exceeded as specified below.

4.1.1. Horizontal motors with one eyebolt

For horizontal motors fitted with only one eyebolt, the maximum allowed angle-of-inclination during the lifting process should not exceed 30º in relation to the vertical axis, as shown in Figure 4.3.

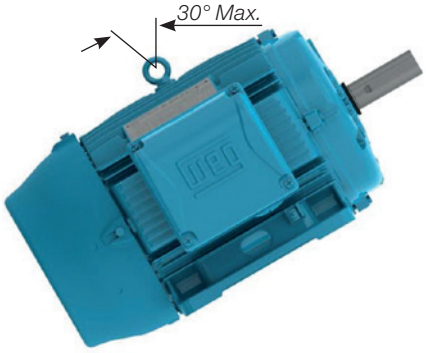


Figure 4.3 *- Maximum allowed angle-of-inclination for motor with one eyebolt*

4.1.2. Horizontal motor with two eyebolts

When motors are fitted with two or more eyebolts, all supplied eyebolts must be used simultaneously for the lifting procedure.

There are two possible eyebolt arrangements (vertical and inclined), as shown below:

- For motors with vertical lifting eyebolts, as shown in Figure 4.4, the maximum allowed lifting angle should not exceed 45° in relation to the vertical axis. We recommend to use a spreader beam for maintaining the lifting elements (chain or rope) in vertical position and thus preventing damage to the motor surface;

Figure 4.4 *- Maximum resulting angle for motors with two or more lifting eyebolts*

- For HGF, W40 and W50 motors, as shown in Figure 4.5, the maximum resulting angle should not exceed 30° in relation to the vertical axis;

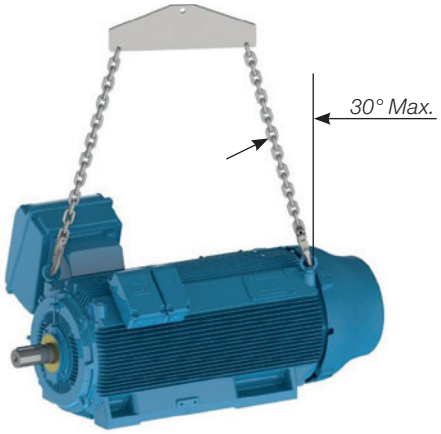


Figure 4.5 *- Maximum resulting angle for horizontal HGF, W40 and W50 motors*

For W60 motors, as shown in Figure 4.6, the use of a spreader beam is required for maintaining the lifting elements (chain or rope) in vertical position and thus preventing damage to the motor surface.

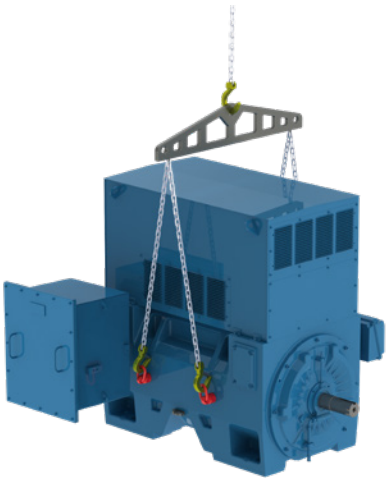


Figure 4.6 *- Lifting for W60 motors with paralel chains*

- For motors fitted with inclined eyebolts, as shown in Figure 4.7, the use of a spreader beam is required for maintaining the lifting elements (chain or rope) in vertical position and thus preventing damage to the motor surface.

Figure 4.7 *- Use of a spreader beam for lifting*

4.1.3. Vertical motors

For vertical mounted motors, as shown in Figure 4.8, the use of a spreader beam is required for maintaining the lifting element (chain or rope) in vertical position and thus preventing damage to the motor surface.

Figure 4.8 *- Lifting of vertical mounted motors*

Always use the eyebolts mounted on the top side of the motor, diametrically opposite, considering the mounting position. See Figure 4.9.

Figure 4.9 *- Lifting of HGF and W50 motors.*

4.1.3.1. Procedures to place W22 motors in the vertical position

For safety reasons during the transport, vertical mounted Motors are usually packed and supplied in horizontal position.
To place W22 motors fitted with eyebolts (see Figure 4.7), to the vertical position, proceed as follows:

1. Ensure that the eyebolts are tightened properly, as shown in Figure 4.1;
2. Remove the motor from the packaging, using the top mounted eyebolts, as shown in Figure 4.10;

Figure 4.10 *- Removing the motor from the packaging*

3. Install a second pair of eyebolts, as shown in Figure 4.11;

Figure 4.11 *- Installation of the second pair of eyebolts*

4. Reduce the load on the first pair of eyebolts to start the motor rotation, as shown in Figure 4.12. This procedure must be carried out slowly and carefully.

Figure 4.12 *- End result: motor placed in vertical position*

These procedures will help you to move motors designed for vertical mounting. These procedures are also used to place the motor from the horizontal position into the vertical position and vertical to horizontal.

4.1.3.2. Procedures to place HGF and W50 motors in the vertical position

HGF motors are fitted with eight lifting points: four at drive end and four at non-drive end. W50 motors are fitted with nine lifting points: four at drive end, one in the central part and four at non-drive end. The motors are usually transported in horizontal position, however for the installation they must be placed in the vertical position.
To place an these motors in the vertical position, proceed as follows:

1. Lift the motor by using the four lateral eyebolts and two hoists, see Figure 4.13;

Figure 4.13 *- Lifting of HGF and W50 motors with two hoists*

2. Lower the hoist fixed to motor drive end while lifting the hoist fixed to motor non-drive end until the motor reaches its equilibrium, see Figure 4.14;

Figure 4.14 *- Placing HGF and W50 motors in vertical position*

3. Remove the hoist hooks from the drive end eyebolts and rotate the motor 180° to fix the removed hooks into the two eyebolts at the motor non-drive end, see Figure 4.15;

Figure 4.15 *- Lifting HGF and W50 motors by the eyebolts at the non-drive end*

4. Fix the removed hoist hooks in the other two eyebolts at the non-drive end and lift the motor until the vertical position is reached, see Figure 4.16.

Figure 4.16 *- HGF and W50 motors in the vertical position*

These procedures will help you to move motors designed for vertical mounting. These procedures are also used to place the motor from the horizontal position into the vertical position and vertical to horizontal.

4.2 Procedures to place W22 vertical mount motors in horizontal position

To place W22 vertical mount motor in horizontal position, proceed as follows:

1. Ensure that all eyebolts are tightened properly, as shown in Figure 4.1;

2. Install the first pair of eyebolts and lift the motor as shown in Figure 4.17;

Figure 4.17 - *Install the first pair of eyebolts*

3. Install the second pair of eyebolts, as shown in Figure 4.18;

Figure 4.18 - *Install the second pair of eyebolts*

4. Reduce the load on the first pair of eyebolts for rotating the motor, as shown in Figure 4.19. This procedure must be carried out slowly and carefully;

Figure 4.19 - *Motor is being rotated to horizontal position*

5. Remove the first pair of eyebolts, as shown in Figure 4.20.

Figure 4.20 - *Final result: motor placed in horizontal position*

5. STORAGE

If the motor is not installed immediately, it must be stored in a dry and clean environment, with relative humidity not exceeding 60%, with an ambient temperature between 5 ºC and 40 ºC, without sudden temperature changes, free of dust, vibrations, gases or corrosive agents. The motor must be stored in horizontal position, unless specifically designed for vertical operation, without placing objects on it. Do not remove the protection grease from shaft end to prevent rust.

If the motor are fitted with space heaters, they must always be turned on during the storage period or when the installed motor is out of operation. Space heaters will prevent water condensation inside the motor and keep the winding insulation resistance within acceptable levels. Store the motor in such position that the condensed water can be easily drained. If fitted, remove pulleys or couplings from the shaft end (more information are given on item 6).

The space heaters should never be energized when the motor is in operation.

5.1. EXPOSED MACHINED SURFACES

All exposed machined surfaces (like shaft end and flange) are factory-protected with temporary rust inhibitor. A protective film must be reapplied periodically (at least every six months), or when it has been removed and/or damaged.

5.2. STORAGE

The stacking height of the motor packaging during the storage period should not exceed 5 m, always considering the criteria indicated in Table 5.1:

Table 5.1 *- Max. recommended stacking height*

Packaging type	Frame sizes	Maximum stacking quantity
Cardboard box	IEC 56 to 132 NEMA 143 to 215	Indicated on the top side of the cardboard box
Wood crate	IEC 56 to 315 NEMA 48 to 504/5	06
	IEC 355 NEMA 586/7 and 588/9	03
	W40 / W50 / W60 / HGF IEC 315 to 630 W40 / W50 / HGF NEMA 5000 to 9600	Indicated on the packaging

Notes:
1) Never stack larger packaging onto smaller packaging;
2) Align the packaging correctly (see Figure 5.1 and Figure 5.2);

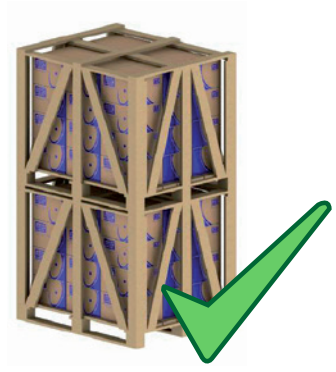


Figure 5.1 *- Correct stacking*

Figure 5.2 *- Incorrect stacking*

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3) The feet of the crates above should always be supported by suitable wood battens (Figure 5.3) and never stand on the steel tape or without support (Figure 5.4);

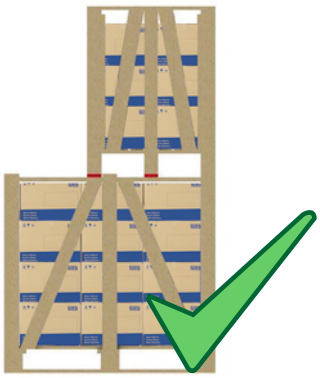


Figure 5.3 - Correct stacking

Figure 5.4 - Incorrect stacking

4) When stacking smaller crates onto longer crates, always ensure that suitable wooden supports are provided to withstand the weight (see Figure 5.5). This condition usually occurs with motor packaging above IEC 225S/M (NEMA 364/5T) frame sizes.

***Figure 5.5** - Use of additional battens for stacking*

5.3 BEARINGS

5.3.1 Grease lubricated bearings

We recommend rotating the motor shaft at least once a month (by hand, at least five revolutions, stopping the shaft at a different position from the original one). The shaft might not rotate freely in WMagnet and WQuattro motors, due to alignment torque from the magnets. It might be necessary to use a lever.

When rotating the shaft, it is necessary to certify that the terminals are insulated to eliminate the risc of electric shock from induced voltage.

If the motor is fitted with shaft locking device, remove it before rotating the shaft and install it again before performing any handling procedure.
Vertical motors may be stored in the vertical or in horizontal position. If motors with open bearings are stored longer than six months, the bearings must be relubricated according to item 8.2 before commissioning of the motor.
If the motor is stored for longer than 2 years, the bearings must be replaced or removed, washed, inspected and relubricated according to item 8.2.

5.3.2 Oil lubricated bearings

The motor must be stored in its original operating position and with oil in the bearings. Correct oil level must be ensured. It should be in the center of the sight glass.
During the storage period, remove the shaft locking device and rotate the shaft by hand every month, at least five revolutions, thus achieving an even oil distribution inside the bearing and maintaining the bearing in good operating conditions. Reinstall the shaft locking device every time the motor has to be moved.
If the motor is stored for a period equal or longer than the oil change interval, the oil must be replaced according to Item 8.2, before starting the operation. If the motor is stored for a period of over two years, the bearings must be replaced or removed, washed according to manufacturer instructions, checked and relubricated according to Item 8.2. The oil of vertical mounted motors is removed to prevent oils leaks during the transport. After receiving the motor the bearings must be lubricated.

5.3.3 Oil Mist lubricated bearings

The motor must be stored in horizontal position. Lubricate the bearings with ISO VG 68 mineral oil in the amount indicated in the Table 5.2 (this is also valid for bearings with equivalent dimensions). After filling with oil, rotate the shaft by hand, at least five revolutions)
During the storage period, remove the shaft locking device (if any) and rotate the shaft by hand every week, at least five revolutions, stopping it at a different position from the original one. Reinstall the shaft locking device every time the motor has to be moved. If the motor is stored for a period of over two years, the bearings must be replaced or removed, washed according to manufacturer instructions, checked and relubricated according to item 8.2.

Table 5.2 - *Amount of oil per bearing*

Bearing size	Amount of oil (ml)	Bearing size	Amount of oil (ml)
6201	15	6309	65
6202	15	6311	90
6203	15	6312	105
6204	25	6314	150
6205	25	6315	200
6206	35	6316	250
6207	35	6317	300
6208	40	6319	350
6209	40	6320	400
6211	45	6322	550
6212	50	6324	600
6307	45	6326	650
6308	55	6328	700

The oil must always be removed when the motor has to be handled. If the oil mist system is not operating after installation, fill the bearings with oil to prevent bearing rusting. During the storage period, rotate the shaft by hand, at least five revolutions, stopping it at a different position from the original one. Before starting the motor, all bearing protection oil must be drained from the bearing and the oil mist system must be switched ON.

5.3.4 Sleeve bearing

The motor must be stored in its original operating position and with oil in the bearings. Correct oil level must be ensured. It should be in the middle of the sight glass. During the storage period, remove the shaft locking device and rotate the shaft by hand every month, at least five revolutions, and at 30 rpm, thus achieving an even oil distribution inside the bearing and maintaining the bearing in good operating conditions. Reinstall the shaft locking device every time the motor has to be moved.
If the motor is stored for a period equal or longer than the oil change interval, the oil must be replaced, according to Item 8.2, before starting the operation.

If the motor is stored for a period longer than the oil change interval, or if it is not possible to rotate the motor shaft by hand, the oil must be drained and a corrosion protection and dehumidifiers must be applied.

5.4. INSULATION RESISTANCE

We recommend measuring the winding insulation resistance at regular intervals to follow-up and evaluate its electrical operating conditions. If any reduction in the insulation resistance values are recorded, the storage conditions should be evaluated and corrected, where necessary.

5.4.1. Insulation resistance measurement

We recommend measuring the winding insulation resistance at regular intervals to follow-up and evaluate its electrical operating conditions. If any reduction in the insulation resistance values are recorded, the storage conditions should be evaluated and corrected, where necessary.

The insulation resistance must be measured in a safe environment.

The insulation resistance must be measured with a megohmmeter. The machine must be in cold state and disconnected from the power supply.

To prevent the risk of an electrical shock, ground the terminals before and after each measurement. Ground the capacitor (if any) to ensure that it is fully discharged before the measurement is taken.

It is recommended to insulate and test each phase separately. This procedure allows the comparison of the insulation resistance between each phase. During the test of one phase, the other phases must be grounded. The test of all phases simultaneously evaluates the insulation resistance to ground only but does not evaluate the insulation resistance between the phases.
The power supply cables, switches, capacitors and other external devices connected to the motor may considerably influence the insulation resistance measurement. Thus all external devices must be disconnected and grounded during the insulation resistance measurement.
Measure the insulation resistance one minute after the voltage has been applied to the winding. The applied voltage should be as shown in Table 5.3.

Table 5.3 *- Voltage for the insulation resistance*

Winding rated voltage (V)	Testing voltage for measuring the insulation resistance (V)
< 1000	500
1000 - 2500	500 - 1000
2501 - 5000	1000 - 2500
5001 - 12000	2500 - 5000
> 12000	5000 - 10000

The reading of the insulation resistance must be corrected to 40 °C as shown in the Table 5.4.

Table 5.4 *- Correction factor for the insulation resistance corrected to 40 °C*

Measuring temperature of the insulation resistance (°C)	Correction factor of the insulation resistance corrected to 40 °C	Measuring temperature of the insulation resistance (°C)	Correction factor of the insulation resistance corrected to 40 °C
10	0.125	30	0.500
11	0.134	31	0.536
12	0.144	32	0.574
13	0.154	33	0.616
14	0.165	34	0.660
15	0.177	35	0.707
16	0.189	36	0.758
17	0.203	37	0.812
18	0.218	38	0.871
19	0.233	39	0.933
20	0.250	40	1.000
21	0.268	41	1.072
22	0.287	42	1.149
23	0.308	43	1.231
24	0.330	44	1.320
25	0.354	45	1.414
26	0.379	46	1.516
27	0.406	47	1.625
28	0.435	48	1.741
29	0.467	49	1.866
30	0.500	50	2.000

The motor insulation condition must be evaluated by comparing the measured value with the values indicated in Table 5.5 (corrected to 40 °C):

Table 5.5 *- Evaluation of the insulation system*

Limit value for rated voltage up to 1.1 kV (MΩ)	Limit value for rated voltage above 1.1 kV (MΩ)	Situation
Up to 5	Up to 100	Dangerous. The motor can not be operated in this condition
5 to 100	100 to 500	Regular
100 to 500	Higher than 500	Good
Higher than 500	Higher than 1000	Excellent

The values indicated in the table should be considered only as reference values. It is advisable to log all measured values to provide a quick and easy overview on the machine insulation resistance.
If the insulation resistance is low, moisture may be present in the stator windings. In this case the motor should be removed and transported to a WEG authorized Service Center for proper evaluation and repair (This service is not covered by the warranty). To improve the insulation resistance through the drying process, see section 8.4.

6. INSTALLATION

The insulation resistance must be measured in a safe environment.

Check some aspects before proceeding with the installation:

1. Insulation resistance: must be within the acceptable limits. See item 5.4.
2. Bearings:
   If the motor is installed without running immediately, proceed as described in item 5.3.
3. Operating conditions of the start capacitors: If single-phase motors are stored for a period of over two years, it is recommended to change the start capacitors before motor starting since they lose their operating characteristics.
4. Terminal box:
   a. the inside of the terminal box must be clean and dry;
   b. the contacts must be correctly connected and corrosion free. See 6.9 and 6.10;
   c. the cable entries must be correctly sealed and the terminal box cover properly mounted in order to ensure the degree of protection indicated on the motor nameplate.
5. Cooling: the cooling fins, air inlet and outlet openings must be clean and unobstructed. The distance between the air inlet openings and the wall should not be shorter than ¼ (one quarter) of the diameter of the air inlet. Ensure sufficient space to perform the cleaning services. See item 7.
6. Coupling: remove the shaft locking device (where fitted) and the corrosion protection grease from the shaft end, including the grounding brush area, and flange immediately before installing the motor. See item 6.4.
7. Drain hole: the motor must always be positioned so the drain hole is at the lowest position (If there is any indication arrow on the drain, the drain must be so installed that the arrow points downwards).
   Motors supplied with rubber drain, threaded drain or any other open/close drain plugs must be opened periodically to allow the exit of condensed water. For environments with high water condensation levels and motor with degree of protection IP55, the drain plugs can be mounted in open position (see Figure 6.1).
   For motors with degree of protection IP56, IP65 or IP66, the drain plugs must remain at closed position (see Figure 6.1), being opened only during the motor maintenance procedures.
   The drain system of motors with Oil Mist lubrication system must be connected to a specific collection system (see Figure 6.12).

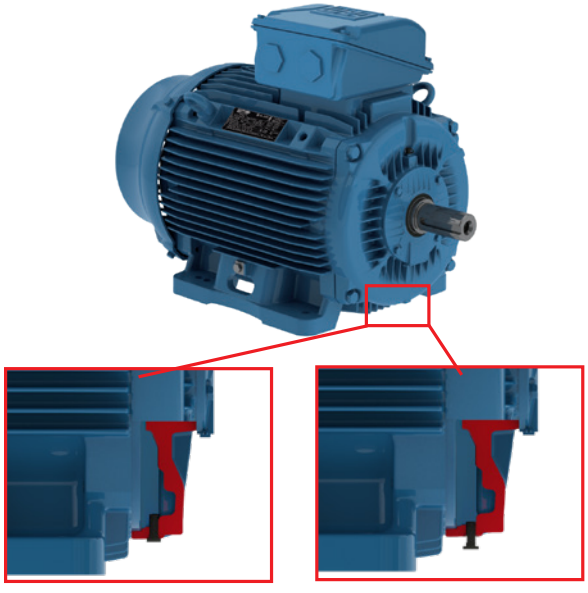


Figure 6.1 *- Detail of the rubber drain plug mounted in closed and open position*

8.Additional recommendations:
a. Check the direction of motor rotation, starting the motor at no-load before coupling it to the load;
b. Vertical mounted motors with shaft end down must be fitted with drip cover to protect them from liquids or solids that may drop onto the motors;
c. Vertical mounted motors with shaft end up should be fitted with water slinger ring to prevent water ingress inside the motor.
d. The fixing elements mounted in the threaded through holes in the motor enclosure (for example, the flange) must be properly sealed.

Remove or fix the shaft key before starting the motor.

Changes on the motor construction (features), such as installation of extended grease fittings or modification of the lubrication system, installation of accessories at alternative locations, etc., can be carried out only after prior written consent from WEG.

6.1. FOUNDATIONS

The foundation is the structure, structural element, natural or prepared base, designed to withstand the stresses produced by the installed equipment, ensuring safe and stable performance during operation. The foundation design should consider the adjacent structures to avoid the influences of other installed equipment and no vibration is transferred through the structure

The foundation must be flat and its selection and design must consider the following characteristics:

a) The features of the machine to be installed on the foundation, the driven loads, application, maximum allowed deformations and vibration levels (for instance, motors with reduced vibration levels, foot flatness, flange concentricity, axial and radial loads, etc. lower than the values specified for standard motors).

b) Adjacent buildings, conservation status, maximum applied load estimation, type of foundation and fixation and vibrations transmitted by theses constructions.

If the motor is supplied with leveling/alignment bolts, this must be considered in the base design.

Please consider for the foundation dimensioning all stresses that are generated during the operation of the driven load.
The user is responsible for the foundation designing and construction.

The foundation stresses can be calculated by using the following equations (see Figure 6.2):

$$F_1 = 0,5 * g * m - (4 * T_b / A)$$
$$F_2 = 0,5 * g * m + (4 * T_b / A)$$

Where:

F_1 and F_2 = lateral stresses (N);
g = gravitational acceleration (9,8 m/s^2);
m = motor weight (kg);
T_b = breakdown torque (Nm);
A = distance between centerlines of mounting holes in feet or base of the machine (end view) (m).

The motors may be mounted on:
- Concrete bases: are most used for large-size motors (see Figure 6.2);
- Metallic bases: are generally used for small-size motors (see Figure 6.3).

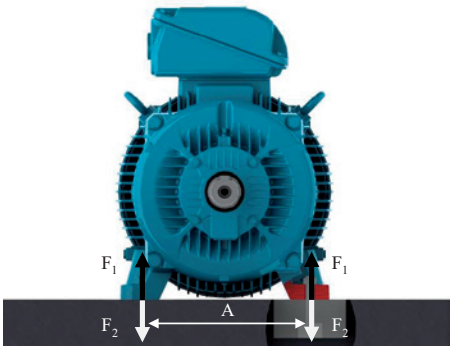


Figure 6.2 *- Motor installed on concrete base*

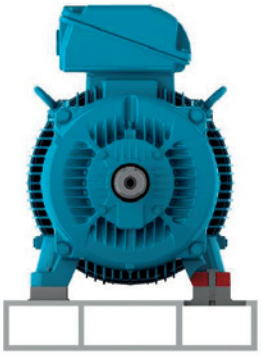


Figure 6.3 *- Motor installed on metallic base*

The metallic and concrete bases may be fitted with sliding system. These types of foundations are generally used where the power transmission is achieved by belts and pulleys. This power transmission system is easier to assemble/disassemble and allows the belt tension adjustment. Other important aspect of this foundation type is the location of the base locking screws that must be diagonally opposite. The rail nearest the drive pulley is placed in such a way that the positioning bolt is between the motor and the driven machine. The other rail must be placed with the bolt on the opposite side (diagonally opposite), as shown in Figure 6.4 .

To facilitate assembly, the bases may have the following features:
- Shoulders and/or recesses;
- Anchor bolts with loose plates;
- Bolts cast in the concrete;
- Leveling screws;
- Positioning screws;
- Steel & cast iron blocks, plates with flat surfaces.

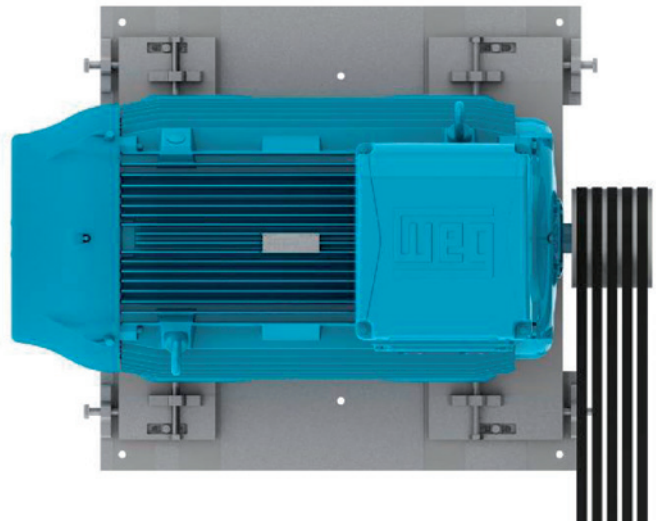


Figure 6.4 *- Motor installed on sliding base*

After completing the installation, it is recommended that all exposed machined surfaces are coated with suitable rust inhibitor.

6.2. MOTOR MOUNTING

Footless motors supplied with transportation devices, according to Figure 6.5, must have their devices removed before starting the motor installation.

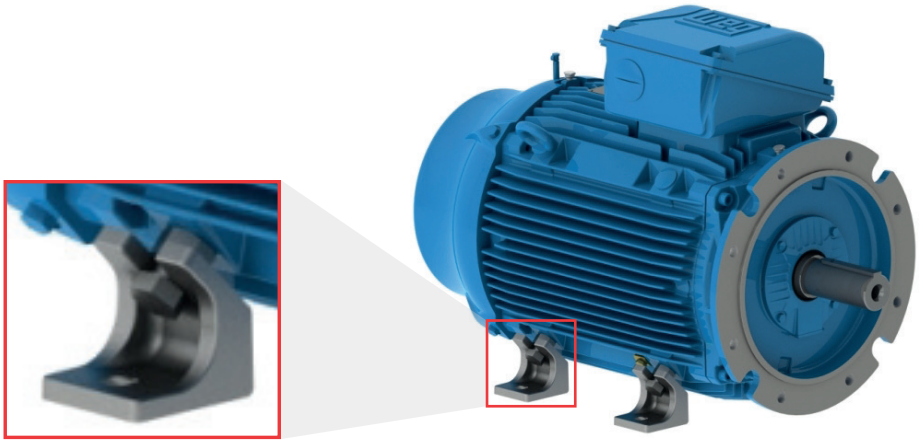


Figure 6.5 *- Detail of the transportation devices for footless motors*

6.2.1. Foot mounted motors

The drawings of the mounting hole dimensions for NEMA or IEC motors can be checked in the respective technical catalogue.
The motor must be correctly aligned and leveled with the driven machine. Incorrect alignment and leveling may result in bearing damage, generate excessive vibration and even shaft distortion/breakage.
For more details, see section 6.3 and 6.6. The thread engagement length of the mounting bolt should be at least 1.5 times the bolt diameter. This thread engagement length should be evaluated in more severe applications and increased accordingly.
Figure 6.6 shows the mounting system of a foot mounted motor indicating the minimum required thread engagement length.

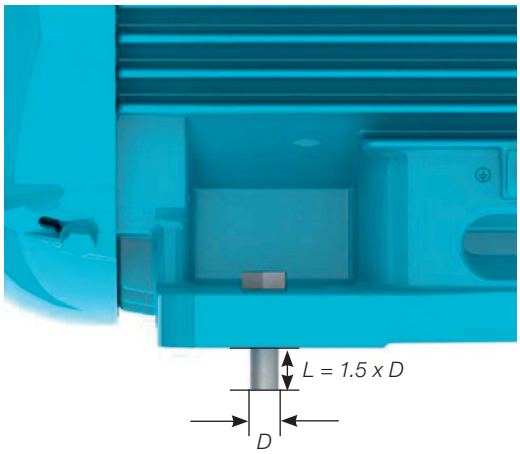


Figure 6.6 *- Mounting system of a foot mounted motor*

6.2.2. Flange mounted motors

The drawings of the flange mounting dimensions, IEC and NEMA flanges, can be checked in the technical catalogue.
The coupling of the driven equipment to the motor flange must be properly dimensioned to ensure the required concentricity of the assembly.
Depending on the flange type, the mounting can be performed from the motor to the driven equipment flange (flange FF (IEC) or D (NEMA)) or from the driven equipment flange to the motor (flange C (DIN or NEMA)).
For the mounting process from the driven equipment flange to the motor, you must consider the bolt length, flange thickness and the thread depth of the motor flange.

In cases that use polymer flanges with a built-in nut or the aluminum flange with hexagonal hole, the length of the motor fixing screw must not exceed the length of the hole, thus avoiding misalignment and clearance of the coupling.

If the motor flange has tapped through-holes, the length of the mounting bolts must not exceed the tapped through-hole length of the motor flange, thus preventing damage to the winding head.

For flange mounting the thread engagement length of the mounting bolt should be at least 1.5 times the bolt diameter. In severe applications, longer thread engagement length may be required.

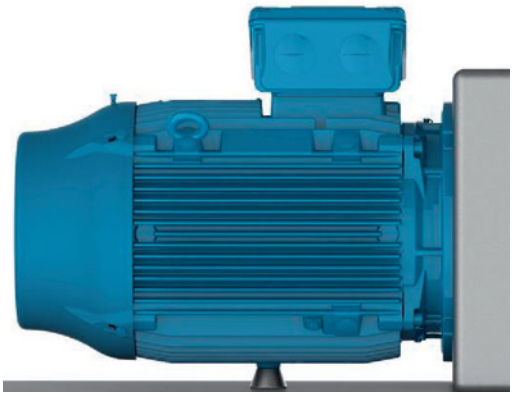


Figure 6.7 *- Mounting method of flange mounted motors with frame base support*

In severe applications or if large motors are flange mounted, a foot or pad mounting may be required in addition to the flange mounting (Figure 6.7). The motor must never be supported on its cooling fins.

For W12 motors, do not exceed the maximum tightening torque of 8 Nm when fixing the foot and/or polymeric flange on the equipment.
When the motor is used in vertical shaft up position, fixed by foot, the foot must be locked axially by the fixing of a flat socket head screw M5x0.8 measuring 16mm length (W63 and W71) or 12mm length (IEC56).
The hexagonal holes of the C-80 and C-105 flanges of W12 motors are suitable for M5 (maximum torque 5 Nm) and M6 (maximum torque 8 Nm) screws, respectively.
Note*:*
When liquid (for example oil) is likely to come into contact with the shaft seal, please contact your local WEG representative.

6.2.3. Pad mounted motors

Typically, this method of mounting is used in axial fans. The motor is fixed by tapped holes in the frame. The dimensions of these tapped holes can be checked in the respective product catalogue. The selection of the motor mounting rods/bolts must consider the dimensions of the fan case, the installation base and the thread depth in the motor frame.
The mounting rods and the fan case wall must be sufficiently stiff to prevent the transmission of excessive vibration to the machine set (motor & fan). Figure 6.8 shows the pad mounting system.

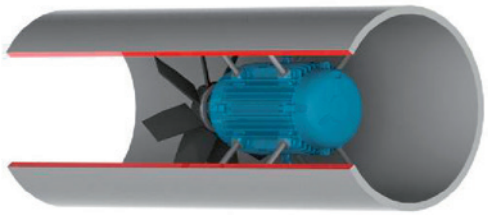


Figure 6.8 *- Mounting of the motor inside the cooling duct*

6.3. BALANCING

Unbalanced machines generate vibration which can result in damage to the motor. WEG motors are dynamically balanced with “half key” and without load (uncoupled). Special balancing quality level must be stated in the Purchase Order.

The transmission elements, such as pulleys, couplings, etc., must balanced with “half key” before they are mounted on the motor shaft.

The balance quality grade meets the applicable standards for each product line.

The maximum balancing deviation must be recorded in the installation report.

6.4. COUPLINGS

Couplings are used to transmit the torque from the motor shaft to the shaft of the driven machine. The following aspects must be considered when couplings are installed:

- Use proper tools for coupling assembly & disassembly to avoid damages to the motor and bearings;
- Whenever possible, use flexible couplings, since they can absorb eventual residual misalignments during the machine operation;
- The maximum loads and speed limits informed in the coupling and motor manufacturer catalogues cannot be exceeded;
- Level and align the motor as specified in sections 6.5 and 6.6, respectively.

Remove or fix the shaft key firmly when the motor is operated without coupling in order to prevent accidents.

6.4.1. Direct coupling

Direct coupling is characterized when the Motor shaft is directly coupled to the shaft of the driven machine without transmission elements. Whenever possible, use direct coupling due to lower cost, less space required for installation and more safety against accidents.

Do not use roller bearings for direct coupling, unless sufficient radial load is expected.

6.4.2. Gearbox coupling

Gearbox coupling is typically used where speed reduction is required.
Make sure that shafts are perfectly aligned and strictly parallel (in case of straight spur gears) and in the right meshing angle (in case of bevel and helical gears).

6.4.3. Pulley and belt coupling

Pulleys and belts are used when speed increase or reduction between motor shaft and driven load is required.

Excessive belt tension will damage the bearings and cause unexpected accidents such as breakage of the motor shaft.

6.4.4. Coupling of sleeve bearing motors

Motors designed with sleeve bearings must be operated with direct coupling to the driven machine or a gearbox. Pulley and belts can not be applied for sleeve bearing motors.

Motors designed with sleeve bearings have 3 (three) marks on the shaft end. The center mark is the indication of the magnetic center and the 2 (two) outside marks indicate the allowed limits of the rotor axial movement, as shown in Figure 6.9.
The motor must be so coupled that during operation the arrow on the frame is placed over the central mark indicating the rotor magnetic center. During start-up, or even during operation, the rotor may freely move between the two outside marks when the driven machine exerts an axial load on the motor shaft. However, under no circumstance, the motor can operate continuously with axial forces on the bearing.

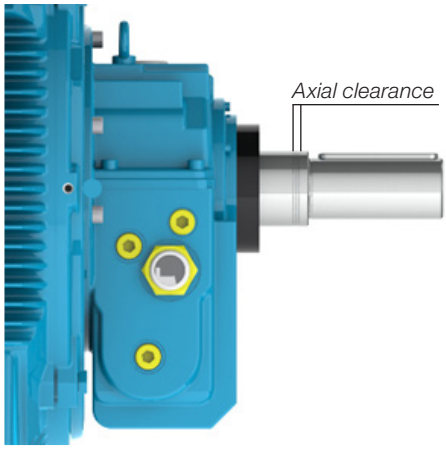


Figure 6.9 *- Axial clearance of motor designed with sleeve bearing*

For coupling evaluation consider the maximum axial bearing clearance as shown in Table 6.1.
The axial clearance of the driven machine and coupling influence the maximum bearing clearance.

Table 6.1 *- Clearance used for sleeve bearings*

Bearing size	Total axial clearance (mm)
9*	3 + 3 = 6
11*	4 + 4 = 8
14*	5 + 5 =10
18	7,5 + 7,5 = 15

** For Motors in accordance with API 541, the total axial clearance is 12.7 mm*

The sleeve bearings used by WEG were not designed to support axial load continuously.
Under no circumstance must the motor be operated continuously at its axial clearance limits.

6.5. LEVELING

The motor must be leveled to correct any deviations in flatness arising from the manufacturing process and the material structure rearrangement. The leveling can be carried out by a leveling screw fixed on the motor foot or on the flange or by means of thin compensation shims. After the leveling process, the leveling height between the motor mounting base and the motor cannot exceed 0.1 mm.
If a metallic base is used to level the height of the motor shaft end and the shaft end of the driven machine, level only the metallic base relating to the concrete base.

Record the maximum leveling deviations in the installation report.

6.6. ALIGNMENT

The correct alignment between the motor and the driven machine is one of the most important variables that extends the useful service life of the motor. Incorrect coupling alignment generates high loads and vibrations reducing the useful life of the bearings and even resulting in shaft breakages. Figure 6.10 illustrates the misalignment between the motor and the driven machine.

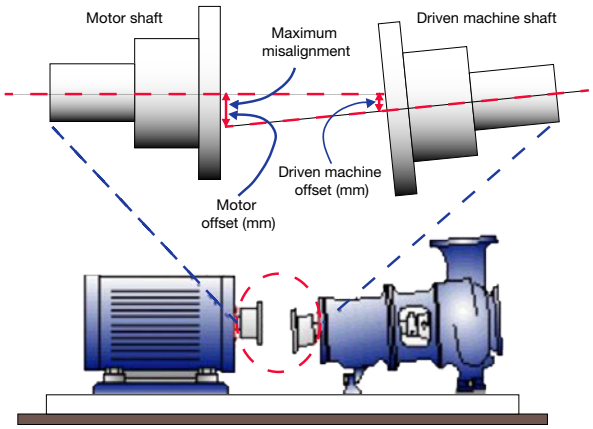
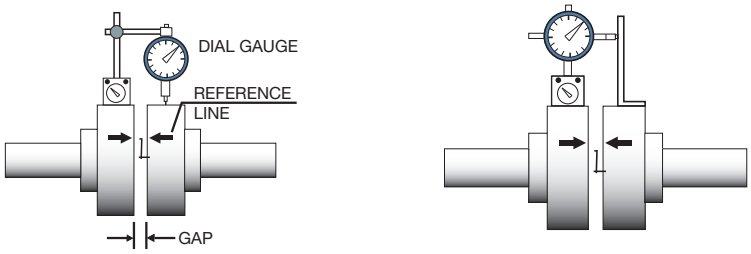


Figure 6.10 *- Typical misalignment condition*

Alignment procedures must be carried out using suitable tools and devices, such as dial gauge, laser alignment instruments, etc.. The motor shaft must be aligned axially and radially with the driven machine shaft.

The maximum allowed eccentricity for a complete shaft turn should not exceed 0.03 mm, when alignment is made with dial gauges, as shown in Figure 6.11. Ensure a gap between couplings to compensate the thermal expansion between the shafts as specified by the coupling manufacturer.



Parallel alignment *Angular alignment*

Figure 6.11 *- Alignment with dial gauge*

If alignment is made by a laser instrument, please consider the instructions and recommendations provided by the laser instrument manufacturer.
The alignment should be checked at ambient temperature with machine at operating temperature.

The coupling alignment must be checked periodically.

Pulley and belt couplings must be so aligned that the driver pulley center lies in the same plane of the driven pulley center and the motor shaft and the shaft of the driven machine are perfectly parallel.
After completing the alignment procedures, ensure that mounting devices do not change the motor and machine alignment and leveling resulting into machine damage during operation.

It is recommended to record the maximum alignment deviation in the Installation Report.

6.7. CONNECTION OF OIL LUBRICATED OR OIL MIST LUBRICATED MOTORS

When oil lubricated or oil mist lubricated motors are installed, connect the existing lubricant tubes (oil inlet and oil outlet tubes and motor drain tube), as shown in Figure 6.12. The lubrication system must ensure continuous oil flow through the bearings as specified by the manufacturer of the installed lubrication system.

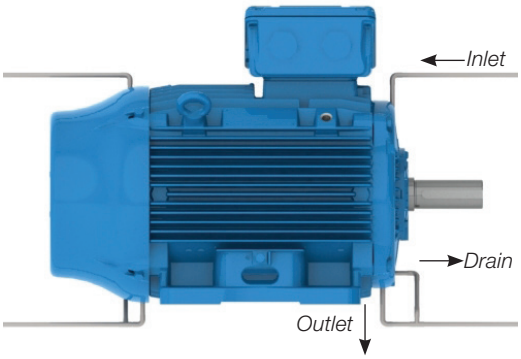


Figure 6.12 *- Oil supply and drain system of oil lubricated or oil mist lubricated motors*

6.8. CONNECTION OF THE COOLING WATER SYSTEM

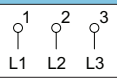
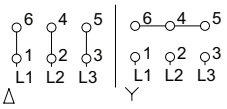
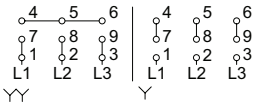
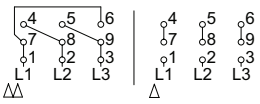
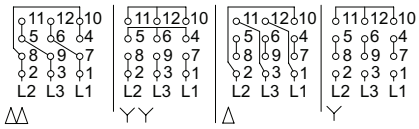
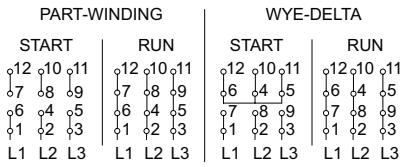
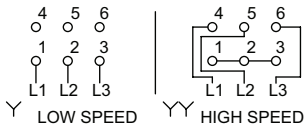
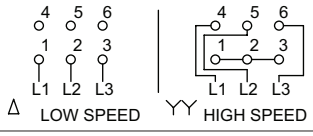
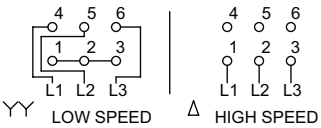
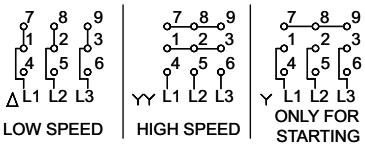
When water cooled motors are installed, connect the water inlet and outlet tubes to ensure proper motor cooling. According to item 7.2, ensure correct cooling water flow rate and water temperature in the motor cooling system.

6.9. ELECTRICAL CONNECTION

Consider the rated motor current, service factor, starting current, environmental and installation conditions, maximum voltage drop, etc. to select appropriate power supply cables and switching and protection devices. All motors must be installed with overload protection systems. Three-phase motors should be fitted with phase fault protection systems.

Before connecting the motor, check if the power supply voltage and the frequency comply with the motor nameplate data. All wiring must be made according to the connection diagram on the motor nameplate. Please consider the connection diagrams in the Tables 6.2 and 6.3 as reference value.
To prevent accidents, check if motor has been solidly grounded in accordance with the applicable standards.

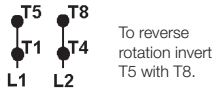
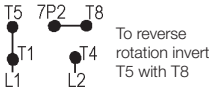
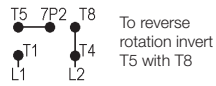
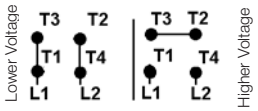
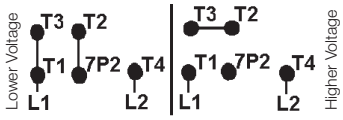
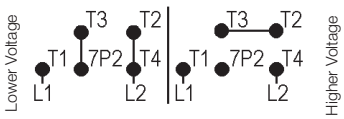
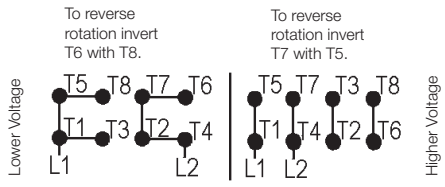
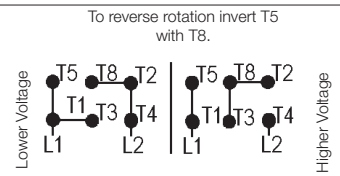
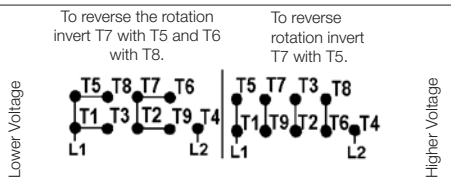
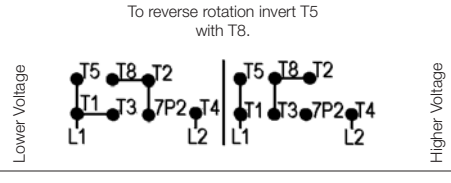
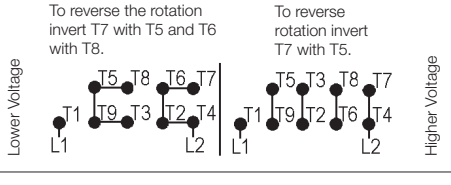
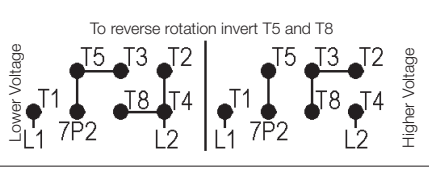
Table 6.2 - *Typical connection diagram for three-phase motors.*

Configuration	Quantity of leads	Type of connection	Connection diagram
Single speed	3	-	
	6	Δ - Y	
	9	YY - Y	
		ΔΔ - Δ	
	12	ΔΔ - YY - Δ - Y	
		Δ - PWS Part-winding start	
Double speed Dahlander	6	YY - Y Variable Torque	
		Δ - YY Constant Torque	
		YY - Δ Constant Output	
	9	Δ - Y - YY	
Double speed Double winding	6	-	

Equivalent table for lead identification													
Lead identification on the wiring diagram		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Single speed	NEMA MG 1 Part 2	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
	IEC 60034-8	U1	V1	W1	U2	V2	W2	U3	V3	W3	U4	V4	W4
Double speed (Dahlander / Double winding)	NEMA MG 1 Part 2[1)]	1U	1V	1W	2U	2V	2W	3U	3V	3W	4U	4V	4W
	IEC 60034-8	1U	1V	1W	2U	2V	2W	3U	3V	3W	4U	4V	4W

1) NEMA MG 1 Part 2 defines T1 to T12 for two or more winding, however WEG adopts 1U to 4W.

Table 6.3 - *Typical connection diagram for single-phase motors.*

Voltage	Direction of Rotation	Thermal Protection	Type	Connection diagram
Single	CW or CCW	With or Without	Run / Permanent Capacitors Two values	
	Both	Without		
		Phenolic Thermal Protector		
		Thermostat		
Double	CW or CCW	Without	Run / Permanent Capacitors Two values or Split Phase	
		Phenolic Thermal Protector		
		Thermostat		
	Both	Without	Split Phase (without capacitor)	
			Run / Permanent Capacitors Two values	
		Phenolic Thermal Protector	Split Phase (without capacitor)	
			Run / Permanent Capacitors Two values	
		Thermostat	Split Phase (without capacitor)	
			Run / Permanent Capacitors Two values	

W12 platform motors with polymeric terminal box cover have the connection diagram printed on its interior. To connect the cables, check on the nameplate the diagram code that must be used.

WARNING - Local Standards have priority on the definition of the connection standards.

The connections presented below are a reference for the connection of the customer's power cables on low voltage motors with terminal block. The terminal blocks presented below are the standard for each product line, however variations may occur.
It is recommended the use of terminals made of electrolytic copper or brass, similar to the terminals used on the motors cables.

W21 and W22

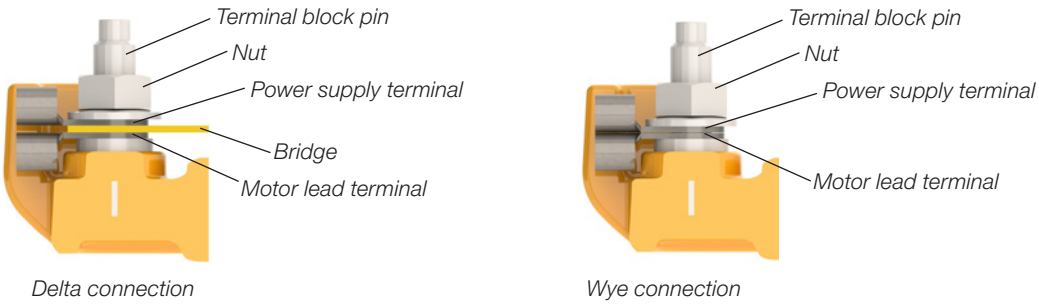


Figure 6.13 *- Connetion for W21 and W22 motors with terminal block*

HGF, W40, W50 and W60

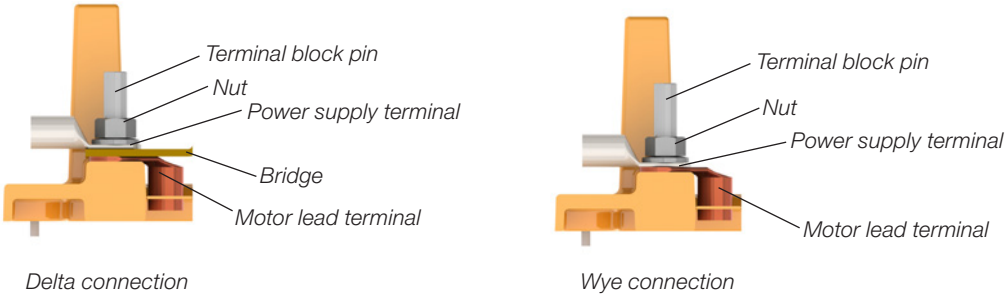


Figure 6.14 *- Connetion for HGF, W40, W50 and W60 motors with terminal block*

If motors are supplied without terminal blocks, insulate the cable terminals with suitable insulation material that meets the power supply voltage and the insulation class indicated on the motor nameplate.

Ensure correct tightening torque for the power cable and grounding connections as specified in Table 8.12.

The clearance distance (see Figure 6.15) between non-insulated live parts with each other and between grounded parts must be as indicated in Table 6.4.

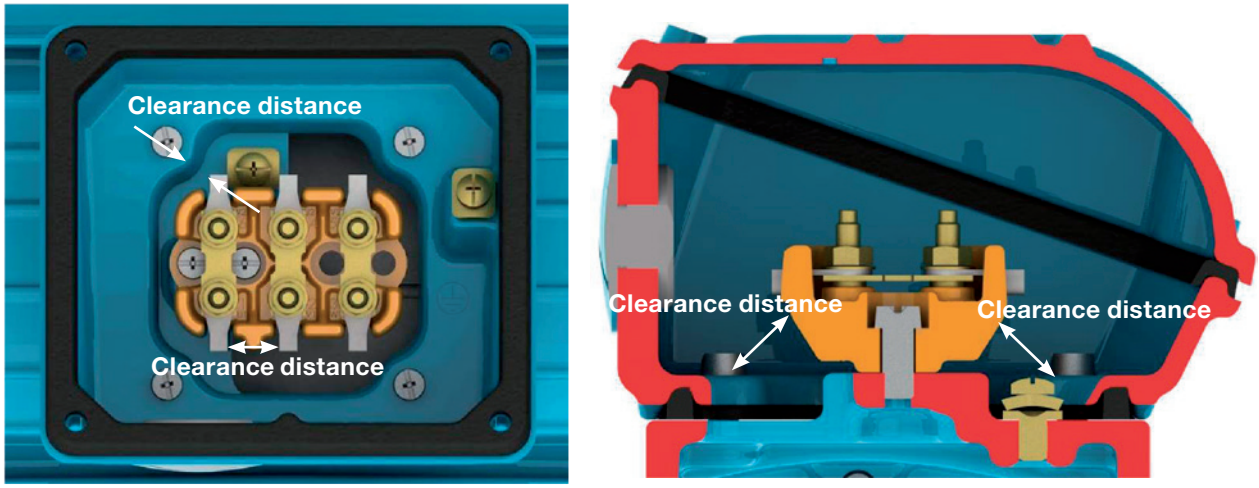


Figure 6.15 - *Clearance distance representation*

Table 6.4 - *Minimum clearance distance (mm) x supply voltage*

Voltage	Minimum clearance distance (mm)
U ≤ 440 V	4
440 < U ≤ 690 V	5.5
690 < U ≤ 1000 V	8
1000 < U ≤ 6900 V	45
6900 < U ≤ 11000 V	70
11000 < U ≤ 16500 V	105

Even when the motor is off, dangerous voltages may be present inside the terminal box used for the space heater supply or winding energization when the winding is used as heating element.
Motor capacitors will hold a charge even after the power has been cut off. Do not touch the capacitors and/or motor terminals, before discharging the capacitors completely. For WMagnet and WQuattro motors, even when the motor is disconnected from the power supply, there may be voltage in the motor's terminals if the rotor moves.

After the motor connection has been completed, ensure that no tool or foreign body has been left inside the terminal box.

Take the required measures in order to ensure the degree of protection indicated on the motor nameplate:
- unused cable inlet holes in the terminal boxes must be properly closed with threaded blanking plugs;
- components supplied loose (for example, terminal boxes mounted separately) must be properly closed and sealed.
The cable inlets used for power supply and control must be fitted with components (for example, cable-glands and conduits) that meet the applicable standards and regulations in each country.

If the motor is fitted with accessories, such as brakes and forced cooling systems, these devices must be connected to the power supply according to the information provided on their nameplates and with special care as indicated above.

In motors with polymeric terminal box and/or its cover, ensure that the fittings and locks of these components are correctly assembled after performing the cable connection.

All protection devices, including overcurrent protection, must be set according to the rated machine conditions. These protection devices must protect the machine against short circuit, phase fault or locked rotor condition. The motor protection devices must be set according to the applicable standards.

Check the direction of rotation of the motor shaft. If there is no limitation for the use of unidirectional fans, the shaft rotation direction can be changed by reversing any two of the phase connections. For single-phase motor, check the connection diagram indicated on the motor nameplate.

6.10. CONNECTION OF THE THERMAL PROTECTION DEVICES

If the motor is supplied with temperature monitoring devices, such as, thermostat, thermistors, automatic thermal protectors, Pt-100 (RTD), etc., they must be connected to the corresponding control devices as specified on the accessory nameplates. The non-compliance with this procedure may void the product warranty and cause serious material damages.

Do not apply test voltage above 2.5 V on thermistors and current above 1 mA on RTDs (Pt-100) according to IEC 60751 standard.

Figure 6.16 and Figure 6.17 show the connection diagram of the bimetal thermal protector (thermostats) and thermistors, respectively.

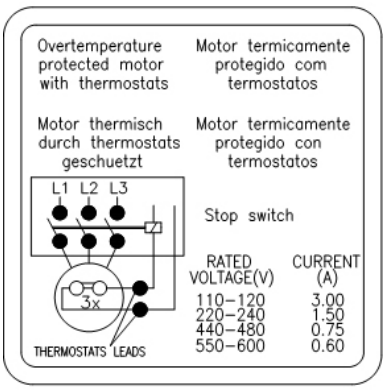


Figure 6.16 *- Connection of the bimetal thermal protectors (thermostats)*

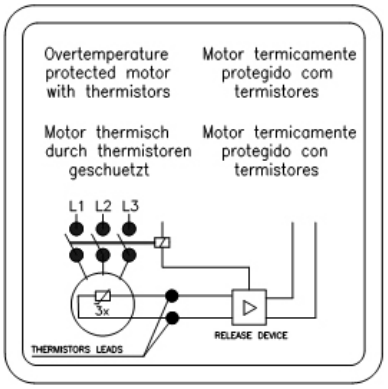


Figure 6.17 *- Thermistor connection*

The alarm temperature limits and thermal protection shutdowns can be defined according to the application; however these temperature limits can not exceed the values in Table 6.5.

Table 6.5 *- Maximum activation temperature of the thermal protections*

Component	Insulation class	Maximum temperature of the protection setting (°C)	
		Alarm	Tripping
Winding	B	-	130
	F	130	155
	H	155	180
Bearing	All	110	120

Notes:
1) The number and type of the installed protection devices are stated on the accessory nameplate of the motor.
2) If the motor is supplied with calibrated resistance, (for example, Pt-100), the motor protection system must be set according to the operating temperatures indicated in Table 6.5.

6.11. RESISTANCE TEMPERATURE DETECTORS (PT-100)

The thermocouples Pt-100 are made of materials, whose resistance depends on the temperature variation, intrinsic property of some materials (usually platinum, nickel or copper), calibrated resistance. Its operation is based on the principle that the electric resistance of a metallic conductor varies linearly with the temperature, thus allowing a continuous monitoring of the motor warm-up through the controller display ensuring a high level of precision and answer stability. These devices are widely used for measuring temperatures in various industry sectors.
In general these devices are used in installations where precise temperature control is required, for example, in installation for irregular or intermittent duty. The same detector may be used for alarm and tripping purposes. Table 6.6 and Figure 6.19 show the equivalence between the Pt-100 resistance and the temperature. The Figure 6.18 shows the connection of a winding Pt-100.

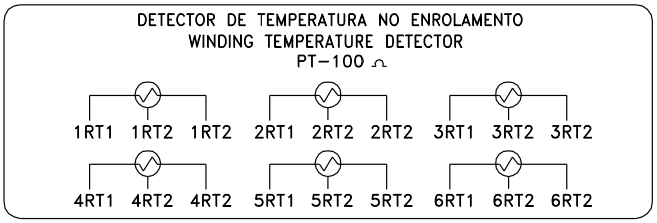


Figure 6.18 *- Connection of winding Pt-100*

Table 6.6 *- Equivalence between the Pt-100 resistance and the temperature*

°C	Ω	°C	Ω	°C	Ω	°C	Ω	°C	Ω
-29	88.617	17	106.627	63	124.390	109	141.908	155	159.180
-28	89.011	18	107.016	64	124.774	110	142.286	156	159.553
-27	89.405	19	107.404	65	125.157	111	142.664	157	159.926
-26	89.799	20	107.793	66	125.540	112	143.042	158	160.298
-25	90.193	21	108.181	67	125.923	113	143.420	159	160.671
-24	90.587	22	108.570	68	126.306	114	143.797	160	161.043
-23	90.980	23	108.958	69	126.689	115	144.175	161	161.415
-22	91.374	24	109.346	70	127.072	116	144.552	162	161.787
-21	91.767	25	109.734	71	127.454	117	144.930	163	162.159
-20	92.160	26	110.122	72	127.837	118	145.307	164	162.531
-19	92.553	27	110.509	73	128.219	119	145.684	165	162.903
-18	92.946	28	110.897	74	128.602	120	146.061	166	163.274
-17	93.339	29	111.284	75	128.984	121	146.438	167	163.646
-16	93.732	30	111.672	76	129.366	122	146.814	168	164.017
-15	94.125	31	112.059	77	129.748	123	147.191	169	164.388
-14	94.517	32	112.446	78	130.130	124	147.567	170	164.760
-13	94.910	33	112.833	79	130.511	125	147.944	171	165.131
-12	95.302	34	113.220	80	130.893	126	148.320	172	165.501
-11	95.694	35	113.607	81	131.274	127	148.696	173	165.872
-10	96.086	36	113.994	82	131.656	128	149.072	174	166.243
-9	96.478	37	114.380	83	132.037	129	149.448	175	166.613
-8	96.870	38	114.767	84	132.418	130	149.824	176	166.984
-7	97.262	39	115.153	85	132.799	131	150.199	177	167.354
-6	97.653	40	115.539	86	133.180	132	150.575	178	167.724
-5	98.045	41	115.925	87	133.561	133	150.950	179	168.095
-4	98.436	42	116.311	88	133.941	134	151.326	180	168.465
-3	98.827	43	116.697	89	134.322	135	151.701	181	168.834
-2	99.218	44	117.083	90	134.702	136	152.076	182	169.204
-1	99.609	45	117.469	91	135.083	137	152.451	183	169.574
0	100.000	46	117.854	92	135.463	138	152.826	184	169.943
1	100.391	47	118.240	93	135.843	139	153.200	185	170.313
2	100.781	48	118.625	94	136.223	140	153.575	186	170.682
3	101.172	49	119.010	95	136.603	141	153.950	187	171.051
4	101.562	50	119.395	96	136.982	142	154.324	188	171.420
5	101.953	51	119.780	97	137.362	143	154.698	189	171.789
6	102.343	52	120.165	98	137.741	144	155.072	190	172.158
7	102.733	53	120.550	99	138.121	145	155.446	191	172.527
8	103.123	54	120.934	100	138.500	146	155.820	192	172.895
9	103.513	55	121.319	101	138.879	147	156.194	193	173.264
10	103.902	56	121.703	102	139.258	148	156.568	194	173.632
11	104.292	57	122.087	103	139.637	149	156.941	195	174.000
12	104.681	58	122.471	104	140.016	150	157.315	196	174.368
13	105.071	59	122.855	105	140.395	151	157.688	197	174.736
14	105.460	60	123.239	106	140.773	152	158.061	198	175.104
15	105.849	61	123.623	107	141.152	153	158.435	199	175.472
16	106.238	62	124.007	108	141.530	154	158.808	200	175.840

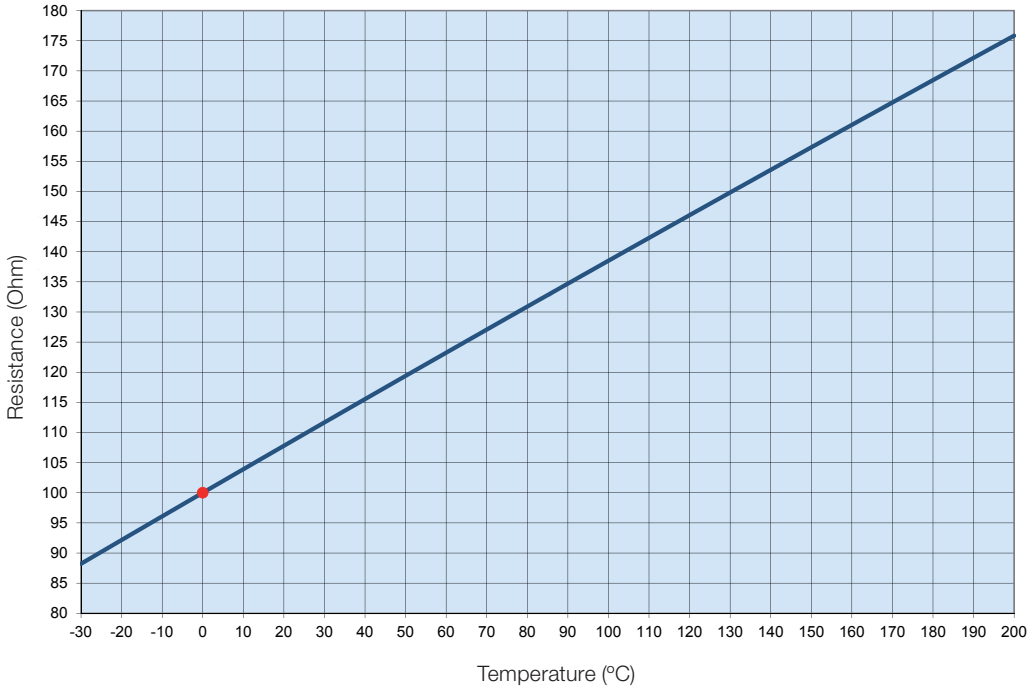


Figure 6.19 *- Ohmic resistance of the Pt-100 x temperature*

6.12. CONNECTION OF THE SPACE HEATERS

Before switching ON the space heaters, check if the space heaters connection have been made according to the connection diagram shown on the space heater nameplate. For motors supplied with dual voltage space heaters (110-127/220-240 V), see Figure 6.20.

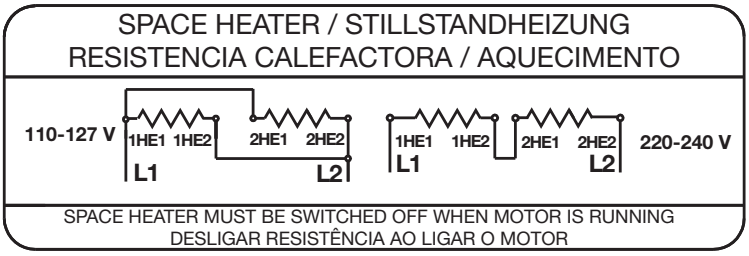


Figure 6.20 *- Dual voltage space heater connection*

The space heaters should never be energized when the motor is in operation.

6.13. STARTING METHODS

Whenever possible, the motor starting must be Direct On Line (DOL) at rated voltage. This is the most simple and feasible starting method. However, it must only be applied when the starting current does not affect the power supply. Please consider the local electric utility regulations when installing a motor.
High inrush current may result in:
a) high voltage drop in the power supply line creating unacceptable line disturbance on the distribution system;
b) requiring oversized protection system (cables and contactor) increasing the installation costs.

If DOL starting is not allowed due to the reasons mentioned above, an indirect starting method compatible with the load and motor voltage to reduce the starting current may be used.
If reduced voltage starters are used for starting, the motor starting torque will also be reduced.

Table 6.7 shows the possible indirect starting methods that can be used depending on the number of the motor leads.

Table 6.7 *- Starting method x number of motor leads*

Number of leads	Possible starting methods
3 leads	Autotransformer Soft-starter
6 leads	Star-Delta Autotransformer Soft-starter
9 leads	Series/Parallel Part winding Autotransformer Soft-starter
12 leads	Star-Delta Series/Parallel Part winding Autotransformer Soft-starter

Table 6.8 shows examples of possible indirect starting methods to be used according to the voltage indicated on the motor nameplate and the power supply voltage.

Table 6.8 *- Starting methods x voltage*

Nameplate voltage	Operating voltage	Star-delta	Autotransformer starting	Starting by series/ parallel switch	Part-winding starting	Starting by Soft-starter
220/380 V	220 V 380 V	YES NO	YES YES	NO NO	NO NO	YES YES
220/440 V	220 V 440 V	NO NO	YES YES	YES NO	YES NO	YES YES
230/460 V	230 V 460 V	NO NO	YES YES	YES NO	YES NO	YES YES
380/660 V	380 V	YES	YES	NO	NO	YES
220/380/440 V	220 V 380 V 440 V	YES NO YES	YES YES YES	YES YES NO	YES YES NO	YES YES YES

6.14. MOTORS DRIVEN BY FREQUENCY INVERTER

The operation with frequency inverter must be stated in the Purchase Order since this drive type may require some changes of the motor design.

WMagnet Motors must only be driven by frequency inverter. The WQuattro line motors must be started direct on-line (DOL) or driven by a frequency inverter in scalar mode.

The frequency inverter used to drive motors up to 690 V must be fitted with Pulse With Modulation (PWM) with vector control.

When a motor is driven by a frequency inverter at lower frequencies than the rated frequency, you must reduce the motor torque to prevent motor overheating. The torque reduction (derating torque) can be found in the item 6.4 of the "Technical Guidelines for Induction Motors driven by PWM Frequency inverters" available on the site www.weg.net.

If the motor is operated above the rated frequency, please note:
- That the motor must be operated at constant output;
- That the motor can supply max. 95% of its rated output;
- Do not exceed the maximum speed and please consider:
  - max. operating frequency stated on the additional nameplate;
  - mechanical speed limitation of the motor.

For WMagnet motors driven by non-WEG inverters, in addition to the speed limit stated in the motor data sheet, the maximum permitted speed limit must be checked to avoid burning the inverter in the event of a power failure. It should be considered according to the equation below:

$$RPM_{max} = \frac{0.9 * V_{rmsMax} * 1000}{ke}$$

Being,
RPM_{max} – Maximum speed allowed to avoid burning the inverter in the event of a power failure in [RPM].
V_{rmsMax} – Maximum input rms voltage of the inverter, as informed by the inverter manufacturer in [V].
ke – Parameter informed on the nameplate and in the motor data sheet in [V / kRPM].

Information on the selection of the power cables between the frequency inverter and the motor can be found in the item 6.4 of the "Technical Guidelines for Induction Motors driven by PWM Frequency inverters" available at www.weg.net.

6.14.1. Use of dV/dt filter

6.14.1.1. Motor with enameled round wire

Motors designed for rated voltages up to 690 V, when driven by frequency inverter, do not require the use of dV/dT filters, provided they comply with the criteria in Table 6.9.

Table 6.9 *- Criteria for the selection of motors with round enameled wire when driven by frequency inverter*

Motor rated votage [1]	Peak voltage at the motor terminals (max)	dV/dt inverter output (max)	Inverter Rise Time [2] (min.)	MTBP [2] Time between pulses (min)
Vnom < 460 V	≤ 1600 V	≤ 5200 V/µs	≥ 0,1 µs	≥ 6 µs
460 ≤ Vnom < 575 V	≤ 2000 V	≤ 6500 V/µs		
575 ≤ Vnom ≤ 1000 V	≤ 2400 V	≤ 7800 V/µs		

Notes:
1. For the application of dual voltage motors, example 380/660 V, consider the lower voltage (380 V).
2. Information supplied by the inverter manufacturer.

6.14.1.2. Motor with prewound coils

Motors with prewound coils (medium and high voltage motors regardless of frame sizes, and low voltage motors from IEC 500 / NEMA 800 frame on), designed for the use with frequency inverters, do not require the use of filters, provided they comply with the criteria in Table 6.10.

Table 6.10 *- Criteria to be considered when using motor with prewound coils to be drive by frequency inverters*

Motor rated voltage	Type of modulation	Turn to turn insulation (phase-phase)		Phase-ground insulation	
		Peak voltage at the motor terminals	dV/dt at the motor terminals	Peak voltage at the motor terminals	dV/dt at the motor terminals
690 < Vnom ≤ 4160 V	Sinusoidal	≤ 5900 V	≤ 500 V/µs	≤ 3400 V	≤ 500 V/µs
	PWM	≤ 9300 V	≤ 2700 V/µs	≤ 5400 V	≤ 2700 V/µs
4160 < Vnom ≤ 6600 V	Sinusoidal	≤ 9300 V	≤ 500 V/µs	≤ 5400 V	≤ 500 V/µs
	PWM	≤ 14000 V	≤ 1500 V/µs	≤ 8000 V	≤ 1500 V/µs

6.14.2. Bearing insulation

Only the motors in IEC frame size 315 (NEMA 50) and larger are supplied, as standard, with insulated bearing. If motor must be driven by frequency inverter, insulate the bearing according to Table 6.11.

Table 6.11 *- Recommendation on the bearing insulation for inverter driven motors*

Frame size	Recommendation
IEC 315 and 355 NEMA 445/7 to L5810/11	■ Insulated bearing/end shield ■ Grounding between shaft and frame by grounding brush
IEC 400 and larger NEMA 680 and larger	■ Insulated NDE bearing ■ Grounding between shaft and frame by grounding brush

When motors are supplied with shaft grounding system, monitor the grounding brush constantly during its operation and, when it reaches the end of its useful life, it must be replaced by another brush with the same specification.

6.14.3. Switching frequency

The minimum inverter switching frequency must not be lower than 2 kHz and should not exceed 5 kHz.

The non-compliance with the criteria and recommendations indicated in this manual may void the product warranty.

6.14.4. Mechanical speed limitation

Table 6.12 shows the maximum speeds allowed for motors driven by frequency inverter. For WMagnet motors, see the motor's data sheet or contact WEG.

Table 6.12 *- Maximum motor speed (in rpm)*

Frame size		DE-bearing	Maximum speed for standard motors
IEC	NEMA		
63-90	143/5	6201 6202 6203 6204 6205	10400
100	-	6206	8800
112	182/4	6207	7600
		6307	6800
132	213/5	6308	6000
160	254/6	6309	5300
180	284/6	6311	4400
200	324/6	6312	4200
225-630	364/5-9610	6314	3600
		6315	3600
		6316	3200
		6218	3600
		6319	3000
		6220	3600
		6320	2200
		6322	1900
		6324	1800
		6328	1800
		6330	1800
		6224	1800
		6228	1800

Note:
To select the maximum allowed motor speed, consider the motor torque derating curve.

For more information on the application of frequency inverters, contact WEG or check the "Technical Guidelines for Induction Motors driven by PWM Frequency inverters" available at www.weg.net.

7. COMMISSIONING

7.1. INITIAL START-UP

After finishing the installation procedures and before starting the motor for the first time or after a long period without operation, the following items must be checked:

- If the nameplate data (voltage, current, connection diagram, degree of protection, cooling system, service factor, etc.) meet the application requirements;
- If the machine set (motor + driven machine) has been mounted and aligned correctly;
- If the motor driving system ensures that the motor speed does not exceed the max. allowed speed indicated in Table 6.12;
- Measure the winding insulation resistance, making sure it complies with the specified values in item 5.4;
- Check the motor rotation direction;
- Inspect the motor terminal box for damage and ensure that it is clean and dry and all contacts are rust-free, the seals are in perfect operating conditions and all unused threaded holes are properly closed thus ensuring the degree of protection indicated on the motor nameplate;
- Check if the motor wiring connections, including grounding and auxiliary equipment connection, have been carried out properly and are in accordance with the recommendations in item 6.9;
- Check the operating conditions of the installed auxiliary devices (brake, encoder, thermal protection device, forced cooling system, etc.);
- Check bearing operating conditions. If the motors are stored and/or installed for more than two years without running, it is recommended to change the bearings, or to remove, wash, inspect and relubricate them before the motor is started. If the motor is stored and/or installed according to the recommendations described in item 5.3, lubricate the bearings as described in item 8.2. For the bearing condition evaluation, it is recommended to use of the vibration analysis techniques: Envelope Analysis or Demodulation Analysis.
- For roller bearing motors with oil lubrication, ensure:
  - The oil level should be in the center of the sight glass (see Figure 8.1 and 8.2);
  - That if the motor is stored for a period equal or longer than the oil change interval, the oil must be changed before starting the motor.
- When motors are fitted with sleeve bearings, ensure:
  - Correct oil level for the sleeve bearing. The oil level should be in the center of the sight glass (see Figure 8.3);
  - That the motor is not started or operated with axial or radial loads;
  - That if the motor is stored for a period equal or longer than the oil change interval, the oil must be changed before starting the motor.
- Inspect the capacitor operating condition, if any. If motors are installed for more than two years, but were never commissioned, it is recommended to change the start capacitors since they lose their operating characteristics;
- Ensure that the air inlet and outlet opening are not blocked. The minimum clearance to the nearest wall (L) should be at least ¼ of the fan cover diameter (D), see Figure 7.1. The intake air temperature must be at ambient temperature.

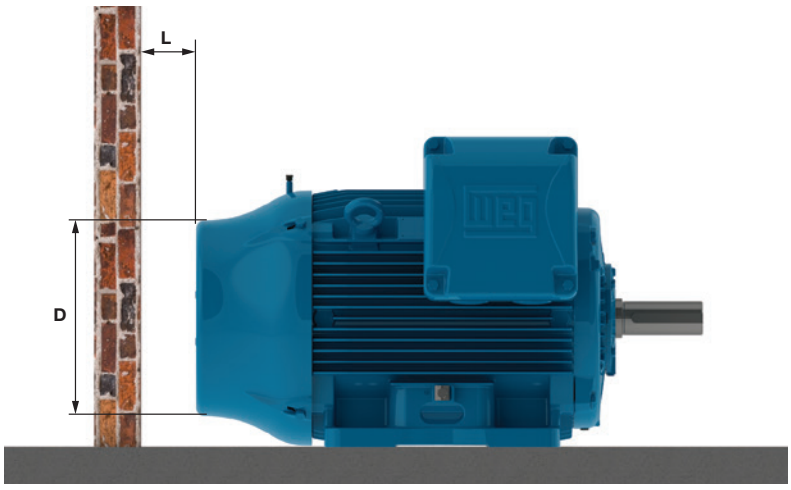


Figure 7.1- *Minimum clearance to the wall*

Please consider the minimum distances shown in the Table 7.1 as reference value;

Table 7.1 *- Minimum distance between the fan cover and wall*

Frame size		Distance between the fan cover and the wall (L)	
IEC	**NEMA**	**mm**	**inches**
63	-	25	0.96
71	-	26	1.02
80	-	30	1.18
90	143/5	33	1.30
100	-	36	1.43
112	182/4	41	1.61
132	213/5	50	1.98
160	254/6	65	2.56
180	284/6	68	2.66
200	324/6	78	3.08
225 250	364/5 404/5	85	3.35
280	444/5 445/7 447/9	108	4.23
315	L447/9 504/5 5006/7/8 5009/10/11	122	4.80
355	586/7 588/9 5807/8/9 5810/11/12	136	5.35
400	6806/7/8 6809/10/11	147	5.79
450	7006/10	159	6.26
500	8006/10	171	6.73
560	8806/10	185	7.28
630	9606/10	200	7.87

- Ensure correct water flow rate and water temperature when water cooled motors are used. See item 7.2;
- Ensure that all rotating parts, such as pulleys, couplings, external fans, shaft, etc. are protected against accidental contact.

Other tests and inspections not included in the manual may be required, depending on the specific installation, application and/or motor characteristics.

After all previous inspections have been carried out, proceed as follows to start the motor:

- Start the motor on no-load (if possible) and check the motor direction of rotation. Check for the presence of any abnormal noise, vibration or other abnormal operating conditions;
- Ensure the motor starts smoothly. If any abnormal operating condition is noticed, switch off the motor, check the assembly system and connections before the motor is started again;
- If excessive vibrations are noticed, check if the motor mounting bolts are well tightened or if the vibrations are not generated and transmitted from adjacent installed equipment. Check the motor vibration periodically and ensure that the vibration limits are as specified in item 7.2.1;
- Start the motor at rated load during a short time and compare the operating current with the rated current indicated on the nameplate;
- Continue to measure the following motor variables until thermal equilibrium is reached: current, voltage, bearing and motor frame temperature, vibration and noise levels;
- Record the measured current and voltage values on the Installation Report for future comparisons.

As induction motors have high inrush currents during start-up, the acceleration of high inertia load requires an extended starting time to reach full speed resulting in fast motor temperature rise. Successive starts within short intervals will result in winding temperature increases and can lead to physical insulation damage reducing the useful life of the insulation system. If the duty cycle S1 / CONT. is specified on the motor nameplate, this means that the motor has been designed for:

- Two successive starts: first start from cold condition, i. e., the motor windings are at room temperature and the second start immediately after the motor stops;
- One start from hot condition, i. e., the motor windings are at rated temperature.

The Troubleshooting Chart in section 10 provides a basic list of unusual cases that may occur during motor operation with the respective corrective actions.

7.2. OPERATING CONDITIONS

Unless otherwise stated in the Purchase Order, electric motors are designed and built to be operated at altitudes up to 1000 meters above sea level and in a temperature range from -20 °C to +40 °C. Any deviation from the normal condition of motor operation must be stated on the motor nameplate. Some components must be changed if the ambient temperature is different from the specified one. Please contact WEG to check the required special features.

For operating temperatures and altitudes differing from those above, the factors indicated in Table 7.2 must be applied to the nominal motor power rating in order to determine the derated available output (Pmax = Pnom x correction factor).

Table 7.2 - *Correction factors for altitude and ambient temperature*

T (°C)	Altitude (m)								
	1000	1500	2000	2500	3000	3500	4000	4500	5000
10							0.97	0.92	0.88
15						0.98	0.94	0.90	0.86
20					1.00	0.95	0.91	0.87	0.83
25				1.00	0.95	0.93	0.89	0.85	0.81
30			1.00	0.96	0.92	0.90	0.86	0.82	0.78
35		1.00	0.95	0.93	0.90	0.88	0.84	0.80	0.75
40	1.00	0.97	0.94	0.90	0.86	0.82	0.80	0.76	0.71
45	0.95	0.92	0.90	0.88	0.85	0.81	0.78	0.74	0.69
50	0.92	0.90	0.87	0.85	0.82	0.80	0.77	0.72	0.67
55	0.88	0.85	0.83	0.81	0.78	0.76	0.73	0.70	0.65
60	0.83	0.82	0.80	0.77	0.75	0.73	0.70	0.67	0.62
65	0.79	0.76	0.74	0.72	0.70	0.68	0.66	0.62	0.58
70	0.74	0.71	0.69	0.67	0.66	0.64	0.62	0.58	0.53
75	0.70	0.68	0.66	0.64	0.62	0.60	0.58	0.53	0.49
80	0.65	0.64	0.62	0.60	0.58	0.56	0.55	0.48	0.44

Motors installed inside enclosures (cubicles) must be ensured an air renewal rate in the order of one cubic meter per second for each 100 kW installed power or fraction of installed power. Totally Enclosed Air Over motors - TEAO (fan and exhaust / smoke extraction) are supplied without cooling fan and the manufacturer of the driven machine is responsible for sufficient motor cooling. If no minimum required air speed between motor fins is indicated on the motor nameplate, ensure the air speed indicated in the table 7.3 is provided. The values shown in Table 7.3 are valid for 60 Hz motors. To obtain the minimum air speed for 50 Hz motors, multiply the values in the table by 0.83.

Table 7.3 *- Minimum required air speed between motor fins (metres/second)*

Frame		Poles			
IEC	**NEMA**	**2**	**4**	**6**	**8**
63 to 90	143/5	13	7	5	4
100 to 132	182/4 to 213/5	18	12	8	6
160 to 200	254/6 to 324/6	20	15	10	7
225 to 280	364/5 to 444/5	22	20	15	12
315 to 450	445/7 to 7008/9	25	25	20	15

The voltage and frequency variations may affect the performance characteristics and the electromagnetic compatibility of the motor. The power supply variations should not exceed the values specified in the applicable standards. Examples:

- ABNT NBR 17094 - Parts 1 and 2. The motor has been designed to supply the rated torque for a combined variation in voltage and frequency:
  - Zone A: ±5% of the rated voltage and ±2% of the rated frequency;
  - Zone B: ±10% of the rated voltage and +3% -5% of the rated frequency.

When operated continuously in Zone A or B, the motor may show performance variations and the operating temperature may increase considerably. These performance variations will be higher in Zone B. Thus it is not recommended to operate the motor in Zone B during extended periods.

- IEC 60034-1. The motor has been designed to supply the rated torque for combined variation in voltage and frequency:
  - Zone A: ±5% of the rated voltage and ±2% of the rated frequency;
  - Zone B: ±10% of the rated voltage and +3% -5% of the rated frequency.

When operated continuously in Zone A or B, the motor may show performance variations and the operating temperature may increase considerably. These performance variations will be higher in Zone B. Thus it is not recommended to operate the motor in Zone B during extended periods. For multivoltage motors (example 380-415/660 V), a ±5% voltage variation from the rated voltage is allowed.

- NEMA MG 1 Part 12. The motor has been designed to be operated in one of the following variations:
  - ±10% of the rated voltage, with rated frequency;
  - ±5% of the rated frequency, with rated voltage;
  - A combined variation in voltage and frequency of ±10%, provided the frequency variation does not exceed ±5%.

If the motor is cooled by ambient air, clean the air inlet and outlet openings and cooling fins at regular intervals to ensure a free airflow over the frame surface. The hot air should never be returned to the motor. The cooling air must be at room temperature limited to the temperature range indicated on the motor nameplate (if no room temperature is specified, please consider a temperature range between -20 °C and +40 °C).

Table 7.4* shows the minimum required water flow for water cooled motors considering the different frame sizes and the maximum allowed temperature rise of the cooling water after circulating through the motor. The inlet water temperature should not exceed 40 °C.

Table 7.4 *- Minimum required water flow and the maximum allowed temperature rise of the cooling water after circulating through the motor*

Frame size		Flow rate (litres/minute)	Maximum allowed water temperature rise (°C)
IEC	NEMA		
180	284/6	12	5
200	324/6	12	5
225	364/5	12	5
250	404/5	12	5
280	444/5 445/7 447/9	15	6
315	504/5	16	6
355	586/7 588/9	25	6

For W60 motors, please see the nameplate at heat-exchanger.
Motors fitted with oil mist lubrication systems can be operated continuously for a maximum of one hour after the failure of the oil pumping system.

Considering the sun's heat increases the operating temperature, externally mounted motors must always be protected from direct sunlight exposure.

Each and every deviation from the normal operating condition (tripping of the thermal protection, noise and vibration level increase, temperature and current rise) should be investigated and corrected by WEG Authorized Service Centers.

Motors fitted with cylindrical roller bearings require a minimum radial load to ensure a normal operation. For information regarding the radial preload, please contact WEG.

7.2.1.Limits of vibration

The vibration severity is the maximum vibration value measured at all positions and in all directions as recommended in the standard IEC 60034-14. Table 7.5 specifies the limits of the maximum vibrations magnitudes according to standard IEC 60034-14 for shaft heights IEC 56 to 400, for vibrations grades A and B. The vibration severity limits in Table 7.5 are given as RMS values (Root Mean Square values or effective values) of the vibration speed in mm/s measured in free suspension condition.

Table 7.5 *- Recommended limits for the vibration severity according to standard IEC 60034-14*

Shaft height [mm]	56 ≤ H ≤ 132	132 ≤ H ≤ 280	H > 280
Vibration grade	Vibration severity on elastic base [mm/s RMS]		
A	1.6	2.2	2.8
B	0.7	1.1	1.8

Notes:
1 - The values in Table 7.5 are valid for measurements carried out with decoupled machines (without load) operated at rated voltage and frequency.
2 - The values in Table 7.5 are valid regardless of the direction of rotation of the machine.
3 - The values in Table 7.5 are not applicable to single-phase motors, three-phase motors powered by a single-phase system or to machines mounted in situ or coupled with inertia flywheels or to loads.

According to NEMA MG 1, the allowed vibration limit for standard motors is 0.15 in/s (peak vibration in in/s).

Note:
For the load operation condition, the use of the standard ISO 10816-3 is recommended for evaluating the motor vibration limits. In the load condition the motor vibration will be influenced by several factors, such as, type of the coupled load, condition of the motor fixation, alignment condition under load, structure or base vibration due to other equipments, etc..

8. MAINTENANCE

The purpose of the maintenance is to extend the useful life of the equipment. The non-compliance with one of these previous items can cause unexpected machine failures.

If motors with cylindrical roller or angular contact bearings are to be transported during the maintenance procedures, the shaft locking device must always be fitted. All HGF, W50 and W60 motors, regardless of the bearing type, must always be transported with the shaft locking device fitted.

All repairs, disassembly and assembly related services must be carried out only by qualified and well-trained personnel by using proper tools and techniques. Make sure that the machine has stopped and it is disconnected from the power supply, including the accessory devices (space heater, brake, etc.), before any servicing is undertaken.
The company does not assume any responsibility or liability for repair services or maintenance operations executed by non-authorized Service Centers or by non qualified service personnel. The company shall have no obligation or liability whatsoever to the buyer for any indirect, special, consequential or incidental loss or damage caused or arising from the company's proven negligence.

Pacemaker users and unqualified personnel shall not open WMagnet and WQuattro motors, because high energy magnets are used.

8.1. GENERAL INSPECTION

The inspection intervals depend on the motor type, application and installation conditions. Proceed as follows during inspection:

- Visually inspect the motor and coupling. Check if abnormal noises, vibrations, excessive heating, wear signs, misalignment or damaged parts are noticed. Replace the damaged parts as required;
- Measure the insulation resistance according to the item 5.4;
- Clean the motor enclosure. Remove oil spills and dust accumulation from the motor frame surface to ensure a better heat transfer to the surrounding ambient;
- Check cooling fan condition and clean the air inlet & outlet openings to ensure a free air flow over the motor;
- Investigate the actual condition of the seals and replace them, if required;
- Drain the condensed water from inside the motor. After draining, reinstall the drain plugs to ensure the degree of protection as indicated on the motor nameplate. The motor must always be positioned so the drain hole is at the lowest position (see item 6);
- Check the connections of the power supply cables, ensuring the correct clearance distance between live and grounded parts, as specified in Table 6.3;
- Check if the tightening torque of the bolted connections and mounting bolts meets the tightening torque specified in Table 8.12;
- Check the status of the cable passages, the cable gland seals and the seals inside the terminal box and replace them, if required;
- Check the bearing operating conditions. Check for the presence of any abnormal noise, vibration or other abnormal operating conditions, like motor temperature rise. Check the oil level, the lube oil condition and compare the workings hours with the informed life time;
- Record and file all changes performed on the motor.

Do not reuse damaged or worn parts. Damaged or worn parts must be replaced by parts supplied by the manufacturer and must be installed as if they were the original parts.

8.2. LUBRICATION

Proper lubrication plays a vital role in the motor performance. Only use the grease or oil types, amounts and lubrication intervals recommended for the bearings. This information is available on the motor nameplate and the lubrication procedures must be carried out according to the type of lubricant (oil or grease).
When the motor is fitted with thermal protection devices for bearing temperature control, consider the operating temperature limits shown in Table 6.5.
The maximum operating temperature of motors used in special applications may differ from those shown in Table 6.4. The grease and oil disposal should be made in compliance with applicable laws in each country.

Please contact WEG when motors are to be installed in special environments or used for special applications.

8.2.1. Grease lubricated rolling bearings

Excess grease causes bearing overheating, resulting in bearing failure.

The lubrication intervals specified in Table 8.1, Table 8.2, Table 8.3, Table 8.4, Table 8.5, Table 8.6, Table 8.7, Table 8.8 and Table 8.9 consider an absolute temperature on the bearing of 70 °C (up to frame size IEC 200 / NEMA 324/6) and 85 °C (for frame size IEC 225 / NEMA 364/5 and above), the motor running at rated speed, a motor mounted in horizontal position and greased with Mobil Polyrex EM grease. Any variation of the parameters listed above must be evaluated.

Table 8.1 *- Lubrication intervals for ball bearings*

Frame		Poles	Bearing designation	Amount of grease (g)	Lubrication intervals (hours)					
					ODP (Open Drip Proof)		W21 TEFC (Totally Enclosed Fan Cooled)		W22 TEFC (Totally Enclosed Fan Cooled)	
IEC	NEMA				50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
90	143/5	2	6205	4	-	-	20000	20000	25000	25000
		4								
		6								
		8								
100	-	2	6206	5						
		4								
		6								
		8								
112	182/4	2	6207/ 6307	9						
		4								
		6								
		8								
132	213/5	2	6308	11				18400		
		4						20000		
		6								
		8								
160	254/6	2	6309	13	20000	20000	18100	15700		
		4					20000	20000		
		6								
		8								
180	284/6	2	6311	18			13700	11500		
		4					20000	20000		
		6								
		8								
200	324/6	2	6312	21			11900	9800		
		4					20000	20000		
		6								
		8								
225 250 280 315 355	364/5 404/5 444/5 445/7 447/9 L447/9 504/5 5008 5010/11 586/7 588/9	2	6314	27	18000	14400	4500	3600	5000	4000
		4			20000	20000	11600	9700	14000	12000
		6					16400	14200	20000	17000
		8					19700	17300	24000	20000
		2	6316	34	14000	*Upon request	3500	*Upon request	4000	*Upon request
		4			20000	20000	10400	8500	13000	10000
		6					14900	12800	18000	16000
		8					18700	15900	20000	20000
		2	6319	45	*Upon request					
		4			20000	20000	9000	7000	11000	8000
		6					13000	11000	16000	13000
		8					17400	14000	20000	17000
		4	6322	60			7200	5100	9000	6000
		6					10800	9200	13000	11000
		8					15100	11800	19000	14000

Table 8.2 - *Lubrication intervals for cylindrical roller bearings*

Frame		Poles	Bearing designation	Amount of grease (g)	Lubrication intervals (hours)					
					ODP (Open Drip Proof)		W21 TEFC (Totally Enclosed Fan Cooled)		W22 TEFC (Totally Enclosed Fan Cooled)	
IEC	NEMA				50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
160	254/6	2	NU309	13	20000	19600	13300	9800	16000	12000
		4				20000	20000	20000	25000	25000
		6								
		8								
180	284/6	2	NU311	18	18400	12800	9200	6400	11000	8000
		4			20000	20000	20000	19100	25000	25000
		6						20000		
		8								
200	324/6	2	NU312	21	15200	10200	7600	5100	9000	6000
		4			20000	20000	20000	17200	25000	21000
		6						20000		25000
		8								
225 250 280 315 355	364/5 404/5 444/5 445/7 447/9 L447/9 504/5 5008 5010/11 586/7 588/9	4	NU314	27	17800	14200	8900	7100	11000	9000
		6			20000	20000	13100	11000	16000	13000
		8					16900	15100	20000	19000
		4	NU316	34	15200	12000	7600	6000	9000	7000
		6			20000	19000	11600	9500	14000	12000
		8				20000	15500	13800	19000	17000
		4	NU319	45	12000	9400	6000	4700	7000	5000
		6			19600	15200	9800	7600	12000	9000
		8			20000	20000	13700	12200	17000	15000
		4	NU322	60	8800	6600	4400	3300	5000	4000
		6			15600	11800	7800	5900	9000	7000
		8			20000	20000	11500	10700	14000	13000

Table 8.3 - *Lubrication intervals for ball bearings - HGF line*

Frame		Poles	Bearing designation	Amount of grease (g)	Lubrication intervals (hours)	
IEC	NEMA				50 Hz	60 Hz
315L/A/B and 315C/D/E	5006/7/8T and 5009/10/11T	2	6314	27	3100	2100
		4 - 8	6320	50	4500	4500
			6316	34		
355L/A/B and 355C/D/E	5807/8/9T and 5810/11/12T	2	6314	27	3100	2100
		4 - 8	6322	60	4500	4500
			6319	45		
400L/A/B and 400 C/D/E	6806/7/8T and 6809/10/11T	2	6315	30	2700	1800
		4 - 8	6324	72	4500	4500
			6319	45		
450	7006/10	2	6220	31	2500	1400
		4	6328	93	4500	3300
			6322	60		4500
		6 - 8	6328	93		
			6322	60		
500	8006/10	4	6330	104	4200	2800
			6324	72	4500	4500
		6 - 8	6330	104		
			6324	72		
560	8806/10	4 - 8	*Upon request			
630	9606/10	4 - 8				

Table 8.4 - *Lubrication intervals for cylindrical roller bearings - HGF line*

Frame		Poles	Bearing designation	Amount of grease (g)	Lubrication intervals (hours)	
IEC	NEMA				50 Hz	60 Hz
315L/A/B and 315C/D/E	5006/7/8 and 5009/10/11	4	NU320	50	4300	2900
		6 - 8			4500	4500
355L/A/B and 355C/D/E	5807/8/9 and 5810/11/12	4	NU322	60	3500	2200
		6 - 8			4500	4500
400L/A/B and 400C/D/E	6806/7/8 and 6809/10/11	4	NU324	72	2900	1800
		6 - 8			4500	4500
450	7006/10	4	NU328	93	2000	1400
		6			4500	3200
		8			4500	4500
500	8006/10	4	NU330	104	1700	1000
		6			4100	2900
		8			4500	4500
560	8806/10	4	NU228 + 6228	75	2600	1600
		6 - 8		106	4500	4500
630	9606/10	4	NU232 + 6232	92	1800	1000
		6		120	4300	3100
		8		140	4500	4500

Table 8.5 - *Lubrication intervals for ball bearings - W50 line*

	Frame		Poles	DE Bearing	Amount of grease (g)	50 Hz (h)	60 Hz (h)	NDE Bearing	Amount of grease (g)	50 Hz (h)	60 Hz (h)
	IEC	NEMA									
Horizontal mounting Ball bearings	315 H/G	5009/10	2	6314	27	4500	3500	6314	27	4500	3500
			4 - 8	6320	50		4500	6316	34		4500
	355 J/H	5809/10	2	6314	27		3500	6314	27		3500
			4 - 8	6322	60		4500	6319	45		4500
	400 L/K and 400 J/H	6806/07 and 6808/09	2	6218	24	3800	2500	6218	24	3800	1800
			4 - 8	6324	72	4500	4500	6319	45	4500	4500
	450 L/K and 450 J/H	7006/07 and 7008/09	2	6220	31	3000	2000	6220	31	3000	2000
			4	6328	93	4500	3300	6322	60	4500	4500
			6 - 8				4500				
Vertical mounting Ball bearings	315 H/G	5009/10	2	7314	27	2500	1700	6314	27	2500	1700
			4	6320	50	4200	3200	6316	34	4500	4500
			6 - 8			4500	4500				
	355 J/H	5809/10	2	7314	27	2500	1700	6314	27	2500	1700
			4	6322	60	3600	2700	6319	45	4500	3600
			6 - 8			4500	4500				4500
	400 L/K and 400 J/H	6806/07 and 6808/09	2	7218	24	2000	1300	6218	24	2000	1300
			4	7324	72	3200	2300	6319	45	4500	3600
			6			4500	4300				4500
			8				4500				
	450 L/K and 450 J/H	7006/07 and 7008/09	2	7220	31	1500	1000	6220	31	1500	1000
			4	7328	93	2400	1700	6322	60	3500	2700
			6			4100	3500			4500	4500
			8			4500	4500				

Table 8.6 - *Lubrication intervals for cylindrical roller bearings - W50 line*

	Frame		Poles	DE Bearing	Amount of grease (g)	50 Hz (h)	60 Hz (h)	NDE Bearing	Amount of grease (g)	50 Hz (h)	60 Hz (h)
	IEC	NEMA									
Horizontal mounting Roller bearings	315 H/G	5009/10	4	NU320	50	4300	2900	6316	34	4500	4500
			6 -8			4500	4500				
	355 J/H	5809/10	4	NU322	60	3500	2200	6319	45		
			6 - 8			4500	4500				
	400 L/K and 400 J/H	6806/07 and 6808/09	4	NU324	72	2900	1800				
			6 - 8			4500	4500				
	450 L/K and 450 J/H	7006/07 and 7008/09	4	NU328	93	2000	1400	6322	60		
			6			4500	3200				
			8				4500				

Table 8.7 - *Lubrication intervals for ball bearings - W40 line*

	Frame		Poles	DE Bearing	Amount of grease (g)	50 Hz (h)	60 Hz (h)	NDE Bearing	Amount of grease (g)	50 Hz (h)	60 Hz (h)
	IEC	NEMA									
Horizontal mounting Ball bearings	160M/L	254/6	2 - 8	6309	13	20000	20000	6209	9	20000	20000
	180M/L	284/6		6311	18			6211	11		
	200M/L	324/6		6312	21						
	225S/M	364/5	2	6314	27	18000	14400	6212	13		
			4 – 8								
	250S/M	404/5	2								
			4 – 8	6316	34	20000	20000				
	280S/M	444/5	2	6314	27	18000	14400				
			4 – 8	6319	45	20000	20000	6314	27		
	280L	447/9	2	6314	27	18000	14400			18000	14400
			4 – 8	6319	45	20000	20000			20000	20000
	315G/F	5010/11	2	6314	27	4500	4500			4500	4500
			4 – 8	6319	45						
	355J/H	L5010/11	2	6218	24	2200	2200	6218	24	2200	2200
			4 – 8	6224	43	4500	4500			4500	4500
	400J/H	L5810/11	2	6220	31	2200	2200	6220	31	2200	2200
			4 – 8	6228	52	4500	4500			4500	4500
	450K/J	L6808/09	2	6220	31	2200	2200			2200	2200
			4 – 8	6228	52	4500	4500			4500	4500

Table 8.8 - Lubrication intervals for cylindrical roller bearings - W40 line

	Frame		Poles	DE Bearing	Amount of grease (g)	50 Hz (h)	60 Hz (h)	NDE Bearing	Amount of grease (g)	50 Hz (h)	60 Hz (h)
	IEC	NEMA									
Horizontal mounting Roller bearings	225S/M	364/5	4 – 8	NU314	27	20000	20000	6314	27	20000	20000
	250S/M	404/5		NU316	34						
	280S/M	444/5		NU319	45		18800				
	280L	447/9				4500	4500			4500	4500
	315G/F	5010/11									
	355J/H	L5010/11		NU224	43			6218	24		
	400J/H	L5810/11		NU228	52		3300	6220	31		
	450K/J	L6808/09									

Table 8.9 - Lubrication intervals for ball bearings and for cylindrical roller bearings - line W60

	Frame		Poles	DE Bearing	Amount of grease (g)	50 Hz (h)	60 Hz (h)	NDE Bearing	Amount of grease (g)	50 Hz (h)	60 Hz (h)
	IEC	NEMA									
Horizontal mounting Ball bearings	355H/G	5810/11	2	6218	24	2300	1500	6218	24	2300	1500
			4/8	6224	43	4500	4500			4500	4500
	400J/H	L5810/11	2	6220	31	1800	1200	6220	31	1800	1200
			4/8	6228	52	4500	4500			4500	4500
	400G/F	6810/11	2	6220	31	1800	1200			1800	1200
			4/8	6228	52	4500	4500			4500	4500
Horizontal mounting Roller bearings	355H/G	5810/11	4	NU224	43	4500	4500	6218	24		
			6/8								
	400J/H	L5810/11	4	NU228	52		1500		31		1500
			6/8				4500	6220			4500
	400G/F	6810/11	4				1500				1500
			6/8				4500				4500

For each increment of 15 ºC above the bearing temperature, the relubrication intervals given in the Table must be halved. The relubrication interval of motors designed by the manufacturer for mounting in horizontal position, but installed in vertical position (with WEG authorization), must be halved.
For special applications, such as: high and low temperatures, aggressive environments, driven by frequency inverter (VFD - frequency inverter), etc., please contact WEG about the required amount of grease and the relubrication intervals.

8.2.1.1. Motor without grease fitting

Motors without grease fittings must be lubricated in accordance with the existing Maintenance Plan. Motor disassembly must be carried out as specified in Item 8.3. If motors are fitted with shielded bearings (for example, ZZ, DDU, 2RS, VV), these bearings must be replaced at the end of the grease service life.

8.2.1.2. Motor with grease fitting

To lubricate the bearings with the motor stopped, proceed as follows:
- Before lubricating, clean the grease nipple and immediate vicinity thoroughly;
- Lift grease inlet protection;
- Remove the grease outlet plug (not required for motors with automatic grease relief fittings, such as IEEE Std 841);
- Pump in approximately half of the total grease indicated on the motor nameplate and run the motor for about 1 (one) minute at rated speed;
- Switch-off the motor and pump in the remaining grease;
- Lower again the grease inlet protection and reinstall the grease outlet plug.

To grease the motor while running, proceed as follows:
- Before lubricating, clean the grease nipple and immediate vicinity thoroughly;
- Lift grease inlet protection;
- If safe and possible, remove the grease outlet plug;
- Pump the total grease indicated on the motor nameplate;
- Lower again the grease inlet protection and reinstall the grease outlet plug (if removed).

For lubrication, use only manual grease gun.

Due to internal clearances in the motor, it is possible that, in the first re-lubrication of the bearings, the grease will not come out of the grease outlet. Therefore, do not apply excess grease expecting for it to come out.

If Motors are provided with a spring device for grease removal, the grease excess must be removed by pulling the rod and cleaning the spring until the spring does not remove more grease.

8.2.1.3. Compatibility of the Mobil Polyrex EM grease with other greases

The Mobil Polyrex EM grease has a polyurea thickener and a mineral oil and it is not compatible with other greases.
If you need another type of grease, contact WEG.
It is not recommended to mix different types of greases. In such a case, clean the bearings and lubrication channels before applying new grease.
The used grease must have in its formulation corrosion and oxidation inhibitors.

8.2.2. Oil lubricated bearings

To change the oil of oil lubricated motor proceed as follows:
- Switch-off the motor;
- Remove threaded oil drain plug;
- Open the valve and drain the oil;
- Close the drain valve again;
- Reinstall the threaded oil drain plug;
- Fill-up with the type and amount of oil as specified on the nameplate;
- Check oil level. The oil level is OK when the lubricant can be viewed approximately in the center of the sight glass;
- Reinstall oil inlet plug;
- Check for oil leaks and ensure that all not used threaded plugs are closed with plugs.

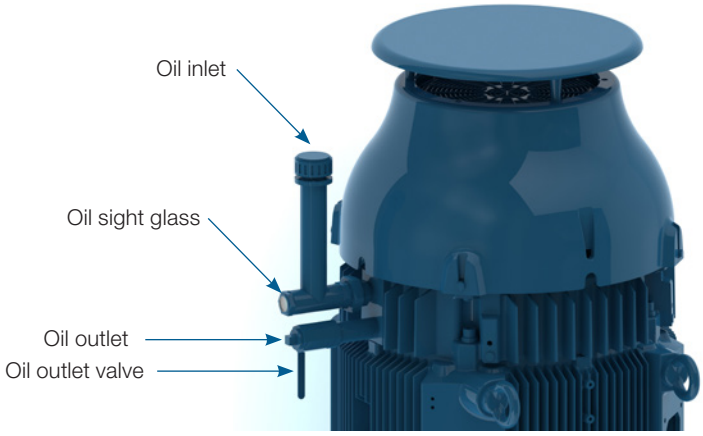


Figure 8.1 *- Oil lubricated bearing - vertical mounting*

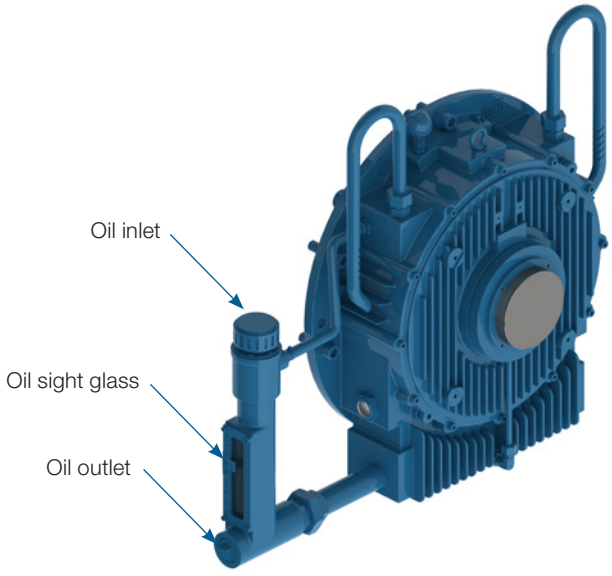


Figure 8.2 *- Oil lubricated bearing - horizontal mounting*

The bearing lubricating oil must be replaced as specified on the nameplate or whenever changes in the oil properties are noticed. The oil viscosity and pH must be checked periodically. The oil level must be checked every day and must be kept in the center of the sight glass.
Please contact WEG, when oils with different viscosities should be used.

***Note**:*
The HGF vertical mounted motors with high axial thrust are supplied with grease lubricated DE-bearings and with oil lubricated NDE-bearings. The DE-bearings must be lubricated according to recommendations in item 8.2.1. Table 8.10 specifies the oil type and the amount of oil required for this motor lubrication.

***Table 8.10** - Oil properties for HGF vertical mounted motors with high axial thrust*

Mounting - high axial thrust	Frame		Poles	Bearing designation	Oil (liters)	Interval (h)	Lubricant	Lubricant specification
	IEC	NEMA						
	315L/A/B and 315C/D/E	5006/7/8T and 5009/10/11T	4 - 8	29320	20	8000	FUCHS Renolin DTA 40 / Mobil SHC 629	ISO VG150 mineral oil with antifoam and antioxidant additives
	355L/A/B and 355C/D/E	5807/8/9T and 5810/11/12T			26			
	400L/A/B and 400C/D/E	6806/7/8T and 6809/10/11T			37			
	450	7006/10			45			

8.2.3. Oil mist lubricated bearings

Check the service conditions of the seals and if replacement is required use only original components. Clean the seal components before assembly (bearing caps, end shields, etc.).
Apply joint sealant between the bearing caps and end shields. The joint sealant must be compatible with the used lubricating oil. Connect the oil lubricant tubes (oil inlet and oil outlet tubes and motor drain tube), as shown in Figure 6.12.

8.2.4. Sleeve bearings

The lubricating oil of sleeve bearings must be changed at the intervals specified in Table 8.11. To replace the oil, proceed as follows:

- NDE-bearing: remove the protection plate from the fan cover;
- Drain the oil through the drain hole located at the bottom of the bearing (see Figure 8.3);
- Close the oil drain hole;
- Remove the oil inlet plug;
- Fill the sleeve bearing with the specified oil and with the amount of oil specified in the Table 8.11;
- Check the oil level and ensure it is kept close to the center of the sight glass;
- Install the oil inlet plug;
- Check for oil leaks.

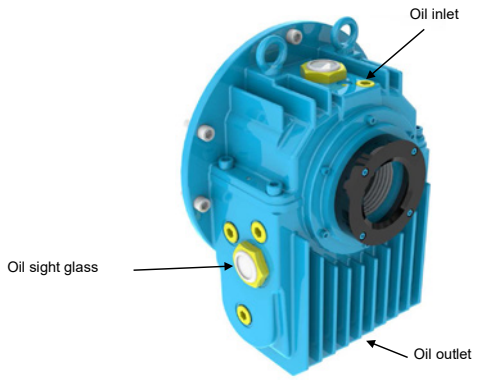


***Figure 8.3** - Sleeve bearing*

Table 8.11 - Oil properties for sleeve bearings

Frame		Poles	Bearing designation	Oil (liters)	Interval (h)	Lubricant	Lubricant specification
IEC	NEMA						
315	5000	2	9-80	3.6	8000	FUCHS Renolin DTA 10	ISO VG32 mineral oil with antifoam and antioxidant additives
355	5800						
400	6800						
450	7000						
315	5000	4 - 8	9-90		8000	FUCHS Renolin DTA 15	ISO VG46 mineral oil with antifoam and antioxidant additives
355	5800		9-100				
400	6800		11-110	4.7			
450	7000		11-125				
500	8000						

The lubricating oil must be replaced as specified on the nameplate or whenever changes on the oil properties are noticed. The oil viscosity and pH must be checked periodically. The oil level must be checked every day and kept in the center of the sight glass.
Please contact WEG, when oils with different viscosities are to be used.

8.3. MOTOR ASSEMBLY AND DISASSEMBLY

All repair services on motors should be always performed by qualified personnel and in accordance with the applicable laws and regulations in each country. Always use proper tools and devices for motor disassembly and assembly.

Disassembly and assembly services can be carried out only after the motor has been disconnected from the power supply and is completely stopped.

Dangerous voltages may be present at the motor terminals inside the terminal box since capacitors can retain electrical charge for long periods of time even when they are not connected directly to a power source or when space heaters are connected to the motor or when the motor windings are used as space heaters. Dangerous voltages may be present at the motor terminals when they are driven by frequency inverter even when they are completely stopped.

Record the installation conditions such as terminal connection diagram, alignment / leveling conditions before starting the disassembly procedures. These records should be considered for later assembly.

Disassemble the motor carefully without causing scratches on machined surfaces or damaging the threads.

Assemble the motor on a flat surface ensuring a good support base. Footless motors must be fixed/locked on the base to prevent accidents.

Handle the motor carefully to not damage the insulated components such as windings, insulated rolling bearings, power cables etc..

Seal elements, such as joint seals and bearing seals should always be replaced when wear or damage is noticed.
Motors with degree of protection higher than IP55 are supplied with joint and screw seal Loctite 5923 (Henkel) Clean the components and apply a new coat of Loctite 5923 on the surfaces before assembly.

For motors with permanent magnet rotor (lines W22 Quattro and W22 Magnet), the motor assembly and disassembly require the use of proper devices due to the attracting or repelling forces that occur between metallic parts. This work must only be performed by a WEG Authorized service center specifically trained for such an operation. People with pacemakers cannot handle these motors.
The permanent magnets can also cause disturbances or damages to other electric equipment and components during maintenance.

For the W40, W50 and HGF motor lines provided with axial fans, the motor and the axial fan have different markings for indicating the direction of rotation for prevent incorrect assembly.
The axial fan must be assembled so that the indicative arrow for direction of rotation is always visible, viewing the non-drive end side. The marking indicated on the axial fan blade, CW for clockwise direction of rotation or CCW for counterclockwise direction of rotation, indicates the direction of rotation of the motor viewing the drive end side.

8.3.1. Terminal box

Proceed as follows to remove the terminal box cover and to disconnect/connect the power supply cables and the cables of the accessory devices:

- Ensure that during the screw removal the terminal box cover does not damage the components installed inside the terminal box;
- If the terminal box cover is fitted with lifting eyebolt, lift the terminal box cover always by its lift eyebolt;
- If motors are supplied with terminal blocks, ensure the correct tightening torque on the motor terminals as specified in Table 8.12;

For flying leads motors, do not push the overlength of leads into the motor in order to prevent that they touch the rotor.

- Ensure that the cables do not contact sharp edges;
- Ensure that the original IP degree of protection is not changed and is maintained as indicate on the motor nameplate. The power supply cables and the control cables must always be fitted with components (cable glands, conduits) that meet the applicable standards and regulations of each country;
- Ensure that the pressure relief device is in perfect operating condition, if provided. The seals in the terminal box must be in perfect condition for reuse and must be reinstalled correctly to ensure the specified degree of protection;
- Ensure the correct tightening torque for the securing bolts of the terminal box cover as specified in Table 8.12.

Table 8.12 *- Tightening torque for the securing bolts [Nm]*

Screw type and seal	M4	M5	M6	M8	M10	M12	M14	M16	M20
Hex bolt/hex socket bolt (rigid joint)	-	3,5 to 5	6 to 9	14 to 20	28 to 40	45 to 70	75 to 110	115 to 170	230 to 330
Combined slotted screw (rigid joint)	1,5 to 3	3 to 5	5 to 10	10 to 18	-	-	-	-	-
Hex bolt/hex socket bolt (flexible joint)	-	3 to 5	4 to 8	8 to 15	18 to 30	25 to 40	30 to 45	35 to 50	-
Combined slotted screw (flexible joint)	-	3 to 5	4 to 8	8 to 15	-	-	-	-	-
Terminal blocks	1 to 1,5	2 to 4 1)	4 to 6,5	6,5 to 9	10 to 18	15,5 to 30	-	30 to 50	50 to 75
Grounding terminals	1,5 to 3	3 to 5	5 to 10	10 to 18	28 to 40	45 to 70	-	115 to 170	-

Note: 1) For 12-pin terminal block, apply the minimum torque of 1.5 Nm and maximum torque of 2.5 Nm.

8.4. DRYING THE STATOR WINDING INSULATION

Dismantle the motor completely. Remove the end shields, the rotor with the shaft, the fan cover, the fan and the terminal box before the wound stator with the frame is transferred to the oven for the drying process. Place the wound stator in the oven heated to max. 120 °C for two hours. For larger motors a longer drying time may be required. After the drying process has been concluded, allow the stator to cool to room temperature. Measure the insulation resistance again as described in item 5.4. Repeat the stator drying process if the required insulation resistance does not meet the values specified in Table 5.3. If the insulation resistance does not improve despite several drying processes, evaluate the causes of the insulation resistance drop carefully and an eventual replacement of the motor winding may be required. If in doubt contact WEG.

To prevent electrical shock, discharge the motor terminals immediately before, and after each measurement. If the motor is equipped with capacitors, these must be discharged before beginning any repair.

Pacemaker users and unqualified personnel shall not open WMagnet and WQuattro motors, because high energy magnets are used.

8.5. SPARE PARTS

When ordering spare parts, always provide complete motor designation, indicating the motor type, the code number and the serial number, which are stated on the motor nameplate.

Spare parts must always be purchased from WEG authorized Service Centers. The use of non-original spare parts can cause motor failure, performance drop and void the product warranty.

The spare parts must be stored in a clean, dry and properly ventilated room, with relative air humidity not exceeding 60%, with ambient temperature between 5 °C and 40 °C, free of dust, vibrations, gases, corrosive smokes and at constant temperature. The spare parts must be stored in their normal mounting position without placing other components onto them.

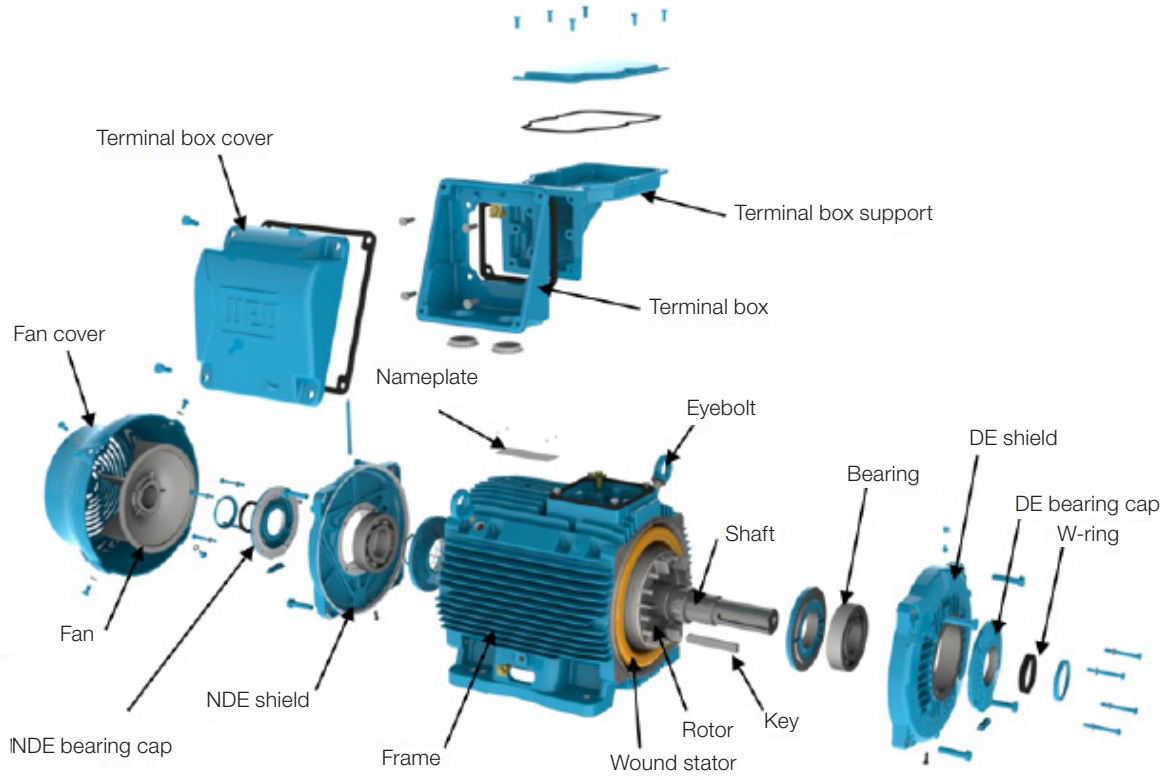


Figure 8.4 *- Exploded view of the components of a W22 motor*

9. ENVIRONMENTAL INFORMATION

9.1. PACKAGING

WEG electric motors are supplied in cardboard, plastic or wooden packaging. These materials can be recycled and must be disposed according to the applicable laws and regulations in each country. All wood used in the packaging of WEG motors come from the company reforestation program and is not submitted to any chemical conservation treatment.

9.2. PRODUCT

Electric motors consist mainly of ferrous metals (steel plates and cast iron), non ferrous metals (copper and aluminum) and plastic materials.

In general, electric motors have relatively long service live. However when they must be discarded, WEG recommends to dismantle the motor, sort the different materials and send them for recycling.

No-recyclable materials should be disposed of at industrial landfills according to the applicable environmental laws and regulations in each country, or co-processed in cement kilns or incinerated.

The recycling service providers, the disposal in industrial landfills, the waste co-processing or the incineration process must be properly authorized by the state environment agency to carry out these activities.

10. TROUBLESHOOTING CHART X SOLUTIONS

This troubleshooting chart provides a basic list of problems that may occur during motor operation, possible causes and recommended corrective actions. In case of doubts, please contact WEG Service Center.

Problem	Possible cause	Corrective action
Motor does not start, neither coupled nor decoupled	Power cables are interrupted	Check the control panel and the motor power supply cables
	Blown fuses	Replace blown fuses
	Wrong motor connection	Correct the motor connection according to connection diagram
	Locked rotor	Check motor shaft to ensure that it rotates freely
The motor starts at no-load, but fails when load is applied. It starts very slowly and does not reach the rated speed	Load toque is too high during start-up	Do not start the motor on load
	Too high voltage drop in the power cables	Check the installation dimensioning (transformer, cable cross section, relays, circuit breakers, etc.)
Abnormal/excessive noise	Defective transmission component or defective driven machine	Check the transmission force, the coupling and the alignment
	Misaligned / unleveled base	Align / level the motor with the driven machine
	Unbalanced components or unbalanced driven machine	Balance the machine set again
	Different balancing methods used for motor and coupling balancing (halve key, full key)	Balance the motor again
	Wrong motor direction of rotation	Reverse the direction of rotation
	Loose bolts	Retighten the bolts
	Foundation resonance	Check the foundation design
	Damaged bearings	Replace the bearings
Motor overheating	Insufficient cooling	Clean air inlet and outlet and cooling fins
		Check the minimum required distance between the fan cover and nearest walls. See item 7
		Check air temperature at inlet
	Overload	Measure motor current, evaluate motor application and if required, reduce the load
	Number of starts per hour is too high or the load inertia moment is too high	Reduce the number of starts per hour
	Power supply voltage too high	Check the motor power supply voltage. Power supply voltage must not exceed the tolerance specified in item 7.2
	Power supply voltage too low	Check the motor power supply voltage and the voltage drop. Power supply voltage must not exceed the tolerance specified in item 7.2
	Interrupted power supply	Check the connection of the power cables
	Voltage unbalance at the motor terminals	Check for blown fuses, wrong commands, voltage unbalance in the power line, phase fault or interrupted power cables
	Direction of rotation is not compatible with the unidirectional fan	Check if the direction of rotation matches the rotation arrow indicated on end shield
Bearing overheating	Excessive grease/oil	Clean the bearing and lubricate it according to the provided recommendations
	Grease/oil aging	
	The used grease/oil does not matches the specified one	
	Lack of grease/oil	Lubricate the bearing according to the provided recommendations
	Excessive axial or radial forces due to the belt tension	Reduce the belt tension
		Reduce the load applied to the motor

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NexTurbo TECHNOLOGIES

OPERATIONS & MAINTENANCE MANUAL

(O&M)

Compressor type:	**GTB–T20 XY**
Serial Number:	**220989**
Project / Plant name:	**Taunton, MA**
Country:	**USA**

Table of Contents

CHAPTER 1

1. Project Specific configuration

1.1 How to read the manual

The summary below describes the project specific configuration of the blowers purchased. As the O&M manual and documentation herein covers the operation and maintenance of several configurations at once, this page shall assist you in selecting the sections relevant for your machine. Whenever configuration relevant sections are displayed in this manual, a reference to this Page will be made.

Project name	**Taunton, MA**
Project number	**220989**
Frame family	**GTB** GTH
Frame Size	T10 **T20** T30 T40 T50 T60
Regulation	X Y **XY** XZ None
Configuration	Baseframe **Compact Console**
Package type	Modular package Compact Plug & Play **Skid package** Core
Pinion shaft bearing type	**Hybrid Ceramic SKF** Tilting pad type
Input shaft bearing type	**Deep Groove Ball** Journal type
Compression medium	**Atmospheric Air** Other Gases
Lube oil cooling type	**Air: Oil** Air: Water
Coupling size	Flender N-Bipex 55 (cam ring 92 shore A)
Usage of the blower system allowed within application(s)	Aeration for the secondary treatment within waste water treatment plants.

Throughout this manual the unit is referred to as *blower*. We do not distinguish between the term blower and compressor, as the same Next Turbo product portfolio is covering both pressure areas.

1.2 Blower main data

Blower type	GTB-T20 XY
Blower serial number	220989
Suggested motor size (not in NTT scope)	200 HP (150 KW), 60 HZ, 460 VAC
Power at design:	188.4 HP (140,5KW) (RATED AT 95F & 50%RH)
Inlet pressure design	14.7 PSIA (1,013BARA)
Discharge pressure design	23.4 PSIA (1,613 BARA)
Differential pressure design	8.7 PSIG (0,6 BARG)
Inlet filter pressure drop design:	0.15 PSIG (0,01BARG)
Max inlet air temperature design	95°F (35°C) AT 50%RH
Max discharge air temp.	193°F (INLET + OUTLET TEMPERATURE)
Airflow design:	4500 ACFM (REF. 14.7 PSI – 95 °F – 50% RH) 7646M3/H (AT 1,013BAR – 35°C – 50%RH)
Cone diffuser position:	90 DEG VERTICAL
Air volume turndown	40-100%
Max Air speed discharge	3214FT/MIN – NPS 14” (16,3 M/S - DN350)

1.3 Weight of individual parts

For security reasons, the blower package and especially the blower core machine must be disassembled and assembled exclusively by NTT certified field service specialists. The workshop manual is available on request, subject to specific training of maintenance personnel.

The below table indicates the approximate weight of the individual components for lifting and handling after dismounting or before re-mounting.

Component	**Approx weight [kg]**
Compressor T20 (without motor) oil filled	620
Console	230
Volute casing + Contour casing	122
Inlet guide vanes IGV T20	17.5
Volute+Contour+Suction+IGV	160

1.4 Specific notes to this order

Items not in NTT scope:

- Main drive motor
- MCC
- Blow-off valve [BOV]
- Discharge check Valve
- Dicharge isolation valve

- Local control panel LCP
- Master control panel MCP
- Instruments as per Instrument, consumer and part list (doc. No. 220989-31)

2. Introduction

2.1 Purpose

This manual is intended to provide basic information about the blowers main components, its working principal as well as the operation of the blower package. It furthermore provides maintenance recommendations and - instructions.

2.2 Audience

This manual is designed for Operators and Maintenance personnel who have a general knowledge about rotating machinery and automation. The Operations & Maintenance Manual is intended for qualified personnel, which are defined as personnel who is familiar with:

- the safety regulations of rotating machines
- handling rotating equipment and its maintenance
- handling automation technology

2.3 Disclaimer

Prescribed usage

This system must only be used within the defined applications – please refer to CHAPTER 1 to see for which application your product was designed for. Reliable operation according to the as sold conditions requires proper transport, storage and installation as well as careful operation and maintenance. The ambient and hazardous conditions in which the Compressor is operating must be within the contractual conditions. In case of questions or uncertainties, please contact your local sales representative or Next Turbo directly under: sales@next-turbo.com

This manual strives to be complete but cannot fill all situations and configurations of a customized solution. Especially common engineering approach shall be applied by the user/client/operator/installation companies/contractors during installation and operation. Next Turbo cannot be held liable for any results derived by lack of proper engineer.

Qualified Personnel

The Blower may only be installed and taken into operation according to the instructions provided in this document. Commissioning and operation of the system may only be done by qualified personnel. Qualified personnel is defined as persons that are trained in doing these tasks in accordance with established safety practices and standards.

Disclaimer of Liability

Next Turbo Technologies S.p.A (NTT) has reviewed the contents of this publication to ensure consistency with the hardware and software provided. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Safety Notices

The delivered Blowers are equipped with effective safety precautions to protect operating and maintenance personnel from any accidents. All components of the plant comply with the corresponding safety standards and meet the appropriate guidelines. Regulations and safety precautions do not, however, offer any protection against carelessness or negligence. Observe the safety information in this documentation and notices posted at the machines.

3. Machinery Safety Requirements

BY UNPROFESSIONAL TREATMENT OF EQUIPMENT AND COMPONENTS, BY NOT OBSERVING THE INSTRUCTIONS IN THIS HANDBOOK AND BY USING THE EQUIPMENT FOR USAGE NOT WITHIN THE SCOPE DEFINED HERE THERE WILL BE A RISK OF PERSONAL INJURY.
MAKE SURE THAT THIS OPERATIONS MANUAL IS AT THE DISPOSAL OF EVERYBODY WHO IS INVOLVED IN OPERATION, MAINTENANCE AND REPAIRS AND THAT THE CONTENT HAS BEEN UNDERSTOOD

3.1 General safety requirements

If the operating instructions in this Operations Manual are not observed, the result may be function interruptions and damages to the blower and subsequent systems as well as personal injuries, for which the manufacturer does not undertake any responsibility.

3.2 Safety Maintenance work

At maintenance work all automatic processes, controls and functions must stand still. They have to be blocked and secured against unintentional restart. Maintenance work or repairs must only be carried out in voltage-free condition by qualified personnel.

3.3 Specific machinery safety requirements

Putting into Operation

The blower unit shall only be operated with correspondence between the design criteria and the operating conditions, indicated in technical documents.

Handling and Lifting

Indication of the blower weight is shown on blower label and on technical documents. Handling and lifting has to be carried out according to manufacturer specifications given.

Automatic Start/Stop

Is possible to start the blower from remote without pre warning from local control. The ISO 7000-0017 symbol warns of remote control Start/Stop.

Emergency Stop

Emergency stop is available inside the unit and next to the PLC touch panel. In case of emergency situation press the emergency stop. Do not use the emergency stop as an ordinary stop function, as the stop with emergency button is not following the normal shout down procedures and repeated emergency stops may damage the blower.

Mechanical Hazard

In compliance with EN294 & EN953 safe fixed guards shall protect the rotating parts. Do not remove the guards unless the blower is not guaranteed to be on off mode.

Inlet System

The inlet system area shall not be blocked and personnel shall stay clear of this area when machine is ready to start.

Hot Surfaces

Hot surfaces plates are placed where by touching blower's surface might cause personal injury. Temperature on surface can exceed 70ºC.

Noise Hazard

The Blowers emit noise; the values are established during final mechanical running test in the manufacturer's factory. Either at the entrance to the blower room or at the acoustic enclosure, shall be installed an ISO3864 warning sign, indicating the use of ear protection.

Electrical Hazard

When blower is operating or even if not on operation but connected to the power supply, any contact with electrical components has to be avoided.

Oil System

The oil is circulating with a temperature of max. 110°C and a maximum pressure of 8 bar. These limits are never to be exceeded. Any change of the oil system is prohibited.

Maintenance & Repairs

Before start any activity on the blower ensure that any power sources and has been properly switched off and mechanical accessories are in service mode: emergency stop button activated, motor cabling disconnected, check valve is correctly working or isolation valve is closed to prevent back flow.

CHAPTER 2

1. Packing, Transport, Loading/Unloading

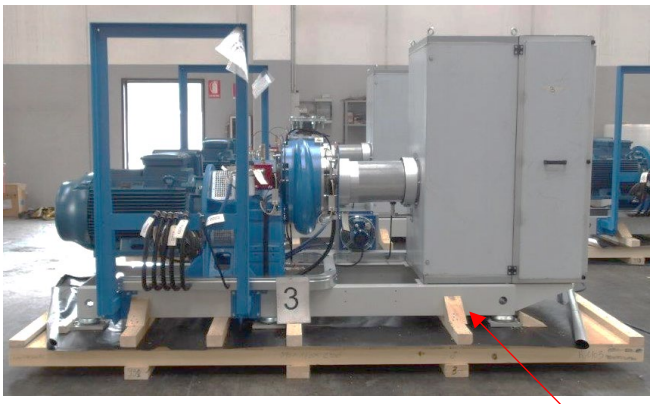
1.1 Handling of the delivery

On receipt of the Compressor delivery, it is advised to check immediately that the individual parts correspond with those listed on the delivery note. Upon unloading, check immediately for possible damage such as dents, scratches, corrosion, torn electric cables, bent pipes, or the like. In case of defects or damage, inform the carrier and supplier immediately.

Proper selection of the appropriate moving equipment is the responsibility of others

1.2 Packing wooden box

The blower is bolted on a wooden made baseplate. The main motor (when flanged) is secured utilizing a wooden socket between the motor and the installation beams. The socket is to be removed only after blower installation (into the blower room).



Wooden baseplate Wooden Socket

Bolt to baseplate

Wooden cover (crate)

Foil bag

A wooden made cover protects the unit and all its accessories. Depending upon packing solution (see worthy, see worthy for container transport, airfreight with light crate), the unit, inside the wooded box might be protected from moisture using a wrapped around barrier bag (foils bag). When airfreight packing is selected, no wrap around bag is available.

THE PICTURES PRESENTED HERE ARE FOR ILLUSTRATIVE PURPOSES ONLY.
FOR DIMENSIONS AND IMAGES. PLEASE REFER TO THE MATERIAL PROVIDED.

1.3 Transportation

During transportation, the unit must not be subjected to extreme forces, shocks or vibrations. In case such situation occurred, kindly contact Supplier immediately.

When receiving the unit:

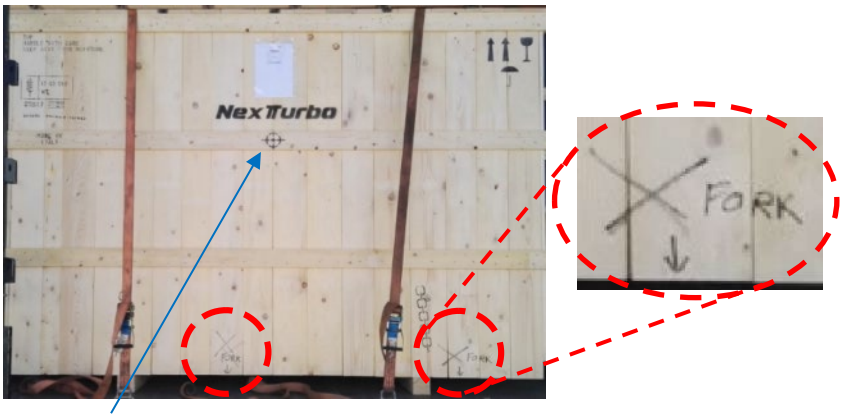
A) Check for any possible damage during transportation in the presence of the transportation company
B) Check that all parts are present as listed on the packing list.

1.4 Loading & Unloading to/from a truck

Following options are available to load/unload the crate to/from a truck:

- FORK LIFT: positioning the forks on specifically marked spots on the crate.

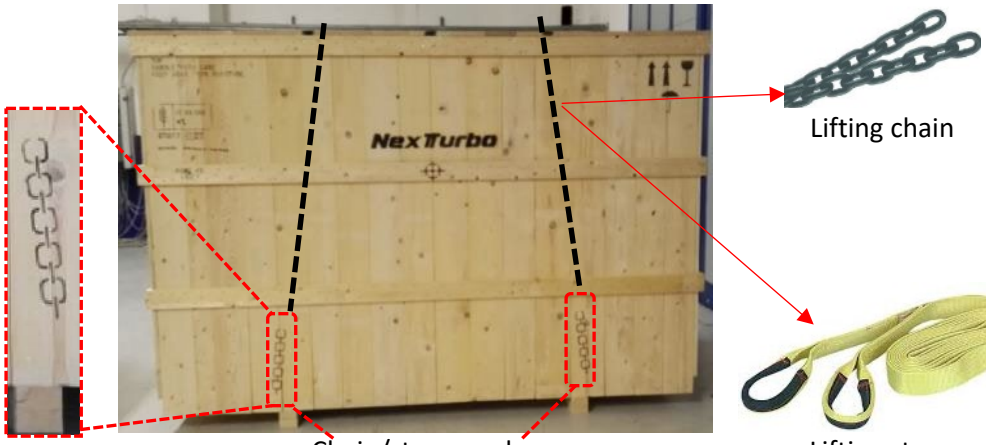
Fork lifter



Center of gravity 2x Marks for Fork lifter

ATTENTION: the center of gravity might not in the middle of the crate. To lift the crate use the marked spots as shown above

- CRANE with STRAPS/CHAINS, a YOKE, lifting beams and/or spreader bar might be needed.



Chain/strap mark

Lifting chain

Spread bar

Lifting strap

Yoke

2. Storage instructions

2.1 Conservation

All components are packed and preserved according to Suppliers Standards. There are three methods of conservation. Which exact method is applied depends upon agreement at point of contract signature. The basis of which method is best suited depending upon:

- Transport type (see worthy, sea worthy into container, airfreight, road transport inside a close truck)
- Storage facilities
- Duration of storage

If no special agreement is made, standard conservation method applies.

2.2 Storage time limits

Standard conservation – max 1 month [for airfreight and road transport, light crate or light packing]

Standard conservation – max 6 months [for sea transport, crate with foil bag]

Long Term conservation – approx. 12 months [special]

The blower (aggregate) has to be stored with its original packing inside a building or under a roof at temperatures above 10C (50F) and air humidity below 70% and a non-saline atmosphere.

The main motor, kindly see instruction from motor manufacturer manual.

Contact the blower supplier when storage time is exceeding the limits mentioned above as an inspection might be necessary.

2.3 Storage

The blower (aggregate) unit can be taken out of the crate and placed on the floor only when packing includes a foil bag. In case of light packing or light crate, the unit is to stay inside the crate or with its original light packing.

Basic instructions:

- Do NOT open or damage the foil bag before the site is ready for the final blower installation.
- Store aggregate in dry and ventilated surroundings.
- When the foil bag is opened and if the motor is equipped with stand-still heater, connected to the power circuit (normally 120/220 Vac) [typically powered from the MCC]
- The aggregate must be protected against small animals and insects
- The temperature should not fall below the dew point in a wet environment
- The aggregate shall normally be checked once a month, and once a week in periods when condensation is likely to occur
- Tropical conditions require special attention, please contact the Supplier
- If the motor manufacturer's instructions are either at a variance with or more restrictive than Supplier's instructions the former shall be adhered to.

If the duration of storage is longer than specified under conservation, it is required to fill on lubricating oil (in case it is not included) and start the oil pump at least once a month for at least one hour (depending upon gearbox type). In case of no electrical oil pump, the motor shaft should by turned (by hand) few rotations. Additionally, the blower has to be turned once in the reverse of the direction of rotation.

During extended periods of storage the drive motor bearings shall be filled up with grease. However, see motor manufacturer's instructions

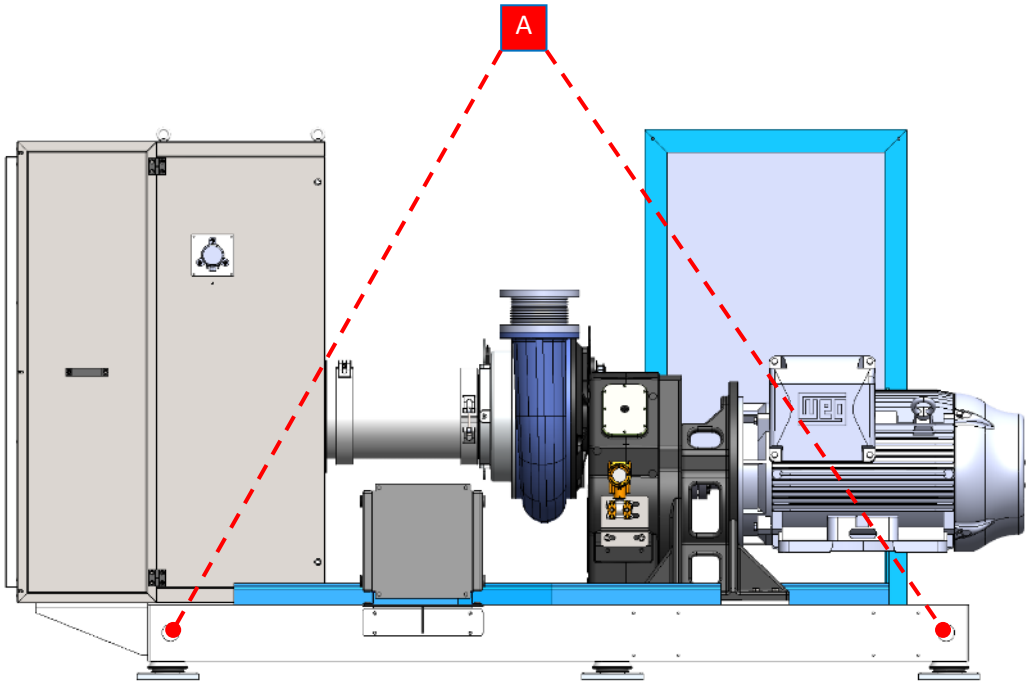
3. Installation instruction

Once the blower is removed from the crate or from its original packing, following instruction to place the unit of the floor have to be followed.

3.1 Lifting instructions (after unpacking)

The compressor shall only be lifted from the indicated points “A”

Adjust the lenght of the chain to lift the compressor in a horizontal position.
Be careful not to damage the compressor parts with the chains.
(see the " General arrangement dwg " of the project for overall dimensions of compressor configuration).



4x Hook lifting poins (ø 60 mm)

A) WITH MOTOR

- The compressor can be lifted with lifting chains/straps fastened on the hooks (built into the compressor baseplate)
- The chains must be connected to a common lifting top point

NOTE: a spreader or a lifting yoke might be needed in order to avoid damaging the components installed

NOTE: a spreader or a lifting yoke might be needed in order to avoid damaging the components installed

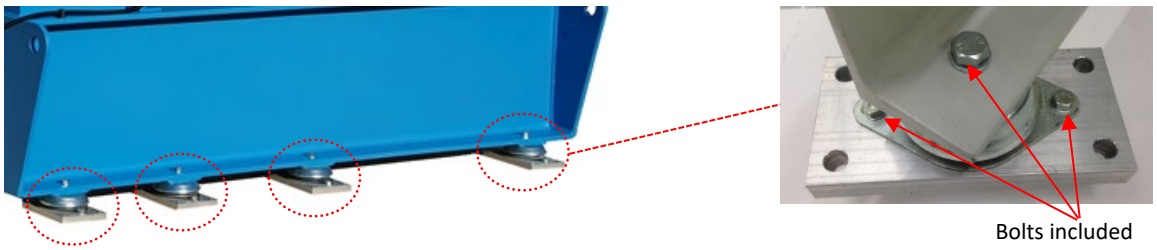
YOKE

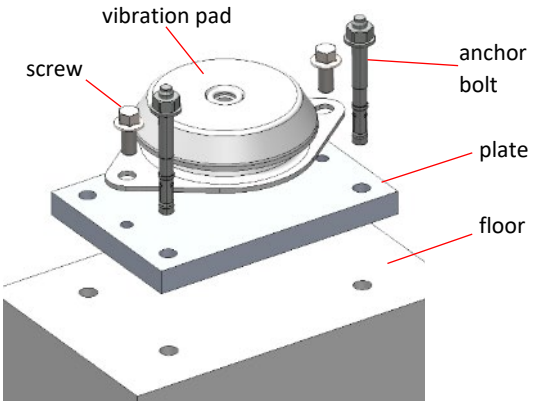
SPREAD BAR

3.2 Placement on floor

The blower unit is already equipped with installed vibration dampers and aluminum plates.

The plates must be bolted to the floor utilizing mechanical expansion bolt M12 or chemical bolts, only on the 2 external holes, not needed on the internal bolts. The bolts must enter the floor by 70 mm as minimum.






anchor bolt

Installation data when using vibration pads:

- vibration pads are already installed on the base-frame (see G.A. Drawing)
- pads have 2 holes (already installed)
- utilize mechanical anchor bolts to fix the plates on the floor. 4 holes for each plate of 14mmØ
- refer to GAD (general assembly drawing) to check footprint details (number of pads, holes diameter, distances, etc.)

NOTE: mechanical anchor bolts are not supplied by NTT

- The blower should not be pushed or pulled when standing on the floor.
- Transverse level is to be set ± 2 mm over the width of the enclosure by placing a machinist level on the floor inside the enclosure or on the metal beams of the blower skid.
- Longitudinal level is to be set ± 2 mm over the length of the enclosure by placing a machinist level on the motor or gearbox top.

Further considerations of installation:

- To prevent particles and substances to enter the compressor, do not uncover the discharge flanges until the pipe system is ready for installation. Clean and inspect all pipe systems before they are connected to the aggregate.

THE BLOWER SHOULD NOT BE PUSHED OR PULLED WHEN STANDING ON THE FLOOR.

3.3 Discharge cone diffuser & blow of valve installation

3.3.1 Installation of cone diffuser and related instruments/pipes

The cone diffuser is supplied loose together with its accessories. The cone diffuser is to be installed utilizing a crane.

Cone diffuser

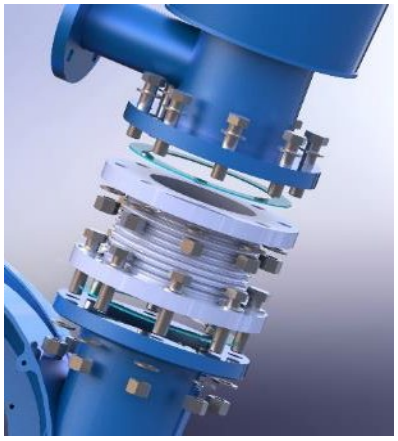
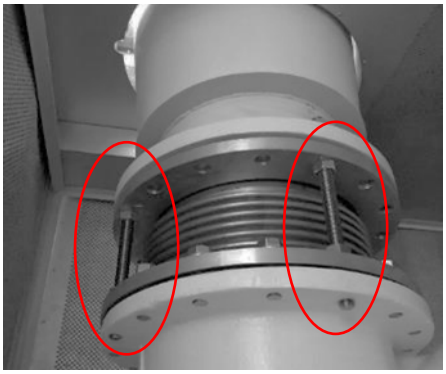


Figure 1

Figure 2

Figure 1: is depicting the installation between blower volute, flexible compensator and cone diffuser. A gasket is to be installed between the compensator / volute and compensator / cone diffuser. Bolts, nuts, washers and gaskets are included in the scope and located into a specific box.

Figure 2: is depicting the installation of the blow-off valve and silencer on the specific flange (of the cone diffuser). A gasket is to be installed between the valve/cone diffuser and cone diffuser/silencer.



No loads and thrusts are allowed on the expansion joint.

If the cone diffuser is not immediately connected to the main header, threaded bars should be installed to prevent loads on the joint.

Remove the bars before connecting the cone to the main header.

The cone diffuser is equipped with connections for the instruments:

A) Discharge temperature transmitter (Figure 4)
B) Pipe for the differential pressure transmitter (Figure 4 & 5)
C) Additional pressure/temperature indicators (optional)

The cone is equipped with a threaded connection hole and the transmitter is equipped with a pass-through nut.

The plastic tube/pipe needs to be connected to the fast connector of the DP transmitter and cone (see below)

Cone, blow off valve and compensator, including bolts and gaskets may not be in Next Turbo Technologies scope of supply.

Figure 4

Temperature transmitter & plastic blue tube/pipe

Figure 5

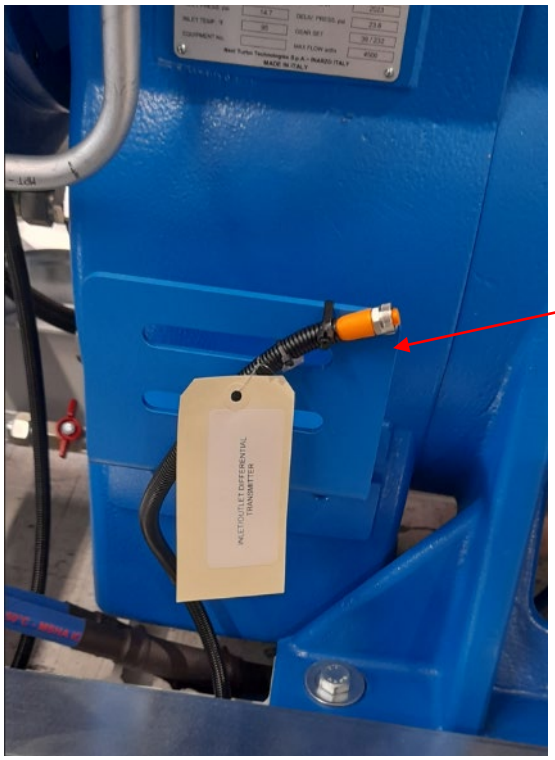
PDT-200

DP transmitter located near the gearbox. The blue tube/pipe is to be connected to the cone diffuser

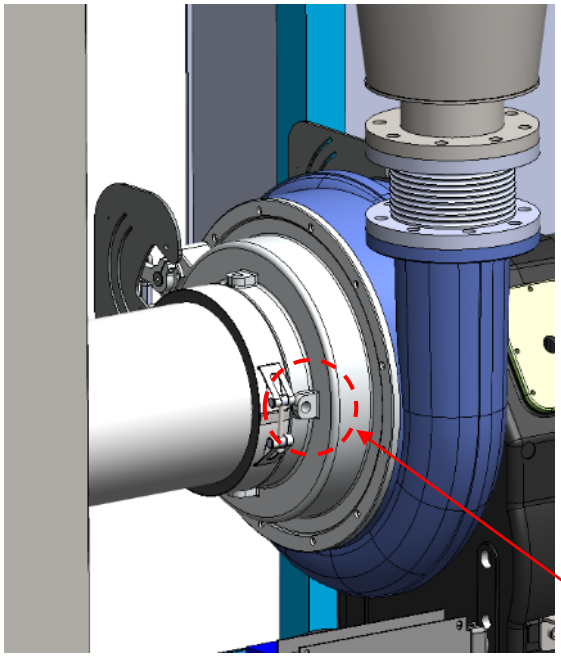
Discharge temperature transmitter & plastic tube/pipe

DETAILS:

Connection cable of the outlet air temperature transmitter TT-101.



Differential pressure transmitter PDT-200 must be installed on the side of the gearbox (support and connection cable are already provided).

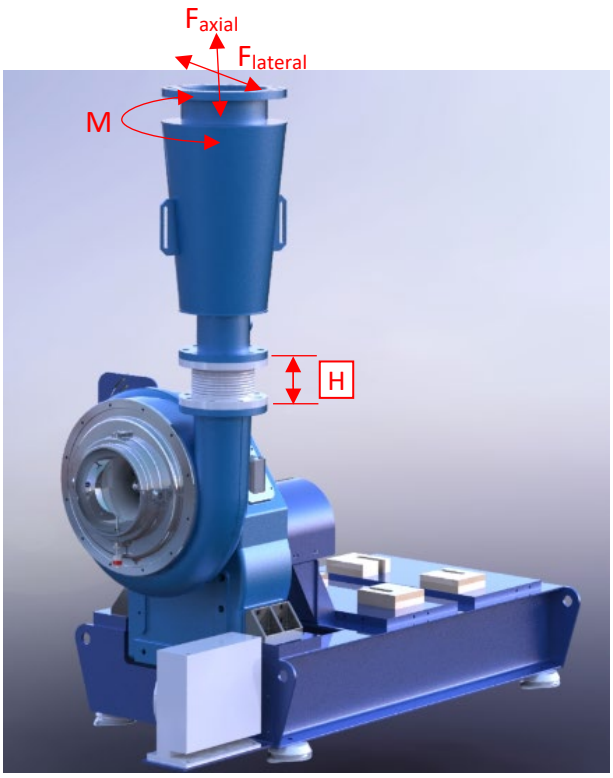


Differential pressure transmitter PDT-200 is equipped with 2 connections for the inlet and outlet pressure pipes. The compressor inlet (picture 8) is to be connected to the low pressure inlet of the transmitter PDT-200 by rilsan pipe. Installation to be done once the cone diffuser is mounted. The cone is already equipped with all necessary fittings to accommodate the blue pipe.

Figure 8
Compressor inlet connection of the blue pipe to PDT 200

3.3.2 Connecting on the blower discharge

Forces and loads from an unsupported discharge piping towards the Blower may result in misalignments, unstable operation and possible damage of the unit.



No loads are allowed on the volute discharge flange. The discharge piping shall therefore be externally supported.

The discharge cone diffuser can't be supported by the volute.

If not included in the scope of supply, it is furthermore recommended that thermal expansions and pressure loads are buffered by means of a flexible connection (e.g.: expansion joint) between blower discharge flange and piping.

The cone diffuser must be in the aligned with the volute (discharge) (+/- 2 mm).

The compensator must be allowed to expansion during operation, therefore distance between the flanges (volute & cone diffuser) must consider such expansion. To properly calculate the distance between flanges, following must be considered:

- the compensator (H)
- its gaskets
- add 1 to +2mm

When following above procedure, the compensator will slide in between the flanges without effort.

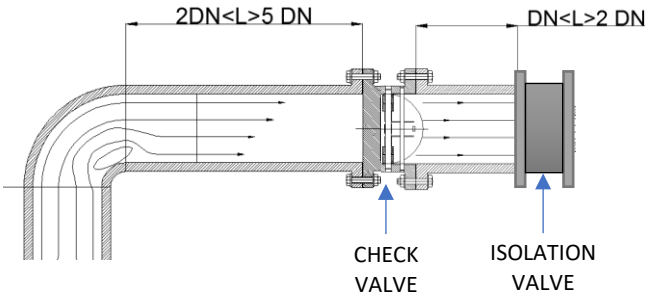
3.4 Check valve installation instructions

- The pipes must be properly aligned and provisions made to minimize stresses from external load/thermal expansion. Always review pipe manufacturer's recommendation.
- In case of pipes with long overhangs, adequate support/jacks shall be provided at the flange ends of the pipe so as to avoid bending of pipes due to weight of the valve.

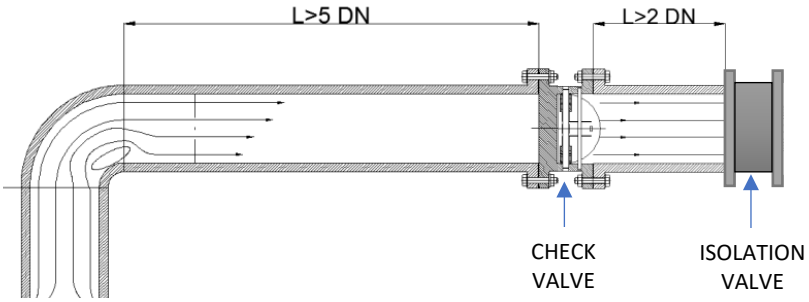
  The improper alignment of the pipe and the valve during installation can lead to unbalanced tightening of the flanges which may cause excessive stress on the bolts and lead to leakage.

- Installation of the dual plate check valves (DP) immediately after elbows, reducers, etc. can cause unstable flow at the entry of the dual plate CV (turbulence). Damage on the internal elements (shafts, springs, etc..) will be caused as the plates are not full opening continuously. In some cases cavitations can appear. Cavitation will accelerate corrosion in the area where it is produced.
- The distance should be calculated considerable in order to avoid turbulences at the entry of the valves. We recommend installing the valve upstream with a minimum distance of 5 times the diameter away from any perturbing element to avoid wear on the internal parts.
- When mating the check valve with butterfly isolation valves, the isolation valve must be installed at least 2 times the diameter downstream of the check valve in order to assure full pressure recovery after the valve.

Acceptable position

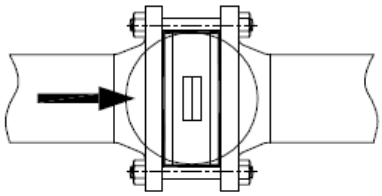


Ideal position

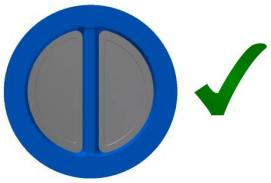


- Wafer valve should be installed between pipe flanges ANSI, equipped with gaskets.

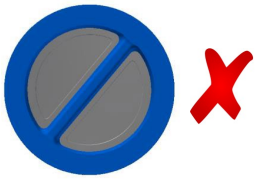
- Dual Plate Check Valves must be installed with the arrow in the direction of the normal flow. This must be checked carefully before installing the valve. Placing a check valve in the opposite direction to the flow will prevent the disc from operating in the intended manner.
- The check valve must be installed horizontally (the hinge pin must be vertical).



Horizontal installation



Correct position



Incorrect position

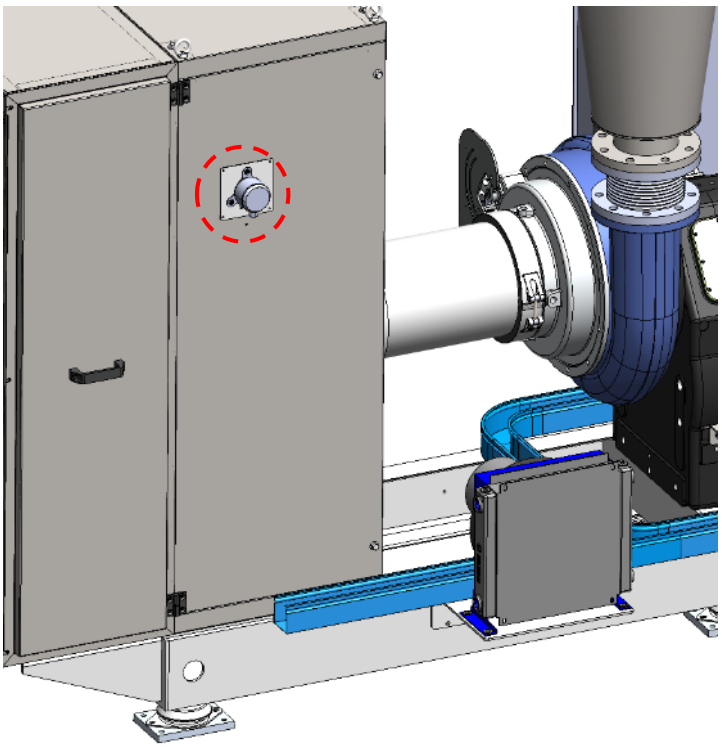
For valves with soft seat (rubber) be careful when welding is made near to the valves. Extreme temperatures (+80°C) can damage the rubber coating of the valves.

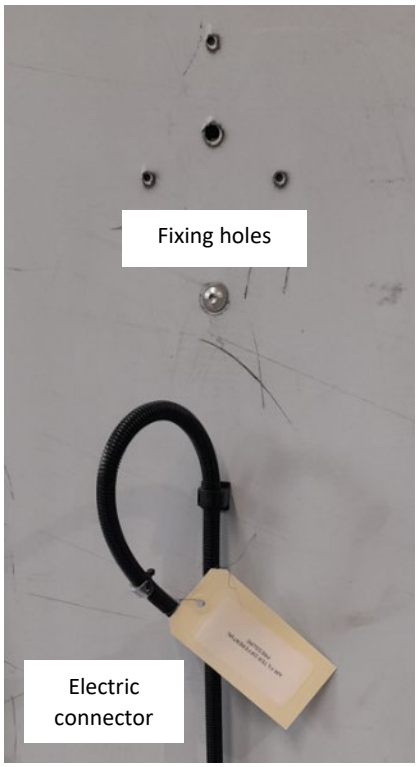
- The valves have a tapped hole for insertion of a lifting eye if needed.
- Clean valve flanges and companion flanges and remove protective grease from the valve flanges. Clean the valve interiors adjacent piping priors to mounting of the valve pipe joint.
- Check all surfaces for cleanliness and other visible sign of foreign matter as the internal surfaces/parts must be clean and free of debris before installation.
- Ensure that the valve is in fully closed position during installation.
- Align the bolt holes of the flanges. Insert the gasket (not supplied with valve) and tighten the bolts.
- Lightly turn bolts or nuts until gaps are eliminated. The tightening of the bolts should then be done in graduated steps using the cross-over tightening method. Bolts should be lubricated for ease of installation.

3.5 Instruments installation

3.5.1 Air filter diffential pressure - PDIT-210

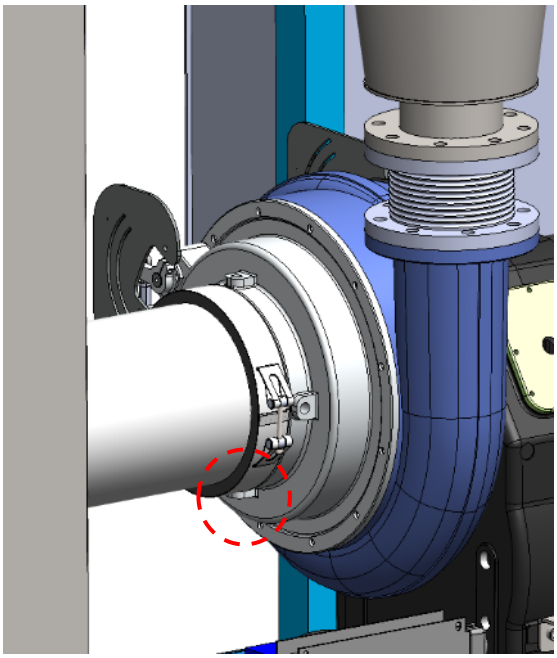
The instrument must be installed on the side of the inlet filter. Electric cable provided with fast connector already wired and clearly marked with ID tag.

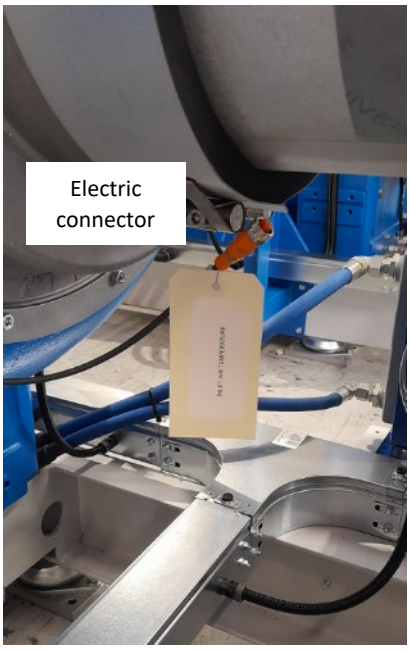




3.5.2 Inlet air temperature - TT-100

The instrument must be installed in the threaded hole placed on the bottom of the inlet flange. Electric cable provided with fast connector already wired and clearly marked with ID tag.

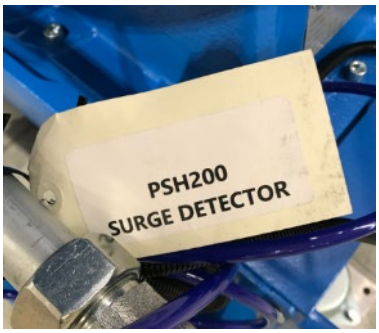




3.5.3 Surge detector installation – PSH-200 (if shipped loose)

Cables equipped with fast connectors are wired into the junction box and ready to be plugged into the respective instruments. Cables are clearly marked in order to avoid installation mistakes, cables are:

- Surging detector PSH-200



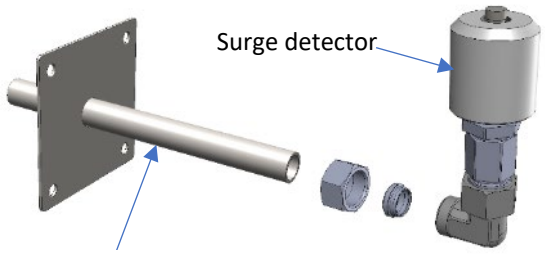
Surge detector + adapter

THE PSH-200 IS SUPPLIED LOOSE AND MUST BE INSTALLED ONSITE.
REFER TO INLET FILTER/SILENCER INSTALLATION.

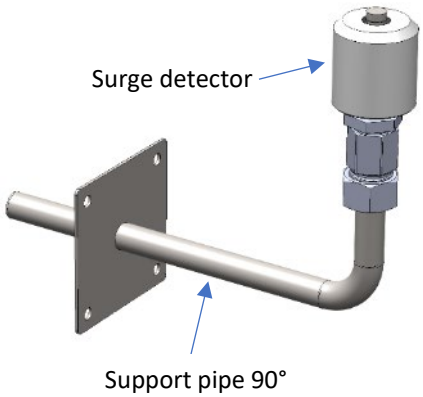
The surge detector must be installed in UP vertical position, as the pictures below. Placing the detector in other position will be cause of failure.

The configuration (A or B) depends on the type of filters.

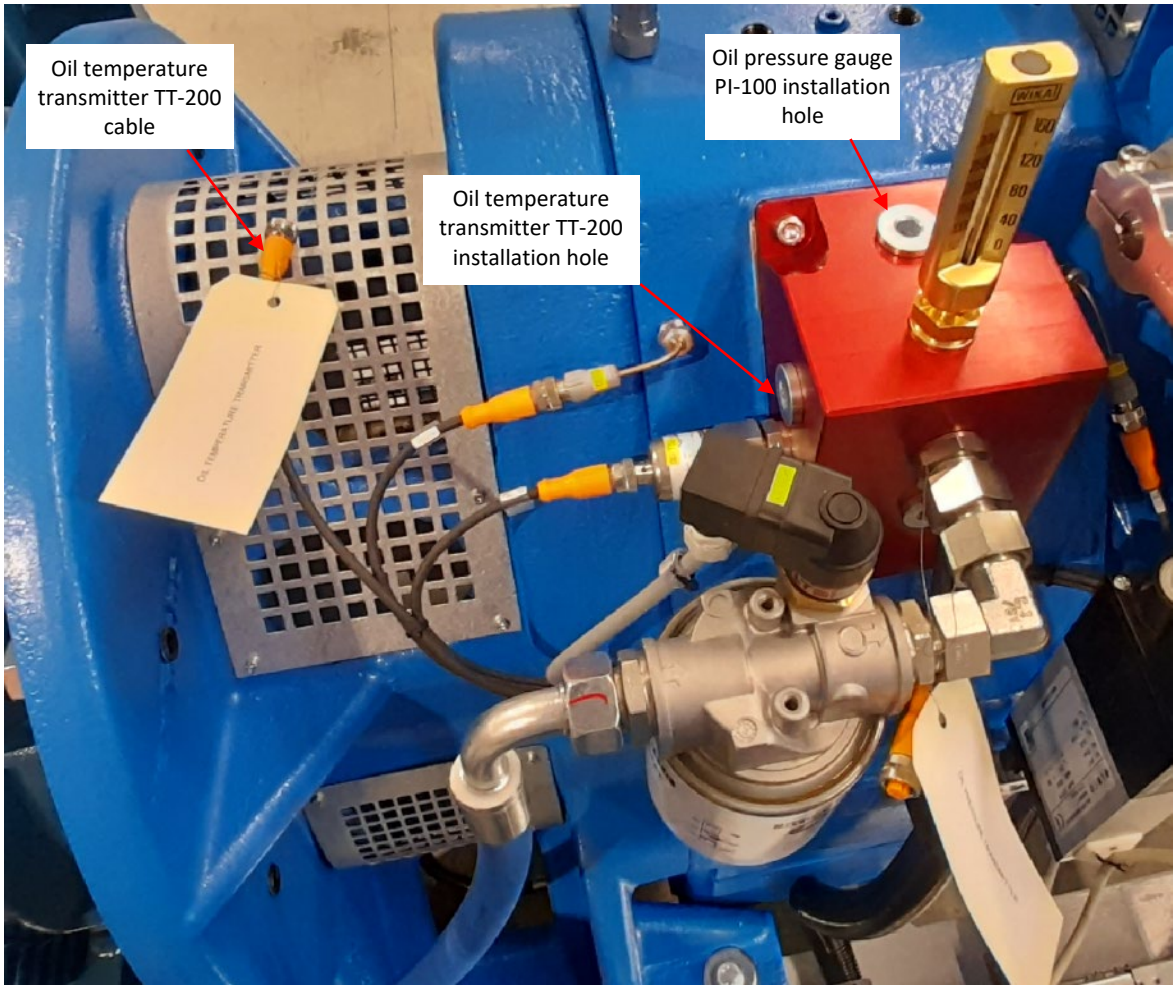
Configuration A

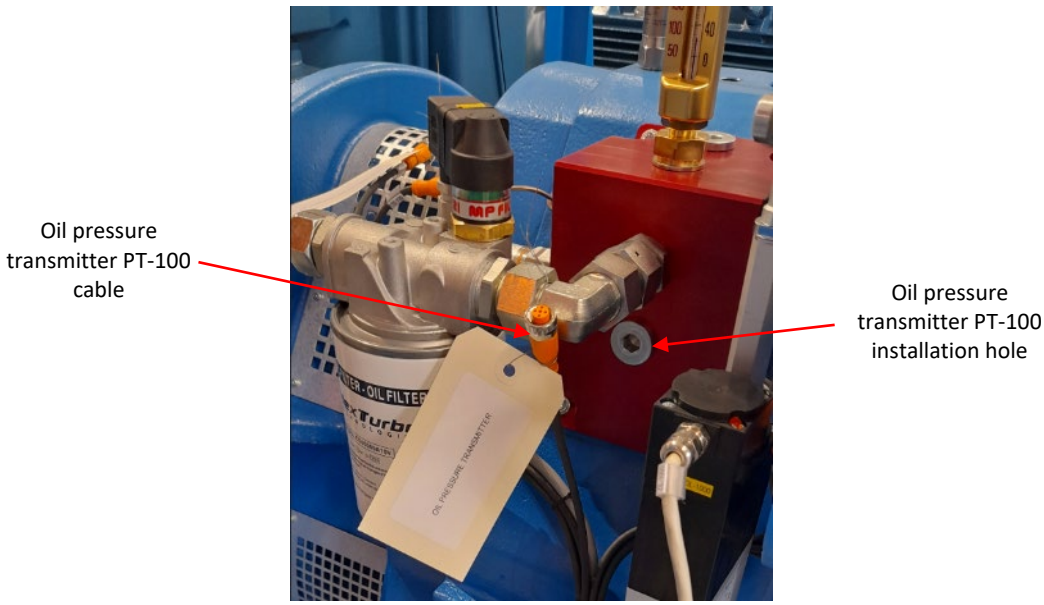


Configuration B



3.5.4 Instruments of hydraulic distributor





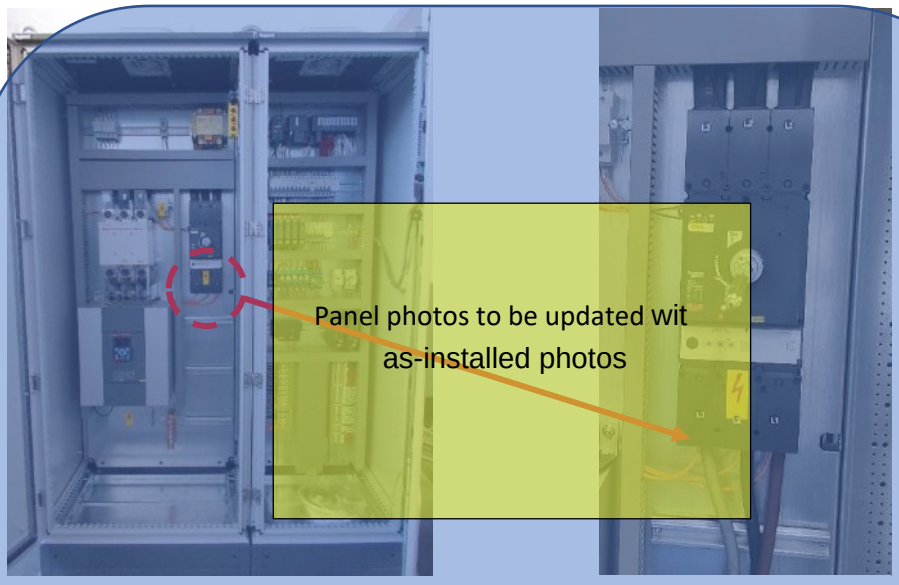
3.6 Cablings to LCP (if included)

The installation of the Local Control Panel is on the skid.

All the conduits/wires are marked.

For the connection please refer to the documents “Cable Layout” and “LCP drawing”.

3.6.1 Power cable connection (with MCC)



MCC & LCP Panel

Power supply connection

Power supply cable Installation from the bottom of the panel “LCP” – kindly refer to LCP drawings (as built version) for the specific project power supply

For wiring the power supply, carry out the following steps:

- Connect 3 phases and ground as shown on the electrical drawing.
- Connect the 3 phases R, S, T to the terminals. Check phase sequence.
- Use a phase sequence instrument to ensure that the power supply is connected properly
- Connect the ground to the “ground terminal strip”
- Cable from the bottom of the Line Arrival Box.
- Additional power supply/UPS might be available, depending upon project specific requirement – refer to LCP drawings – as built version

REFER TO LCP ELECTRICAL DRAWINGS.

3.6.2 Power cable connection (no MCC)

FIGURE 1 – Plate to accommodate the cable glands (cables)

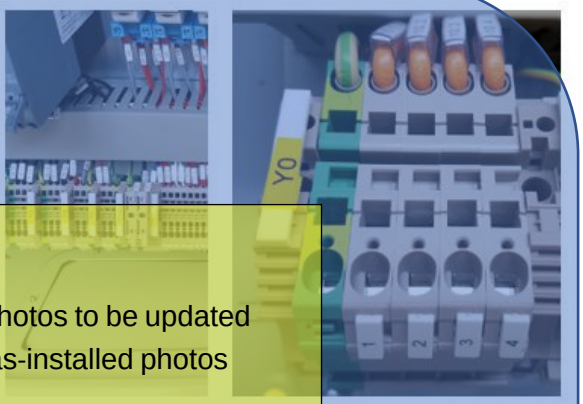


FIGURE 2 - Power supply cable connection 1x 380/ 400 / 440 / 460Vac – 50/60Hz

Panel photos to be updated with as-installed photos

Power supply cable Installation from the bottom of the panel “LCP” – kindly refer to LCP drawings (as built version) for the specific project power supply

For wiring the power supply, carry out the following steps:

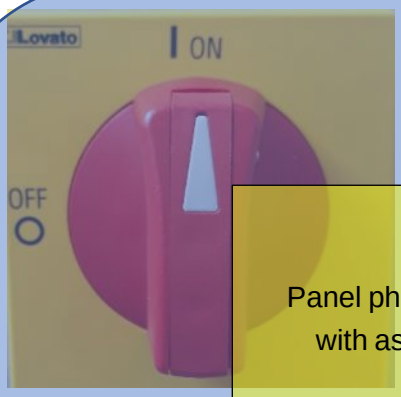
- Connect 3 phases and ground as shown on the electrical drawing.
- Connect the 3 phases R, S, T to the terminals. Check phase sequence.
- Use a phase sequence instrument to ensure that the power supply is
- connected properly
- Connect the ground to the “ground terminal strip” (refer to Figure 2)
- Cable from the bottom of the LCP.

REFER TO LCP ELECTRICAL DRAWINGS.

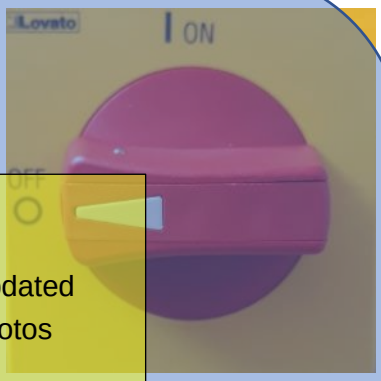
3.6.3 Reset/Engage main power switch

NTT blower delivered with an LCP (standing next to the units or wall mounted) are equipped with a main power switch. (Pictures below show the main switch status)

The power switch has 2 positions:



ENGAGED



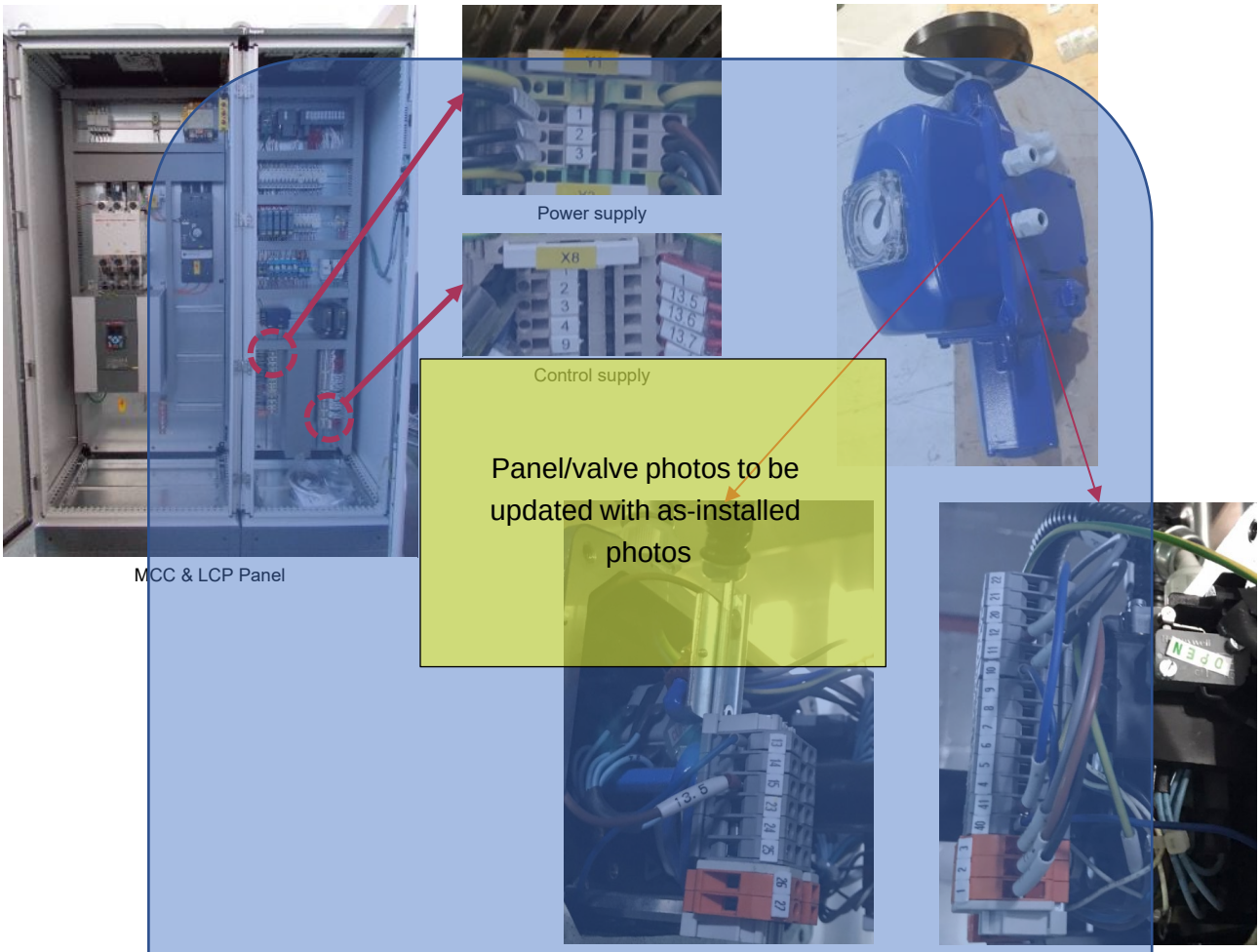
DISENGAGED

Panel photos to be updated with as-installed photos

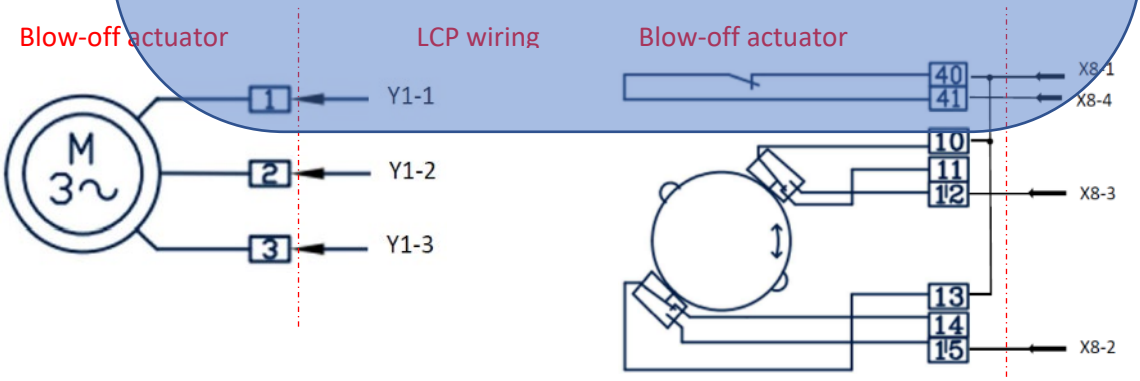
Position	LCP
Engaged (I)	LCP in powered ON
Disengaged (O)	LCP is powered OFF

3.7 Blow off valve cable connection

The blow-off valve actuator is equipped with 2x cable glands to accommodate the power and control. Please refer to the cable layout document.



Both power and control cables are supplied by Next Turbo. The wiring (on the blow-off valve actuator) is carried out after the pipe and the valve is properly installed (by others). Wiring is also by others (it means not carried out by Next Turbo). The cables are wired directly from the blow-off valve actuator to the LCP.



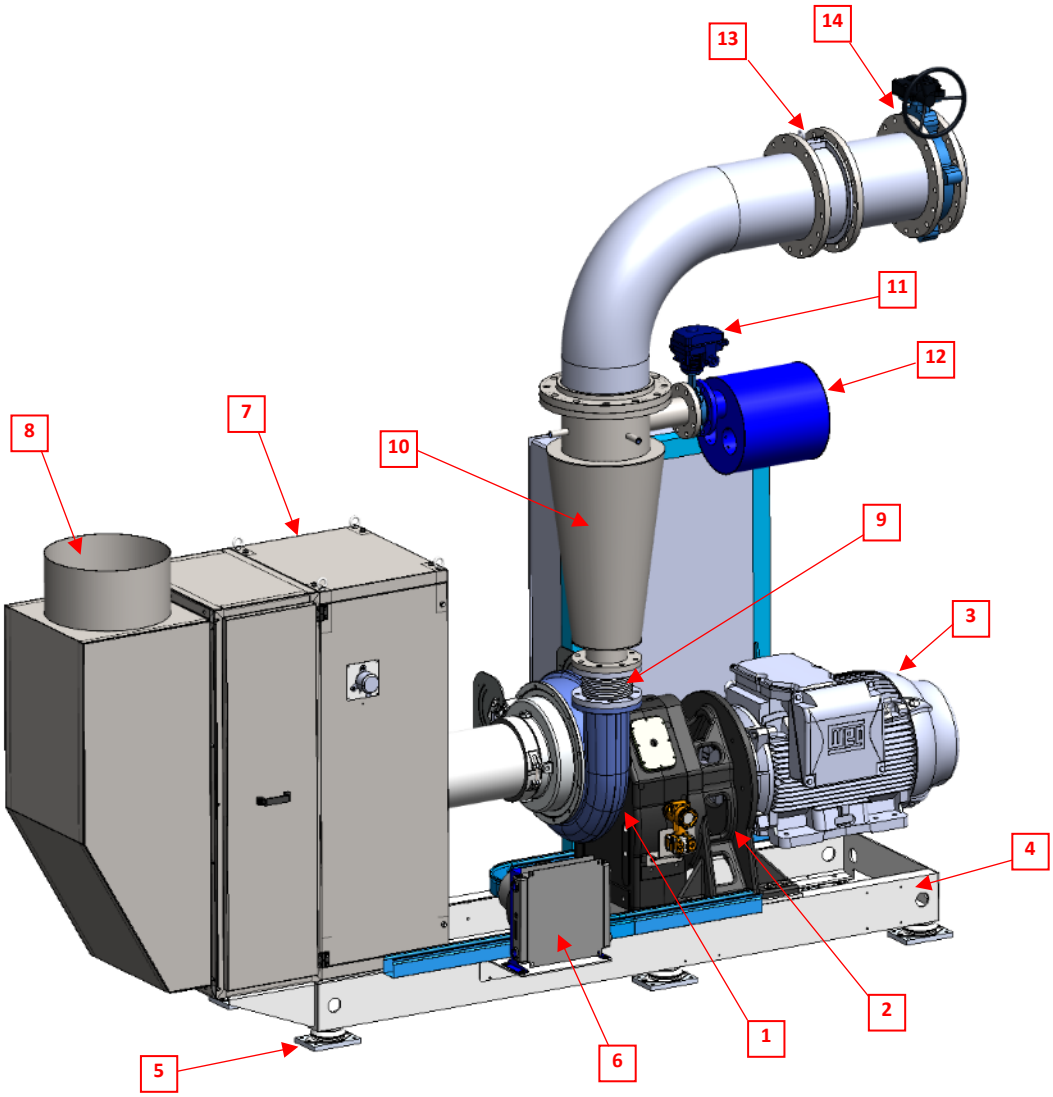
REFER TO LCP ELECTRICAL DRAWINGS.

CHAPTER 3

1. Blower Package

1.1 Package Overview

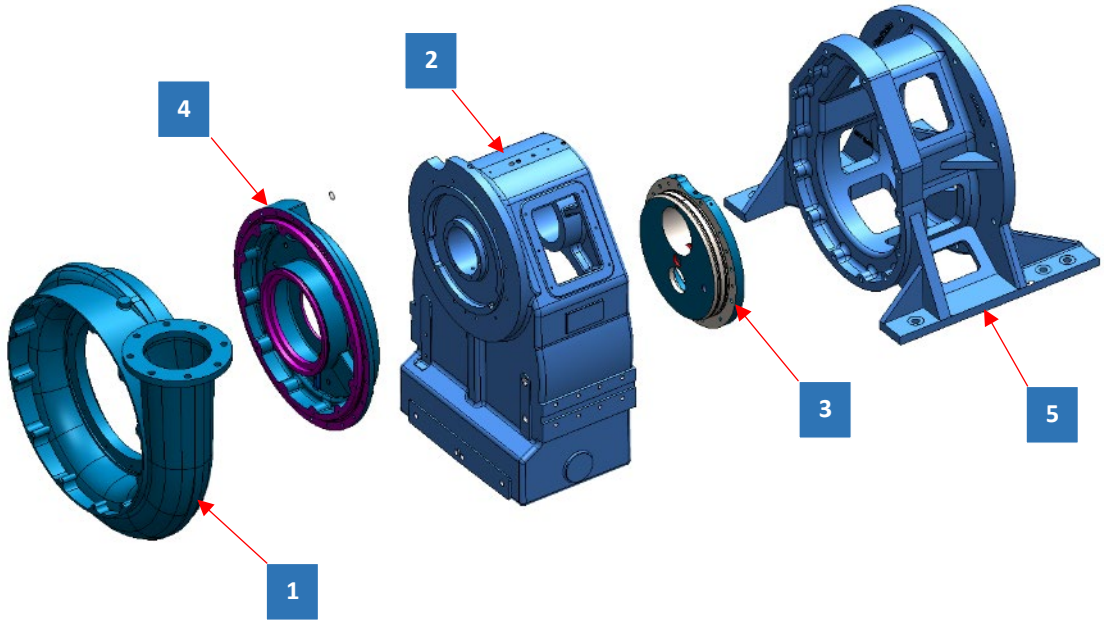
The Next Turbo compressor package consists of the following parts. If items are not part of the delivery this is shown in the order. In case that items, which are essential for operation of the compressor, are not included in the scope of delivery, this will be highlighted in CHAPTER 1 Section 1.1.



1	Single Stage Compressor / Gearbox		**8**	Plenum [not in NTT scope]
2	Compact console		**9**	Flexible compensator DN150
3	Main drive motor 150 kW [not in NTT scope]		**10**	Cone diffuser DN150-NPS 14” (silenced)
4	Baseplate		**11**	Blow-off Valve NPS 4” [not in NTT scope]
5	Vibration damper/ Machine mounts		**12**	BOV silencer NPS 4”
6	Lube oil cooler (air:oil)		**13**	Check valve NPS 14” [not in NTT scope]
7	Inlet air filter / silencer		**14**	Isolation valve NPS 14” [not in NTT scope]

2. Component Description

2.1 Casing



The utilized castings are all made from heat treated and machined material type nodular cast iron GJS400-15, design: 6,5 bar (95psi), 200°C(392F). The blower volute is of vertical split design in order to ease assembly and disassembly and to increase serviceability, i.e. extraction of the discharge diffuser plate.

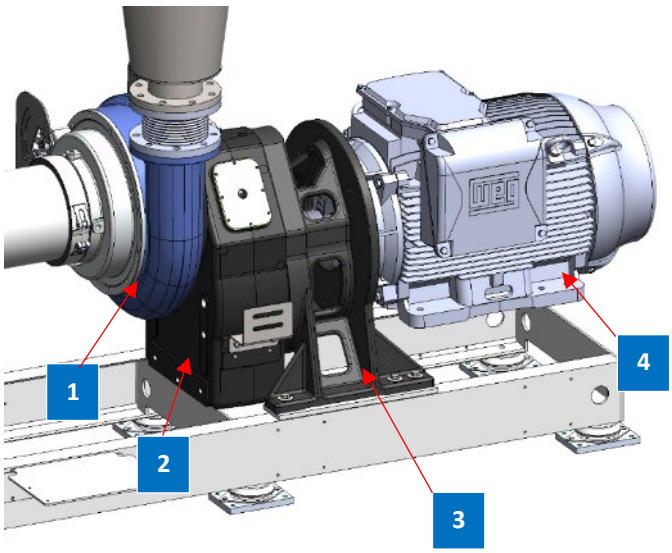
The list of castings is:

1	Volute Casing
2	Gearbox Casing
3	Gear box cover casing
4	Diffuser back plate casing
5	Mounting console (only compact console configuration)

2.2 Base fixture

The base fixture for the blower and motor depends on the selected Configuration – please refer to CHAPTER 1 section 1.1 to find out which configuration your purchased blower is built in.

2.2.1 Configuration: Compact Console (B5)



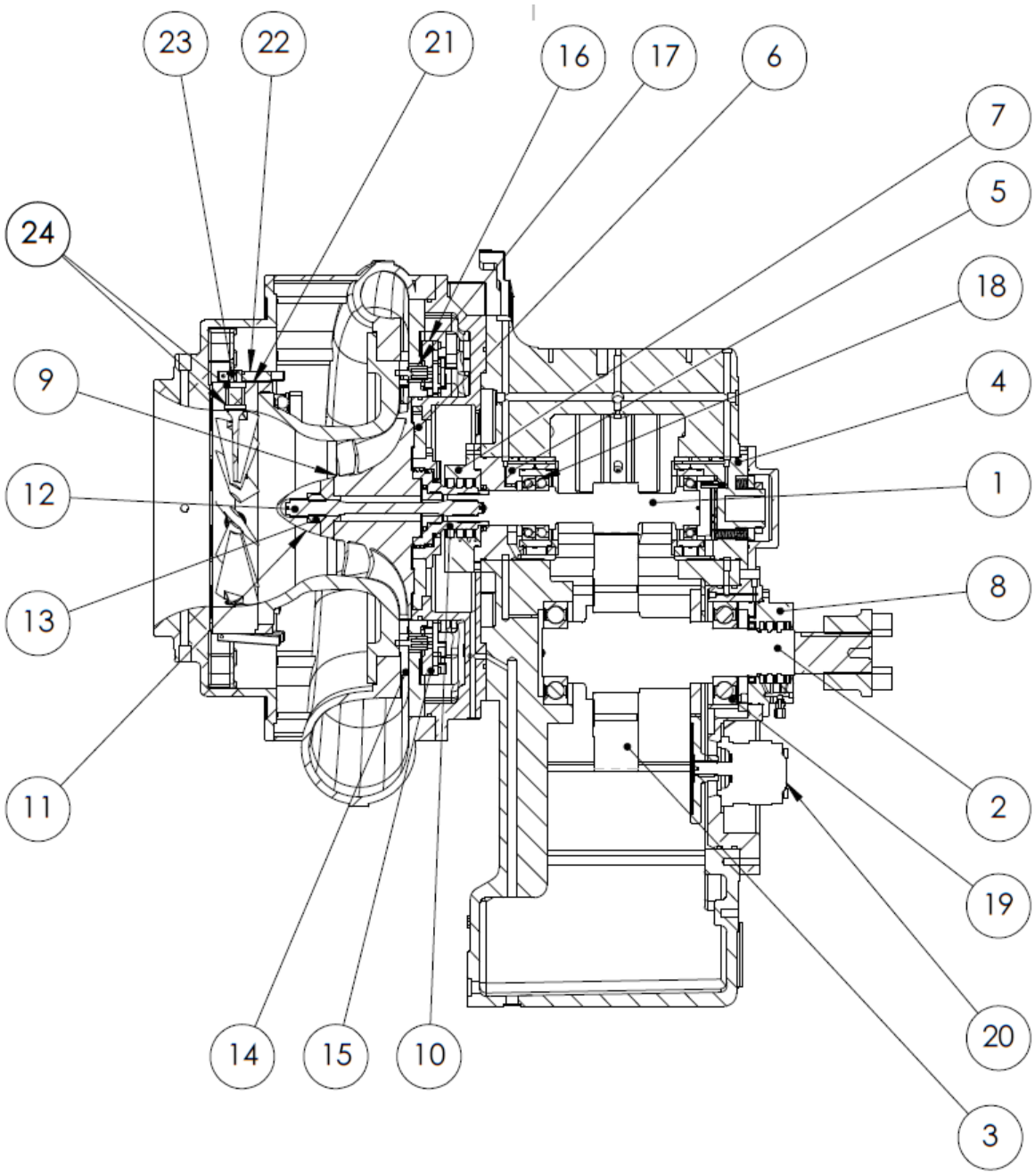
1	Compressor
2	Integrated Gearbox, flange mounted to the central console
3	Central console, mounted on steel beam supports onto the acoustic enclosure base
4	B5 electrical main drive motor, flange mounted to central console

The compressor and the motor are mounted on a common console, which is fitted on a base structure. The console is of machined cast iron GJS400. By its utilization it reduces the necessary distance between motor and compressor, thus allows for a compact design of the compressor skid. The serviceability is not limited by the console. The motor is flanged type (B5) and is self-aligning with the compressor via a flexible coupling.

The working tolerances are very precise <0.1 mm for which the alignment of the electric motor is done automatically by the centering of the coupling flange. The coupling is able to compensate for the following values of misalignment (not simultaneously):

- Angular misalignment: 0.159 mm
- Radial misalignment: 0.159 mm

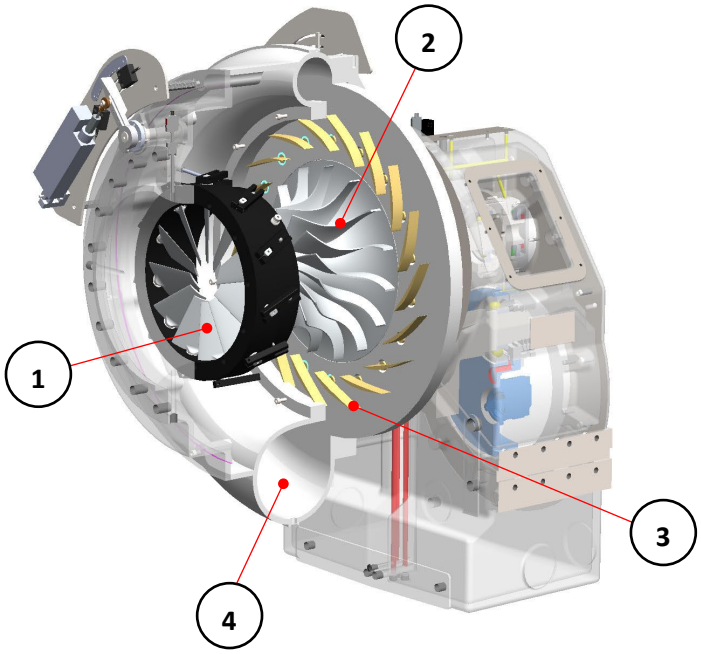
2.3 Core blower



1	Pinion shaft	**9**	Impeller	**17**	Diffuser bushing
2	Slow shaft	**10**	Impeller hub	**18**	Bearing fast shaft (set)
3	Bull gear	**11**	Impeller nose	**19**	Bearing slow shaft (set)
4	Bearing housing blower side	**12**	Impeller central screw	**20**	Oil pump
5	Bearing housing motor side	**13**	Impeller special nut	**21**	IGV vanes (when available)
6	Air seal labyrinth	**14**	Diffuser vanes	**22**	IGV lever (when available)
7	Oil seal labyrinth fast shaft	**15**	Diffuser lever	**23**	IGV blade (when available)
8	Oil seal labyrinth slow shaft	**16**	Diffuser link	**24**	IGV bearing (when available)

2.3.1 Main parts and function

The blower is a single stage compressor and can be equipped with a capacity regulation system of type “X” (variable diffuser vanes) or type “Y” (inlet guide vanes) or with a combination of both, type “XY” (variable discharge diffuser vanes and inlet guide vanes). Please refer to *Regulation type* in CHAPTER 1 to identify with which system your blower is equipped.

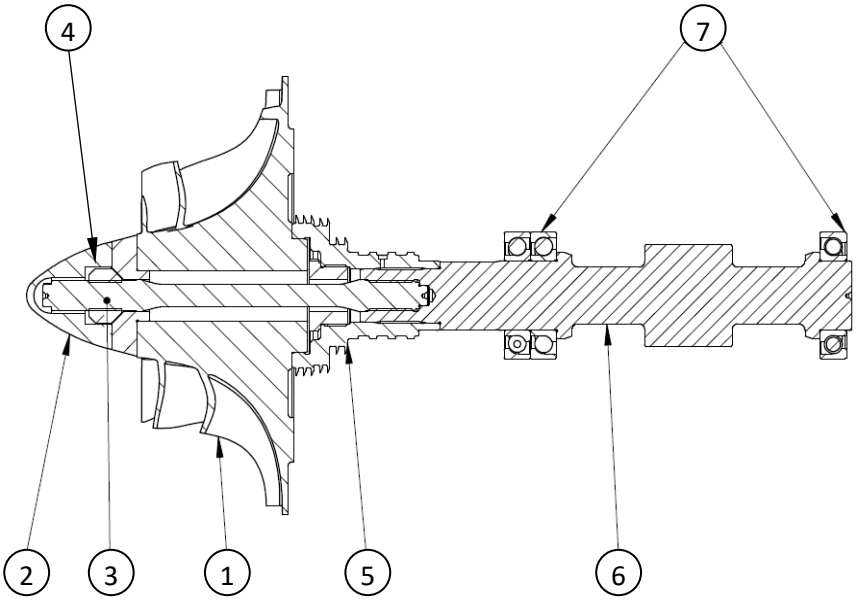


1	Inlet guide vanes (IGV)
2	Impeller
3	Diffuser vanes (VDV)
4	Volute casing

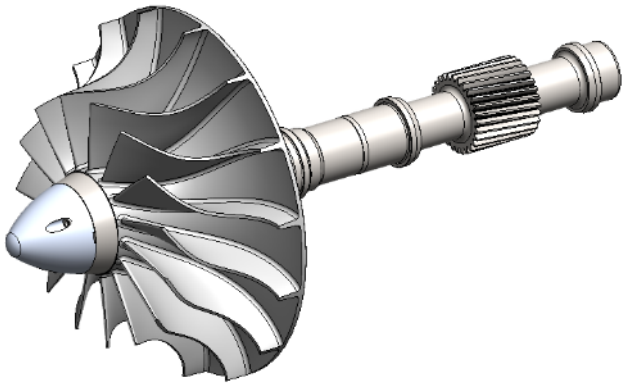
Functions of components:

- Inlet guide vanes (IGV): Pre-rotates the medium in order to optimize power consumption.
- Impeller: The medium is then passing to the impeller, in which its kinetic energy (gas speed) is increased in a rotational direction.
- Discharge diffuser vanes (VDV): After the impeller the medium is passing along the set of variable diffuser vanes, which is adapting the airflow vector and therefore the relative airspeed to match the capacity requirements; essentially moving the compressor characteristic curve along the capacity axis.
- Volute casing: The medium is collected in the volute ring and guided into the discharge conus shaped diffuser, as indicated.

2.3.2 Rotor shaft/impeller



1	Impeller
2	Impeller nose
3	Impeller screw
4	Impeller special nut
5	Impeller hub
6	Pinion shaft
7	High speed bearings



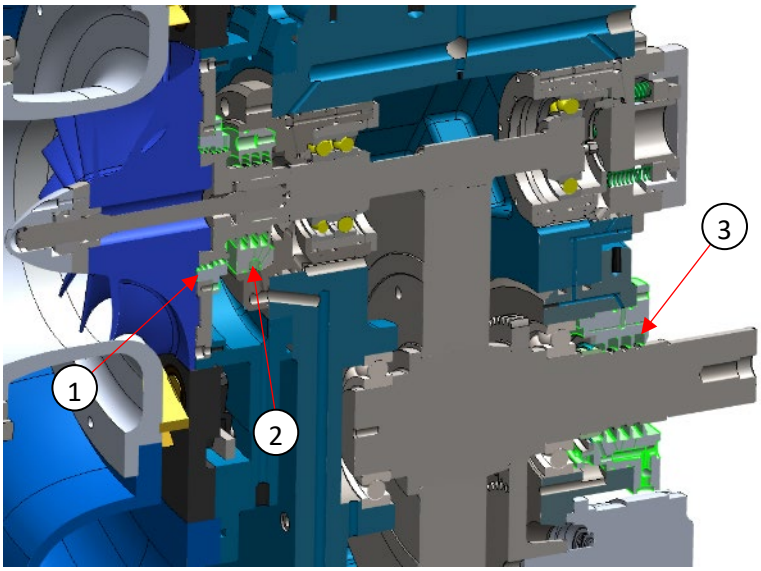
The design of the rotor/ impeller system is an overhung design, with the impeller positioned at the end of the pinion shaft. The operation area is between the first and the second critical speed with sufficient buffer. The impeller is of material aluminium alloy DIN3.1924 AlCu2MgNi, milled out of a solid forged raw material, the rotor is of material high tensile steel 16NiCrS4. The impeller is fitted to the rotor drive with hydraulically tensioned central screw and related rotor nut.

The rotor/ impeller is dynamically balanced during production. Only certified trained service personnel with the required special tooling should conduct the disassembly.

2.3.3 Air and oil sealing

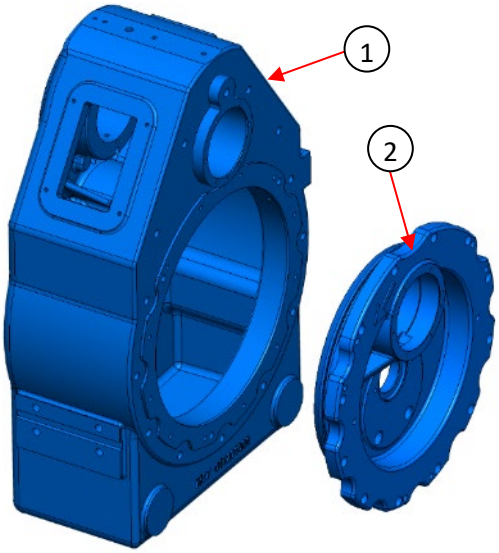
Two types of sealing are present in the compressor: the air sealing is of non-contact labyrinth type and made from aluminium alloy. The oil sealing ring is made of aluminium alloy. The sealings are designed to prevent air and oil leakages out of the compressor, thus guaranteeing oil free, efficient compression.

Clearances between the labyrinth and impeller lead to contact free operation; only minor running-in-wear might occur. The chambers of the sealing ring collect the lubricant and drains it back into the gearbox.



1	Air seal labyrinth
2	Oil seal labyrinth fast shaft
3	Air seal labyrinth slow shaft

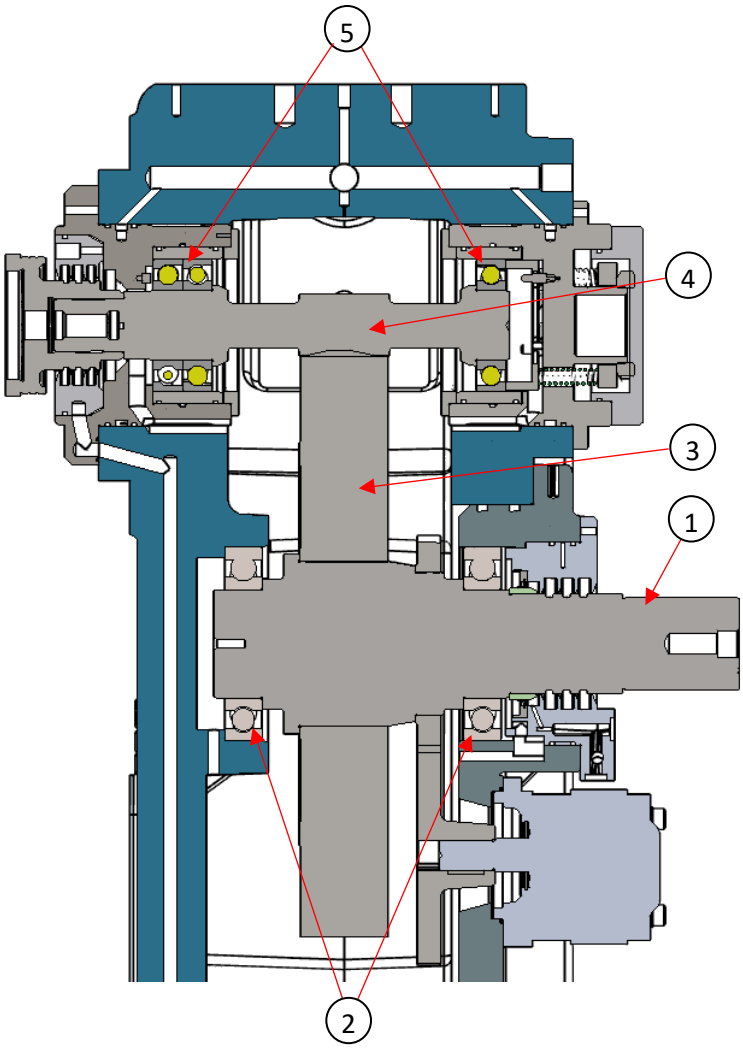
2.3.4 Gearbox



In the Next Turbo gearbox, the pinion shaft bearing housings are located in the same casting. This design is increasing the centring precision of the bearings. The castings are made by Nodular cast iron EN-GJS400, design: design: 6,5 bar (95psi), 200°C (392 heat treated and machined. Dedicated opening (FIG 2) for mounting of the complete slow shaft assembling.

1	Main gearbox
2	Gear cover

2.3.5 Gearwheels and Shaft



The gearwheels are made of high tensile steel 18CrNiMo7-6, hardened and precision ground in order to assure a long life time in heavy duty conditions. The bull gear is shrunk on the input shaft.

1	Input shaft
2	Input shaft ball bearings
3	Bull gear
4	Pinion shaft (fast shaft)
5	Pinion shaft ball bearings

2.3.6 Bearings

Please refer to the type of bearings on the pinion and input shaft present on your purchased blower in Chapter 1. The pinion shaft is supported by two bearings locations, one which is located behind the impeller and one on the motor side – they are usually indicated with (M)otor-side and (C)ompressor side. Two bearings locations also support the input shaft.

Frame family: GTB

Within the GTB family, Next Turbo utilizes high precision hybrid angular contact ball bearings. The fast shaft is supported by two or three bearings, one or two behind the impeller and one on the opposite end. Two deep groove ball bearings support the slow shaft coupled with the motor shaft, one per side. The high-speed bearings are located in bearing housing with integrated oil spray channels.

Advantages of ceramic angular ball bearings

- Uses only 25 (model: T10, T20) or 45 litres (model T30, T40) of oil, oil tank integrated in gearbox (no external pipes, fittings, less danger of oil leakages)
- Very good bearing efficiency of around 98%, resulting in lower energy costs throughout the equipment lifetime.
- Ceramic ball bearings utilized in GTB gearbox are standard SKF bearing (one of the largest international bearing manufacturers); available on open market.
- Requires no external electrical oil pump, an integrated mechanical oil pump (driven by the compressor shaft itself) is the most secure and reliable option (electrical power cuts, damage to electrical pump).
- Costs of SKF spare bearing (replacement only for fast shaft required) is lower in comparison with hydrodynamic bearing, usually replacement each 10 years required.
- Bearing service & exchange much simpler (and quicker) and is it locally done by local service provider.

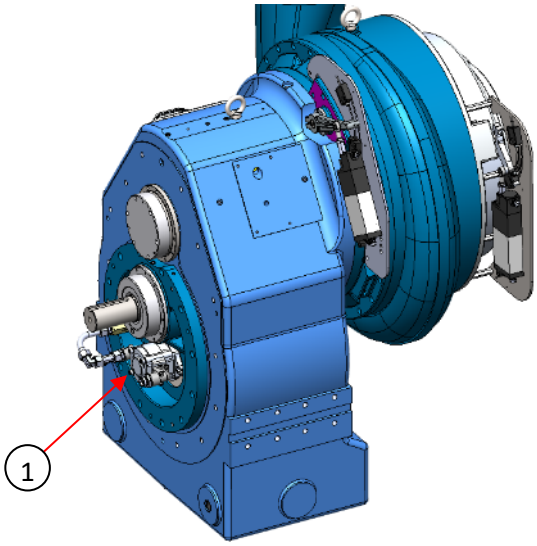
2.3.7 Oil lubrication system

The oil lubrication system for the two frame families GTB and GTH differ in its design. Please refer to chapter 1 to see which frame family your purchased blower belongs in and continue reading at the appropriate sub-chapter.

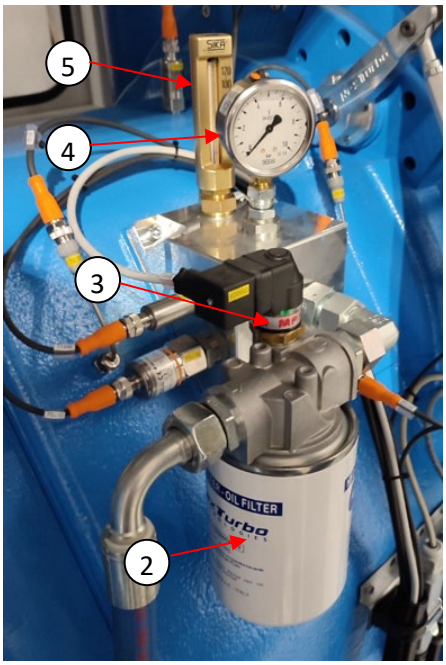
Frame family: GTB

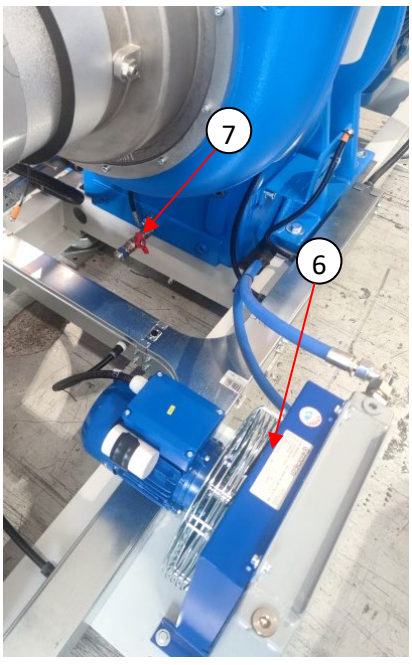
A mechanical oil pump, driven by the slow shaft, allows the lubricant to be circulated within the lubrication system of the bearings and to the toothed gearwheels. Most of the oil paths and openings are integrated into the castings with reduced external oil pipes. This results in a less complex oil system and increases reliability.

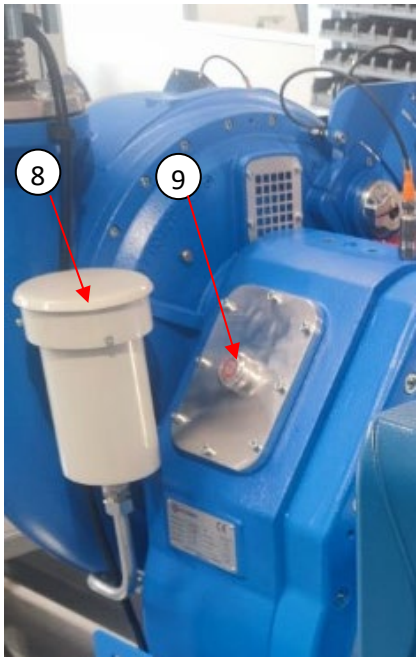
The oil reservoir is integrated into the gearbox.



1	Mechanical oil pump
2	Oil filter
3	Oil filter clogging detector
4	Oil pressure gauge
5	Oil temperature indicator
6	Oil cooler (air-oil type)
7	Oil drain valve
8	Oil demister
9	Oil filling plug



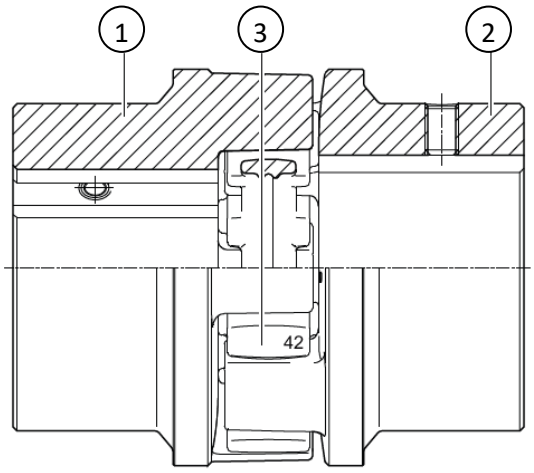




2.3.8 Coupling

General description (BWN type)

A N-BIPEX coupling consists of two hub parts that are connected to one another by a cam ring made of an elastomer material. The hub parts are joined to the shaft by finished bores with a parallel key.



1	Coupling part 1
2	Coupling part 2
3	Cam ring

Thanks to this arrangement, the coupling is rigid against torsion and transmits the torque without torsional backlash. In axial and radial direction, the coupling remains flexible and is able to absorb axial, radial and angular misalignment.

Assembling coupling part 1/2

Installation should be done by skilled personnel with maximum care.

Please also refer to the manufacturer's instruction manual.

Preparation

(Remove the storage layer is the hub on the shafts)

Procedure

- Unscrew the set screw out of coupling parts 1/2 until it is no longer possible for there to be a collision with the parallel key or the shaft.
- Clean the bores and shaft ends.
- Coat the bores of the coupling parts 1/2 and the shafts with MoS2 assembly paste (e.g. Microgleit LP 405).
- Mount the coupling part 1/2 on the shaft.

To make assembly easier, you can heat coupling part 1/2 with cylindrical bore up to a maximum of 120 °C if required. Note when doing this the temperature range of the cam ring (50) (see indication of the manufacturer). Remove the cam ring (50) where appropriate. Protect adjacent components against damage and heating to temperatures above 80 °C.

- Secure the coupling parts 1/2 with a set screw or an end plate. When securing with a set screw the shaft must not protrude or be set back from the inner side of the hub.
- Tighten up the set screw or the screw to attach the end plate to the specified tightening torque TA (for the set screw please see table below).

Coupling part 1/2 (1 or 2) of types BWN and BNT				
Coupling size	Tapped hole d1	Clearance e mm	Tightening torque T_A Nm	Width across flats Hexagon socket wrench mm
19	M5	10	3	2.5
24	M5	10	3	2.5
28	M8	15	8	4
38	M8	15	8	4
42	M8	20	8	4
48	M8	20	8	4
55	M10	20	15	5
65	M10	20	15	5
75	M10	25	15	5
90	M12	30	25	6

- If you have removed the cam ring (50), re-fit the cam ring (50).

Aligning the coupling

The shafts that are joined by the coupling are never on an ideal precise axis but have a certain amount of misalignment.

Misalignment in the coupling leads to restoring forces that can stress adjacent machine parts (e.g. the bearings) to an unacceptable extent.

The misalignment values in operation result from the following:

- Misalignment due to assembly

  Incorrect position due to a lack of precision when aligning

- Misalignment due to operation

  Example: Load-related deformation, thermal expansion

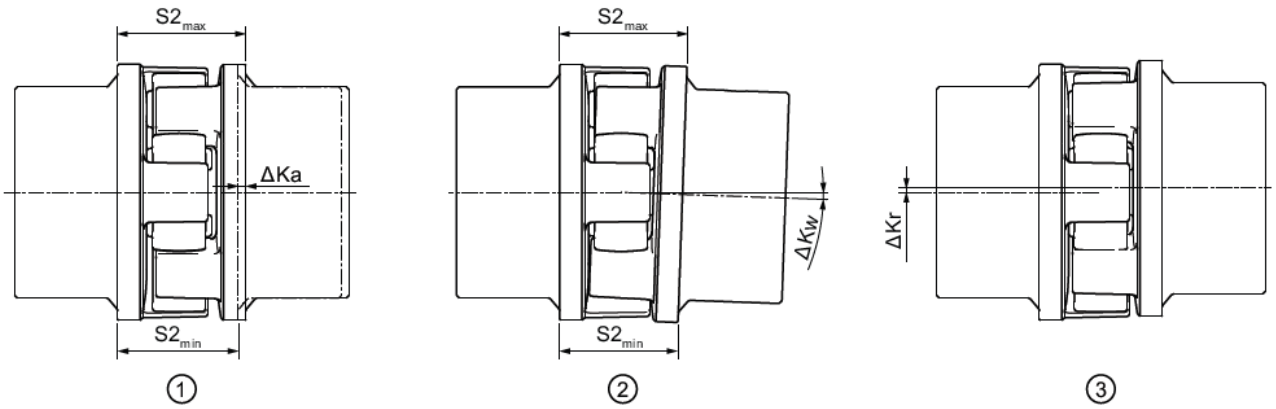
You can minimise misalignment by aligning after assembly. A lower misalignment in the coupling has the following advantages:

- Reduced wear of the elastomer components
- Reduced restoring forces
- Misalignment reserves for operation of the coupling

You can find the maximum permitted shaft misalignment values in the coupling's manufacturer manual.

Possible misalignment

The following types of misalignment can occur:



① Axial misalignment (ΔKa)
② Angular misalignment (ΔKw)
③ Radial misalignment (ΔKr)

You can find the maximum permitted shaft misalignment values in the coupling's manufacturer manual.

Removing coupling part 1/2

 **WARNING**
Danger from burners and hot coupling parts Risk of injury due to burners and hot surfaces. Burners or hot coupling parts can lead to an explosion in potentially explosive atmospheres. • Wear suitable protective equipment (gloves, safety goggles). • Ensure that the area is not at risk of explosion.

Procedure

1. Move the coupled machines apart.
2. Secure the coupling parts to prevent them from falling.
3. Remove the axial locking elements (set screw, end plate).
4. Use a suitable pulling fixture.
5. Heat up the coupling part 1/2 using a burner above the parallel keyway along its length to maximum 80 °C.

Note when doing this the temperature range of the cam ring (50). Remove the cam ring (50) where appropriate.

6. Pull off the coupling part 1/2. Use suitable lifting gear when doing this.
7. Check the hub bore and the shaft for damage and protect them against corrosion.
8. Replace any damaged parts.

2.3.9 Capacity Regulation system

Please check the regulation system your purchased blowers have incorporated in Chapter 1 Section 1.1 and read the relevant sub-sections below.

- **X-Regulation –** The gas flow is regulated by Variable diffuser vanes (VDV). Only this regulation system is deployed on this type of blower. The result is a wide gas-flow regulation range from 40/45% to 100% of gasflow, or even wider.
- **Y-Regulation** - The gas flow is regulated by Inlet Guide Vanes (IGV). Only this regulation system is deployed on this type of blower. The result is a gas-flow regulation range which is suitable for processes in which if lower gas flows also result in lower pressure requirements.
- **XY-Regulation** – A combination of VDV and IGV above. The VDV controls the capacity regulation, similar to an X-machine, whereas the IGV adjusts the pre-rotation for power optimizations based on changes in inlet pressure, temperature and system pressures.
- **XZ-Regulation** – A special regulation method, which acts similar as the XY regulation, but the IGV is replaces by a low-frequency VFD, which regulates the impeller speed as so slightly for adjustment purposes. It is to highlight that the VFD and speed regulation is NOT used for capacity control – as this would result in loss of pressure capacity. This regulation is used if a VFD as a motor starter is strictly required by weak plant power grids and anyhow available.

Variable diffuser vanes (VDV)

1

2

1 Diffuser 100% open
2 Diffuser 45/40% open

The airflow regulation is done with variable discharge diffusers. Gas.flow regulation between 100% to 45/40% and below are possible - where 100% is the maximal designed airflow. Figure “1” with diffuser vanes at an wide angle, Figure “2” with diffuser vanes at a steep angle.

The variable diffuser vanes are made of brass alloy Cu3Zn2 and are aerodynamically shaped and designed to obtain the highest efficiency over the entire operating range. The variable diffuser vanes are mounted in permanently lubricated sleeve bearings, which is 100% oil and grease free as well as being maintenance free.

The diffusers blades are driven by electrical actuator with limit switches, local position indicator and remote position transmitter. The actuator is powered by the local control panel which is to constantly monitor the diffuser position and adjusts the airflow according to the process requirements.

Inlet Guide Vanes (IGV)

3

4

3 Inlet guide vanes 100% open
4 Inlet guide vanes 45% open

The IGV (Inlet guide vanes) is pre-rotating the air within a regulation between 100 to 45/40%.

The guide vanes are mounted in permanently lubricated sealed ball bearings, which is 100% oil and grease free as well as being maintenance free.

The IGV is driven by electrical actuator with limit switches, local position indicator and remote position transmitter. The actuator is powered by the local control panel which is to constantly monitor its position and adjusts the angle according to actual conditions (inlet air temperature, differential pressure across the blower and diffuser position)

The inlet guide vanes are made of Ergal (aluminium alloy), milled from solid and aerodynamically shaped and designed to obtain the highest efficiency over the entire operating range.

The VDV and IGV mechanical position (minimum and maximum) are fixed by limit switches. These limits are shown in the table in the document MECHANICAL & FUNCTIONAL RUN TEST CERTIFICATE.

2.4 Inlet system

The inlet system consists of two parts: the inlet silencer and inlet filter elements.

Before the inlet filters a coarse filter is located to intercept larger particles and objects. This is in order to protect the fine filters and extend their usage period. For exchange intervals, please refer to the maintenance section.

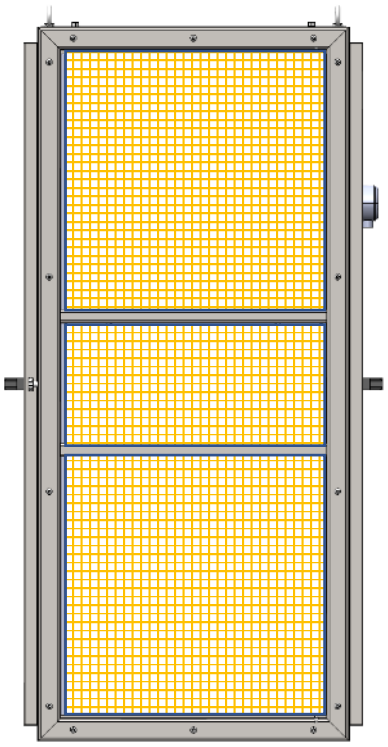
2.4.1 Inlet silencer

Labyrinth type inlet silencer. Including a flexible connection to compressor inlet. No baffles or other corroding material used for silencing within the inlet channel. The material used is carbon steel sheets to form the labyrinth.

2.4.2 Inlet filter

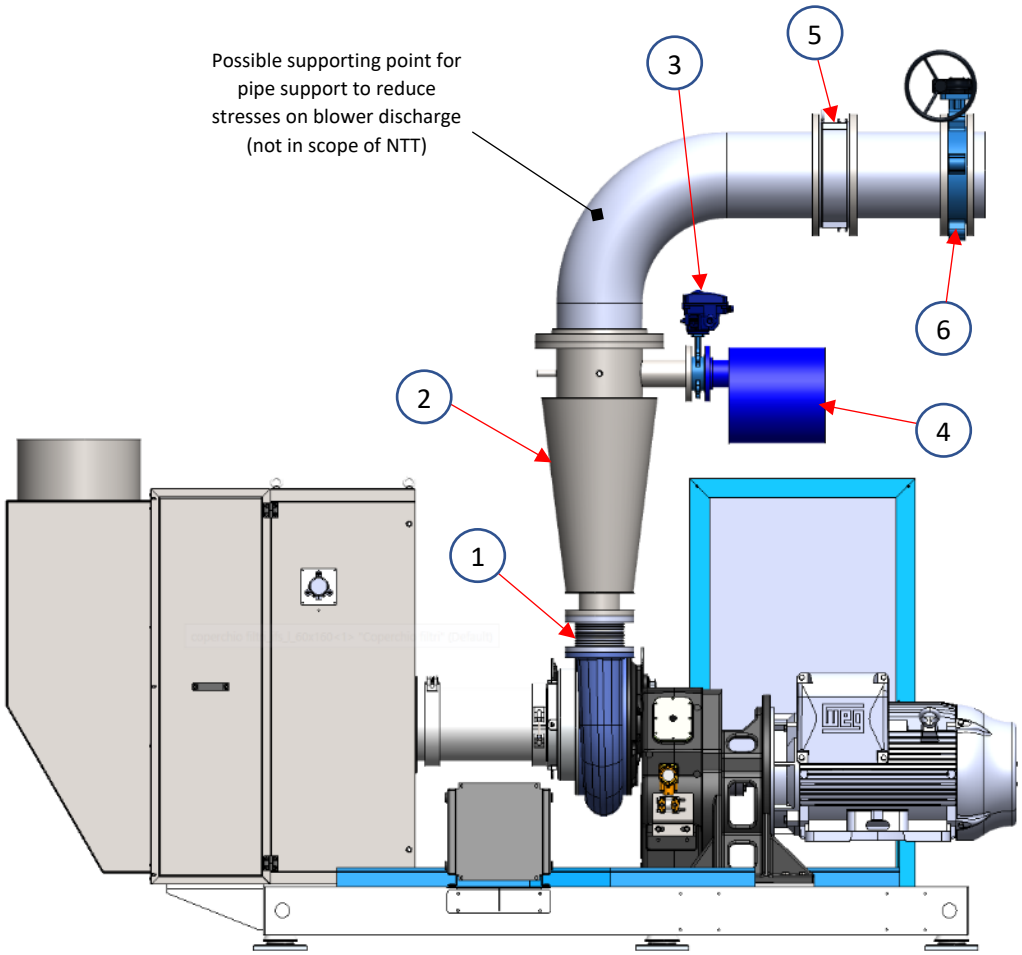
All pocket filters are glass fiber-free, no corroding, moisture-resistant up to 100% rel. humidity, self-extinguishing to DIN 53438 (Fire Class F1) as well as microbiologically inactive and meet all hygiene requirements for HVAC systems to EN13779. The pocket filters are easy to replace from outside the silencer hood. Please refer to the datasheet of the filter on the amount of filter bags are included in one blower set.

- Filter type: first & second stage
- Filtration: 95%
- Filter Media: synthetic-organic, nonwoven
- Front frame: Polyurethane



Filter size	600x1600 mm
Lay-out	2 full + 1 half
Pre-filter (1^{st} stage)	2x Full + 1x Half Airgam TZS-48 G2 EN779 Compact (Full=592x592x50, Half 592x287x50)
Fine filter (2^{nd} stage)	2x Full + 1x Half Freundenberg F45S G4 EN779 Pocket (Full=592x592x330, Half 592x289x330)

3. Discharge system



The discharge system is composed by:

1	Flexible compensator
2	Cone diffuser
3	Blow-off valve [not in NTT scope]
4	Silencer
5	Check valve [not in NTT scope]
6	Isolation valve [not in NTT scope]

Please refer to GAD (General assembly drawing) and the exact scope of supply concerning these parts.

3.1.1 Flexible compensator

To reduce vibrations and forces from and to the blower unit, a flexible compensator with guide pipe and bellow of stainless steel with flange of St. 37.2 according to DIN 2501 is mounted between blower discharge and cone diffuser.

3.1.2 Cone diffuser

The main function of the discharge cone diffuser is to convert the gas velocity into static pressure. The cone diffuser also offers an additional discharge silencing due to its dampening lining. This reduces the noise emitted into the discharge piping.

Air temperature transmitter and related fittings are always included when the “Y” regulation (Inlet guide vane -IGV) if ordered. The cone diameter size is selected with the criteria of limiting the gas speed at the outlet to a value <25 m/s (<4920f/min). Please refer to your order for project specific limits.

3.1.3 Blow-off valve and silencer

The blow-off valve functions as a pressure relief valve during start/stop to avoid surging. The valve is made as a butterfly valve for mounting between flanges DIN 2501, PN10 or ANSI 16,5, equipped with an electric actuator with hand wheel for manual operation and with limit switches.

The blow-off valve is typically equipped with a silencer to reduce the start-stop peak noise further. In case of the compact plug & play package the silencing function is taken over by a special compartment within the enclosure itself.

3.1.4 Check valve (wafer type)

The check valve prevents the compressed gas from flowing backwards into the blower, thereby keeping the blowers pinion shaft from running backwards when not in operation.

The non-return check valve is with dual spring-loaded flaps and wafer type.

The valve is supplied loose for mounting by others – as far as in scope of delivery. The check valve must be mounted on horizontal pipe, before the common header. Gasket should be Installed between flanges.

3.1.5 Isolation valve

An electrical actuated blower discharge isolation valve of butterfly type should be installed. The valve should be equipped with limit switches and should be powered and controlled by the Local Control Panel of the Blower (LCP).

Valve is supplied loose for mounting by others – as far as in scope of delivery. The Isolation valve to be installed after the check valve on blower discharge pipe. See Installation instructions on how to install.

CHAPTER 4

1. Operation of Compressor System

Please refer to the instructions included in LCP and MCS operator manuals.

1.1.1 Acronyms

LCP	Local Control Panel
HMI	Human Machine Interface
VDV	Variable Diffuser Vanes
IGV	Inlet Guide Vanes
BOV	Blow Off Valve
Local mode	Operator is manually starting/stopping the blower and increasing/decreasing the airflow
Remote mode	MCS/SCADA/DCS is automatically starting/stopping the blower and increasing/decreasing the airflow
Start	Push button or command to start the blower
Stop	Push button or command to stop the blower
Light	Noise enclosure internal light
Led	HMI virtual LED (light-emitting diode) – indicates a certain function/status is ON or OFF
DCS	Distributed Control System
MCS	Master Control System
Watchdog	IP WatchDog" refers to the method of detecting if an IP device works correctly
Discharge Isolation valve	The discharge isolation valve is installed downstream the check valve and its function is to isolate the blower from the common header.
MCC motor running	MCC motor running means the main motor is powered by the MCC and the MCC provides the signal as feedback to the LCP
TRIP	The compressor is automatically shut down a systematic way when a malfunction occurs
ALARM	The compressor keeps operating while the alarm brings a malfunction to the attention of operators and maintenance personnel

2. First Time Start-Up

DO NOT ATTEMPT TO START THE BLOWER IF MANDATORY ITEMS FOR ITS SAFE OPERATION ARE NOT INSTALLED

2.1 Preparations for first start-up

2.1.1 First Start-up Checklist

- Kindly follow the document pre-commissioning step by step check list
- Kindly follow the document commissioning step by step check list
- DO NOT ATTEMPT to start the compressor until a NTT technician or representative is onsite.

General check

- Fill up the compressors with lubricating oil, check the oil level, (lubricant oil might be included already)
- Check the compressor suction system, silencer(s), compensators and air filters (internal/external) for correct mounting and cleanliness
- Check especially the area in front of the impeller, the inlet, and the inlet pipe. Check the flexible connection between the inlet pipe and inlet filter/inlet duct for correct mounting (if applicable).
- Check cone diffuser, blow-off valve and non-return check valve on pressure side of compressor for correct mounting. An arrow (on the check valve) indicates the sense of direction of the air (if applicable).

2.1.2 Procedure for first start-up

Kindly refer to document LCP & HMI Operations manual

- Turn on power on main switch (LCP)
- HMI panel is active after 1 minute.
- Select service mode if not already in selected (via HMI)
- While the service mode is selected, check the following:

- Check diffuser VDV actuator function (opening and closing and max and min position)
- Check the inlet guide vanes IGV function (opening and closing and max and min position)
- Check enclosure fan and direction of rotation (switch it on and off)
- Check blow–off valve (opening and closing and max and min position)
- Check noise enclosure fan (correct function: air to be extracted out of the cabin, check sense of rotation)
- Check electrical inlet & discharge valve [if installed] (opening and closing and max and min position)
- Check oil cooler motor [if available] (sense of rotation – see arrow top left corner)
- Check electrical oil pump motor (sense of rotation by switching it on and off)

- Switch to local mode (via HMI)

2.2 Test run blower

Kindly refer to document LCP & HMI Operations manual

IMPORTANT NOTE: first-time motor greasing to be performed immediately after compressors first startup.

It is important to note the type of grease must be identical with the one used by the motor manufacturer from the factory, as mixing different types of grease may result in potential damage to the motor bearings.

After the test run of the blower the motor shall be controlled once per week for a period of two weeks. Check that vibration levels and sound emission are not excessive. Check the oil level after the test run of the blower. Some of the oil will be filling the oil cooler, therefore some oil topping might be required.

3. Starting/Stopping of the Turbo Compressor

IN CASE THE LCP IS NOT SUPPLIED BY NTT, THE BELOW DESCRIPTION/INFORMATION MIGHT BE DIFFERENT. NTT IS NOT RESPONSIBLE FOR PARTS/ITEM WHICH ARE NOT SUPPLIED BY NTT

3.1 Starting the turbo compressor

3.1.1 Start Conditions

The following conditions must be full filled, otherwise the turbo compressor will not be able to start. If these conditions are not full filled a status message will indicate the turbo compressor is NOT READY TO BE STARTED.

1. NO alarm neither trip is shown on the HMI
2. The MCC healthy signal is available - no alarm neither trip on the MCC
3. Discharge electrical valve is closed and status shown on the HMI (if available)
4. Blow-off valve is open, and status shown on the HMI
5. VDV variable discharge diffuser & IGV is at minimum position, status shown on the HMI
6. Provided above condition is full filled, the HMI will provide following info: “compressor ready to start”
7. In case one of the above conditions is not full-filled, the HMI will show what is wrong and inform: compressor not ready to start – the stop button LED blinks green/grey to highlight the unit is not ready to start. The LED has steady green light ON, then the unit is ready to start.

3.1.2 Start Sequence

Compressor local mode selected (start button on the HMI)

1. The inlet and outlet isolation valves open up to fully open position (if available)
2. Electrical oil pump starts and pre-lubricate the gearbox for 1 minute (available on GTH version).
3. The main motor starts with diffuser & IGV in minimum position (provided there is no alarm neither trip)
4. The electrical oil pump stops after approx. 30 seconds, the oil pressure is kept at working point by the mechanical oil pump (GTH version).
5. The IGV opens up
6. The blow-off valve closes slowly
7. When the blow off valve is closed, compressor airflow can be adjusted (operator acts on the HMI opening/closing the variable discharge diffuser - VDV)
8. Exhaust fan1 is turned on

3.1.3 Status information

Status information which is in sequence indicating the current step in the start sequence.

- Not Ready To Start
- Ready To Start
- Waiting feedback from MCC
- BOV Closed
- BOV Closing
- BOV Open
- BOV Opening
- VDV max position
- VDV min position
- Discharge Isolation valve Closed (if available)
- Discharge Isolation valve Closing (if available)
- Discharge Isolation valve Open (if available)
- Discharge Isolation valve Opening (if available)

3.2 Stopping the turbo compressor

3.2.1 Normal stop sequence

1. Compressor stops via stop button on the HMI
2. The electrical lube oil pumps start for a period of 5 minutes (available on GTH version)
3. Exhaust fan (1 out of 2) remains in operation for 15 minutes
4. The VDV variable discharge diffuser will slowly close to its minimum position, followed by the IGV
5. Once the diffuser has reached the minimum position, the blow-off valve opens to its max open position
6. The main motor is now stopped
7. The inlet & discharge valves will now close to its fully closed position (if available)
8. Once normal stop sequence is completed, the compressor can be re-started **(max 4 times per hour is typical)**

3.2.2 Status information

Status information which is in sequence indicating the current step in the stop sequence.

- Stop sequence activated
- Ready To Start appears 1 minute after complete stop

3.3 Capacity Control of turbo compressor

The airflow of the compressor is regulated via discharge variable diffuser (VDV), airflow turn-down is between 45 to 100% where 100% is max design airflow design. The VDV are aerodynamic shapes and designed to obtain the highest efficiency over the entire regulating range.

The VDV are integrally mounted inside the compressor and mounted in permanently lubricated sleeve bearings which are totally oil free as well as maintenance free.

The diffusers vanes are operated via an electrical actuator equipped with limit switches and internal position device. The actuator is powered by the local control panel which is constantly monitoring the diffuser positions and adjusts the airflow as per process requirement.

The operator can manually control the compressor air flow by acting on the HMI push buttons open & close VDV (if the compressor control is set to manual). In case the control is set to auto mode, the Master Control Panel System or DCS/SCADA will automatically control the airflow in accordance with given set-point (air pressure or airflow).

3.4 Status monitoring

The PLC installed into the LCP is constantly monitoring all variables (via instrumentation mounted on compressor skid and accessories). All data are available for the operator and also available for a main control (DCS/SCADA) via network communication system.

3.5 Settings

- Main motor MCC with DOL or soft starter ramp is programmed during compressor test at the factory (when supplied by NTT)
- Calibration of IGV & Discharge Diffuser Vanes is done during compressor test at the factory. Positioning and scaling is pre-set via HMI. Values are shown on a specific document made after the test. “see mechanical run test certificate” check CD/DVD: 18.0656 O&M/ Quality book/ Mechanical & Functional Run Test Certificate
- Setting blow off valve closing time is done during compressor test at the factory. Positioning and timing is pre-set via HMI. Values are shown on HMI. Values are shown on chapter 6.3.4 of this document.
- Alarms & trips set-points for all instrument, accessories and main motor are set during compressor test at the factory. Values are shown on chapter 3 – paragraph 1.3 of this document. The pre-set values can be changed in the HMI

4. Fault Finding

IN CASE THE LCP IS NOT SUPPLIED BY NTT, THE BELOW DESCRIPTION/INFORMATION MIGHT BE DIFFERENT. NTT IS NOT RESPONSIBLE FOR PARTS/ITEM WHICH ARE NOT SUPPLIED BY NTT

4.1 Abnormal operation conditions

4.1.1 Quick stop (critical situation)

When an abnormal operating condition is registered by the compressor control system requires a quicker stop (compared to normal stop procedure) of the turbo compressor, a quick stop sequence is initiated. These events are:

- Compressor Surging
- Compressor Recirculation
- High Motor Winding or Bearing Temperature (when available)
- MCC with DOL or Soft starter failure

The Stop Sequence is:

1. Occurrence of an abnormal operating condition
2. Electrical oil pump starts
3. The blow-off valve opens and the diffuser closes
4. The turbo compressor stops when the blow-off valve has reached its fully open position; at the latest 6 seconds after the abnormal operating condition occurred
5. Electrical oil pumps stops after 10 minutes
6. Exhaust fan 1 is in operation for 15 minutes
7. The isolation valves close after the blow-off valve is fully open (if available)

The quick stop procedures is made to reduce potential compressor damages created by abnormal operating conditions.

4.1.2 Critical stop

When a critical operating condition is registered by the compressor control system requires an immediate stop (compared to quick stop) of the turbo compressor.

Critical operation conditions are:

- Compressor high high (HH) vibration
- Compressor high high (HH) bearing temperature
- Compressor low low (LL) lubrication oil pressure
- Compressor high high (HH) discharge air temperature

A critical stop sequence is:

1. A critical operating condition occurs
2. Electrical oil pump starts
3. The turbo compressor stops immediately (main motor power cut-off immediately)
4. The blow-off valve opens, the diffuser closes (while the motor stops)
5. Electrical oil pumps stops after 10 minutes
6. Exhaust fan 1 is in operation for 15 minutes
7. The isolation valves close after the blow-off valve is fully open (if available)

The quick stop procedures are made to reduce potential compressor damages created by abnormal operating conditions.

4.1.3 Emergency stop/power failure

Emergency Stop conditions are: risk of personal injury or property damage.

1. The emergency stop pushbutton is pressed or a power failure occurs
2. The turbo compressor stops
3. All auxiliaries i.e. oil/air coolers, blow-off valve, and the discharge diffuser vanes, the isolation valves are stopped and remain in their current position. All 400Vac power circuit is cut-off while 24VDC remains ON.

5. List of alarms & trips

IN CASE THE LCP IS NOT SUPPLIED BY NTT, THE BELOW DESCRIPTION/INFORMATION MIGHT BE DIFFERENT. NTT IS NOT RESPONSIBLE FOR PARTS/ITEM WHICH ARE NOT SUPPLIED BY NTT

5.1 Definition

Alarms: are operating and process states that require the operating personnel to react by issuing an acknowledgement but not require the compressor to be stopped.

Trips: are critical or hazardous operating and process states that require the compressor to be stopped and the operating personnel to react by issuing an acknowledgement.

5.2 Remote/local reset alarms

The above listed alarms can be acknowledged remotely by the DCS hardwired to LCP signal “remote reset alarms” or locally via HMI “reset alarms”. This function is allowed also with the compressor in operation.

5.3 Alarm list

Please refer to the instructions included in LCP and MCS operator manuals.

5.4 Trip list

Please refer to the instructions included in LCP and MCS operator manuals.

CHAPTER 5

1. Maintenance

1.1 Interval overview

The table below describes both regular maintenance activities, which can be performed by the operational crew of the plant as well as preventive maintenance packages from the supplier certified service personnel. The intervals should be seen as an indication and recommendation from the supplier, as local conditions may vary. When the individual maintenance scheme is setup, special attention should be given to parts in the air-path of the blower. Our certified service experts are happy to assist you in setting up an individual maintenance plan.

Please check which frame family your product belongs to in CHAPTER 1, Section 1.1

Maintenance Activity	Time Interval GTB frame family	Requirements
Oil sample	After 2 years of operation	On positive result oil can be used for 1 more year over the time interval mentioned here
Oil change	After 2-3 years of operation, or 20,000 hours whatever comes earlier	Trained Plant personnel or local NTT service partners acc. O&M manual
Oil filter change	After 1 year of operation	Trained Plant personnel or local NTT service partners acc. O&M manual
Air inlet filter change	Coarse filter twice a year. Fine filter once a year**	Trained Plant personnel or local NTT service partners acc. O&M manual
Motor maintenance	Please refer to the respective datasheet/motor manual	According to respective datasheet & motor manual
Oil cooler (oil to air)	Regular cleaning might be necessary, depending on ambient conditions. Oil cooler placed outside, subject to sandstorms. Requires cleaning after sand-storm	Trained Plant personnel or local NTT service partners
Oil cooler (oil to water)	Yearly cleaning might be necessary, all depending upon fouling and/or water calcium. Due to potential galvanic corrosion, water to oil coolers might require replacement every 2 years (suggested as pro-active maintenance)	Trained Plant personnel or local NTT service partners acc. O&M manual
Lube oil system, 3 ways thermostatic valve [if installed]	Yearly check, replacement might be necessary every 2 years as pro-active maintenance	Trained Plant personnel or local NTT service partners acc. O&M manual
Oil fittings, hoses, pipes	Tightening and check to be carried out once a year	Trained Plant personnel, **proven skills with hydraulic systems**
Oil cooler/ oil pump/ enclosure fan maintenance	Please refer to the respective datasheet	Trained Plant personnel or local NTT service partners acc. O&M manual

Preventive Service A	After 25,000 operating hours	Certified Service personnel
Preventive Service B	After 50,000 operating hours	Certified Service personnel

**NOTE: the inlet air filter replacement is indicative and depends upon the inlet air condition of the plant. If the environment is dusty, the filters might need to be replaced more often.

1.2 Regular maintenance activities

1.2.1 Oil change

Please refer to CHAPTER 1, Section 1.1 the related FRAME FAMILY and FRAME SIZE of your product and follow the relevant instructions below.
The required oil amount in the tank varies based on type of oil cooling, location of oil cooler (i.e. length of oil pipe). Below are indications only with fluctuation tolerances in litre gallons.

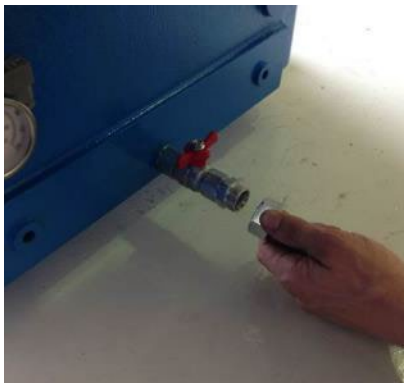
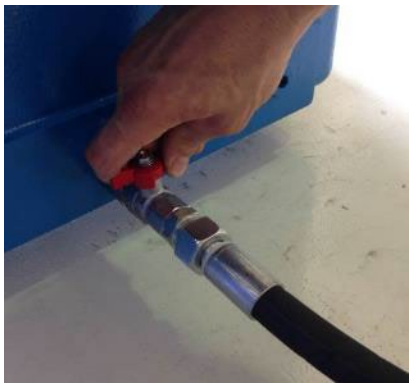
Compressor size	Oil amount *	Notes
GTB-T10	22 l (= 4.9 gal)	See oil type in datasheet
GTB-T20	22 l (= 4.9 gal)	See oil type in datasheet
GTB-T30	60,5 l (= 13,3 gal)	See oil type in datasheet
GTB-T40	60,5 l (= 13,3 gal)	See oil type in datasheet

* air to oil heat exchangers are included.

Please ensure the correct amount of oil filling; if you overfill the oil tank damages might occur which are not covered by usual warranty. Please ensure tank is filled before first use; usually compressor is shipped without first oil filing.

FRAME FAMILY: GTB

The compressor integrated oil tank is equipped with a treated plug which is used to empty the tank. Once this operation is done, the new oil is poured into the tank from the top of the gearbox and an oil level gauge is showing when the tank is full. No special tool required. The oil needs to be chosen from the list of lubricants


1.2.2 Oil filter cartridge replacement

The oil filter is replaced once a year. This operation does not require any special tool. The filter cartridge is simply replace with a new one. The oil breather is service free.

NOTE: for filter type and details, check O&M/ Auxiliaries & mechanical instruments & parts

Oil filter

Oil breather

IMPORTANT: CHECK OIL FILTER TIGHTENING BEFORE COMPRESSOR FIRST START. CHECK IT AGAIN AFTER 500 duty hours

1.2.3 Air filter change

The inlet air filter is composed by a set of compact pre filters and a set of pocket type fine filters. The pre filter has to be replaced once **6 months** (indicatively, see suction conditions), while the fine filter every **1 year**. In case of dusty environments, filter replacement can happen more often. The fine filter is equipped with a differential pressure gauge which indicated the clogging level on its display.

Compact pre-filter

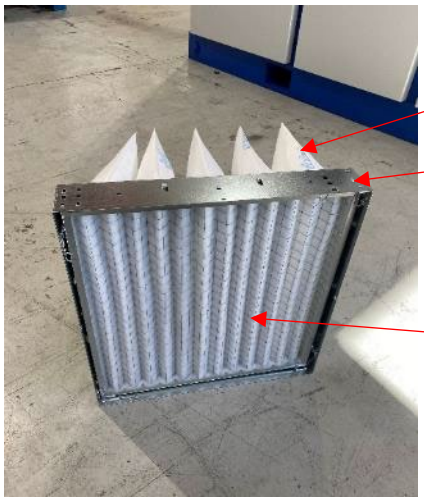
Pocket type fine filter

Differential pressure indicator (digital or mechanical)

Remove the bolts and open the door

If present, remove the fixing element

Pull-out the filter frame



1.2.4 Water oil cooler circuit & maintenance (if installed)

If the purchased blower features an Air-to-Oil cooling (see CHAPTER 1 SECTION 1.1), please read here:

The lube oil cooler is installed on the skid and fixed on specifically designed supports. The entire lubrication system is mounted and tested before the shipment. The water inside the cooler is removed right after the factory test. The cooler outside material and inner material depends upon specifications.

- The water cooler must be cleaned once a year as it might be subject to fouling, depending upon water characteristics and calcium etc. Due to potential galvanic corrosion, suggested replacement is every 2 years.
- The water cooler instruments, such as the solenoid valve and flow switch might be included in the scope pf supply or be provided from civil/ client side. In either case it is recommended to replaced them once a year (as pro-active maintenance).

1.2.5 Oil fittings, oil hoses & pipes

It is suggested to check the tightening of the oil fittings, hoses and pipes before the compressor first start and after 500h of operation. It is suggested to check the same once a year.

BE AWARE: tightening of the oil fitting must be carried out by a skilled technician whom has proven experience with hydraulic piping systems. Hard or unproper tightening can lead to break downs or oil leaks. in case of doubts, kindly refer to local agent or service provider.

1.2.6 Motor maintenance

General Motor Maintenance

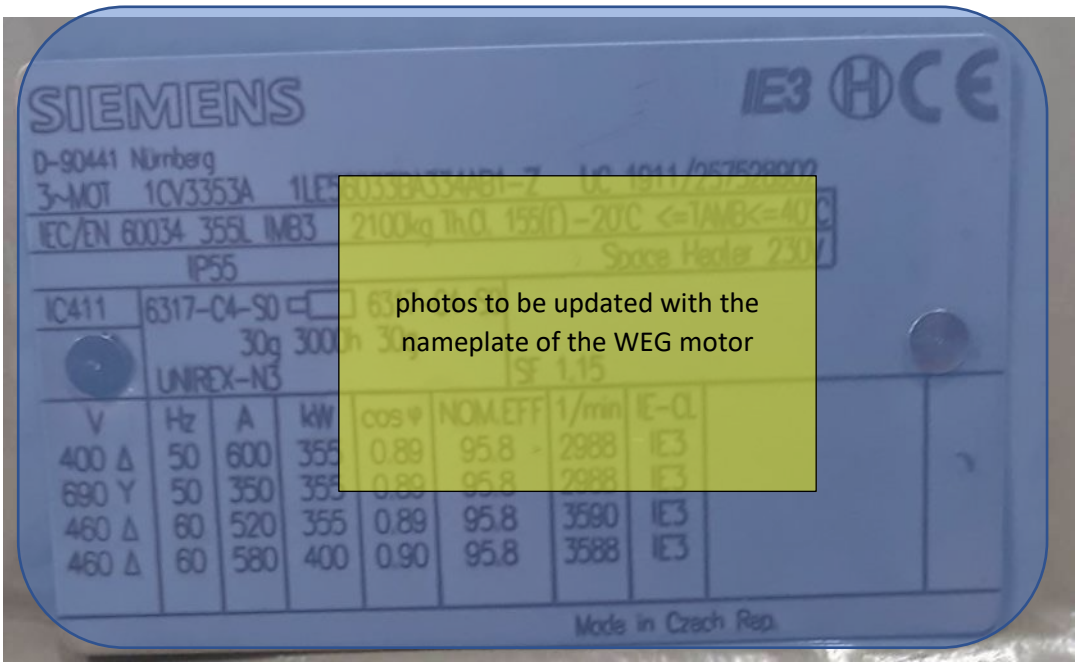
For greasing after first-start up: refer to motor O&M manual.

After the initial greasing of the motor a subsequent greasing interval must be scheduled and carried out by the plant service personnel; the intervals are indicated on the plate of the motor. It is MANDATORY to keep record of greasing used and greasing intervals. In case of longer storage of the units, please refer to the storage instructions.

For bearings replacement, refer to motor O&M. In case of doubts, contact Next Turbo Technologies. We suggest to always contact Next Turbo Technologies before carrying out any kind of maintenance/service/corrective maintenance on the motors. BEARING GREASING task must be carried out by the plant personnel.

Please refer to the nameplate on the motor for finding out which greasing brand/ type and amount is required as well as the exact re-greasing intervals.

Below is meant as an example, illustrating the where the information usually can be found.



photos to be updated with the nameplate of the WEG motor

DO NOT MIX DIFFERENT TYPES OF GREASE – ONLY NAMEPLATE GREASE MUST BE USED

It is MANDATORY to keep record of greasing used and greasing intervals for guarantee purposes. Greasing activities must be sent to local agent or to Next Turbo Technologies directly.

Without mandatory record of greasing warranty is voided

2. Preventive maintenance

2.1 Service A

This preventive service package consists of the following activities. It shall be performed by a manufacturer certified service technician with the appropriate trainings and valid certification. All activities of the regular maintenance mentioned in last section are included as well.

Estimated time frame for the full-service activity (per unit): **10 hours**

- Inlet air filter silencer inspection
- Cleaning of air inlet filter silencer
- Check of oil leakages before service
- Variable diffusers inspection
- Variable diffusers cleaning
- Variable diffuser alignment gap
- Inlet guide vanes inspection
- Inlet guide vanes cleaning
- Inlet guide vanes alignment gap
- Dismounting of blower air part: suction closing plate, inlet contour, volute
- Impeller inspection
- Cleaning of Impeller
- Cleaning of all air exposed parts and surfaces
- Inspection of the variables diffuser drive system
- Inspection of the inlet guide vanes drive system
- Check or changing of seals (O-rings)
- Assembling of blower
- Check of clearance of impeller and axial bearings (GAP2)
- Check of clearance between impeller and inlet contour (GAP1)
- Assembling of the variable diffuser system and adjustment of diffuser arm to the mechanical zero
- Assembling of the inlet guide vanes system and adjustment of IGV arm to the mechanical zero
- Inspection or change of the oil filter

Final activity

- Startup of blower
- Check of safety functions and control system
- Inspection of all accessories, cone diffuser, check valve, isolation valve, blow of valve and silencer
- Electric motor & coupling check
- Vibration recording (RMS)
- Lubricating oil system check of oil leakages, oil cooler system and piping

THE CLEANING SERVICE “SERVICE A” IS CARRIED OUT EVERY 25,000H, HOWEVER, IN DUSTY ENVIRONMENTS, THIS SERVICE MAY NEED TO BE PERFORMED MORE OFTEN. DUST CAN WEAR THE DISCHARGE DIFFUSER MECHANISM LOCATED ON THE DISCHARGE OF THE BLOWER. THE USER IS RESPONSIBLE TO CARRY OUT THE CLEANING ACCORDING TO THE DUST LEVEL AFTER DISCUSSING WITH THE LOCAL CERTIFIED AGENT. PLEASE CONTACT NEXT TURBO FOR ADVICE.

2.2 Service B

This preventive service package consists of the following activities. It shall be performed by a manufacturer certified service technician with the appropriate trainings and valid certification. All activities of the regular maintenance and Service I mentioned in last section are included as well.

Estimated time frame for the full-service activity (per unit): **15 hours**

- Inlet air filter inspection
- Inlet air filter silencer inspection
- Cleaning of air inlet filter silencer
- Check of oil leakages before service
- Variable diffusers inspection
- Variable diffusers cleaning
- Variable diffuser alignment
- Inlet guide vanes inspection
- Inlet guide vanes cleaning
- Inlet guide vanes alignment
- Dismounting of blower air part: suction closing plate, inlet contour, volute
- Impeller inspection
- Cleaning of Impeller
- Cleaning of all air exposed parts and surfaces
- Inspection of the variables diffuser drive system
- Inspection of the inlet guide vanes drive system
- Check or changing of O-rings
- Assembling of blower
- Check of clearance of impeller and axial bearings (GAP2)
- Check of clearance between impeller and inlet contour (GAP1)
- Assembling of the variable diffuser system and adjustment of diffuser arm to the mechanical zero
- Assembling of the inlet guide vanes system and adjustment of IGV arm to the mechanical zero
- Inspection or change of the oil filter
- Dismounting of gearbox
- Check or gearwheels, bearings & labyrinth seals
- Inspection and decision on replacement of complete FAST shaft bearings (GTB or GTH) or replacement of bearing pads (GTH) or postponement of replacement until next service interval
- Inspection and decision on replacement of SLOW shaft bearings
- Check or changing of gearbox and labyrinth seal O-rings
- Assembling and cleaning of gearbox
- Check of gears clearance

Final activity

- Startup of blower
- Check of safety functions and control system
- Inspection of all accessories, cone diffuser, check valve, isolation valve, blow of valve and silencer
- Electric motor & coupling check
- Vibration recording (RMS)
- Lubricating oil system check of oil leakages, oil cooler system and piping

3. Lubrification oil specification

Please refer to CHAPTER 1, Section 1.1 the related FRAME FAMILY and FRAME SIZE of your product and follow the relevant information given in the tables below.

Lubrication oil specification

Frame family	Oil Type acc. DIN51502	ISO VG	Viscosity Index (min) acc. ASTM D2270	FZG STAGE min. ISO 14635-1
GTB Series	PAO	32	148	11

PAO = Synthetic oil, polyalfaolifine

Tank capacity

Compressor size	Oil amount *	Notes
GTB-T10	22 l (= 4.9 gal)	See oil type in datasheet
GTB-T20	22 l (= 4.9 gal)	See oil type in datasheet
GTB-T30	60,5 l (= 13,3 gal)	See oil type in datasheet
GTB-T40	60,5 l (= 13,3 gal)	See oil type in datasheet

* air to oil heat exchangers are included.

Please ensure the correct amount of oil filling; if you overfill the oil tank damages might occur which are not covered by usual warranty. Please ensure tank is filled before first use; usually compressor is shipped without first oil filing.

NEVER MIX DIFFERENT OILS, NOT EVEN FOR TOPPING PURPOSES. THE GEARBOX COULD BE SUBJECT TO DAMAGES – MIXING OF DIFFERENT OIL MUST BE TOTALLY AVOIDED.

LIST OF SUITABLE GEARBOX LUBRICATION OILS

Company	GTB Series
TOTAL	DACNIS SH 46
SHELL	MADRELA AS 46
MOBIL	**MOBIL SHC 624**
Q8	Q8 SCHUMANN 32
STATOIL	COMPWAY SX 32
ESSO	ESSO COMPRESSOR OIL RS32

Next Turbo Technologies S.p.A suggests to use **EXXON MOBIL SHC 624**

Mobil

Mobil SHC™ 600 Series

Exceptional Performance Gear and Bearing Oils

Product Description

Mobil SHC™ 600 Series lubricants are exceptional performance gear and bearing oils designed to provide outstanding service in terms of equipment protection, oil life and problem-free operation helping to enable increased customer productivity. These scientifically engineered oils are formulated using the latest proprietary and patent pending Mobil SHC technology to provide outstanding and balanced performance in demanding applications at high and low temperatures. Mobil SHC 600 products feature excellent low temperature properties, as well as improved air release performance in the lower viscosity grades. These products are resistant to mechanical shear, even in heavily loaded gear and high shear bearing applications, so that there is virtually no loss of viscosity.

Mobil SHC 600 Series products have low traction coefficients relative to mineral oils which derive from the molecular structure of the base stocks used. This results in low fluid friction in the load zone of non-conforming surfaces such as gears and rolling contact bearings. Low fluid friction produces lower operating temperatures and improved gear efficiency, which translates into reduced power consumption. Mobil SHC 600 Series products have demonstrated up to 3.6% improvement in energy efficiency in controlled laboratory testing(*). Mobil SHC 600 Series formulation also provides excellent resistance to oxidation and deposit formation at elevated temperatures, as well as exceptional resistance to rusting and corrosion, antiwear, demulsibility, foam control and air release properties, and multi-metal compatibility. Mobil SHC 600 Series oils maintain good compatibility with seals and other materials used in equipment normally lubricated with mineral oils.

Mobil SHC 600 Series lubricants are suitable for use in a wide range of equipment, not only as high temperature problem solvers, but also because of the other benefits they offer.

(*) Energy efficiency relates solely to the performance of Mobil SHC 600 when compared to conventional (mineral) reference oils of the same viscosity grade in circulating and gear applications. The technology used allows up to 3.6% efficiency compared to the reference when tested in a worm gearbox under controlled conditions. Efficiency improvements will vary based on operating conditions and application.

Features and Benefits

The Mobil SHC brand of lubricants are recognized and appreciated around the world for their innovation and outstanding performance. These synthetic products, molecularly designed and pioneered by our research scientists, embody the continuing commitment to using advanced technology to provide outstanding lubricant products. The development of Mobil SHC 600 Series was preceded by close contacts between our scientists and application specialists with key Original Equipment Manufacturers (OEMs) to ensure that the products provide exceptional performance in the continually evolving industrial equipment designs.

Our work with key equipment builders has helped confirm the results from our own laboratory and rig tests showing the exceptional performance of Mobil SHC 600 Series lubricants. Not least among the benefits, shown in work with OEMs, is the potential for energy efficiency improvements up to 3.6% relative to mineral oils (*). These benefits are particularly evident in equipment with a high level of mechanical losses, such as high ratio worm gears.

To develop the latest Mobil SHC technology for Mobil SHC 600 Series oils, our product formulation scientists chose select base oils because of their exceptional thermal/oxidative resistance potential and combined them with a balanced additive system, which complements the inherent benefits of the base oils to provide excellent oil life, deposit control and resistance to thermal/oxidative and chemical degradation. This formulation approach provides low temperature fluidity characteristics exceeding that of many conventional mineral products and is a key benefit for remote, low ambient temperature applications. Mobil SHC 600 Series oils offer the following features and potential benefits:

Features	Advantages and Potential Benefits

Features	Advantages and Potential Benefits
Superb high temperature thermal/oxidation resistance	Helps extend equipment high temperature operating capability Long oil life, helps reduce maintenance costs Helps minimize deposits to enable trouble-free operation and long filter life
High Viscosity Index and absence of wax	Maintains viscosity and film thickness at high temperatures Helps enable exceptional low temperature performance, including start-up
Low traction coefficient	Helps reduce friction and increase efficiency in sliding mechanisms such as gearing, with potential for reduced power consumption and lower steady-state operating temperatures. Helps minimize the effects of micro slip in rolling contact bearings to potentially extend rolling-element life
High load carrying capability	Helps protects equipment and extends life; helps minimize unexpected downtime and extends service periods
Balanced additive combination	Provides excellent performance in terms of rust and corrosion prevention, water separability, foam control and air release performance enabling problem-free operation in a wide range of industrial applications, and reduced operating costs

(*) Energy efficiency relates solely to the performance of Mobil SHC 600 when compared to conventional (mineral) reference oils of the same viscosity grade in circulating and gear applications. The technology used allows up to 3.6% efficiency compared to the reference when tested in a worm gearbox under controlled conditions. Efficiency improvements will vary based on operating conditions and application.

Applications

While Mobil SHC 600 Series are generally compatible with mineral oil based products, admixture may detract from their performance. Consequently it is recommended that before changing a system to one of Mobil SHC 600 Series products, it should be thoroughly cleaned out and flushed to achieve the maximum performance benefits. Mobil SHC 600 Series oils are compatible with most NBR, FKM and most other elastomeric seal materials that are used with mineral oils. There is the potential for substantial variations in the elastomers. For best results, consult your equipment supplier, seal manufacturer, or your local company representative to verify compatibility.

Mobil SHC 600 Series lubricants are recommended for use in a wide variety of gear and bearing applications where high or low temperatures are encountered or where operating temperatures or bulk oil temperatures are such that conventional lubricants give unsatisfactory life, or where improved efficiency is desired. They are particularly effective in applications where the maintenance costs of component replacement, system cleaning and lubricant changes are high. Specific applications require selection of the appropriate viscosity grade and include:

- Filled for life gearboxes, especially high ratio/ low-efficiency worm gears
- Remotely located gearboxes, where oil change-out is difficult
- Low temperature applications, such as ski lifts where seasonal oil changes can be avoided
- Mixer roll bearings and roll neck bearings where high temperatures are encountered
- Plastic calenders
- Severe centrifuge applications, including marine centrifuges
- Railroad A/C Traction Drives
- Mobil SHC 626, 627, 629 and 630 are suitable for Oil Flooded Rotary Screw Compressors compressing natural gas, field gas gathering, CO2 and other process gasses used in the natural gas industry
- Mobil SHC 629, 630, 632, 634, 636, and 639 are approved by Siemens AG for use in Flender gearboxes

Specifications and Approvals

Mobil SHC 600 Series meets or exceeds the requirements of:	624	625	626	627	629	630	632	634	636	639
AGMA 9005 E02	X	X	X	X	X	X	X	X	X	X

Mobil SHC 600 Series meets or exceeds the requirements of:	624	625	626	627	629	630	632	634	636	639
DIN 51517-3 CLP				X	X	X	X	X	X	X
ISO 12925-1 CKB	X									
ISO 12925-1 CKD		X	X	X	X	X	X	X	X	X

Mobil SHC 600 Series has the following builder approvals:	624	625	626	627	629	630	632	634	636	639
Fives Cincinnati			P-63 P-80	P-76	P-77				P-34	P-78
SIEMENS AG Flender gear units, T 7300, Table A-c, Flender Code No.					A36	A35	A34	A33	A32	A31
SEW Eurodrive: SEW IG CLP HC SEW SG CLP HC	 32 32		 68 68		 150 150	 220 220	320	 460 460	680	1000

Typical Properties

Mobil SHC 600 Series	624	625	626	627	629	630	632	634	636	639
ISO Viscosity Grade	32	46	68	100	150	220	320	460	680	1000
Viscosity, ASTM D 445										
cSt @ 40ºC	32	46	68	100	150	220	320	460	680	1000
cSt @ 100ºC	6.3	8.5	11.6	15.3	21.1	28.5	38.5	50.7	69.0	98.8
Viscosity Index, ASTM D2270	148	161	165	162	166	169	172	174	181	184
Pour Point, ºC, ASTM D5950	-57	-54	-51	-45	-39	-36	-33	-30	-30	-27
Flash Point, ºC, ASTM D 92	236	225	225	235	220	220	225	228	225	222
Density @ 15°C (60°F) (g/cc) ASTM D4052	0.85	0.85	0.86	0.86	0.86	0.87	0.87	0.87	0.87	0.87
Appearance, visual	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange
TOST, ASTM D 943 mod, hours	10,000+	10,000+	10,000+	10,000+	10,000+	10,000+	10,000+	10,000+	10,000+	10,000+
RPVOT, ASTM D 2272, minutes	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
Rust protection, ASTM D665B, Synthetic Sea Water	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Water Separability, ASTM D1401,Min. to 37 ml water @ 54ºC	10	15	15	-	-	-	-	-	-	-
Water Separability, ASTM D1401,Min. to 37 ml water @ 82ºC	-	-	-	15	20	20	20	20	20	25
Copper Corrosion, ASTM D130, 24 hrs @ 121ºC	1B	1B	1B	1B	1B	1B	1B	1B	1B	1B

Mobil SHC 600 Series	624	625	626	627	629	630	632	634	636	639
Foam Test, ASTM D892, Seq I,II,IIITendency / Stability, ml/ml	15/0, 20/0, 25/0	10/0, 30/0, 10/0	10/0, 20/0, 10/0	0/0, 10/0, 0/0	0/0, 0/0,0/0	0/0, 10/0, 0/0	0/0,0/0,0/00/0,0/0,0/00/0,0/0,0/0			0/0, 0/0, 0/0
FZG gear scuffing test, A/8.3/90, ISO 14635-1 (mod), Failure Stage	11	12	12	12	13	13+	13+	13+	13+	13+
FAG FE8 Bearing Wear Test 7.5/80-80 ((DIN 51819-3) Roller Wear (mg)	-	-	-	2	2	2	2	2	2	2

Health and Safety

Based on available information, this product is not expected to produce adverse effects on health when used for the intended application and the recommendations provided in the Material Safety Data Sheet (MSDS) are followed. MSDS's are available upon request through your sales contract office, or via the Internet. This product should not be used for purposes other than its intended use. If disposing of used product, take care to protect the environment.

All products may not be available locally.

Note for Canadian users: Mobil SHC 600 Series is not controlled under Canadian WHMIS legislation.

8-2016

Exxon Mobil Corporation
22777 Springwoods Village Parkway
Spring TX 77389

1-800-ASK MOBIL (275-6624)

SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: **MOBIL SHC 624**
Product Description: Synthetic Base Stocks and Additives
Product Code: 201560500510, 602920-00, 970382
Intended Use: Circulating/gear oil

COMPANY IDENTIFICATION

Supplier: **EXXON MOBIL CORPORATION**
22777 Springwoods Village Parkway
Spring, TX. 77389 USA

24 Hour Health Emergency	609-737-4411
Transportation Emergency Phone	800-424-9300 or 703-527-3887 CHEMTREC
Product Technical Information	800-662-4525
MSDS Internet Address	http://www.exxon.com, http://www.mobil.com

SECTION 2 HAZARDS IDENTIFICATION

This material is not hazardous according to regulatory guidelines (see (M)SDS Section 15).

Other hazard information:

HAZARD NOT OTHERWISE CLASSIFIED (HNOC): None as defined under 29 CFR 1910.1200.

PHYSICAL / CHEMICAL HAZARDS

No significant hazards.

HEALTH HAZARDS

High-pressure injection under skin may cause serious damage. Excessive exposure may result in eye, skin, or respiratory irritation.

ENVIRONMENTAL HAZARDS

No significant hazards.

NFPA Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0
HMIS Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

This material is defined as a mixture.

Hazardous Substance(s) or Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
1-DECENE, HOMOPOLYMER HYDROGENATED	68037-01-4	60 - < 70%	H304
TRIPHENYL PHOSPHATE	115-86-6	0.1 - < 1%	H400(M factor 1), H410(M factor 1)

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

As per paragraph (i) of 29 CFR 1910.1200, formulation is considered a trade secret and specific chemical identity and exact percentage (concentration) of composition may have been withheld. Specific chemical identity and exact percentage composition will be provided to health professionals, employees, or designated representatives in accordance with applicable provisions of paragraph (i).

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Hazardous Combustion Products: Incomplete combustion products, Aldehydes, Oxides of carbon, Smoke, Fume, Sulfur oxides

FLAMMABILITY PROPERTIES

Flash Point [Method]: >210°C (410°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

PROTECTIVE MEASURES

Avoid contact with spilled material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do it without risk. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do it without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). When the material is handled in bulk, an electrical spark could

ignite any flammable vapors from liquids or residues that may be present (e.g., during switch-loading operations). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator.

STORAGE

The container choice, for example storage vessel, may effect static accumulation and dissipation. Do not store in open or unlabelled containers.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Substance Name	Form	Limit / Standard			NOTE	Source
1-DECENE, HOMOPOLYMER HYDROGENATED	Aerosols (thoracic fraction)	TWA	5 mg/m3		N/A	ExxonMobil
TRIPHENYL PHOSPHATE		TWA	3 mg/m3		N/A	OSHA Z1
TRIPHENYL PHOSPHATE		TWA	3 mg/m3		N/A	ACGIH

Exposure limits/standards for materials that can be formed when handling this product: When mists/aerosols can occur the following are recommended: 5 mg/m³ - ACGIH TLV (inhalable fraction), 5 mg/m³ - OSHA PEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

No biological limits allocated.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid
Color: Orange
Odor: Characteristic
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.85
Flammability (Solid, Gas): N/A
Flash Point [Method]: >210°C (410°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D
Boiling Point / Range: > 316°C (600°F)
Decomposition Temperature: N/D
Vapor Density (Air = 1): > 2 at 101 kPa
Vapor Pressure: < 0.013 kPa (0.1 mm Hg) at 20 °C
Evaporation Rate (n-butyl acetate = 1): N/D

pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible
Viscosity: 32 cSt (32 mm2/sec) at 40 °C
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION
Freezing Point: N/D
Melting Point: N/A
Pour Point: -48°C (-54°F)

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: See sub-sections below.

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

POSSIBILITY OF HAZARDOUS REACTIONS: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

INFORMATION ON TOXICOLOGICAL EFFECTS

Hazard Class	Conclusion / Remarks
Inhalation	
Acute Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Irritation: No end point data for material.	Negligible hazard at ambient/normal handling temperatures.
Ingestion	
Acute Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Skin	
Acute Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Skin Corrosion/Irritation: No end point data for material.	Negligible irritation to skin at ambient temperatures. Based on assessment of the components.
Eye	
Serious Eye Damage/Irritation: No end point data for material.	May cause mild, short-lasting discomfort to eyes. Based on assessment of the components.
Sensitization	
Respiratory Sensitization: No end point data for material.	Not expected to be a respiratory sensitizer.
Skin Sensitization: No end point data for material.	Not expected to be a skin sensitizer. Based on assessment of the components.
Aspiration: Data available.	Not expected to be an aspiration hazard. Based on physico-chemical properties of the material.

Germ Cell Mutagenicity: No end point data for material.	Not expected to be a germ cell mutagen. Based on assessment of the components.
Carcinogenicity: No end point data for material.	Not expected to cause cancer. Based on assessment of the components.
Reproductive Toxicity: No end point data for material.	Not expected to be a reproductive toxicant. Based on assessment of the components.
Lactation: No end point data for material.	Not expected to cause harm to breast-fed children.
Specific Target Organ Toxicity (STOT)	
Single Exposure: No end point data for material.	Not expected to cause organ damage from a single exposure.
Repeated Exposure: No end point data for material.	Not expected to cause organ damage from prolonged or repeated exposure. Based on assessment of the components.

OTHER INFORMATION

Contains:
Synthetic base oils: Not expected to cause significant health effects under conditions of normal use, based on laboratory studies with the same or similar materials. Not mutagenic or genotoxic. Not sensitizing in test animals and humans.

The following ingredients are cited on the lists below: None.

--REGULATORY LISTS SEARCHED--

1 = NTP CARC	3 = IARC 1	5 = IARC 2B
2 = NTP SUS	4 = IARC 2A	6 = OSHA CARC

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.
Material -- Not expected to demonstrate chronic toxicity to aquatic organisms.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

ECOLOGICAL DATA

Ecotoxicity

Test	Duration	Organism Type	Test Results
Aquatic - Acute Toxicity	96 hour(s)	Oncorhynchus mykiss	LL50 1003 mg/l: data for similar materials
Aquatic - Chronic Toxicity	21 day(s)	Daphnia magna	NOELR 1 mg/l: data for similar materials

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products. Protect the environment. Dispose of used oil at designated sites. Minimize skin contact. Do not mix used oils with solvents, brake fluids or coolants.

REGULATORY DISPOSAL INFORMATION

RCRA Information: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed as hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrositivity or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT): Not Regulated for Land Transport

LAND (TDG): Not Regulated for Land Transport

SEA (IMDG): Not Regulated for Sea Transport according to IMDG-Code

Marine Pollutant: No

AIR (IATA): Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: This material is not considered hazardous in accordance with OSHA HazCom 2012, 29 CFR 1910.1200.

Listed or exempt from listing/notification on the following chemical inventories: TSCA
Special Cases:

Inventory	Status
AICS	Restrictions Apply

PRODUCT REGISTRATION STATUS: USA

EPCRA SECTION 302: This material contains no extremely hazardous substances.

SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.

SARA (313) TOXIC RELEASE INVENTORY: This material contains no chemicals subject to the supplier notification requirements of the SARA 313 Toxic Release Program.

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
PHENOL, 4,4-METHYLENEBIS(2,6-BIS(1,1-DIMETHYLETHYL)-	118-82-1	5

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):
H304: May be fatal if swallowed and enters airways; Aspiration, Cat 1
H400: Very toxic to aquatic life; Acute Env Tox, Cat 1
H410: Very toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 1

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

Updates made in accordance with implementation of GHS requirements.

Internal Use Only

MHC: 0B, 0B, 0, 0, 0, 0 PPEC: A

DGN: 2007950XUS (1013326)

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4. Spare parts list

In case of wear- or spare parts order, we recommend to either approach your local sales contact or write us under service.nta@next-turbo.com.

5. Disposal of waste

The disposal of waste should be handled in accordance with regulation from local authorities.

- As a norm, used air filters elements and used cleaning filter cloth (depending on cleaning residuals) might be disposed of as combustible material, as well as oil moistened cloth and used oil filters (to be checked with local authorities for disposal regulations).
- Used lubrication oil has to be treated as chemical waste (to be checked with local authorities for disposal regulations).
- Iron and other metal components, which have been replaced might be removed as scrap (to be checked with local authorities for disposal regulations).

END OF DOCUMENT

Registered Office: Via Robbioni 39, 21100 Varese, Italy
Headquarters: Via San Francesco 62, 21020 Inarzo (Varese), Italy

More information available at http://www.next-turbo.com

Blow-off Valve Actuator

Model: SEU125HVPD0P2U8

Product Data Sheet
PDS-02-04-99-3059-EN Rev. 2
September 2021

Bettis SCE300

Electric Actuator

- The SCE300 is an intelligent quarter-turn electric actuator designed for direct mounting to a Bettis valve. Compact and lightweight, this all-in-one actuator fits all the features of larger, heavier actuators into a neat, innovative design.

BETTIS

EMERSON

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Table of Contents

General Applications

The SCE300 electric actuator is available in six sizes and is designed for on/off or modulating control of the valve that the actuator is mounted to. The actuator is suitable for installation in a wide range of plants, including heavy industrial, chemical, petrochemical, and onshore/offshore Oil and Gas installations.

Technical Data

Power supply:	Single-phase from 24 to 48 V DC or AC at 50/60 Hz Single-phase from 100 to 240 V DC or AC at 50/60 Hz Three-phase from 208-240 V AC, 380-480 V AC, and 500-575 V AC
Voltage fluctuations:	+/-10%
Frequency:	+/- 5%
Torque output:	From 35 Nm to 2000 Nm / 26 lb.ft to 1475 lb.ft
Ambient temperature	
Standard temp range:	-25 °C to +70 °C / -13 °F to 158 °F
Low temp range:	-40 °C to +70 °C / -40 °F to 158 °F
Conduit entry:	M25 (Qty 4) or 1" NPT (Qty 4)
Travel Stroke:	90° ± 10° each direction (70° min and 110° max)

Features

- Low- or high-voltage power supply (DC, single-phase AC, or three-phase AC)
- Multiple adjustable stroking times to suit specific applications
- Interchangeable base plate and range of shaft inserts enable simple connection to any valve type
- Over-temperature protection is provided by a sensor located within the control enclosure, as to limit the temperature of the motor and control system
- Epicyclical gearing ensures reliable and smooth operation
- Top-mounted position indicator
- Constantly-engaged manual override (for use when power is lost), featuring a handwheel that does not rotate while the motor is in operation
- Optional local control panel for manual valve operation with additional open/closed indicator
- Simple upgrade options for modulating control and network communication via DeviceNet or Profibus DP protocols
- Latched-type output contacts for fully open/ fully closed remote indication. Output contacts for monitor and blinker/local selector indication are also available

Component Parts - 063 / 125 / 250/ 500 / 1000

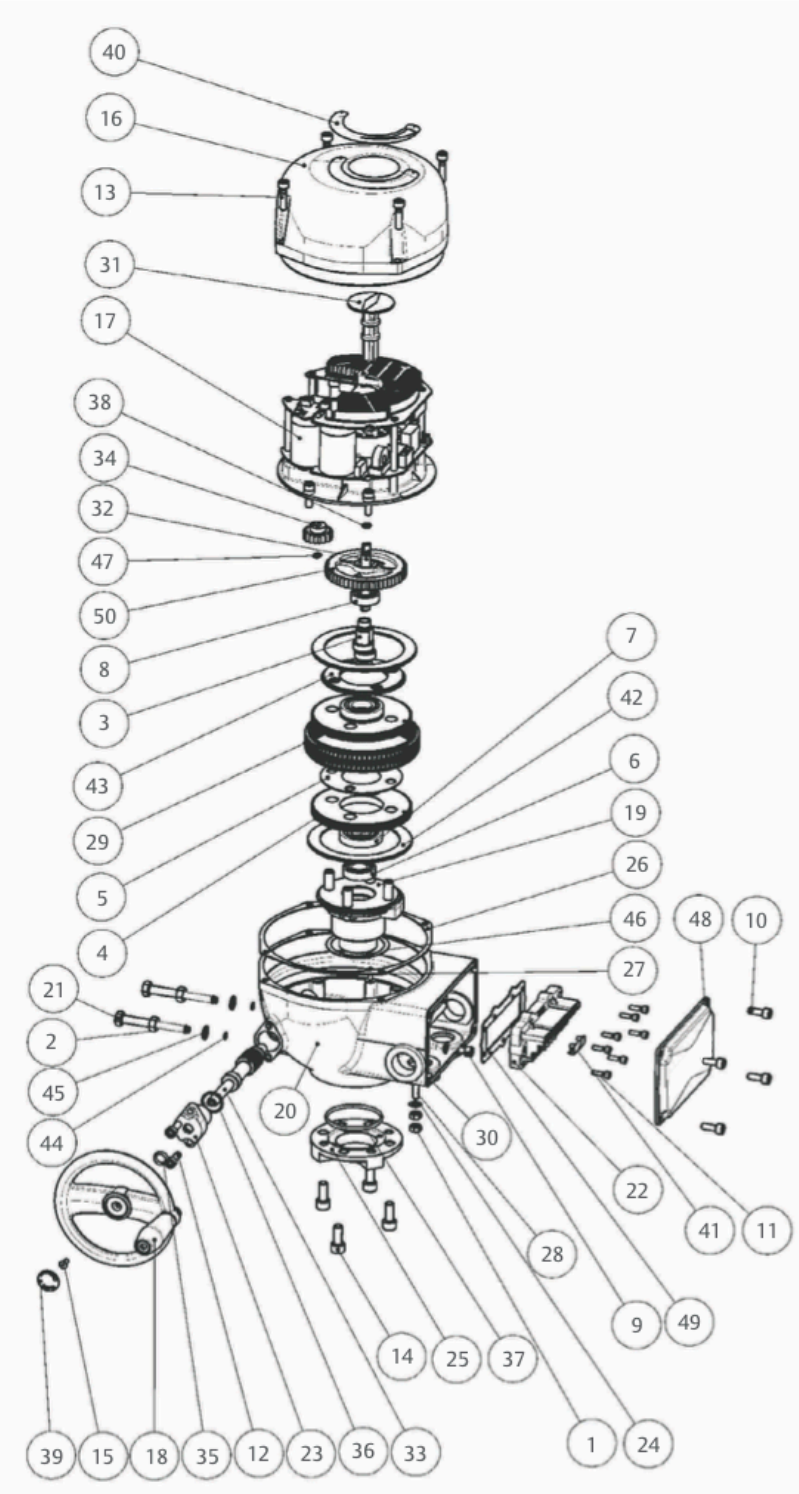
Table 1.

Part	Description	Quantity
1	Nut	2
2	Nut	2
3	Eccentric	1
4	Planocentric gear	2
5	Spacer	1
6	Ball bearing	1
7	Ball bearing	2
8	Ball bearing	1
9	ESH screw	1
10	HSHC screw	4
11	HSHC screw	7
12	HSHC screw	2
13	HSHC screw	4
14	HSHC screw	4
15	HSSC screw	1
16	Cover assembly	1
17	Drive and control unit	1
18	Handwheel	1
19	Output drive assembly	1
20	Standard housing	1
21	Stopper	2
22	Terminal block	1
23	Worm shaft flange	1
24	Anti-loosening washer	1
25	Base plate	1

Part	Description	Quantity
26	Cover gasket	1*
27	Dowel pin	1
28	Earth stud	1
29	Fixed anulus	1
30	Gasket	1*
31	Indicator	1
32	Indicator shaft	1
33	Manual worm shaft	1
34	Motor pinion	1
35	O-ring	1*
36	O-ring	1*
37	O-ring	1*
38	O-ring	1*
39	Plug	1
40	Position label	1
41	Power clamps protection	1
42	Ring	2
43	Ring for pins alignement	1
44	Ring	2
45	Seal washer 8.3	2
46	Sliding ring	1
47	Snap ring for shaft D.6	1
48	Terminal block cover	1
49	Terminal board gasket	1*
50	Wheel	1

* Indicates recommended spare parts.

Figure 1.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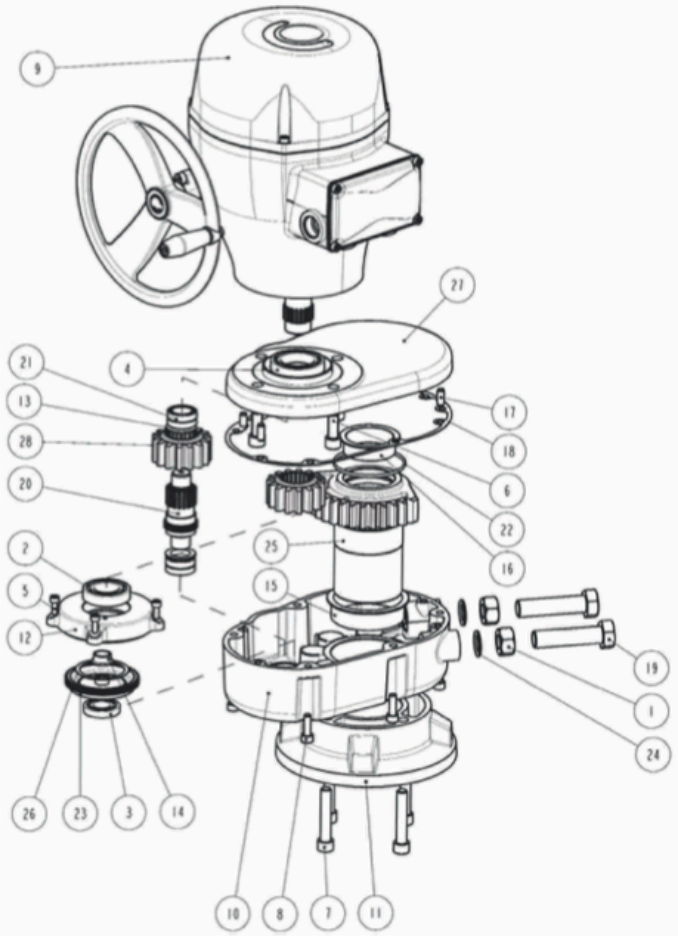
Components - Model 2000

Table 2.

Part	Description	Quantity
1	Nut M20 ISO 4032 EN 24032	2
2	Ball bearing type 6006	1
3	Ball bearing type 16004	1
4	Ball bearing type 61908	1
5	HSHC screw UNI5931- M6x16	3
6	HSHC screw UNI5931- M12x30	4
7	HSHC screw UNI5931- M12x65	4
8	HSHC screw UNI5931- M8x25 A4-70	6
9	SCE300 actuator	1
10	Base housing	1
11	Base plate ISO 5211 / F12-F16	1
12	Bearing support	1
13	Bushing	2
14	Bushing	1
15	Bushing	1
16	Bushing	1
17	Dowel pin UNI EN 22338 D 8x20 type B	4
18	Gasket	1*
19	Hex head screw M20x80 UNI EN 24017	2
20	Idle wheel shaft	1
21	Needle bearing type NKI 22/16	2
22	O-ring Di=82.22/W=2.62	1*
23	Position wheel	1
24	Seal washer 20.3	2
25	Selector gear	1
26	Sliding ring	1
27	Upper cover	1
28	Wheel	2

* Indicates recommended spare parts

Figure 2.



Design Features

Mechanical Connection to the Valve

The SCE300 features a multi-drilled base plate and a range of drive inserts to allow direct mounting to almost all valve types in accordance with EN ISO 5211 and other manufacturers' standards.

Power Supply

The SCE300 can simply be connected to a local power supply. The actuator can accept any single-phase input voltage (from 24 to 48 V DC or AC and 100 to 240 V DC or AC). Alternatively, three-phase voltages 208-240 V AC, 380-480 V AC, and 500-575 V AC are also available.

Electric Motor Thermostat

A thermostat to protect the motor temperature in hot applications is included as standard in the control circuit of the electric actuator.

Heater

An integral heater comes as standard within the actuator and is powered by the motor power supply. The heater is automatically activated when the temperature drops below 10 °C (50 °F) in order to prevent condensation.

Actuator Service

The standard SCE300 electric actuator is suitable for open/closed and modulating applications.

Compact and Light Design

The SCE300 is very compact and is balanced for easy installation to small valves, minimizing both load to the valve shaft and stress to the pipework.

Actuator Configuration

Each actuator is equipped with 2 rotary switches on the logic board to configure each function and parameter like position, torque, open/close speed and output contacts. Additionally each optional module has its own additional switches for its specific configuration.

Local Manual Override

A constantly-engaged manual override (which does not rotate during motor operation) is fitted to all SCE300 actuators.

Torque and Sizing

The SCE300 range is comprised of six models for operating torques up to 2000 Nm / 1475 lb.ft, with a configurable operation time from 15 to 180 seconds. The nominal output torque value is constant along the entire stroke..

Position Monitoring

The SCE300 provides a local mechanical position indicator. For remote indication, position is detectable via a non-contact sensor. The open and closed position are configured via the electronic control card.

Electronic Remote Controls

Internal drive to reverse the actuator rotation direction via remote control signals with internal 24 V DC or external 24 V DC/AC up to 120 V DC/AC power supply. As default, remote controls are configured as "3-wires" (1 signal to open and 1 signal to close); remote controls can be configured as "2-wires" (signal present to open, signal absent to close).

Output Contacts

4 latched-type output contacts for fully open/fully close remote indication; 1 output contact for blinker/local selector indication (local selector feature only with OM3 installed).

Monitor Relay

1 output contact for monitor (loss of power, torque alarm, high temperature alarm, travel alarm, position sensor, hardware malfunction, local interface malfunction, local selector in Local.

Optional Modules and Performance N/A

Optional modules

OM1 I/0 Additional Module

Analog position INPUT 4-20 mA or 0-10 V DC
Analog position OUTPUT 4-20 mA or 0-10 V DC
4 additional SPST output contacts

OM3 Local Interface

Local/remote selector
OP/CL pushbuttons
2 LEDs for local indication

OM13 3-wire Module

100/240 V AC
3-wire control module for open/close

OM9 Profibus DP V0/V1 Bus Communication Network Interface

OM11 DeviceNet Bus Communication Network Interface

Table 3.

Order Code	OM1 I/O additional module	OM3 local interface	OM9 PDP V0/V1	OM11 Devicenet	OM13 3-wires module
1	✓				
3	✓	✓			
5		✓			
A			✓		
B		✓	✓		
C				✓	
D		✓		✓	
W					✓

NOTES:
1. Each optional module (OMx) will be provided with its own installation and maintenance instructions.
2. All modules except OM13 are available for both single phase and 3-phase voltage versions.
3. OM13 is not available with 3-phase supply and for LV version (single phase voltage from 24 to 48 V DC / V AC).

Performance and Approvals

Table 4. Operating Times

Model	Nominal torque (Nm / lb-ft)	Operating time (seconds 90°) at selected step		
		8	6	4
063	63 / 46	15	28	48
125	125 / 92	15	28	48
250	250 / 184	15	28	48
500	500 / 369	15	28	48
1000	1000 / 738	24	45	80
2000	2000 / 1475	53	100	180

Times are guaranteed with a tolerance of ±10% on the 90° stroke.

Table 5.

Approvals	
Waterproof	IP66/68 or NEMA 4/4X/6 (NEMA ICS6/NEMA 250) CAN/CSA C22.2 No 139 and UL 429-2009
Explosionproof	ATEX: Ex db eb IIB T5 Gb IECEx: Ex db eb IIB T5 Gb FM: Class I Zone 1 AEx db eb IIB T5 Gb FM-c: (CSA-C22.2) Ex db eb IIB T5 Gb INMETRO: Ex d e IIB T5 Gb EAC: Ex de IIB T5 Gb X CCC: Ex de IIB T5 Gb ATEX: Ex db eb h IIB T5 Gc (Size 2000 only) IECEx: Ex db eb h IIB T5 Gb (Size 2000 only)

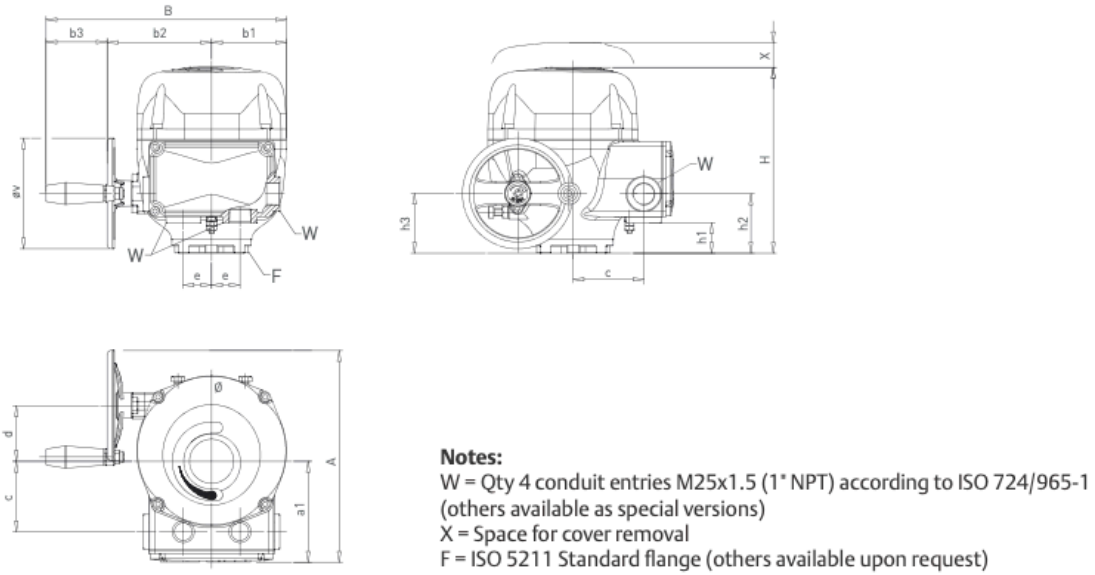
Table 6.

Applicable Directives and Regulations	
Electromagnetic compatibility directive (EMC)	comply with EMC Directive 2014/30/EU
Low voltage directive (LV)	comply Low Voltage Directive 2014/35/EU
Machinery directive	comply with the Machinery Directive 2006/42/EC
ATEX directive	comply with the ATEX Directive 2014/34/EU
Vibration and noise	1 to 500 Hz with 2 g peak acceleration (IEC60068-2-6-appendix B) 65 dB (grade A at 1 m distance) (UNI EN ISO 1680)

See Table 19 "Selection Guide" for dedicated product information.

Overall Dimensions Models 063 / 125 / 250 / 500 / 1000

Figure 3.



Notes:
W = Qty 4 conduit entries M25x1.5 (1" NPT) according to ISO 724/965-1 (others available as special versions)
X = Space for cover removal
F = ISO 5211 Standard flange (others available upon request)

Table 7. SCE300 base unit models 063 to 1000 - metric (mm, kg)

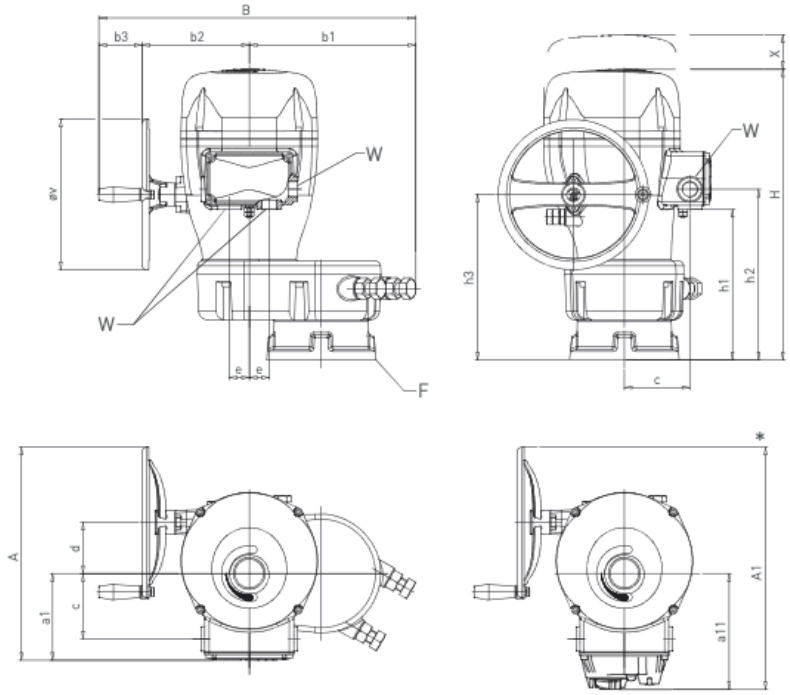
Model	A	B	H	a1	b1	b2	b3	c	d	e	h1	h2	h3	øv	x	F	kg
063	239	272	210	114.0	85	118	69	80.0	63	32	35.5	67.0	67.5	125	175	F07	7.5
125	239	272	230	114.0	85	118	69	80.0	63	32	53.5	86.0	86.5	125	175	F10	9.5
250	295	332	287	129.0	109	154	69	95.0	76	32	63.5	95.0	92.0	180	230	F12	16.5
500	295	332	287	129.0	109	154	69	95.0	76	32	63.5	95.0	92.0	180	230	F12	18.0
1000	340	349	364	138.5	109	171	69	104.5	81	32	140.0	172.5	164.0	240	230	F16	26.0

Table 8. SCE300 base unit models 063 to 1000 - imperial (in, lb)

Model	A	B	H	a1	b1	b2	b3	c	d	e	h1	h2	h3	øv	x	F	lb
063	9.41	10.71	8.27	4.49	3.35	4.65	2.72	3.15	2.48	1.26	1.40	2.64	2.67	4.92	6.89	F07	17
125	9.41	10.71	9.06	4.49	3.35	4.65	2.72	3.15	2.48	1.26	2.11	3.39	3.41	4.92	6.89	F10	21
250	11.61	13.07	11.30	5.08	4.29	6.06	2.72	3.74	2.99	1.26	2.50	3.74	3.62	7.09	9.06	F12	36
500	11.61	13.07	11.30	5.08	4.29	6.06	2.72	3.74	2.99	1.26	2.50	3.74	3.62	7.09	9.06	F12	40
1000	13.39	13.74	14.33	5.45	4.29	6.73	2.72	4.11	3.19	1.26	5.51	6.79	6.46	9.45	9.06	F16	57

Overall Dimensions - Model 2000

Figure 4.



Notes:
W = Qty 4 conduit entries M25x1.5 (1" NPT) according to ISO 724/965-1
(others available as special versions)
X = Space for cover removal
F = ISO 5211 Standard flange (others available upon request)

Table 9. SCE300 Model 2000 - metric (mm, kg)

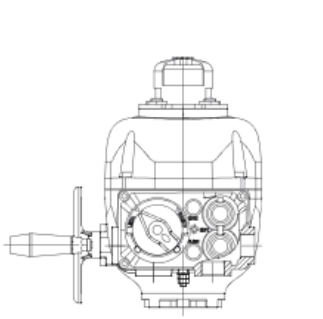
Model	A	A1	B	H	a1	a11	b1	b2	b3	c	d	e	h1	h2	h3	øv	x	F	kg
2000	340	387	506	464	138.5	185.5	266	171	69	104.5	81	32	240	272.5	264	240	230	F10 and F14	45.0
2000	340	387	506	464	138.5	185.5	266	171	69	104.5	81	32	240	272.5	264	240	230	F12 and F16	46.5

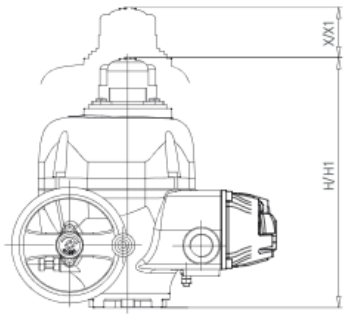
Table 10. SCE300 Model 2000 - imperial (in, lb)

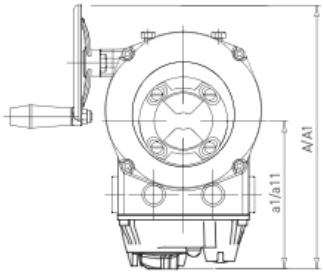
Model	A	A1	B	H	a1	a11	b1	b2	b3	c	d	e	h1	h2	h3	øv	x	F	lb
2000	13.39	15.24	19.92	18.27	5.45	7.30	10.47	6.73	2.72	4.11	3.19	1.26	9.45	10.73	10.39	9.45	9.06	F10 and F14	99
2000	13.39	15.24	19.92	18.27	5.45	7.30	10.47	6.73	2.72	4.11	3.19	1.26	9.45	10.73	10.39	9.45	9.06	F12 and F16	103

Overall Dimensions - Optional Modules

Figure 5.







Notes:
1. Dimensions a1 and A are for the standard unit.
2. Dimensions a11 and A1 are for the standard unit plus a local interface option.
3. Dimensions H and X are for the standard unit.
4. Dimensions H1 and X1 are for the standard unit plus a Beacon-type indicator.
5. X / X1 indicates the space for cover removal.
6. All other dimensions are as per the standard unit.

Table 11. SCE300 with optional modules - metric (mm, kg)

Model	A	A1	a1	a11	H	H1	X	X1	kg[1]	kg[2]
063	239	285	114.0	160.0	210	270	175	265	7.5	8.0
125	239	285	114.0	160.0	230	290	175	265	9.5	10.0
250	295	341	129.0	175.0	287	347	230	330	15.5	16.0
500	295	341	129.0	175.0	287	347	230	330	17.0	17.5
1000	340	387	138.5	185.5	364	425	230	330	23.0	26.5

Table 12. SCE300 with optional modules - imperial (in, lb)

Model	A	A1	a1	a11	H	H1	X	X1	lb[1]	lb[2]
063	9.41	11.22	4.49	6.30	8.27	10.63	6.89	10.43	17	18
125	9.41	11.22	4.49	6.30	9.06	11.42	6.89	10.43	21	22
250	11.61	13.43	5.08	6.89	11.30	13.66	9.06	12.99	34	35
500	11.61	13.43	5.08	6.89	11.30	13.66	9.06	12.99	37	39
1000	13.39	15.24	5.45	7.30	14.33	16.73	9.06	12.99	51	58

1. Weight with Beacon option module
2. Weight with local interface module

Output Drive Dimensions

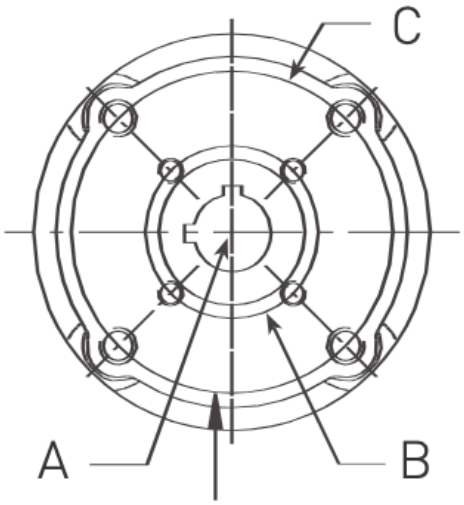
Bettis Direct Mount System

Bettis Valve pioneered direct mounting to compact valve actuator systems, and the SCE300 is no exception. The SCE300 continues in this customer-oriented vein by offering maximum mounting flexibility with every actuator purchased.

The SCE300 offers dual mounting bolt circles and dual shaft acceptance with most units. This feature allows fewer actuator models to cover more valve sizes and types.

Figure 6.

Figure 7.



A = Drive insert

B = First bolt circle

C = Second bolt circle

Output Flange

Figure 8.

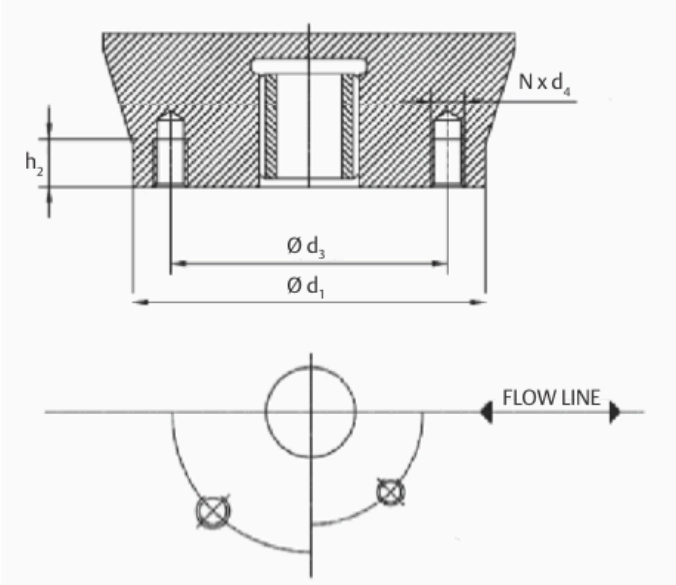


Table 13.

Model	EN ISO 5211 flange	d1		d3		d4	N	h2	
		in.	mm	in.	mm			in.	mm
063	F05	3.543	90	1.969	50	M6	4	0.354	9
	F07	3.543	90	2.756	70	M8	4	0.472	12
125	F07	4.921	125	2.756	70	M8	4	0.472	12
	F10	4.921	125	4.016	102	M10	4	0.591	15
250	F07	5.906	150	2.756	70	M8	4	0.472	12
	F10	5.906	150	4.016	102	M10	4	0.591	15
	F12	5.906	150	4.921	125	M12	4	0.709	18
500	F10	5.906	150	4.016	102	M10	4	0.039	1
	F12	5.906	150	4.921	125	M12	4	0.709	18
1000	F10	6.890	175	4.016	102	M10	4	0.591	15
	F14	6.890	175	5.512	140	M16	4	0.945	24
1000	F12	8.268	210	4.921	125	M12	4	0.709	18
	F16	8.268	210	6.496	165	M20	4	1.181	30
2000	F10	6.890	175	4.016	102	M10	4	0.591	15
	F14	6.890	175	5.512	140	M16	4	0.945	24
2000	F12	8.268	210	4.921	125	M12	4	0.709	18
	F16	8.268	210	6.496	165	M20	4	1.181	30

Table 14.

Model	NON ISO K flange	d1		d3		d4 (Metric)	N	h2	
		in.	mm	in.	mm			in.	mm
063	KF1	4.016	102	1.752	45	M6	4	0.354	9
	KF2	4.016	102	3.252	83	M10	4	0.591	15
125	KF2	4.016	102	3.252	83	M10	4	0.591	15
250	KF2	5.984	152	3.252	83	M10	4	0.591	15
	KF3	5.984	152	5.000	127	M12	4	0.709	18
500	KF2	5.984	152	3.252	83	M10	4	0.591	15
	KF3	5.984	152	5.000	127	M12	4	0.748	19
1000	KF3	7.992	203	5.000	127	M12	4	0.748	19
	KF4	7.992	203	6.496	165	M20	4	1.181	30
2000	KF3	7.992	203	5.000	127	M12	4	0.709	18
	KF4	7.992	203	6.496	165	M20	4	1.181	30

Table 15.

Model	NON ISO K flange	d1		d3		d4 (UNC)	N	h2	
		in.	mm	in.	mm			in.	mm
063	KF1	4.016	102	1.752	45	1/4" - 20 UNC	4	0.354	9
	KF2	4.016	102	3.252	83	3/8" - 16 UNC	4	0.591	15
125	KF2	4.016	102	3.252	83	3/8" - 16 UNC	4	0.591	15
250	KF2	5.984	152	3.252	83	3/8" - 16 UNC	4	0.866	22
	KF3	5.984	152	5.000	127	1/2" - 13 UNC	4	0.866	22
500	KF2	5.984	152	3.252	83	3/8" - 16 UNC	4	0.866	22
	KF3	5.984	152	5.000	127	1/2" - 13 UNC	4	0.866	22
1000	KF3	7.992	203	5.000	127	1/2" - 13 UNC	4	0.787	20
	KF4	7.992	203	6.496	165	3/4" - 10 UNC	4	1.181	30
2000	KF3	7.992	203	5.000	127	1/2" - 13 UNC	4	0.787	20
	KF4	7.992	203	6.496	165	3/4" - 10 UNC	4	1.181	30

Figure 9.

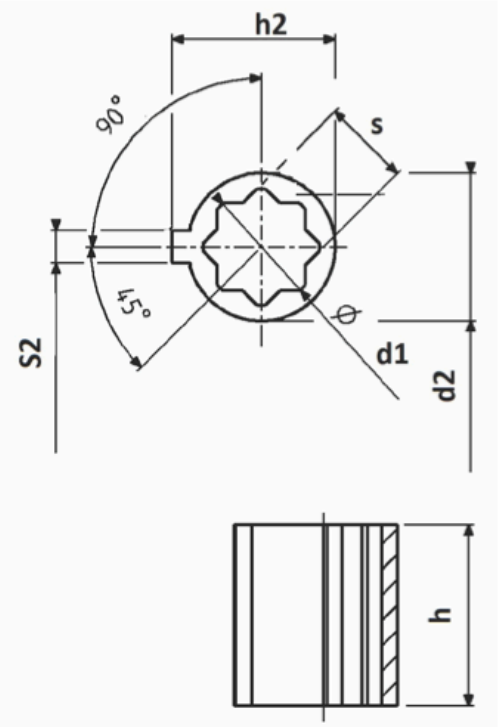
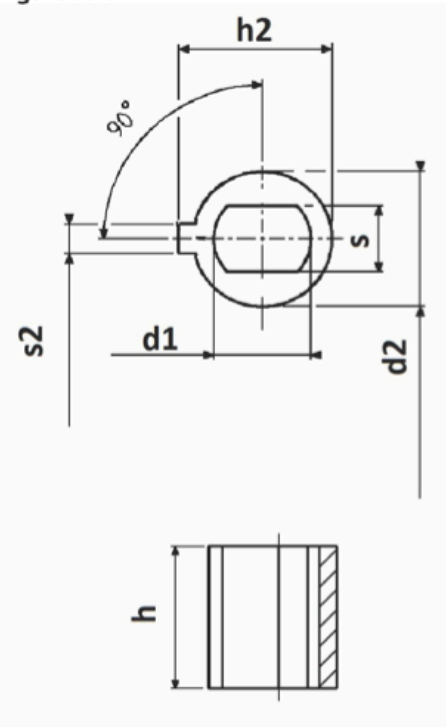


Table 16.

Star Drive (see Figure 9)

Model	Part Number	d2		S		d1		S2		h2		H (max stem height)	
		in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
SCE300-063	3400630310	1.125	29	0.669	17	0.885	22	0.250	6	1.240	31	1.378	35
SCE300-125	3401250310	1.377	35	0.866	22	1.122	28	0.393	10	1.496	38	2.126	54
SCE300-250	3401250310	1.377	35	0.866	22	1.122	28	0.393	10	1.496	38	2.126	54
SCE300-250	3405000310	1.875	48	1.062	27	1.437	36	0.5	13	2.02	51	2.204	56
SCE300-500	3405000310	1.875	48	1.062	27	1.437	36	0.500	13	2.020	51	2.204	56
SCE300-1000	3409000310	2.250	57	1.417	36	1.909	48	0.500	13	2.402	61	4.842	123
SCE300-2000	3409000310	2.250	57	1.417	36	1.909	48	0.500	13	2.402	61	4.842	123

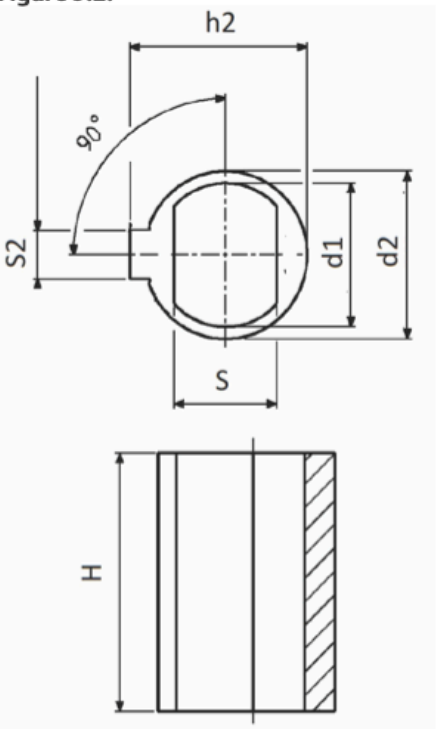
Figure 9.1.



Double D (see Figure 9.1)

Model	Part Number	d2		S		d1		S2		h2		H (max stem height)	
		in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
SCE300-063	3400630320	1.125	29	0.551	14	0.787	20	0.250	6	1.240	31	1.378	35
SCE300-063	3400630330	1.377	29	0.500	13	0.748	19	0.250	6	1.240	31	1.378	35

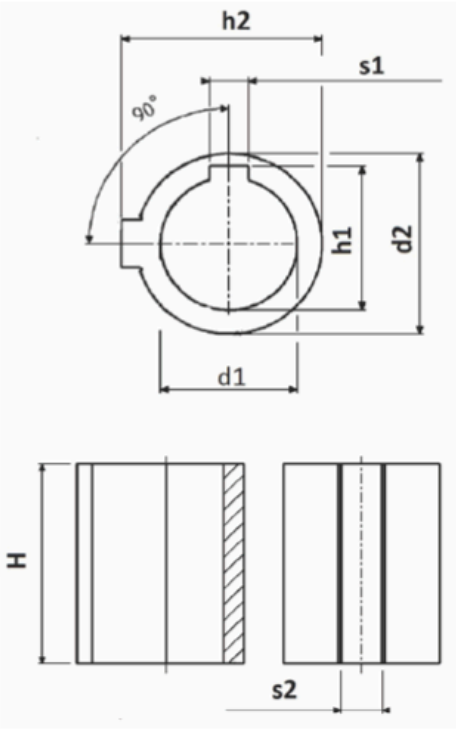
Figure 9.2.



Double D (see Figure 9.2)

Model	Part Number	d2		S		d1		S2		h2		H (max stem height)	
		in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
SCE300-125	3401250320	1.377	35	0.866	22	1.181	30	0.393	10	1.496	38	1.968	50
SCE300-250	3401250320	1.377	35	0.866	22	1.181	30	0.393	10	1.496	38	1.968	50
SCE300-250	3402500310	1.875	48	0.866	22	1.181	30	0.500	13	2.020	51	2.216	54
SCE300-500	3402500310	1.875	48	0.866	22	1.181	30	0.500	13	2.020	51	2.216	54

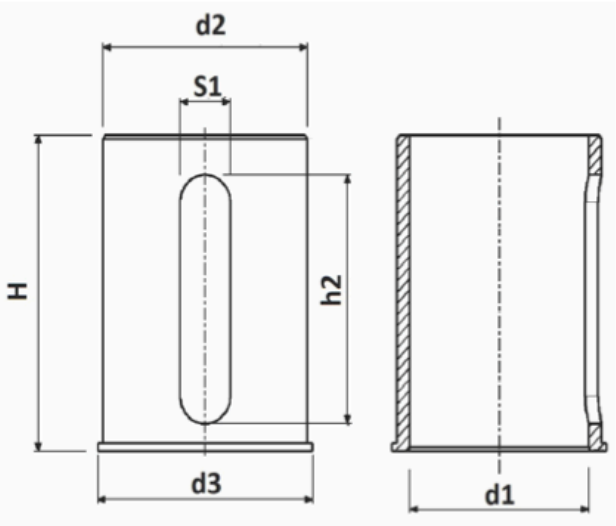
Figure 10.



Keyed (see Figure 10)

Model	Part Number	d2		S1		d1		S2		h2		H (max stem height)		h1	
		in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
SCE300-250	3405000320	1.875	48	0.393	10	1.377	35	0.500	13	2.020	51	2.204	56	1.496	38
SCE300-500	3405000320	1.875	48	0.393	10	1.377	35	0.500	13	2.020	51	2.204	56	1.496	38

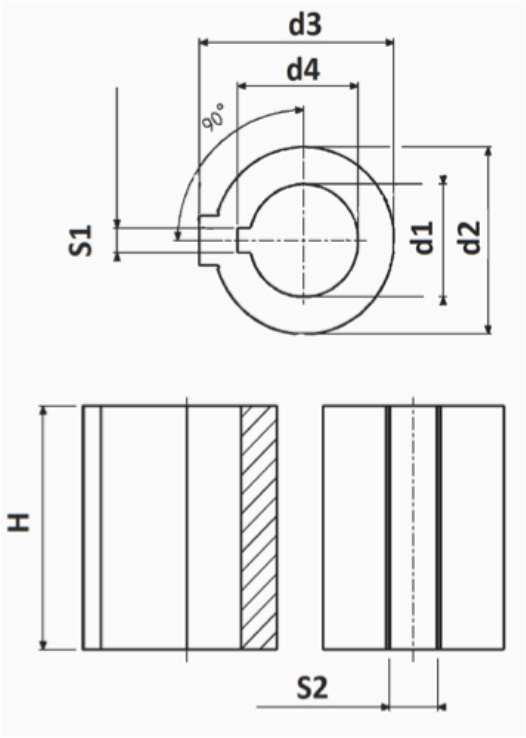
Figure 11.



Keyed (Special Key; see Figure 11)

Model	Part Number	d2		S1		d1		d1 (max)		h2		H (max stem height)		d3	
		in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
SCE300-1000	4409000320	2.250	57	0.551	14	1.968	50	-	-	2.480	63	4.842	123	2.362	60
SCE300-2000	4409000320	2.250	57	0.551	14	1.968	50	-	-	2.480	63	4.842	123	2.362	60
SCE300-1000	4409000330	2.250	57	0.500	13	1.879	48	-	-	3.149	80	4.842	123	2.362	60
SCE300-2000	4409000330	2.250	57	0.500	13	1.879	48	-	-	3.149	80	4.842	123	2.362	60
SCE300-1000 (Unmachined insert)	4409000361	2.250	57	0.500	13	0.704	18	1.968	50	2.480	63	4.842	123	2.362	60
SCE300-2000 (Unmachined insert)	4409000361	2.250	57	0.500	13	0.704	18	1.968	50	2.480	63	4.842	123	2.362	60

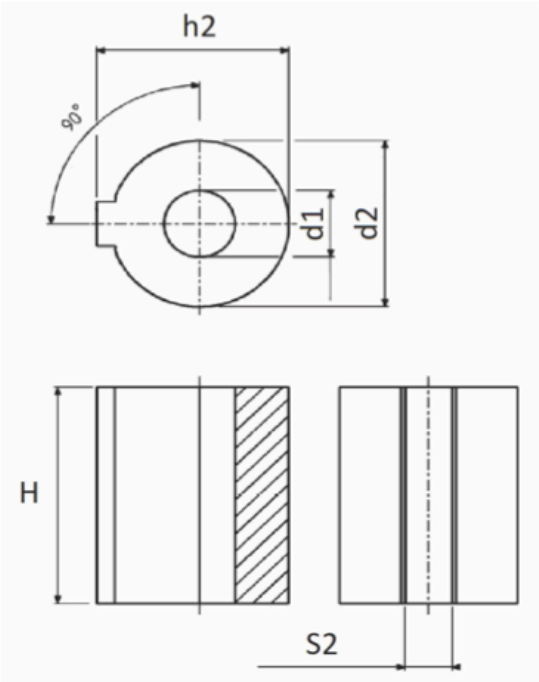
Figure 12.



Keyed (Special Key; see Figure 12)

Model	Part Number	d2		S1		d1		S2		d3		H (max stem height)		d4	
		in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
SCE300-125	3401250330	1.377	35	0.250	6	1 1/8	29	0.393	10	1.496	38	2.126	54	1.252	32
SCE300-250	3401250330	1.377	35	0.250	6	1 1/8	29	0.393	10	1.496	38	2.126	54	1.252	32
SCE300-250	3402500320	1.875	48	0.250	6	1 1/8	29	0.500	13	2.020	51	2.126	54	1.252	32
SCE300-500	3402500320	1.875	48	0.250	6	1 1/8	29	0.500	13	2.020	51	2.204	56	1.252	32
SCE300-500	3405000330	1.875	48	0.375	10	1 5/8	41	0.500	13	2.020	51	2.204	56	1.795	46

Figure 13.

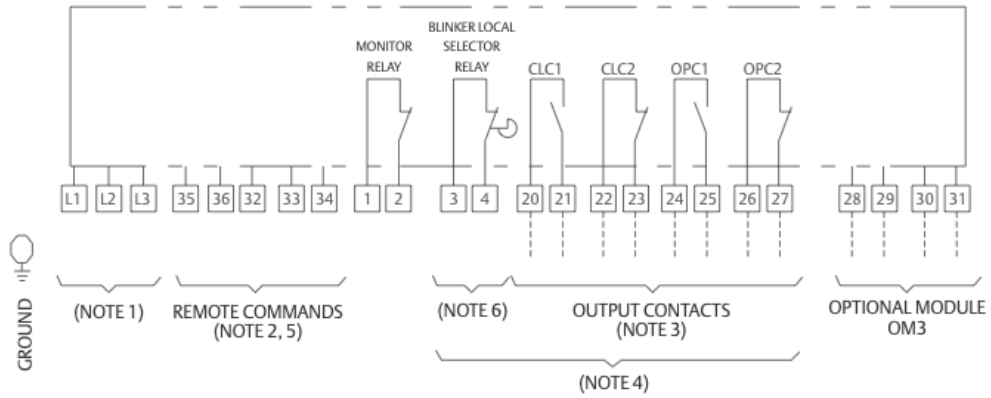


Unmachined Insert (Special Key; see Figure 13)

Model	Part Number	d2		S1		d1		S2		h2		H (max stem height)		d1 (max)	
		in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
SCE300-063	5400630360	1.125	29	-	-	0.393	10	0.250	6	1.240	31	1.378	35	0.885	22
SCE300-125	5401250360	1.377	35	-	-	0.551	14	0.393	10	1.496	38	2.126	54	1.122	28
SCE300-250	5401250360	1.377	35	-	-	0.551	14	0.393	10	1.496	38	2.126	54	1.122	28
SCE300-500	5405000360	1.875	48	-	-	0.748	19	0.500	13	2.020	51	2.204	56	1.437	36

Wiring Diagram

Figure 14.

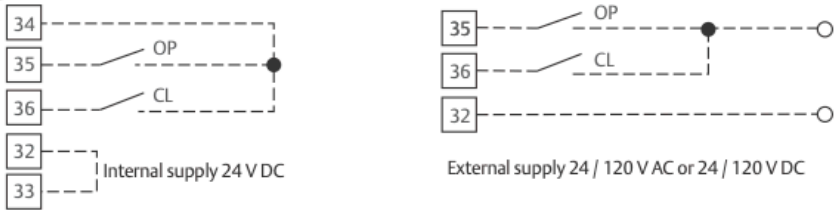


NOTES:

1) Power connection L1-L2 for V DC or V AC single phase motor supply:
from 24 V to 48 V or from 100 V to 240 V.
Power connection L1-L2-L3 for 3 phase motor supply from 208 V to 575 V.
(Check on the actuator label for the correct voltage to be applied).

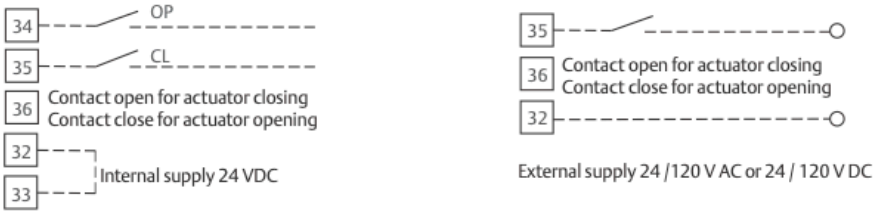
2a) Remote command options: standard configuration

Figure 15.



2b) Remote command options: 2 wires setting (to be configured)

Figure 16.



3. Contacts shown in intermediate position CLC1-CLC2 end of travel signaling in CLOSING.
Contacts shown in intermediate position OPC1-OPC2 end of travel signaling in OPENING.
4. Output contact rating 240 V AC / 5 A - 30 V DC / 5 A - 120 V DC / 0.5 A.
Output contacts (when used) have to be feed with the same external voltage.
5. Control command rating 24 to 120 V AC or V DC.
Control signal: minimum duration > 600 ms.
Total current drawn for remote controls < 25 mA.
6. Blinker or local selector monitoring function (when OM3 is present) to be configured.

Current Absorption - Single-Phase and DC Voltage

Table 17. Current absorption - single-phase and DC voltage

Model	Selected step	Operating time (s/90°)	Current absorption (A)											
			24 V AC	48 V AC	90 V AC	110 V AC	230 V AC	264 V AC	24 V DC	48 V DC	90 V DC	110 V DC	230 V DC	264 V DC
063	8	15	2.26	1.01	0.590	0.473	0.334	0.289	2.02	1.01	0.605	0.476	0.222	0.196
	6	28	1.60	0.84	0.405	0.334	0.253	0.217	1.53	0.75	0.415	0.343	0.158	0.138
	4	48	1.38	0.73	0.317	0.265	0.209	0.176	1.30	0.64	0.318	0.260	0.120	0.106
125	8	15	4.20	1.70	0.980	0.810	0.430	0.420	4.50	1.81	1.040	0.820	0.390	0.340
	6	28	2.60	1.28	0.780	0.630	0.370	0.340	2.65	1.27	0.810	0.640	0.300	0.260
	4	48	2.04	1.00	0.680	0.560	0.340	0.290	2.10	0.96	0.720	0.570	0.270	0.220
250	8	15	10.30	4.90	2.440	1.970	0.920	0.800	9.70	4.80	2.520	1.950	0.900	0.780
	6	28	8.20	3.80	1.650	1.350	0.640	0.570	7.20	3.60	1.650	1.320	0.630	0.540
	4	48	6.40	3.30	1.440	1.170	0.560	0.500	6.80	3.20	1.460	1.140	0.540	0.470
500	8	15	14.50	6.80	3.200	2.520	1.150	1.000	14.00	7.00	3.220	2.530	1.120	0.980
	6	28	9.50	4.60	1.900	1.550	0.760	0.670	9.30	4.50	1.920	1.540	0.720	0.620
	4	48	7.00	3.40	1.550	1.240	0.600	0.530	7.10	3.40	1.510	1.240	0.580	0.500
1000	8	24	14.50	6.80	3.200	2.520	1.150	1.000	14.00	7.00	3.220	2.530	1.120	0.980
	6	45	9.50	4.60	1.900	1.550	0.760	0.670	9.30	4.50	1.920	1.540	0.720	0.620
	4	80	7.00	3.40	1.550	1.240	0.600	0.530	7.10	3.40	1.510	1.240	0.580	0.500
2000	8	53	14.50	6.80	3.200	2.520	1.150	1.000	14.00	7.00	3.220	2.530	1.120	0.980
	6	100	9.50	4.60	1.900	1.550	0.760	0.670	9.30	4.50	1.920	1.540	0.720	0.620
	4	180	7.00	3.40	1.550	1.240	0.600	0.530	7.10	3.40	1.510	1.240	0.580	0.500

Current Absorption - Three-Phase Voltage

Table 18. Current absorption - three-phase voltage

Model	Selected step	Operating time (s/90°)	Current absorption (A)						
			208 V AC	240 V AC	380 V AC	400 V AC	480 V AC	500 V AC	575 V AC
063	8	15	0.226			0.176			0.107
	6	28	0.165			0.101			0.080
	4	48	0.132			0.083			0.057
125	8	15	0.344			0.227			0.171
	6	28	0.295			0.180			0.143
	4	48	0.245			0.155			0.125
250	8	15	0.800	0.73	0.52		0.49	0.37	0.340
	6	28	0.590	0.56	0.41		0.35	0.29	0.280
	4	48	0.530	0.50	0.37		0.30	0.27	0.250
500	8	15	1.073	0.97	0.65		0.58	0.46	0.430
	6	28	0.720	0.64	0.47		0.39	0.32	0.310
	4	48	0.590	0.55	0.41		0.32	0.29	0.280
1000	8	24	1.073	0.97	0.65		0.58	0.46	0.430
	6	45	0.720	0.64	0.47		0.39	0.32	0.310
	4	80	0.590	0.55	0.41		0.32	0.29	0.280
2000	8	53	1.073	0.97	0.65		0.58	0.46	0.430
	6	100	0.720	0.64	0.47		0.39	0.32	0.310
	4	180	0.590	0.55	0.41		0.32	0.29	0.280

Ordering Information

The model number on the first row below is SED063LVPD1M6D4, and only serves as an example of how to build a model number from Table 19.

Table 19. Selection Guide

	SED		063		LV	PD	1	M	6	D4
Product										
SPD	ISO5211 flange, star drive insert, 4 x M25 conduit entries									
SPE	ISO5211 flange, D or DD drive insert, 4 x M25 conduit entries									
SPB	ISO5211 flange, blank drive insert, 4 x M25 conduit entries									
SPU	Bettis flange, D or DD drive insert, 4 x M25 conduit entries, Metric bolt holes									
SPK	Bettis flange, blank drive insert, 4 x M25 conduit entries, Metric bolt holes									
SED	ISO5211 flange, star drive insert, 4 x 1" NPT conduit entries									
SEE	ISO5211 flange, D or DD drive insert, 4 x 1" NPT conduit entries									
SEB	ISO5211 flange, blank drive insert, 4 x 1" NPT conduit entries									
→ SEU	Bettis flange, D or DD drive insert, 4 x 1" NPT conduit entries, UNC bolt holes									
SEK	Bettis flange, blank drive insert, 4 x 1" NPT conduit entries, UNC bolt holes									
Models										
063	Model 063 (63 Nm / 46 lb.ft)		06B	Model 063 (63 Nm / 46 lb.ft) with Beacon						
→ 125	Model 125 (125 Nm / 92 lb.ft)		12B	Model 125 (125 Nm / 92 lb.ft) with Beacon						
250	Model 250 (250 Nm / 184 lb.ft)		25B	Model 250 (250 Nm / 184 lb.ft) with Beacon						
500	Model 500 (500 Nm / 369 lb.ft)		50B	Model 500 (500 Nm / 369 lb.ft) with Beacon						
1K0	Model 1000 (1000 Nm / 738 lb.ft)		1KB	Model 1000 (1000 Nm / 738 lb.ft) with Beacon						
2K0	Model 2000 (2000 Nm / 1475 lb.ft)		2KB	Model 2000 (2000 Nm / 1475 lb.ft) with Beacon						
Voltage										
LV	Single-phase 24-48 V AC/DC		3A	Three-phase 208-240 V AC						
→ HV	Single-phase 100-240 V AC/DC		3B	Three-phase 380-480 V AC						
			3C	Three-phase 500-575 V AC						
Speed/Duty										
→ PD	Models 063-500 (15, 28, 48 seconds/90°), ON-OFF/S4-50% ,1200 St/h									
PE	Model 1000 (24, 45, 80 seconds/90°), ON-OFF/S4-50% ,1200 St/h									
PF	Model 2000 (53, 100, 180 se onds/90°), ON-OFF/S4-50% ,1200 St/h									
Optional Modules										
→ 0	No optional modules	A	OM9	W OM13						
1	OM1	B	OM3 + OM9							
3	OM1 + OM3	C	OM11							
5	OM3	D	OM3 + OM11							
Conduit Entry Plugs										
→ P	Plastic Plugs									
M	Metal Plugs (ATEX certified)									

SED		063	LV	PD	1	M	6	D4
Approvals/Protections								
0	Waterproof QPS-CSA (C22.2 -139) IP66/68M (NEMA 4/4X/6) [T°amb -40 °C to +60 °C/ -40 °F to +140 °F]							
2	Waterproof IP66/68M - NEMA 4/4X/6 [T°amb -25 °C to +70 °C/ -13 °F to +158 °F]							
3	Waterproof IP66/68M - NEMA 4/4X/6 [T°amb -40 °C to +70 °C/ -40 °F to +158 °F]							
4	ATEX Explosionproof Ex db eb IIB T5 Gb / Ex tb IIIC T100 °C Db IP66/68M [T°amb -20 °C to +65 °C / -4 °F to +149 °F]							
4	ATEX Explosionproof Ex db eb h IIB T5 Gc / Ex h tc IIIC T100°C Dc IP66/68M [T°amb -20 °C to +65 °C / -4 °F to +149 °F] (Size 2000 only)							
D	* ATEX Explosionproof Ex db nA IIB T5 Gc / Ex tb IIIC T100°C Db IP66/68M [T°amb -20 °C to +65 °C / -4 °F to +149 °F]							
D	* ATEX Explosionproof Ex db h nA IIB T5 Gc / Ex h tc IIIC T100 °C Dc IP66/68M [T°amb -20 °C to +65 °C / -4 °F to +149 °F] (Size 2000 only)							
9	ATEX Explosionproof Ex db eb IIB T5 Gb / Ex tb IIIC T100 °C Db IP66/68M [T°amb -40 °C to +65 °C / -40 °F to +149 °F]							
9	ATEX Explosionproof Ex db eb h IIB T5 Gc / Ex h tc IIIC T100 °C Dc IP66/68M [T°amb -40 °C to +65 °C / -40 °F to +149 °F] (Size 2000 only)							
E	* ATEX Explosionproof Ex db nA IIB T5 Gc / Ex tb IIIC T100 °C Db IP66/68M [T°amb -40 °C to +65 °C / -40 °F to +149 °F]							
E	* ATEX Explosionproof Ex db h nA IIB T5 Gc / Ex h tc IIIC T100 °C Dc IP66/68M [T°amb -40 °C to +65 °C / -40 °F to +149 °F] (Size 2000 only)							
F	IECEx Explosionproof Ex db eb IIB T5 Gb / Ex tb IIIC T100 °C Db IP66/68 [T°amb -20 °C to +65 °C / -4 °F to +149 °F]							
F	IECEx Explosionproof Ex db eb h IIB T5 Gb / Ex h tb IIIC T100 °C Db IP66/68 [T°amb -20 °C to +65 °C / -4 °F to +149 °F] (Size 2000 only)							
H	* IECEx Explosionproof Ex db nA IIB T5 Gc / Ex tc IIIC T100 °C Dc IP66/68 [T°amb -20 °C to +65 °C / -4 °F to +149 °F]							
H	* IECEx Explosionproof Ex db h nA IIB T4 Gc / Ex h tc IIIC T100 °C Dc IP66/68 [T°amb -20 °C to +65 °C / -4 °F to +149 °F] (Size 2000 only)							
G	IECEx Explosionproof Ex db eb IIB T5 Gb / Ex tb IIIC T100 °C Db IP66/68 [T°amb -40 °C to +65 °C / -40 °F to +149 °F]							
G	IECEx Explosionproof Ex db eb h IIB T5 Gb / Ex h tb IIIC T100 °C Db IP66/68 [T°amb -40 °C to +65 °C / -40 °F to +149 °F] (Size 2000 only)							
I	* IECEx Explosionproof Ex db nA IIB T5 Gc / Ex tc IIIC T100 °C Dc IP66/68 [T°amb -40 °C to +65 °C / -40 °F to +149 °F]							
I	* IECEx Explosionproof Ex db h nA IIB T4 Gc / Ex h tc IIIC T100 °C Dc IP66/68 [T°amb -40 °C to +65 °C / -40 °F to +149 °F] (Size 2000 only)							
6	FM Explosionproof Class I Zone 1 AEx db eb IIB T5 Gb - Class II, Division 1, Group E, F and G T4 - Class III T4, Type 4, 4x and 6 IP66 [T°amb -40 °C to 65 °C / -40 °F to +149 °F]							
6	FM Explosionproof Class I Zone 1 AEx db eb IIB T5 Gb - Type 4, 4x and 6 IP66/68 [T°amb -40 °C to 65 °C / -40 °F to +149 °F] (Size 2000 only)							
7	FM-c (per CSA-C22.2) Explosionproof Ex db eb IIB T5 Gb; Class II, Division 1, Group E, F and G; T4, Type 4, 4x and 6 IP66 [T°amb -40 °C to 65 °C / -40 °F to +149 °F]							
7	FM-c (per CSA-C22.2) Explosionproof Ex db eb IIB T5 Gb; Type 4, 4x and 6 IP66/68 [T°amb -40 °C to 65 °C / -40 °F to +149 °F] (Size 2000 only)							
B	INMETRO Explosionproof Ex d e IIB T5 Gb / Ex tb IIIC T100 °C Db IP66/68M [T°amb -20 °C to +65 °C / -4 °F to +149 °F]							
C	INMETRO Explosionproof Ex d e IIB T5 Gb / Ex tb IIIC T100 °C Db IP66/68M [T°amb -40 °C to +65 °C / -40 °F to +149 °F]							
L	* INMETRO Explosionproof Ex db nA IIB T5 Gc / Ex tc IIIC T100°C Dc IP66/68M [T°amb -20 °C to +65 °C / -4 °F to +149 °F]							
M	* INMETRO Explosionproof Ex db nA IIB T5 Gc / Ex tc IIIC T100°C Dc IP66/68M [T°amb -40 °C to +65 °C / -40 °F to +149 °F]							
N	EAC - Ex de IIB T5 Gb X [T°amb -40 °C to 65 °C / -40 °F to +149 °F]							
O	* EAC - Ex de [ia] IIB T5 Gb X [T°amb -40°C to 65°C / -40°F to +149 °F]							
P	ECAS Explosionproof Ex db eb IIB T5 Gb / Ex tb IIIC T100 °C Db IP66/68M [T°amb -20 °C to +65 °C / -4 °F to +149 °F]							
P	ECAS Explosionproof Ex db eb h IIB T5 Gc / Ex h tc IIIC T100°C Dc IP66/68M [T°amb -20 °C to +65 °C / -4 °F to +149 °F] (Size 2000 only)							
Q	* ECAS Explosionproof Ex db nA IIB T5 Gc / Ex tb IIIC T100°C Db IP66/68M [T°amb -20 °C to +65 °C / -4 °F to +149 °F]							
Q	* ECAS Explosionproof Ex db h nA IIB T5 Gc / Ex h tc IIIC T100 °C Dc IP66/68M [T°amb -20 °C to +65 °C / -4 °F to +149 °F] (Size 2000 only)							
R	ECAS Explosionproof Ex db eb IIB T5 Gb / Ex tb IIIC T100 °C Db IP66/68M [T°amb -40 °C to +65 °C / -40 °F to +149 °F]							
R	ECAS Explosionproof Ex db eb h IIB T5 Gc / Ex h tc IIIC T100 °C Dc IP66/68M [T°amb -40 °C to +65 °C / -40 °F to +149 °F] (Size 2000 only)							
S	* ECAS Explosionproof Ex db nA IIB T5 Gc / Ex tb IIIC T100 °C Db IP66/68M [T°amb -40 °C to +65 °C / -40 °F to +149 °F]							
S	* ECAS Explosionproof Ex db h nA IIB T5 Gc / Ex h tc IIIC T100 °C Dc IP66/68M [T°amb -40 °C to +65 °C / -40 °F to +149 °F] (Size 2000 only)							
T	CCC Explosionproof Ex de IIB T5 Gb / Ex tD A21 IP66/68 T100 °C [T°amb -20 °C to +65 °C / -4 °F to +149 °F]							
U	CCC Explosionproof Ex de IIB T5 Gb / Ex tD A21 IP66/68 T100 °C [T°amb -40 °C to +65 °C / -40 °F to +149 °F]							
V	* CCC Explosionproof Ex d nA IIB T5 Gc / Ex tD A22 IP66/68 T100 °C [T°amb -20 °C to +65 °C / -4 °F to +149 °F]							
Z	* CCC Explosionproof Ex d nA IIB T5 Gc / Ex tD A22 IP66/68 T100 °C [T°amb -40 °C to +65 °C / -40 °F to +149 °F]							
Flange Insert								
See Table 20								

1. * in the case of OM3 installed.

Table 20. Flange Insert

00	No flange insert
ISO5211	
B4	Model 063 flange ISO 5211/F05 and F07 - insert not machined (SxB_product)
B5	Model 125 flange ISO 5211/F07 and F10 - insert not machined (SxB_product)
B5	Model 250 flange ISO 5211/F07 and F10 and F12 - insert not machined (SxB_product)
B6	Model 500 flange ISO 5211/F10 and F12 - insert not machined (SxB_product)
B7	Models 1000 and 2000 flange ISO 5211/F10 and F14 - insert not machined (SxB_product)
BA	Models 1000 and 2000 flange ISO 5211/F12 and F16 - insert not machined (SxB_product)
D4	Model 063 flange ISO 5211/F05 and F07 - double-star, 17-star insert (SxD_product)
D5	Model 125 ISO 5211/F07 and F10 - double star, 22-star insert (SxD_product)
D5	Model 250 ISO 5211/F07 and F10 and F12 - double star, 22-star insert (SxD_product)
D6	Model 250 ISO 5211/F10 and F12 - double star, 27-star insert (SxD_product)
D6	Model 500 ISO 5211/F10 and F12 - double star, 27-star insert (SxD_product)
D7	Models 1000 and 2000 ISO 5211/F10 and F14 - double star, 36-star insert (SxD_product)
DA	Models 1000 and 2000 ISO 5211/F12 and F16 - double star, 36-star insert (SxD_product)
E3	Model 063 flange ISO 5211/F05 and F07 - Double D 20 mm x 14 mm insert (SxE_product)
E5	Model 125 ISO 5211/F07 and F10 - Double D 30 mm x 22 mm insert (SxE_product)
E5	Model 250 ISO 5211/F07 and F10 and F12 - Double D 30 mm x 22 mm insert (SxE_product)
E5	Model 500 ISO 5211 and F10 and F12 - Double D 30 mm x 22 mm insert (SxE_product)
E6	Model 250 flange ISO 5211/F10 and F12 - Keyed 35 mm x 10 mm x 8 mm insert (SxE_product)
E6	Model 500 flange ISO 5211/F10 and F12 - Keyed 35 mm x 10 mm x 8 mm insert (SxE_product)
E9	Models 1000 and 2000 ISO 5211/F12 and F16 - Keyed 50 mm x 14 mm x 9 mm insert (SxE_product)
EA	Models 1000 and 2000 ISO 5211/F10 and F14 - Keyed 50 mm x 14 mm x 9 mm insert (SxE_product)
Bettis and Non-ISO5211	
K4	Model 063 Bettis flange (1.75 in. and 3.25 in. bolt circles) - insert not machined (SxK_product)
K8	Model 125 Bettis flange (3.25 in. bolt circle) - insert not machined (SxK_product)
K8	Model 250 Bettis flange (3.25 in. and 5.00 in. bolt circles) - insert not machined (SxK_product)
KA	Model 500 Bettis flange (3.25 in. and 5.00 in. bolt circles) - insert not machined (SxK_product)
KC	Models 1000 and 2000 Bettis flange (5.00 in. and 6.50 in. bolt circles) - insert not machined (SxK_product)
U4	Model 063 Bettis flange - Insert DD 19 x 12.7 mm (SxU_product)
U8	Models 125 and 250 Bettis Flange - insert D 28.58 x 6.35 x 6.35 mm (SxU_product)
U8	Model 500 Bettis Flange - insert D 28.58 x 6.35 x 6.35 mm
UA	Model 500 Bettis Flange - insert D 41.28 x 9.53 x 9.53 mm (SxU_product)
UC	Models 1000 and 2000 Bettis Flange - insert D 47.63 x 12.7 x 12.7 mm (SxU_product)

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Blow-off Valves, 4”

Tags

MBV-6102
MBV-6202
MBV-6302
MBV-6402

KEYSTONE SERIES GR RESILIENT SEATED BUTTERFLY VALVES

GRW/GRL

A heavy duty industrial resilient seated butterfly valve
GRW - Wafer body design
GRL - Lugged body design

GENERAL APPLICATION

Water, air, dry bulk conveying etc. These valves are for any service where a drop-tight shut-off with maximum flow area is required.

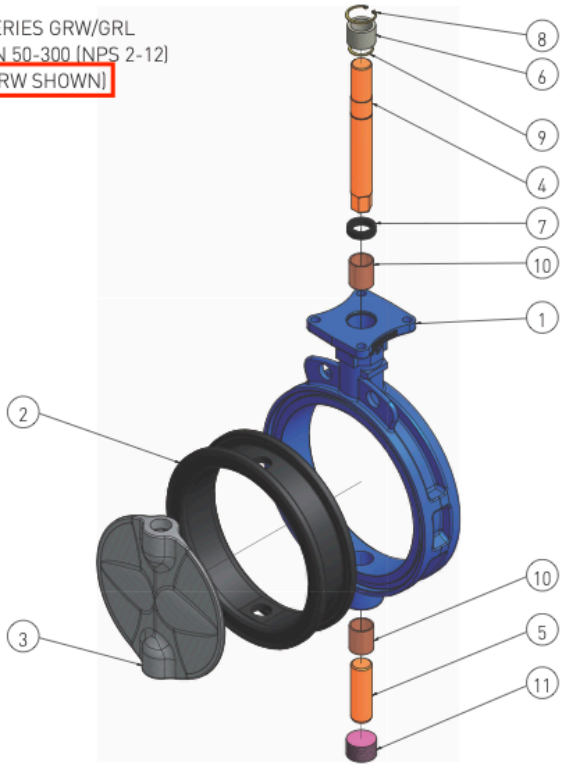
TECHNICAL DATA

Sizes:	DN 50 - 900 (NPS 2 - 36)
Pressure:	16 bar DN 50 - 300 (230 psi NPS 2 - 12) 10 bar DN 350 - 900 (150 psi NPS 14 - 36)
Reinforced seat:	16 bar DN 350 - 600 (230 psi NPS 14 - 24)
End of line:	10 bar DN 50 - 300 (150 psi NPS 2 - 12) 6 bar DN 350 - 900 (90 psi NPS 14 - 36)
Reinforced seat:	10 bar DN 350 - 600 (150 psi NPS 14 - 24)
Vacuum service:	0.4 bar (5.8 psia)
Temperature:	-40°C to +160°C (-40 °F to +320°F)
Flange accommodation:	PN 6/10/16 ASME 125/150 JIS 10K BS Table E AS4087 PN 16 AS2129 Table E

FEATURES

- Wafer and lugged body design with face-to-face dimension, according to EN 558 Series 20 and API 609.
- Designed according to EN 593 and API 609.
- The seat is field replaceable and fully isolates the body and shaft from the flow.
- Primary shaft sealing exceeds the pressure rating of the valve and prevents leakage through shaft area to atmosphere.
- A secondary shaft sealing provides back-up safety.
- A molded-in O-ring in the seat for flange sealing eliminates the need for gaskets.
- Shaft seals prevent moisture penetrating into the shaft area.
- The two piece shaft allows for a thin disc and provides minimal obstruction to flow (up to DN 300/ NPS 12).
- Rounded polished disc edge gives full concentric sealing, lower torques, longer seat life and drop-tight shut-off.
- Body locating holes allow ease of installation and centering between the flanges.
- Extended body neck allows for pipe insulation.
- Top and bottom shaft bearings for optimized support and minimum friction and decreased torque.
- Top bushing absorbs actuator side thrust loads.
- All valves comply to Pressure Equipment Directive (2014/68/EU) Module B + D, CE Marking.
- Available approvals: NSF/ANSI 61, ACS, KIWA, WRAS, DVGW-G, ABS, CU-TR, DNV

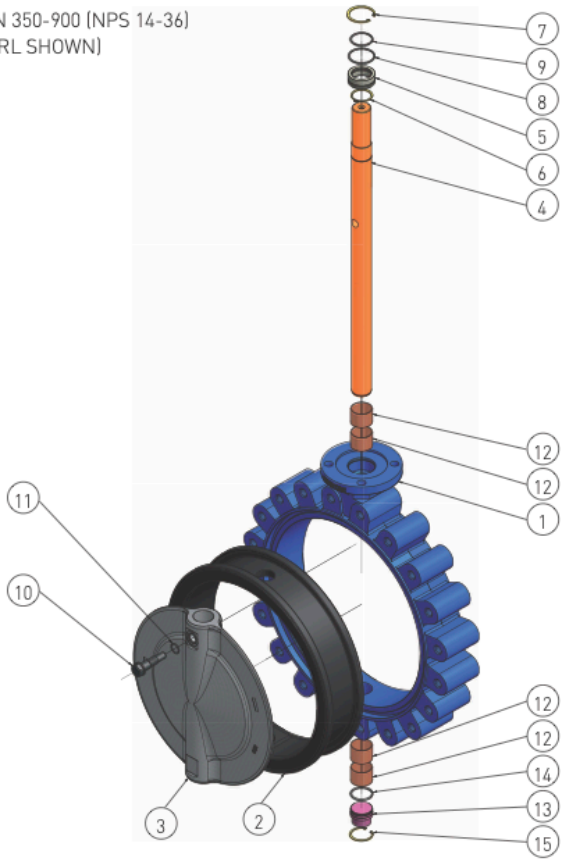
SERIES GRW/GRL
DN 50-300 (NPS 2-12)
(GRW SHOWN)



PARTS LIST

Item	Qty	Description
1	1	Body
2	1	Seat
3	1	Disc
4	1	Upper shaft
5	1	Lower shaft
6	1	Upper bushing
7	1	Packing
8	1	Body circlip
9	1	Shaft circlip
10	2	Upper and lower bearing
11	1	Plug

DN 350-900 (NPS 14-36)
(GRL SHOWN)



PARTS LIST

Item	Qty	Description
1	1	Body
2	1	Seat
3	1	Disc
4	1	Shaft
5	1	Bushing
6	1	Shaft circlip
7	1	Body circlip
8	1	Body O-ring
9	1	Shaft O-ring
10	1	Disc screw
11	1	Disc screw O-ring
12	4*	Upper and lower bearing
13	1	Plug
14	1	Plug O-ring
15	1	Plug circlip

NOTES

* Only 2 bearings are used for the DN 350 (NPS 14) valve size.

MATERIAL SPECIFICATION

Part name	Material	Material specification	Remark
DN 50-300 (NPS 2-12)			
Body	Ductile iron	ASTM A536 Gr 65-45-12	
		ASTM A395 Gr 60-40-18	(Optional)
	Carbon steel	ASTM A216 WCB	
	316 stainless steel	ASTM A351 Gr CF8M	
	Duplex	ASTM A890 Gr 4A	
	Super Duplex	ASTM A890 Gr 5A	
Disc	Super duplex	ASTM A890 Gr 5A	
	Duplex	ASTM A890 Gr 4A	
	316 stainless steel	ASTM A351 Gr CF8M	
	304 stainless steel	ASTM A351 Gr CF8	
	Aluminium bronze	ASTM B148 UNS C95200	
	Nickel aluminium bronze	ASTM B148 UNS C95800	
	Ductile iron NYL	ASTM A536 Gr 65-45-12	NYL = Nylon coating, max. temp. 60°C (140°F)
	Ductile iron CTD	ASTM A536 Gr 65-45-12	CTD = Nickel plating
Shaft	316 stainless steel	ASTM A276 Gr 316	
	431 stainless steel	ASTM A276 Gr 431	
	Super duplex	ASTM A276 UNS S32750	
	Monel® K500	ASTM B865 UNS N05500	
Seat	EPDM		Food grade, NSF/ANSI 61
	NBR		Food grade
	HNBR		
	White NBR		Food grade
	Fluoroelastomer (FKM)		
Bushing	Polyester		
Packing	NBR		
Bearing	PTFE/steel		
Circlip	Stainless steel		
Plug	Carbon steel		
DN 350-900 (NPS 14-36)			
Body	Ductile iron	ASTM A536 Gr 65-45-12	
		ASTM A395 Gr 60-40-18	(Optional)
	Carbon steel*	ASTM A216 WCB	
	316 stainless steel*	ASTM A351 Gr CF8M	
	Duplex	ASTM A890 Gr 4A	
	Super Duplex	ASTM A890 Gr 5A	
Disc	Super duplex	ASTM A890 Gr 5A	
	Duplex	ASTM A890 Gr 4A	
	316 stainless steel	ASTM A351 Gr CF8M	
	304 stainless steel	ASTM A351 Gr CF8	
	Aluminium bronze	ASTM B148 UNS C95200	
	Nickel aluminium bronze	ASTM B148 UNS C95800	
	Ductile iron NYL	ASTM A536 Gr 65-45-12	NYL = Nylon coating, max. temp. 60°C (140°F)
	Ductile iron CTD	ASTM A536 Gr 65-45-12	CTD = Epoxy coated, max. temp. 120°C (250°F)
	Ductile iron Ebonite		Max. temp. 100°C (212°F)
Shaft	431 stainless steel	ASTM A276 Gr 431 S43100	
	Duplex	ASTM A276 UNS S31803	
	Super duplex	ASTM A276 UNS S32750	
	Monel® K500	ASTM B865 UNS N05500	
Seat	EPDM		Food grade, NSF/ANSI 61
	NBR		Food grade
	HNBR		
	White NBR		Food grade
	Fluoroelastomer (FKM)		
Disc screw	Super duplex	ASTM A276 UNS S32750	
	Duplex	ASTM A276 UNS S31803	
Disc screw O-ring	EPDM		
	NBR		
	FKM		
Plug	Carbon steel		
Plug O-ring	NBR		
Plug circlip	Stainless steel		
Bushing	Polyester		
Shaft/Body O-ring	NBR		
Bearing	PTFE/steel		
Shaft/Body circlip	Stainless steel		

NOTES

Valves with super duplex disc will have super duplex disc screw. All other discs will have a duplex disc screw.

Monel® is a registered trademark of Special Metals Corporation.

* Carbon steel and 316 stainless steel body material options are available up to and including DN 600 / NPS 24

MATERIAL SPECIFICATION - REINFORCED SEAT

Part name	Material	Material specification	Remark
DN 350 - 600 (NPS 14 - 24)			
Body	Ductile iron	ASTM A536 Gr 65-45-12	
		ASTM A395 Gr 60-40-18	(Optional)
	Carbon steel	ASTM A216 WCB	
	316 stainless steel	ASTM A351 Gr CF8M	
	Duplex	ASTM A890 Gr 4A	
	Super Duplex	ASTM A890 Gr 5A	
Disc	316 Stainless steel	ASTM A351 Gr CF8M	
	Nickel aluminium bronze	ASTM B148 UNS C95800	
	Ductile iron ctd	ASTM A536 Gr 65-45-12	CTD = Epoxy coated, max. temp. 120°C (250°F)
Shaft	431 Stainless steel	ASTM A276 Gr 431 S43100	
	Super duplex	ASTM A276 UNS S32750	
Seat	EPDM E6		Metal reinforced EPDM, Food Grade
	NBR N8		Metal reinforced NBR, Food Grade
Disc screw	Duplex	ASTM A276 UNS S31803	
Disc screw o-ring	NBR		
Plug	Carbon steel		
Plug o-ring	NBR		
Plug circlip	Stainless steel		
Bushing	Polyester		
Shaft/body o-ring	NBR		
Bearing	PTFE/steel		
Shaft/body circlip	Stainless steel		

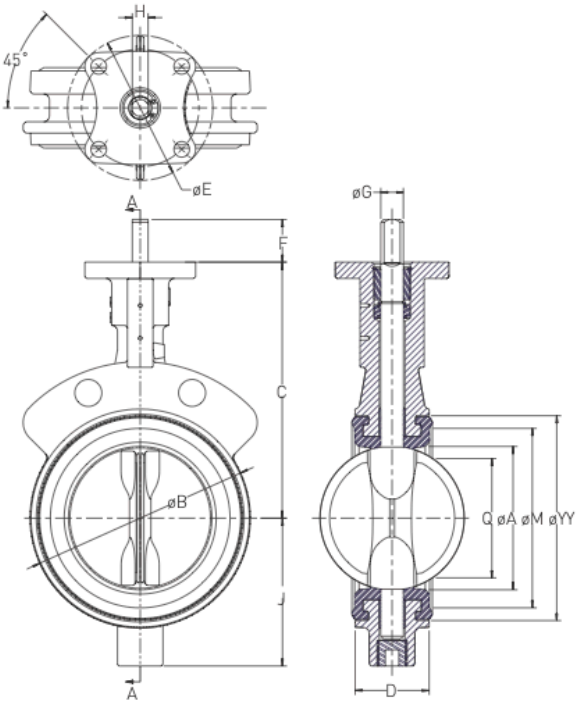
NOTES

Valves with super duplex disc will have super duplex disc screw. All other discs will have a duplex disc screw.

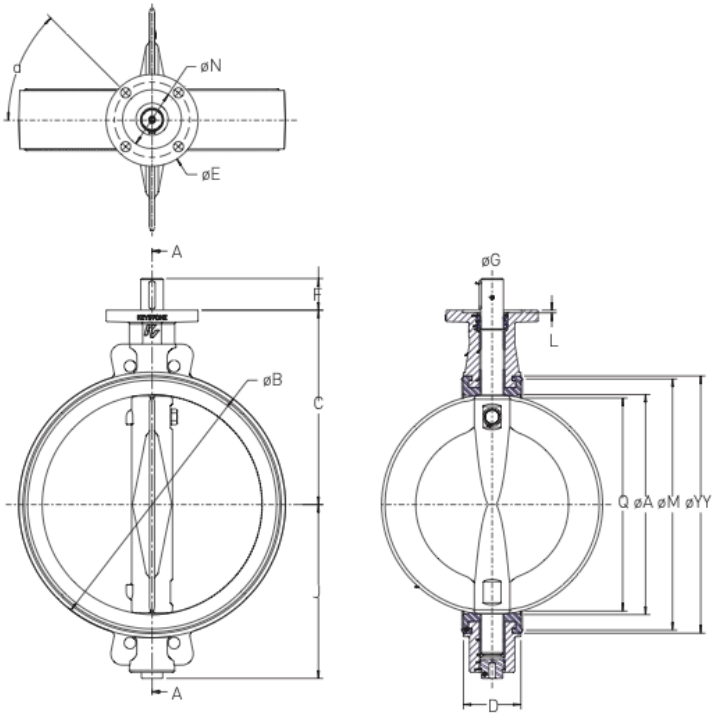
KEYSTONE SERIES GR RESILIENT SEATED BUTTERFLY VALVES

GRW/GRL - METRIC DATA

SERIES GRW (WAFER)
DN 50-300



DN 350-900



VALVE DIMENSIONS (mm)

Size (DN)	A	B	C	D	E	F	J	L	M	N	Q[1]	YY	Shaft G	Shaft H[2]	Shaft Key	Top plate drilling Bolt circle	Top plate drilling No. holes	Top plate drilling α	Top plate drilling Hole dia.	Adapt. code[4]	Weight[3] (kg)
50	50	91	135	43	100	30	60	-	66	-	28	80	15.88	11.11	-	82.5	4	45°	11.0	BAC	2.0
65	62	105	150	46	100	30	76	-	78	-	43	93	14.29	9.53	-	82.5	4	45°	11.0	BAB	2.7
80	77	123	160	46	100	30	82	-	97	-	65	112	14.29	9.53	-	82.5	4	45°	11.0	BAB	3.2
100	99	154	180	52	100	30	104	-	129	-	87	144	15.88	11.11	-	82.5	4	45°	11.0	BAC	4.3
125	124	187	195	56	100	30	120	-	160	-	113	175	19.05	12.70	-	82.5	4	45°	11.0	BAD	5.9
150	150	208	210	56	100	30	131	-	181	-	142	196	19.05	12.70	-	82.5	4	45°	11.0	BAD	6.8
200	195	265	240	60	150	32	162	-	233	-	188	248	22.23	15.88	-	127.0	4	45°	13.5	CAE	11.8
250	245	320	275	68	150	50	198	-	290	-	237	305	28.58	-	6.4 x 6.4	127.0	4	45°	13.5	CAF	19.1
300	291	372	310	78	150	50	230	-	340	-	283	355	28.58	-	6.4 x 6.4	127.0	4	45°	13.5	CAF	26.8
350	325	416	325	78	150	76	260	-	378	-	318	398	35.00	-	8 x 8	127.0	4	45°	13.5	CAG	40.0
400	380	474	360	102	150	76	298	-	435	-	368	455	35.00	-	8 x 8	127.0	4	45°	13.5	CAG	61.0
450	434	534	395	114	200	76	334	6	495	130	421	515	41.35	-	9.5 x 9.5	165.0	4	45°	22.0	DAH	86.0
500	486	589	430	127	200	108	385	6	549	130	471	569	47.60	-	12.7 x 9.5	165.0	4	45°	22.0	DAJ	106.0
600	585	691	500	154	200	108	456	6	650	130	568	670	47.60	-	12.7 x 9.5	165.0	4	45°	22.0	DAJ	158.0
700	685	800	570	165	200	108	518	6	755	130	668	775	57.20	-	12.7 x 9.5	165.0	4	45°	22.0	DAK	231.0
750	735	862	605	165	200	108	551	6	816	130	719	835	57.20	-	12.7 x 9.5	165.0	4	45°	22.0	DAK	271.0
800	785	907	640	190	300	90	583	6	860	200	765	880	73.00	-	19 x 12.7	254.0	8	22.5°	17.5	KAV	326.0
900	885	1007	715	203	300	140	659	6	960	200	864	980	73.00	-	19 x 12.7	254.0	8	22.5°	17.5	KAV	419.0

NOTES

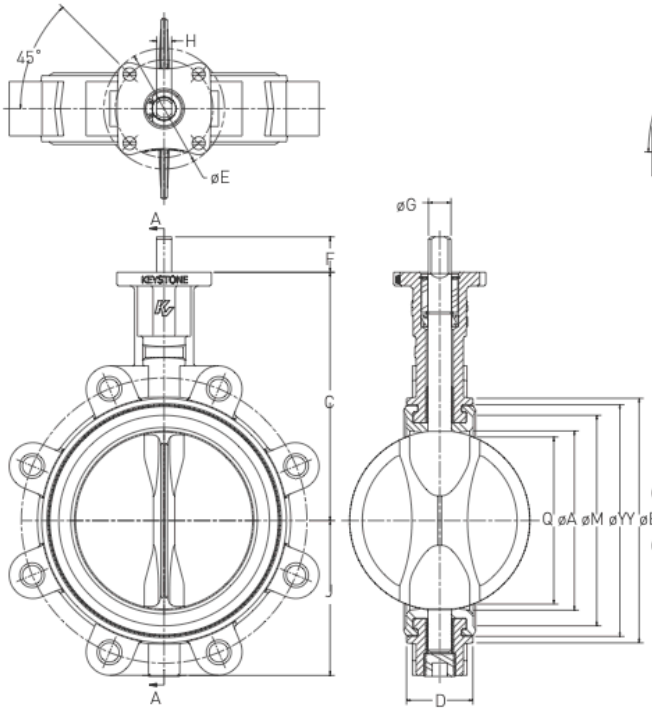
1. 'Q' dimension is the minimum allowable pipe or flange inside diameter at the centered body face to protect the disc sealing edge against damage when opening the valve.
2. 'H' dimension refers to flat on shaft.
3. Weight may vary depending on trim materials used.
4. DN 50 - actual shaft dimension is 12 mm x 8 mm A/F and is fitted with an adaptor to produce a BAC connection. Actual "F" dimension without adapter is 25.
5. øYY dimension is to the outside of the seat.
6. øM dimension is to the O-ring seal.

KEYSTONE SERIES GR RESILIENT SEATED BUTTERFLY VALVES

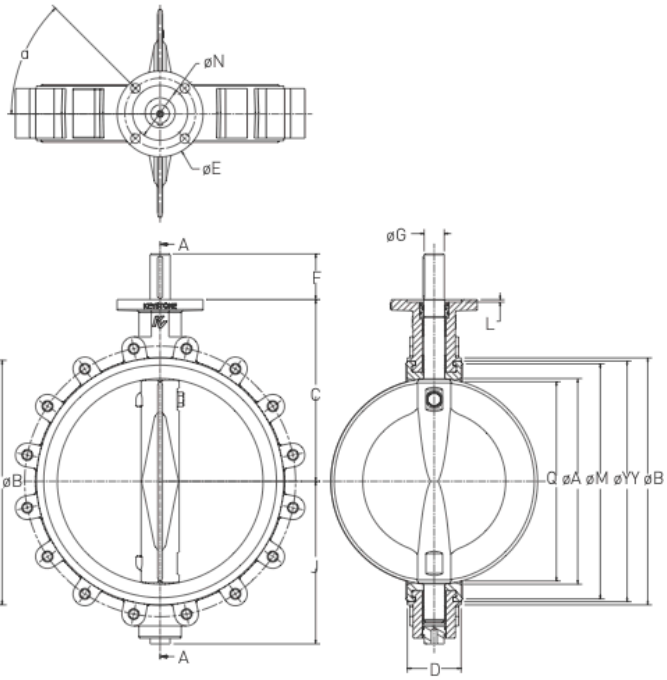
GRW/GRL - METRIC DATA

SERIES GRL (LUG)

DN 50-300



DN 350-900



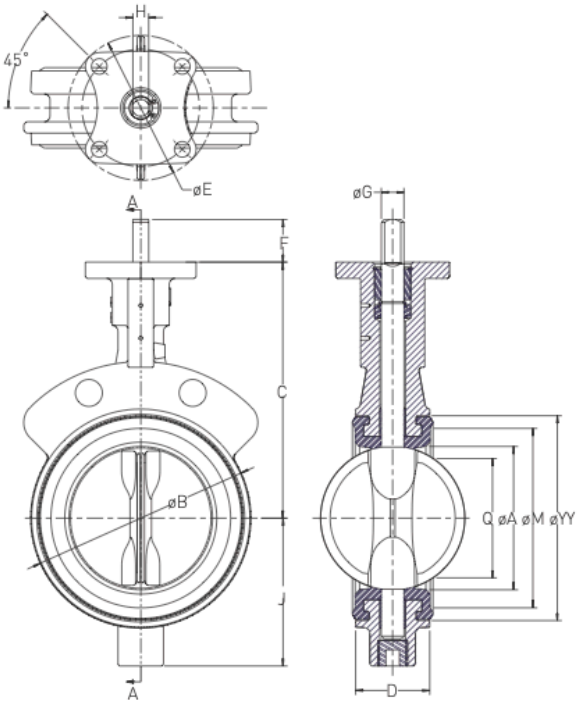
VALVE DIMENSIONS (mm)

Size (DN)	A	B	C	D	E	F	J	L	M	N	Q [1]	YY	Shaft G	Shaft H [2]	Shaft Key	Top plate drilling Bolt circle	Top plate drilling No. holes	Top plate drilling α	Top plate drilling Hole dia.	Adapt. code [4]	Weight [3] (kg)
50	50	92	135	43	100	30	60	-	66	-	28	80	15.88	11.11	-	82.5	4	45°	11.0	BAC	3.0
65	62	105	150	46	100	30	76	-	78	-	43	93	14.29	9.53	-	82.5	4	45°	11.0	BAB	4.0
80	77	126	160	46	100	30	82	-	97	-	65	112	14.29	9.53	-	82.5	4	45°	11.0	BAB	4.5
100	99	156	180	52	100	30	104	-	129	-	87	144	15.88	11.11	-	82.5	4	45°	11.0	BAC	7.0
125	124	190	195	56	100	30	120	-	160	-	113	175	19.05	12.70	-	82.5	4	45°	11.0	BAD	10.0
150	150	214	210	56	100	30	131	-	181	-	142	196	19.05	12.70	-	82.5	4	45°	11.0	BAD	11.0
200	195	268	240	60	150	32	162	-	233	-	188	248	22.23	15.88	-	127.0	4	45°	13.5	CAE	17.0
250	245	321	275	68	150	50	198	-	290	-	237	305	28.58	-	6.4 x 6.4	127.0	4	45°	13.5	CAF	29.5
300	291	375	310	78	150	50	230	-	340	-	283	355	28.58	-	6.4 x 6.4	127.0	4	45°	13.5	CAF	41.0
350	325	416	325	78	150	76	260	-	378	-	318	398	35.00	-	8 x 8	127.0	4	45°	13.5	CAG	52.0
400	380	474	360	102	150	76	298	-	435	-	368	455	35.00	-	8 x 8	127.0	4	45°	13.5	CAG	88.0
450	434	534	395	114	200	76	334	6	495	130	421	515	41.35	-	9.5 x 9.5	165.0	4	45°	22.0	DAH	107.0
500	486	589	430	127	200	108	385	6	549	130	471	569	47.60	-	12.7 x 9.5	165.0	4	45°	22.0	DAJ	161.0
600	585	691	500	154	200	108	456	6	650	130	568	670	47.60	-	12.7 x 9.5	165.0	4	45°	22.0	DAJ	235.0
700	685	800	570	165	200	108	518	6	755	130	668	775	57.20	-	12.7 x 9.5	165.0	4	45°	22.0	DAK	315.0
750	735	862	605	165	200	108	551	6	816	130	719	835	57.20	-	12.7 x 9.5	165.0	4	45°	22.0	DAK	378.0
800	785	907	640	190	300	90	583	6	860	200	765	880	73.00	-	19 x 12.7	254.0	8	22.5°	17.5	KAV	438.0
900 [5]	885	1007	715	203	300	140	659	6	960	200	864	980	73.00	-	19 x 12.7	254.0	8	22.5°	17.5	KAV	559.0

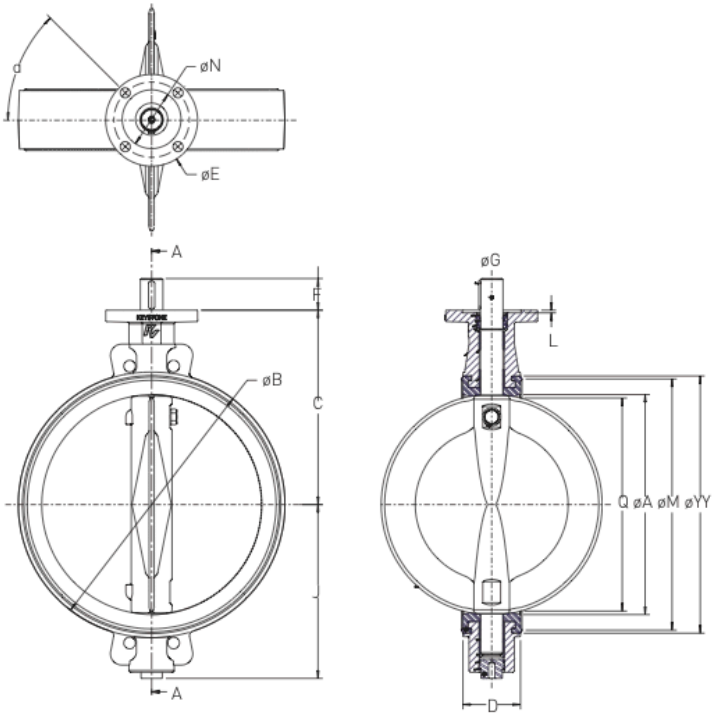
NOTES

1. 'Q' dimension is the minimum allowable pipe or flange inside diameter at the centered body face to protect the disc sealing edge against damage when opening the valve.
2. 'H' dimension refers to flat on shaft.
3. Weight may vary depending on trim materials used.
4. DN 50 - actual shaft dimension is 12 mm x 8 mm A/F and is fitted with an adaptor to produce a BAC connection. Actual "F" dimension without Adapter is 25.
5. Valve size DN 900 is tapped flange design and has no separate lugs.
6. øYY dimension is to the outside of the seat.
7. øM dimension is to the O-ring seal.

SERIES GRW (WAFER)
NPS 2-12



NPS 14-36



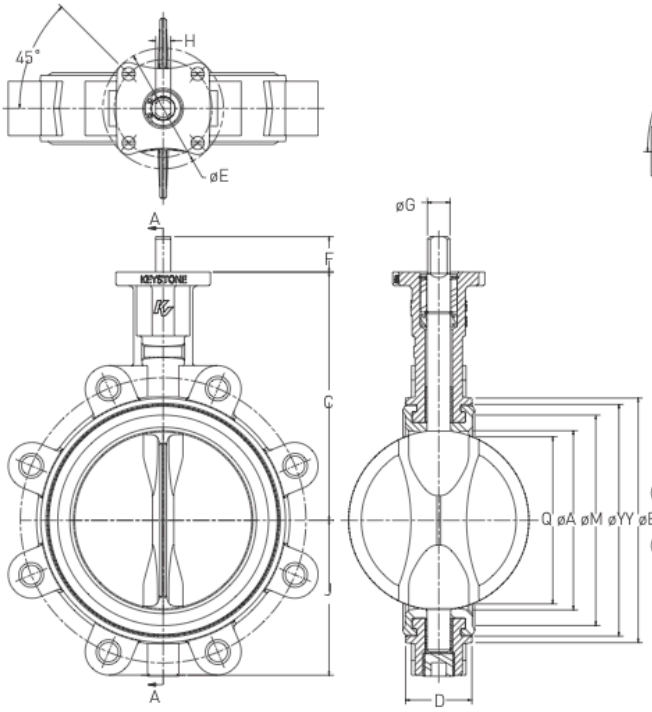
VALVE DIMENSIONS (in)

Size (NPS)	A	B	C	D	E	F	J	L	M	N	Q[1]	YY	Shaft G	Shaft H[2]	Shaft Key	Top plate drilling Bolt circle	Top plate drilling No. holes	Top plate drilling α	Top plate drilling Hole dia.	Adapt. code[4]	Weight[3] (lbs)
2	1.97	3.58	5.31	1.69	3.94	1.18	2.36	-	2.60	-	1.10	3.15	5/8	7/16	-	3¼	4	45°	0.43	BAC	4.5
2.5	2.44	4.13	5.91	1.81	3.94	1.18	2.99	-	3.07	-	1.70	3.66	9/16	3/8	-	3¼	4	45°	0.43	BAB	6
3	3.03	4.84	6.30	1.81	3.94	1.18	3.23	-	3.82	-	2.56	4.41	9/16	3/8	-	3¼	4	45°	0.43	BAB	7
4	3.90	6.06	7.09	2.05	3.94	1.18	4.09	-	5.08	-	3.43	5.67	5/8	7/16	-	3¼	4	45°	0.43	BAC	9.5
5	4.88	7.36	7.68	2.20	3.94	1.18	4.72	-	6.30	-	4.45	6.89	¾	½	-	3¼	4	45°	0.43	BAD	13
6	5.91	8.19	8.27	2.20	3.94	1.18	5.16	-	7.13	-	5.59	7.72	¾	½	-	3¼	4	45°	0.43	BAD	15
8	7.68	10.43	9.45	2.36	5.91	1.26	6.38	-	9.17	-	7.40	9.76	⅞	5/8	-	5	4	45°	0.53	CAE	26
10	9.65	12.6	10.83	2.68	5.91	1.97	7.80	-	11.42	-	9.33	12.01	1⅛	-	¼ x ¼	5	4	45°	0.53	CAF	42
12	11.46	14.65	12.20	3.07	5.91	1.97	9.06	-	13.39	-	11.14	13.98	1⅛	-	¼ x ¼	5	4	45°	0.53	CAF	59
14	12.80	16.38	12.80	3.07	5.90	2.99	10.24	-	14.88	-	12.50	15.67	1⅜	-	5/16 x 5/16	5	4	45°	0.53	CAG	88
16	14.96	18.66	14.17	4.02	5.90	2.99	11.73	-	17.13	-	14.50	17.91	1⅜	-	5/16 x 5/16	5	4	45°	0.53	CAG	134
18	17.09	21.02	15.55	4.49	8.00	2.99	13.15	0.24	19.49	5.12	16.60	20.28	1⅝	-	⅜ x ⅜	6½	4	45°	0.87	DAH	190
20	19.13	23.19	16.93	5.00	8.00	4.25	15.16	0.24	21.61	5.12	18.60	22.40	1⅞	-	½ x ⅜	6½	4	45°	0.87	DAJ	234
24	23.03	27.20	19.69	6.06	8.00	4.25	17.95	0.24	25.59	5.12	22.30	26.38	1⅞	-	½ x ⅜	6½	4	45°	0.87	DAJ	348
28	26.97	31.50	22.44	6.50	8.00	4.25	20.39	0.24	29.72	5.12	26.30	30.51	2¼	-	½ x ⅜	6½	4	45°	0.87	DAK	509
30	28.94	33.94	23.82	6.50	8.00	4.25	21.69	0.24	32.13	5.12	28.30	32.87	2¼	-	½ x ⅜	6½	4	45°	0.87	DAK	597
32	30.91	35.71	25.20	7.48	11.81	3.54	22.95	0.24	33.86	7.87	30.10	34.65	2⅞	-	¾ x ½	10	8	22.5°	0.69	KAV	719
36	34.84	39.65	28.15	7.99	11.81	5.51	25.94	0.24	37.80	7.87	34.00	38.58	2⅞	-	¾ x ½	10	8	22.5°	0.69	KAV	924

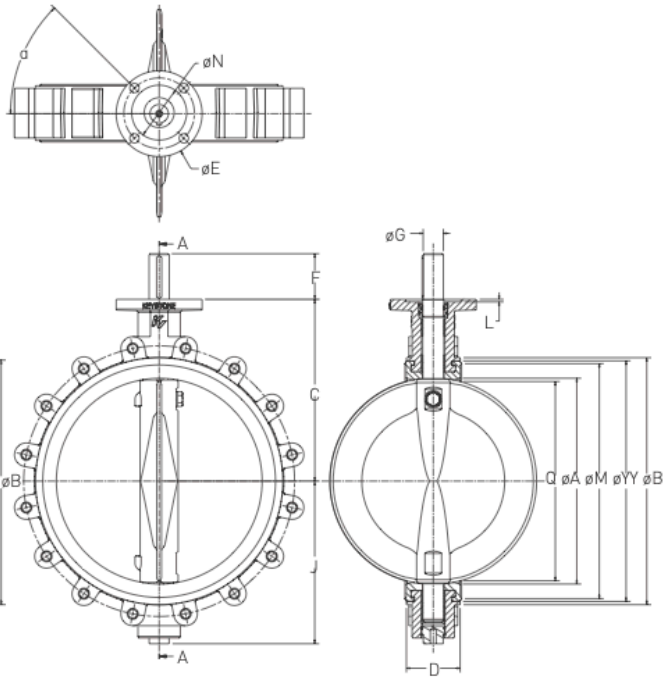
NOTES

1. 'Q' dimension is the minimum allowable pipe or flange inside diameter at the centered body face to protect the disc sealing edge against damage when opening the valve.
2. 'H' dimension refers to flat on shaft.
3. Weight may vary depending on trim materials used.
4. NPS 2 - actual shaft dimension is ½ in x ⅓ in A/F and is fitted with an adaptor to produce a BAC connection. Actual "F" dimension without Adapter is .98.
5. øYY dimension is to the outside of the seat.
6. øM dimension is to the O-ring seal.

SERIES GRL (LUG)
NPS 2-12



NPS 14-36



VALVE DIMENSIONS (in)

Size (NPS)	A	B	C	D	E	F	J	L	M	N	Q[1]	YY	Shaft G	Shaft H[2]	Shaft Key	Top plate drilling Bolt circle	Top plate drilling No. holes	Top plate drilling α	Top plate drilling Hole dia.	Adapt. code[4]	Weight[3] (lbs)
2	1.97	3.62	5.31	1.69	3.94	1.18	2.36	-	2.60	-	1.10	3.15	5/8	7/16	-	3¼	4	45°	0.43	BAC	7
2.5	2.44	4.13	5.91	1.81	3.94	1.18	2.99	-	3.07	-	1.70	3.66	9/16	3/8	-	3¼	4	45°	0.43	BAB	9
3	3.03	4.96	6.30	1.81	3.94	1.18	3.23	-	3.82	-	2.56	4.41	9/16	3/8	-	3¼	4	45°	0.43	BAB	10
4	3.90	6.14	7.09	2.05	3.94	1.18	4.09	-	5.08	-	3.43	5.67	5/8	7/16	-	3¼	4	45°	0.43	BAC	15
5	4.88	7.48	7.68	2.20	3.94	1.18	4.72	-	6.30	-	4.45	6.89	¾	½	-	3¼	4	45°	0.43	BAD	21.5
6	5.91	8.43	8.27	2.20	3.94	1.18	5.16	-	7.13	-	5.59	7.72	¾	½	-	3¼	4	45°	0.43	BAD	24
8	7.68	10.55	9.45	2.36	5.91	1.26	6.38	-	9.17	-	7.40	9.76	⅞	5/8	-	5	4	45°	0.53	CAE	38
10	9.65	12.60	10.83	2.68	5.91	1.97	7.80	-	11.42	-	9.33	12.01	1⅛	-	¼ x ¼	5	4	45°	0.53	CAF	65
12	11.46	14.76	12.20	3.07	5.91	1.97	9.06	-	13.39	-	11.14	13.98	1⅛	-	¼ x ¼	5	4	45°	0.53	CAF	90
14	12.80	16.38	12.80	3.07	5.90	2.99	10.24	-	14.88	-	12.51	15.67	1⅜	-	5/16 x 5/16	5	4	45°	0.53	CAG	115
16	14.96	18.66	14.17	4.02	5.90	2.99	11.73	-	17.13	-	14.50	17.91	1⅜	-	5/16 x 5/16	5	4	45°	0.53	CAG	194
18	17.09	21.02	15.55	4.49	8.00	2.99	13.15	0.24	19.49	5.12	16.58	20.28	1⅝	-	⅜ x ⅜	6½	4	45°	0.87	DAH	236
20	19.13	23.19	16.93	5.00	8.00	4.25	15.16	0.24	21.61	5.12	18.56	22.40	1⅞	-	½ x ⅜	6½	4	45°	0.87	DAJ	355
24	23.03	27.20	19.69	6.06	8.00	4.25	17.95	0.24	25.59	5.12	22.35	26.38	1⅞	-	½ x ⅜	6½	4	45°	0.87	DAJ	518
28	26.97	31.50	22.44	6.50	8.00	4.25	20.39	0.24	29.72	5.12	26.30	30.51	2¼	-	½ x ⅜	6½	4	45°	0.87	DAK	694
30	28.94	33.94	23.82	6.50	8.00	4.25	21.69	0.24	32.13	5.12	28.31	32.87	2¼	-	½ x ⅜	6½	4	45°	0.87	DAK	833
32	30.91	35.71	25.20	7.48	11.81	3.54	22.95	0.24	33.86	7.87	30.12	34.65	2⅞	-	¾ x ½	10	8	22.5°	0.69	KAV	966
36[5]	34.84	39.65	28.15	7.99	11.81	5.51	25.94	0.24	37.80	7.87	34.03	38.58	2⅞	-	¾ x ½	10	8	22.5°	0.69	KAV	1232

For ASME 125/150 - flange bolt threads for NPS 2-16 are UNC
- flange bolt threads for NPS 18-36 are 8UN

NOTES

1. 'Q' dimension is the minimum allowable pipe or flange inside diameter at the centered body face to protect the disc sealing edge against damage when opening the valve.
2. 'H' dimension refers to flat on shaft.
3. Weight may vary depending on trim materials used.
4. NPS 2 - actual shaft dimension is ½ in x ⅓ in A/F and is fitted with an adaptor to produce a BAC connection. Actual "F" dimension without the Adapter is .98.
5. Valve size NPS 36 is tapped flange design and has no separate lugs.
6. øYY dimension is to the outside of the seat.
7. øM dimension is to the O-ring seal.

KEYSTONE SERIES GR RESILIENT SEATED BUTTERFLY VALVES

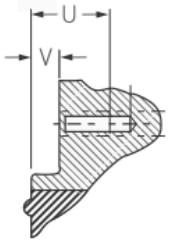
GRW/GRL - METRIC DATA

DIMENSIONS OF TAPPED FLANGE LOCATING HOLES (mm)

Size	Series GRW		Series GRL	
(DN)	U	V	U	V
700	45.5	5.5	45.5	5.5
750	52.5	12.5	45.5	5.5
800	60.0	20.0	45.5	5.5
900	54.5	6.5	54.5	6.5

Note: all holes in lugged version are through threaded, except the holes closest to top and bottom shaft.

SERIES GRW AND GRL



PRESSURE-TEMPERATURE DIAGRAM

Seat material*	Disc material**	Body material	Size range (DN)	Valve function Standard / End of Line	Temperature (°C) -40	-28	-20	-15	0	50	100	120	130	150	160
EPDM***	all	DI ASTM A536 CS ASTM A216 WCB	50-300	Std / EOL	16 bar / 10 bar										
EPDM	all	316 SS, Super Duplex, Duplex, DI ASTM A395	50-300	Std / EOL	16 bar / 10 bar										
NBR and white NBR	all	all	50-300	Std / EOL				16 bar / 10 bar							
HNBR	all	all	50-300	Std / EOL				16 bar / 10 bar							
FKM	all	all	50-300	Std / EOL				16 bar / 10 bar					10 bar / 6 bar		
EPDM***	all	DI ASTM A536 CS ASTM A216 WCB	350-900	Std / EOL	10 bar / 6 bar										
EPDM	all	316 SS, Super Duplex, Duplex, DI ASTM A395	350-600	Std / EOL	10 bar / 6 bar										
NBR	all	all	350-900	Std / EOL				10 bar / 6 bar							
HNBR	all	all	350-900	Std / EOL				10 bar / 6 bar							
FKM	all	all	350-900	Std / EOL				10 bar / 6 bar					6 bar / 4 bar		
EPDM E6	all	all	350-600	Std / EOL			16 bar / 10 bar								
NBR N8	all	all	350-600	Std / EOL				16 bar / 10 bar							

* All seat materials drop tight

** Per material listed in the material specification tables

***

For non-PED requirements with EPDM seats, valves can be rated to a minimum temperature of -40°C.
Maximum temperature for ductile iron disc/epoxy ctd. (DN 350-900) is 120°C.
Maximum temperature for ductile iron disc/nylon ctd. is 60°C.

FLOWRATE CO-EFFICIENTS - K_v VALUES

	Disc opening (degrees)								
Valve size (DN)	10°	20°	30°	40°	50°	60°	70°	80°	90°
50	0	0.9	4.8	14	30	47	72	99	108
65	0	2.4	11.0	27	50	78	123	172	217
80	0	6.0	28.0	55	91	141	215	304	409
100	0	14.0	57.0	109	177	265	407	600	807
125	0	28.0	85.0	158	250	389	630	964	1251
150	7	52.0	130.0	226	367	578	987	1551	1946
200	22	115.0	231.0	405	646	1029	1773	2910	3516
250	34	173.0	339.0	641	980	1546	2677	4449	5806
300	49	253.0	495.0	935	1430	2255	3905	6710	8910
350	119	304.0	637.0	1142	1936	3110	5010	8969	10407
400	155	397.0	832.0	1492	2529	4062	6544	11714	13592
450	196	503.0	1053.0	1888	3200	5141	8288	14826	17203
500	242	621.0	1300.0	2331	3951	6347	10224	18303	21238
600	349	894.0	1871.0	3357	5689	9140	14723	26357	30583
700	475	1216.0	2547.0	4569	7744	12440	20040	35875	41626
750	545	1396.0	2924.0	5245	8890	14281	23005	41183	47785
800	620	1589.0	3327.0	5968	10114	16248	26174	46857	54369
900	785	2011.0	4211.0	7553	12801	20564	33127	59303	68811

Note: K_v = The volume of water in m^3/hr that will pass through a valve with a pressure drop of 1 bar at 20°C.

MAXIMUM ALLOWABLE SHAFT TORQUES (Nm)

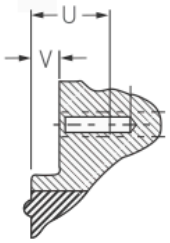
	Valve size (DN)																	
Shaft material	50	65	80	100	125	150	200	250	300	350	400	450	500	600	700	750	800	900
316SS	65	110	110	160	260	260	380	762	762									
431SS	90	155	155	230	365	365	650	1307	1307	1542	1824	2977	3219	5086	6312	7128	7088	14740
Duplex										1156	1368	2233	2414	3815	4734	5346	5316	11055
Super duplex	85	142	142	210	340	340	600	1200	1200	1413	1672	2729	2951	4366	5418	6118	6084	12652
Monel® K500	76	129	129	190	306	306	540	1080	1080	1284	1520	2481	2682	4239	5260	5907	5907	12283

DIMENSIONS OF TAPPED FLANGE LOCATING HOLES (in)

Size (NPS)	Series GRW		Series GRL	
	U	V	U	V
28	1.8	0.22	1.8	0.22
30	2.1	0.49	1.8	0.22
32	2.4	0.79	1.8	0.22
36	2.1	0.26	2.1	0.26

Note: all holes in lugged version are through threaded, except the holes closest to top and bottom shaft.

SERIES GRW AND GRL



PRESSURE-TEMPERATURE DIAGRAM

Seat material*	Disc material**	Body material	Size range (NPS)	Valve function Standard / End of Line	Temperature (°F) -40	-20	0	32	122	212	248	266	302	320
EPDM***	all	DI ASTM A536 CS ASTM A216 WCB	2-12	Std / EOL				230 psi /150 psi						
EPDM	all	316 SS, Super Duplex, Duplex, DI ASTM A395	2-12	Std / EOL				230 psi /150 psi						
NBR and white NBR	all	all	2-12	Std / EOL				230 psi /150 psi						
HNBR	all	all	2-12	Std / EOL				230 psi /150 psi						
FKM	all	all	2-12	Std / EOL				230 psi /150 psi				150 psi /90 psi		
EPDM***	all	DI ASTM A536 CS ASTM A216 WCB	14-36	Std / EOL				150 psi /90 psi						
EPDM	all	316 SS, Super Duplex, Duplex, DI ASTM A395	14-24	Std / EOL				150 psi /90 psi						
NBR	all	all	14-36	Std / EOL				150 psi /90 psi						
HNBR	all	all	14-36	Std / EOL				150 psi /90 psi						
FKM	all	all	14-36	Std / EOL				150 psi /90 psi				90 psi /60 psi		
EPDM E6	all	all	14-24	Std / EOL				230 psi /150 psi						
NBR N8	all	all	14-24	Std / EOL				230 psi /150 psi						

* All seat materials drop tight

** Per material listed in the material specification tables

***

For non-PED requirements with EPDM seats, valves can be rated to a minimum temperature of -40°F.
Maximum temperature for ductile iron disc/epoxy ctd. (NPS 14-36) is 248°F. Maximum temperature for ductile iron disc/nylon ctd is 140°F.

FLOWRATE CO-EFFICIENTS - C_v VALUES

Valve size (NPS)	Disc opening (degrees) 10°	20°	30°	40°	50°	60°	70°	80°	90°
2	0	1.0	6	16	35	54	83	114	125
2.5	0	2.8	13	31	58	90	142	199	251
3	0	7	32	64	105	163	249	351	473
4	0	16	66	126	205	306	471	694	933
5	0	32	98	183	289	450	728	1114	1446
6	8	60	150	261	424	668	1141	1793	2250
8	25	133	267	468	747	1190	2050	3364	4065
10	39	200	392	741	1133	1787	3095	5143	6712
12	57	292	572	1081	1653	2607	4514	7757	10301
14	138	351	736	1320	2238	3595	5792	10369	12031
16	179	459	962	1725	2924	4696	7565	13542	15713
18	227	582	1217	2183	3699	5943	9582	17140	19888
20	280	718	1503	2695	4568	7338	11820	21160	24553
24	403	1034	2163	3881	6577	10566	17021	30471	35356
28	549	1406	2945	5282	8953	14382	23168	41474	48123
30	630	1614	3380	6064	10277	16510	26595	47610	55243
32	717	1837	3846	6899	11692	18784	30259	54170	62854
36	908	2325	4868	8732	14799	23773	38297	68558	79550

Note: C_v = The volume of water in U.S.gpm that will pass through a valve with a pressure drop of 1 psi at 70°F.

MAXIMUM ALLOWABLE SHAFT TORQUES (in lbs)

Shaft material	Valve size (NPS) 2	2.5	3	4	5	6	8	10	12	14	16	18	20	24	28	30	32	36
316SS	575	975	975	1415	2300	2300	3360	6740	6740									
431SS	800	1370	1370	2035	3230	3230	5750	11570	11570	13650	16140	26350	29490	45010	55860	63100	62750	130500
Duplex										10230	12110	19760	21370	33770	41900	47300	47050	97900
Super duplex	750	1260	1260	1860	3010	3010	5310	10620	10620	12510	14800	24150	26115	38640	47950	54150	53850	112000
Monel® K500	670	1140	1140	1680	2710	2710	4780	9560	9560	11360	13450	21960	23740	37520	46550	52570	52280	108700

VALVE SEATING AND UNSEATING TORQUES (Nm)

Application	Valve size (DN)																	
ΔP (bar)	**50**	**65**	**80**	**100**	**125**	**150**	**200**	**250**	**300**	**350**	**400**	**450**	**500**	**600**	**700**	**750**	**800**	**900**
I																		
3.5	13	19	26	37	58	81	148	241	345	467	639	845	1089	1700	2494	2967	3495	4422
7	13	20	27	40	63	88	164	271	387	520	719	960	1248	1979	2943	3521	4169	5275
10	14	21	30	44	70	99	188	315	451	595	832	1123	1473	2373	3575	4302	5120	6479
14	15	23	33	49	80	113	219	374	536	-	-	-	-	-	-	-	-	-
16	15	25	36	51	85	120	235	403	578	-	-	-	-	-	-	-	-	-
3.5 (U/C)	8	11	16	22	35	49	89	145	207	280	383	507	653	1020	1497	1780	2097	2653
II																		
3.5	14	21	29	42	66	93	169	274	392	528	718	945	1212	1877	2736	3245	3811	4822
7	14	22	31	45	71	100	185	303	434	580	796	1058	1369	2153	3180	3793	4479	5667
10	15	23	33	49	78	111	208	347	498	652	906	1217	1590	2542	3804	4565	5419[1]	6858
14	16	26	36	54	88	125	240	406	583	-	-	-	-	-	-	-	-	-
16	17	27	38	56	93	132	255	436	626	-	-	-	-	-	-	-	-	-
3.5 (U/C)	8	13	17	25	40	56	101	164	235	317	431	567	727	1126	1642	1947	2287	2893
III																		
3.5	15	23	32	48	74	105	190	306	439	588	797	1045	1336	2055	2978	3523	4127	5222
7	16	24	34	50	79	112	206	336	481	639	874	1156	1490	2328	3417	4065	4788	6059
10	16	26	36	54	86	122	229	380	545	709	981	1312	1707	2710	4034	4828	5719[1]	7237
14	17	28	40	59	96	136	261	439	629	-	-	-	-	-	-	-	-	-
16	18	29	41	61	101	143	276	468	672	-	-	-	-	-	-	-	-	-
3.5 (U/C)	9	14	19	29	44	63	114	184	263	353	478	627	801	1233	1787	2114	2476	3133
IV																		
3.5	17	26	37	55	86	122	221	355	509	679	915	1195	1521	2322	3341	3940	4601	5822
7	18	27	39	58	91	129	237	384	551	728	990	1303	1671	2589	3772	4473	5252	6646
10	18	29	41	62	99	140	260	428	615	795	1094	1454	1883	2963	4378	5223	6168[1]	7805
14	19	31	45	67	108	154	292	487	700	-	-	-	-	-	-	-	-	-
16	20	32	46	69	113	161	307	517	742	-	-	-	-	-	-	-	-	-
3.5 (U/C)	10	16	22	33	52	73	133	213	305	408	549	717	913	1393	2005	2364	2761	3493

NOTES

3.5 U/C refers to reduced diameter disc option.

1. Duplex shaft not suitable for these conditions, use only 431 stainless steel or super duplex.

TORQUE APPLICATION FACTOR CATEGORIES

Application I

Clean liquid lubricating media (water, clean oils, lube oil, mineral oil, etc.); and with no deposit or chemical attack, valve operated at least once a week.
Temperature range from 0°C to maximum temperature rating of the elastomer seat.

Application II

Other liquid media and lubricating gases (aqueous liquids, such as food and beverage, water, etc.); and with minor deposit or chemical attack, valve operated at least once a month.
Temperature range from 0°C to maximum temperature rating of the elastomer seat.

Application III

a. Dry non-abrasive media or gases (non-abrasive powders and dry gas); or
b. Fluids with moderate deposit or chemical attack; or
c. Valves operated less than once a month.

Temperature range from 0°C to maximum temperature rating of the elastomer seat.

Application IV

a. Dry abrasive media and degreasing applications (sand, cement, silicone free, oxygen cleaned); or
b. Liquids with severe deposit; or
c. Valves not frequently operated (once a year).

All above with temperature range from -10°C to maximum temperature rating of the elastomer seat.

NOTES

1. For applications with temperatures above or below the guidelines above, please consult factory.
2. For dry service valves it is suggested to use U/C discs (reduced diameter) when service conditions are less than 3.5 bar.

VALVE SEATING AND UNSEATING TORQUES (in lbs)

Application	Valve size (NPS)																	
ΔP (psi)	2	2.5	3	4	5	6	8	10	12	14	16	18	20	24	28	30	32	36
I																		
50	115	168	230	327	513	717	1310	2133	3054	4137	5654	7479	9635	15043	22076	26264	30933	39137
100	115	177	239	354	558	779	1452	2399	3425	4605	6363	8500	11048	17518	26045	31164	36899	46688
150	124	186	266	389	620	876	1664	2788	3992	5262	7360	9936	13038	21007	31641	38076	45315	57340
200	133	204	292	434	708	1000	1938	3310	4744	-	-	-	-	-	-	-	-	-
230	133	221	319	451	752	1062	2080	3567	5116	-	-	-	-	-	-	-	-	-
50 (U/C)	69	101	138	196	308	430	786	1280	1832	2482	3393	4487	5781	9026	13246	15758	18560	23482
II																		
50	124	186	257	372	584	823	1496	2425	3469	4673	6354	8364	10728	16617	24218	28723	33731	42679
100	124	195	274	398	628	885	1637	2682	3841	5129	7048	9366	12118	19059	28142	33572	39638	50155
150	133	204	292	434	690	982	1841	3071	4408	5770	8023	10775	14074	22498	33670	40404	47966 [1]	60695
200	142	230	319	478	779	1106	2124	3593	5160	-	-	-	-	-	-	-	-	-
230	150	239	336	496	823	1168	2257	3859	5541	-	-	-	-	-	-	-	-	-
50 (U/C)	74	112	154	223	350	494	897	1455	2082	2804	3812	5018	6437	9970	14531	17234	20239	25607
III																		
50	133	204	283	425	655	929	1682	2708	3885	5208	7053	9249	11821	18191	26361	31183	36529	46220
100	142	212	301	443	699	991	1823	2974	4257	5654	7733	10233	13188	20600	30239	35979	42378	53622
150	142	230	319	478	761	1080	2027	3363	4824	6277	8685	11614	15109	23989	35700	42734	50617 [1]	64050
200	150	248	354	522	850	1204	2310	3885	5567	-	-	-	-	-	-	-	-	-
230	159	257	363	540	894	1266	2443	4142	5948	-	-	-	-	-	-	-	-	-
50 (U/C)	80	122	170	255	393	558	1009	1625	2331	3125	4232	5550	7093	10915	15817	18710	21918	27732
IV																		
50	152	233	330	491	764	1081	1956	3141	4503	6012	8103	10577	13461	20552	29575	34872	40727	51533
100	157	242	344	513	807	1143	2095	3401	4878	6440	8760	11533	14794	22912	33385	39591	46487	58823
150	163	257	366	547	873	1237	2304	3792	5441	7038	9680	12872	16663	26226	38744	46229	54593 [1]	69083
200	171	275	394	591	959	1362	2582	4313	6191	-	-	-	-	-	-	-	-	-
230	175	285	408	613	1003	1425	2721	4574	6567	-	-	-	-	-	-	-	-	-
50 (U/C)	91	140	198	295	458	648	1174	1884	2702	3607	4862	6346	8076	12331	17745	20923	24436	30920

NOTES

50 U/C refers to reduced diameter disc option.

1. Duplex shaft not suitable for these conditions, use only 431 stainless steel or super duplex.

TORQUE APPLICATION FACTOR CATEGORIES

Application I

Clean liquid lubricating media (water, clean oils, lube oil, mineral oil, etc.); and with no deposit or chemical attack, valve operated at least once a week.
Temperature range from 32°F to maximum temperature rating of the elastomer seat.

Application II

Other liquid media and lubricating gases (aqueous liquids, such as food and beverage, water, etc.); and with minor deposit or chemical attack, valve operated at least once a month.
Temperature range from 32°F to maximum temperature rating of the elastomer seat.

Application III

a. Dry non-abrasive media or gases (non-abrasive powders and dry gas); or
b. Fluids with moderate deposit or chemical attack; or
c. Valves operated less than once a month.

Temperature range from 32°F to maximum temperature rating of the elastomer seat.

Application IV

a. Dry abrasive media and degreasing applications (sand, cement, silicone free, oxygen cleaned); or
b. Liquids with severe deposit; or
c. Valves not frequently operated (once a year).

All above with temperature range from 15°F to maximum temperature rating of the elastomer seat.

NOTES

1. For applications with temperatures above or below the guidelines above, please consult factory.
2. For dry service valves it is suggested to use U/C discs (reduced diameter) when service conditions are less than 50 psi.

VALVE SEATING AND UNSEATING TORQUES (Nm) - REINFORCED SEAT

	Valve size (DN)				
Differential pressure (bar)	**350**	**400**	**450**	**500**	**600**
I*					
10	851	1173	1563	2026	3198
14	986	1374	1849	2419	3876
16	1053	1474	1992	2615	4216
II*					
10	947	1298	1721	2221	3879
14	1081	1499	2007	2614	4157
16	1149	1599	2150	2810	4496
III*					
10	1297	1755	2300	2936	4509
14	1432	1956	2586	3329	5187
16	1499	2057	2729	3525	5526

NOTES

As the reinforced seat is intended for high pressure applications the base torque commences at 1000 kPa/10 bar.
Reinforced seats are suitable for:

- Severe vacuum application (use 10 bar torque values).
- High line velocities up to 12 m/s for liquids.
- Pressure testing during erection and commissioning.

TORQUE APPLICATION FACTOR CATEGORIES

Application I

Clean liquid lubricating media (water, clean oils, lube oil, mineral oil, etc.);
and with no deposit or chemical attack, valve operated at least once a week.
Temperature range from 0°C to maximum temperature rating of the elastomer seat.

Application II

Other liquid media and lubricating gases (aqueous liquids, such as food and beverage, water, etc.);
and with minor deposit or chemical attack, valve operated at least once a month.
Temperature range from 0°C to maximum temperature rating of the elastomer seat.

Application III

a. Dry non-abrasive media or gases (non-abrasive powders and dry gas); or
b. Fluids with moderate deposit or chemical attack; or
c. Valves operated less than once a month.

Temperature range from 0°C to maximum temperature rating of the elastomer seat.

NOTES

1. For applications with temperatures above or below the guidelines above, please consult factory.

VALVE SEATING AND UNSEATING TORQUES (in lbs) - REINFORCED SEAT

	Valve size (NPS)				
Differential pressure (psi)	**14**	**16**	**18**	**20**	**24**
I*					
150	7532	10382	13834	17932	28305
200	8727	12161	16365	21410	34306
230	9320	13046	17631	23145	37315
II*					
150	8382	11488	15232	19658	34332
200	9568	13267	17763	23136	36793
230	10170	14152	19029	24871	39793
III*					
150	11479	15533	20357	25986	39908
200	12673	17310	22886	29461	45904
230	13266	18204	24151	31196	48905

NOTES

As the reinforced seat is intended for high pressure applications the base torque commences at 150 psi.
Reinforced seats are suitable for:

- Severe vacuum application (use 150 psi torque values).
- High line velocities up to 34.9 f/s for liquids.
- Pressure testing during erection and commissioning.

TORQUE APPLICATION FACTOR CATEGORIES

Application I
Clean liquid lubricating media (water, clean oils, lube oil, mineral oil, etc.);
and with no deposit or chemical attack, valve operated at least once a week.
Temperature range from 32°F to maximum temperature rating of the elastomer seat.

Application II
Other liquid media and lubricating gases (aqueous liquids, such as food and beverage, water, etc.);
and with minor deposit or chemical attack, valve operated at least once a month.
Temperature range from 32°F to maximum temperature rating of the elastomer seat.

Application III
a. Dry non-abrasive media or gases (non-abrasive powders and dry gas); or
b. Fluids with moderate deposit or chemical attack; or
c. Valves operated less than once a month.
Temperature range from 32°F to maximum temperature rating of the elastomer seat.

NOTES

1. For applications with temperatures above or below the guidelines above, please consult factory.

SELECTION GUIDE

Example:						GRL	0100	- D0	A1	S2	E0	A1	K	- 00	000	00
Series																
GR																
Body style																
GRL	Lug															
GRW	Wafer															
Size																
0050	DN 50/NPS 2	**0200**	DN 200/NPS 8	**0500**	DN 500/NPS 20											
0065	DN 65/NPS 2½	**0250**	DN 250/NPS 10	**0600**	DN 600/NPS 24											
0080	DN 80/NPS 3	**0300**	DN 300/NPS 12	**0700**	DN 700/NPS 28											
0100	DN 100/NPS 4	**0350**	DN 350/NPS 14	**0750**	DN 750/NPS 30											
0125	DN 125/NPS 5	**0400**	DN 400/ NPS 16	**0800**	DN 800/NPS 32											
0150	DN 150/NPS 6	**0450**	DN 450/NPS 18	**0900**	DN 900/NPS 36											
Body																
D0	Ductile iron A536	**C0**	Carbon steel A216	**U0**	Duplex											
D3	Ductile iron A395	**S0**	Stainless steel A351	**V0**	Super Duplex											
Disc																
D0	Ductile iron - ENP (DN 50-300, NPS 2-12)			**S1**	304 stainless steel											
D1	Ductile iron - epoxy (DN 350-900, NPS 14-36)			**A1**	Aluminum bronze											
D2	Ductile iron - nylon ctd			**N0**	Nickel aluminum bronze											
D3	Ductile iron - FBE [3] ctd			**U0**	Duplex											
S0	316 stainless steel			**V0**	Super duplex[2]											
Shaft																
S0	316 stainless steel[1]			**U0**	Duplex											
S2	431 stainless steel			**V0**	Super duplex											
				M1	Monel® K500											
Seat																
E0	EPDM FG (NSF ANSI/61 and ACS)			**N8**	NBR reinforced (DN 350-600, NPS 14-24)											
E6	EPDM reinforced (DN 350-600, NPS 14-24)			**N9**	White NBR											
H1	HNBR			**F1**	FKM											
N0	NBR FG															
Flange drilling																
Single drilled lug and wafer						**Multi-drilled wafer**										
A1	ASME 125/150	**P1**	ISO 7005 PN 6			**M3**	ASME 150, AS 2129E									
AD	AS 4087 PN 16/AS2129 Table D*	**P2**	ISO 7005 PN 10			**M6**	ASME 150, AS 2129E, AS 4087 PN 16									
AE	AS2129 table E	**P3**	ISO 7005 PN 16													
J1	JIS B2210 - 10K	**PA**	PN 6/10/16													
J5	JIS B2210 - 5K	**PB**	PN 10/16													
Actuator mounting																
K	Keystone mount															
Actuation																
00	None			**G1**	Gear - blue											
H1	10 pos handle - blue			**G5**	Chainwheel - blue											
Special																
000	None			**C22**	NSF/ANSI std 61											
P04	Reduced disc for 50 dpi			**009**	Silicone free											
Coating																
00	Standard			**03**	C5M blue ctd body											
02	C3 blue ctd body															

NOTES

1. The standard shaft material is 431 stainless steel. 316 SS is only available as an option on DN 50-300 (NPS 2-12).
2. All disc screws will be of duplex except for super duplex disc which will have a super duplex disc screw.
3. FBE = Fusion bond epoxy
4. Carbon Steel and 316 Stainless Steel body material options are available up to and including DN 600 / NPS 24.

Other options are available on request. Please consult your local sales representative.

Monel® is a registered trademark of the Special Metals Corporation.

Blow-off Valves

Tags

MBV-6102
MBV-6202
MBV-6302
MBV-6402

EMERSON

KEYSTONE SERIES GR RESILIENT SEATED BUTTERFLY VALVES

MODEL CODE OPTIONS AND DESCRIPTIONS - NORTH AMERICA AND EUROPE ONLY

Model / Series		Size	End Connection	Drilling / Schedule	Face to Face	Pressure Rating		Body Material	Disc Material	Stem Material	Seat Material	Sealing Material	Mounting Type	Actuation Type		Optional Feature 1	Optional Feature ...		Actuation Option
GR	-	0200	L0	A1	00	16	-	D1	S00	S0	E0	00	K	B	-	NP1	TPZ	+	GS-001

MODEL / SERIES

Code	Description
GR	Series GR

SIZE

Code	Description
0020	DN 20 / NPS ¾
0025	DN 25 / NPS 1
0032	DN 32 / NPS 1¼
0040	DN 40 / NPS 1½
0050	DN 50 / NPS 2
0065	DN 65 / NPS 2½
0080	DN 80 / NPS 3
0100	DN 100 / NPS 4
0125	DN 125 / NPS 5
0150	DN 150 / NPS 6
0200	DN 200 / NPS 8
0250	DN 250 / NPS 10
0300	DN 300 / NPS 12
0350	DN 350 / NPS 14
0400	DN 400 / NPS 16
0450	DN 450 / NPS 18
0500	DN 500 / NPS 20
0600	DN 600 / NPS 24
0700	DN 700 / NPS 28
0750	DN 750 / NPS 30
0800	DN 800 / NPS 32
0900	DN 900 / NPS 36
1000	DN 1000 / NPS 40
1050	DN 1050 / NPS 42
1100	DN 1100 / NPS 44
1200	DN 1200 / NPS 48
1350	DN 1350 / NPS 54
1400	DN 1400 / NPS 56
1500	DN 1500 / NPS 60
1600	DN 1600 / NPS 64
1650	DN 1650 / NPS 66
1800	DN 1800 / NPS 72
ZZZZ	Special

END CONNECTION

Code	Description
L0	Lugged
W0	Wafer
F0	Flanged

DRILLING / SCHEDULE

Code	Description
A1	ASME 150
C2	AWWA C207 - UNC
MB	PN 6/10/16, ASME 150
M1	M1 - PN 10/16, ASME 150, BS E, JIS 10
M2	PN 10/16, ASME 150, BS E
PB	PN 10/16
P1	PN 6
P2	PN 10
P3	PN 16
ZZ	Special

FACE TO FACE

Code	Description
00	Standard (Refer to Product Literature)

PRESSURE RATING

Code	Description
04	3.5 bar / 50 psi
10	10 bar / 150 psi
16	16 bar / 230 psi
ZZ	Pressure Rating not Specified

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GR	-	0200	L0	A1	00	16	-	D1	S00	S0	E0	00	K	B	-	NP1	TPZ	+	GS-001

BODY MATERIAL

Code	Description
D1	Ductile Iron A536 65-45-12 / EN 5.3106 (JS1030)
D2	Ductile Iron EN-GJS-400-18-LT/A395 60-40-18
D3	Ductile Iron A395 60-40-18
D5	Ductile Iron EN-GJS-400-15
CQ	Carbon steel A216 WCB / EN 1.0619
SQ	Stainless Steel A351 CF8M / EN 1.4408
ZZ	Special

DISC MATERIAL

Code	Description
D01	Ductile Iron - ENP (NPS 2 - 12)
D02	Ductile Iron - Epoxy (NPS 14 - 72)
D03	Ductile Iron - Nylon
D04	Ductile Iron - FBE Blue
D07	Ductile Iron - Ebonite
U00	Duplex 2205
V00	Super Duplex 2507 (S32750)
S00	Stainless Steel 316
S10	Stainless Steel 304
A00	Aluminium Bronze
N00	Nickle Aluminium Bronze
ZZZ	Special

STEM MATERIAL

Code	Description
S0	Stainless Steel 316 (NPS 2 - 12)
S2	Stainless Steel 431
U0	Stainless Steel Duplex
V0	Super Duplex 2507 (S32750)
M1	Monel K500
ZZ	Special

SEAT MATERIAL

Code	Description
E0	EPDM - FG HT
E5	EPDM - WA3
E6	EPDM - Metal Reinforced
N0	NBR - FG
N7	NBR - DVGW-G
N9	NBR - White
N8	NBR - Metal Reinforced
F0	FKM - A
H1	HNBR
ZZ	Special

SEALING MATERIAL

Code	Description
00	Standard (Refer to Product Literature)

OPERATOR MOUNTING TYPE

Code	Description
I	ISO 5211
K	Keystone Design

ACTUATION TYPE

Code	Description
B	Bare Stem

OPTIONAL FEATURES

Code	Description
NP1	Additional 316 stainless steel tag
TPZ	Special hydrostatic test report

NOTE

For the full list of optional features, consult your local Emerson representative.

ADDITIONAL ACTUATION OPTIONS

Code	Description
HS-##	Standard handle[1]
GS-###	Standard gear[1]
PS-######	Standard pneumatic actuator[2]
HZ	Other handle[3]
GZ	Other gear operators[3]
PZ	Other pneumatic actuators[3]
EZ	Other electric actuators[3]

NOTES

1. Additional characters identify specific handle or gear. For the full list, consult the Handles and Gear Operators Addendum [VCREF-14325].
2. Additional characters identify actuator configuration.
3. Required operator, mounting and accessory part number(s) are specified per order acknowledgment.

NOTE

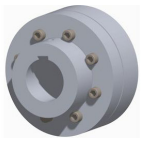
Consult your local Emerson representative for additional options.

Emerson.com/FinalControl

FLENDER

Data sheet FLENDER couplings N-EUPEX A 180.0

Foglio dati FLENDER couplings N-EUPEX A 180.0



Version according to the catalog MD 10.1
Esecuzione secondo catalogo MD 10.1

MLFB-Ordering data: **2LC0100-8AB99-0AA0**
L1F+M1E

Client order no. / *N. d´ordine del cliente*:
Order no. / *N. d´ordine Flender*:
Offer no. / *N. di offerta*:
Remarks / *Annotazione*:

Item no. / *N. di item*:
Consignment no. / *N. di commessa*:
Project / *Progetto*:

Product selection
Selezione prodotti

Series Serie	N-EUPEX	Torsional stiffness Rigidità di rotazione	Torsionally flexible Torsionalmente elastici
Type Forma costruttiva	A		
Size Grandezza	180.0		
Scope of supply Dotazione di fornitura	complete coupling Giunto completo		

Basic data 1)
Dati di base 1)

Rated coupling torque Coppia nominale del giunto	T_{KN}	880 Nm	permissible axial misalignment Ka 2)	ΔK_a	2 mm
Maximum coupling torque Coppia massima del giunto	T_{Kmax}	2,640 Nm	permissible radial misalignment Kr 3)	ΔK_r	0.3 mm
Coupling overload torque Coppia di sovraccarico del giunto	T_{KOL}	3,080 Nm	permissible angular misalignment Kw 3)	ΔK_w	0.1 °
Alternating coupling torque Coppia variabile del giunto	T_{KW}	132 Nm	Torsional stiffness, dynamic 4)	C_{Tdyn}	46 kNm/rad
Maximum coupling speed Numero di giri massimo del giunto	n_{Kmax}	3,800 min^{-1}			
Permissible ambient temperature Temperatura ambiente ammessa	T_a	-30°C ...80°C			
			Weight Peso		13.2 kg

Connection 1 part 1 5)
Collegamento 1 Parte 1 5)

Hub design Esecuzione del mozzo	finish bored con fori finiti
Bore diameter Diametro del foro	65 mm
Bore tolerance Tolleranza del foro	ISO H7
Shaft-hub connection Collegamento albero-mozzo	keyway acc. to DIN 6885-1 (JS9) Scanalatura per chiavetta secondo DIN 6885-1
Number of keyways, offset Numero di cave, offset delle cave	one keyway Una scanalatura per chiavetta
Axial locking Protezione assiale	with setscrew con vite di regolazione
Balancing principle Principio di equilibratura	balancing acc. to half feather key agreement Equilibratura in base alla semi-chiavetta

Connection 2 part 2 5)
Collegamento 2 Parte 2 5)

Hub design Esecuzione del mozzo	finish bored con fori finiti
Bore diameter Diametro del foro	60 mm
Bore tolerance Tolleranza del foro	ISO H7
Shaft-hub connection Collegamento albero-mozzo	keyway acc. to DIN 6885-1 (JS9) Scanalatura per chiavetta secondo DIN 6885-1
Number of keyways, offset Numero di cave, offset delle cave	one keyway Una scanalatura per chiavetta
Axial locking Protezione assiale	with setscrew con vite di regolazione
Balancing principle Principio di equilibratura	balancing acc. to half feather key agreement Equilibratura in base alla semi-chiavetta

Product-specific options
Opzioni specifiche del prodotto

Elastomer Elastomero	packs NBR 80 Shore A Elementi NBR 80 Shore A

Balance state
Stato equilibratura

Balancing quality Qualità di equilibratura	G 16 |n=1500 min^{-1} G 16 |n=1500 min^{-1}

Preservation Conservazione	cleaning emulsion - indoor storage up to 3 months

Corrosion protection Protezione contro la corrosione	Factory certificates Certificati di fabbrica
Paint coat[3)] Verniciatura[3)]	without paint finish Senza vernice

additional text
Testo aggiuntivo

Note
Nota

1) The formula symbols are defined in Catalog.
1) La definizione dei simboli è riportata nel Catalogo.

2) The permissible axial offset is applicable for offsets that slowly occur, e.g. as a result of thermal expansion of the coupled shaft
2) Il disassamento assiale vale per gli spostamenti che si verificano lentamente, dovuti ad es. alla dilatazione termica degli alberi a

3) Permissible shaft offset at rated speed n_N = 1500 min^{-1}
3) Disassamento dell'albero ammesso al numero di giri nominale n_N = 1500 min^{-1}

4) Torsional stiffness at 0.5 * TKN, excitation amplitude of 0.1 * TKN with 10 Hz, ambient temperature 20°C
4) Rigidità della molla di torsione a 0,5 * TKN, ampiezza di eccitazione di 0,1 * TKN con 10 Hz, temperatura ambiente 20°C

5) The orderer is responsible for verifying the design strength of the shaft-hub connection.
5) La prova di rigidità della struttura del giunto albero-mozzo spetta al committente.

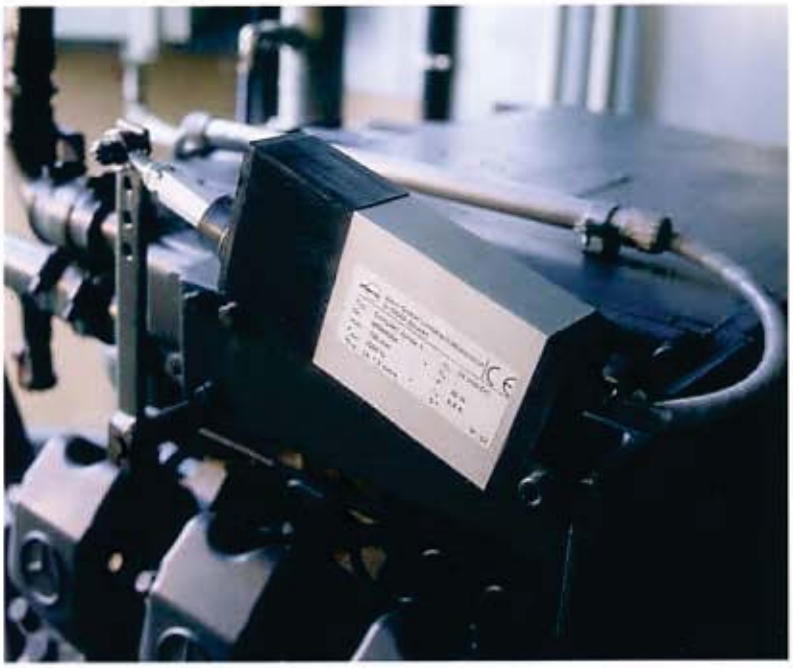
Linear actuators "Junior"

Technical data · Applications · Options

The linear actuators of the "Junior" series are versatile push-rod actuators used mainly for

- diesel engine gas adjustment
- metering equipment
- points switching
- tilting fixtures
- operation of shutters
- valve and slider operation

and many other applications.



The facts

	Junior 1	Junior 1/S	Junior 2
Load (N)	10–2000	50–4000	100–10000
Stroke speed (mm/s)	1.3–70	0.9–57	1.2–85
Standard stroke length (mm)	100	100	150
	(stroke length extension at 50 mm intervals)		
Operating voltage	24 V/DC		
Temperature range (°C)	-10 to +50		
Protection class	IP 54		
Double scraper ring	at piston outlet		
Piston rod	torsion-lock		
Cable length (m)	1.5		

Options

- Potentiometer for output of a stroke-dependent resistance value
- Encoder
- Adjustable articulated lug
- Rotatable articulated lug
- Spring-action articulated lug in pressure direction
- DIN 71752 clevis end
- DIN 648 joint rod head
- Operating voltage 12 V DC or 48 V DC

Junior 2 only

- Brake (not in combination with potentiometer or encoder)

Other mounting types, stroke lengths, stroke speeds, special voltages, circuit variants, cable types as well as additional equipment (protective sleeve, recirculating ball spindle, plug connections, etc.) on request.

"Our smallest models"

Load (N) and stroke speeds (mm/s)

Note:

All technical data are average values and are based on an ambient temperature of 20 °C.

Stroke speeds of direct current motors are load- and temperature-dependent. Exact characteristic curves (stroke speed - load) on request.

elero Junior 1

Version	Rating: S3 40%			Rating: S3 60%			Rating: S 1			Additional planetary gear stage	Max. stroke length
	Load N	Stroke speed mm/s	Nominal current A	Load N	Stroke speed mm/s	Nominal current A	Load N	Stroke speed mm/s	Nominal current A		
A	50	55	1.2								200
B	70	30	1.2								100
C	300	15	1.2	250	17	1.1	150	20	0.8		200
D	450	8	1.2	400	9	1.1	250	10	0.8		100
E	500	10	1.2	400	13	1.1	300	15	0.8		200
F	800	5	1.2	700	6	1.1	400	7.5	0.8		100
G	1100	4	1.2	1000	4.5	1.1	700	5.5	0.8	x	200
H	1600	2	1.2	1400	2.5	1.1	1000	2.7	0.8	x	100
I	1400	3	1.2	1200	3.5	1.1	900	4	0.8	x	200
J	1700	1.5	1.2	1400	1.7	1.1	1200	2	0.8	x	100
K	2000	2	1.2	2000	2	1.1	1500	2.6	0.8	x	200
L							2000	1.3	0.8	x	100

elero Junior 1/S

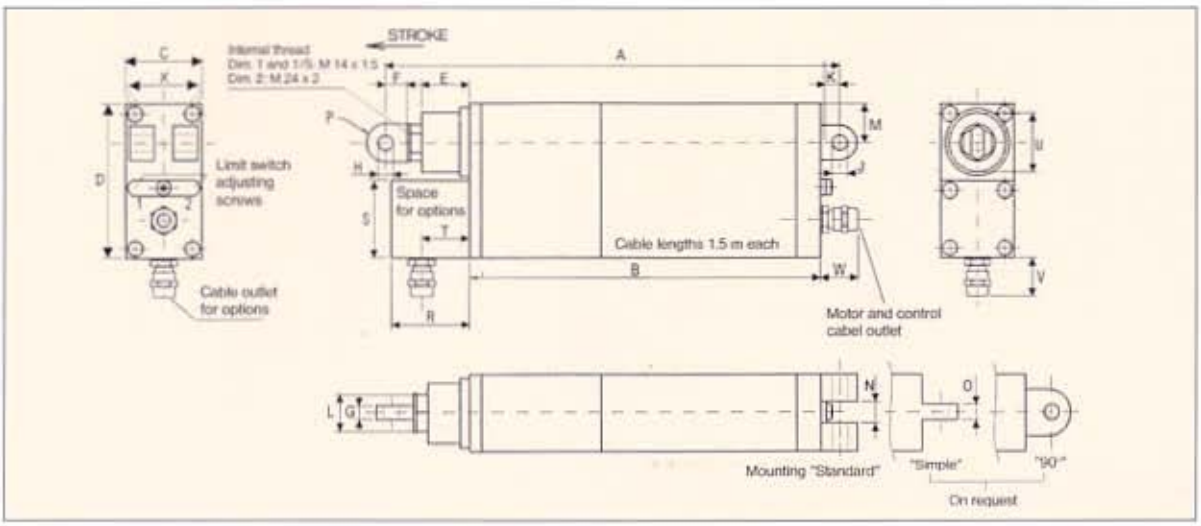
Version	Rating: S3 15%			Rating: S3 40%			Rating: S3 60%			Rating: S 1			Additional planetary gear stage	Max. stroke length
	Load N	Stroke speed mm/s	Nominal current A	Load N	Stroke speed mm/s	Nominal current A	Load N	Stroke speed mm/s	Nominal current A	Load N	Stroke speed mm/s	Nominal current A		
A	150	50	2.5											200
B	280	22	2.5											100
C	1000	11	2.5	850	12	2.0	700	13	1.8	450	14.5	1.3		200
D	1250	5.5	2.5	1050	6.2	2.0	900	6.5	1.8	600	7.5	1.3		100
E	1350	7.5	2.5	1100	9	2.0	950	9.5	1.8	700	10	1.3		200
F	1800	3.5	2.5	1500	4.5	2.0	1300	4.7	1.8	800	5.3	1.3		100
G	3500	2.5	2.5	3200	3	2.0	2800	3.2	1.8	2000	3.5	1.3	x	200
H	4000	1.5	2.5	3700	1.5	2.0	3500	1.6	1.8	2500	1.8	1.3	x	100
I	4000	2.1	1.8	4000	2.1	1.8	4000	2.1	1.8	2900	2.5	1.3	x	150
J										4000	1.2	1.3	x	100
K										4000	1.6	1.2	x	150
L										4000	0.9	1.1	x	100

elero Junior 2

Version	Rating: S3 15%			Rating: S3 40%			Rating: S3 60%			Rating: S 1			Available with brake only	Additional planetary gear stage	Max. stroke length
	Load N	Stroke speed mm/s	Nominal current A	Load N	Stroke speed mm/s	Nominal current A	Load N	Stroke speed mm/s	Nominal current A	Load N	Stroke speed mm/s	Nominal current A			
A	400	70	6.0										x		350
B	400	38	6.0										x		200
C	1000	19	6.0	700	21	4.7	450	24	4.2	200	26	3.0	x		350
D	1400	12	6.0	800	13	4.7	500	13.5	4.2	250	14	3.0	x		200
E	1800	14	6.0	1300	15	4.7	1000	16	4.2	600	17	3.0	x		350
F	2600	6.5	6.0	1700	7.5	4.7	1500	8	4.2	800	8.5	3.0			200
G	3000	5	6.0	2000	6	4.7	1800	6.2	4.2	1000	7	3.0		x	350
H	5000	3	6.0	4500	3.3	4.7	3800	3.5	4.2	2500	3.8	3.0		x	200
I	5300	3	6.0	4000	3.6	4.7	3500	3.7	4.2	2200	4.3	3.0		x	350
J	9000	1.8	6.0	8000	2	4.7	7000	2.1	4.2	4500	2.2	3.0		x	200
K	7500	2	6.0	6200	2.2	4.7	5700	2.3	4.2	3800	2.7	3.0		x	350
L	10000	1.2	6.0	8000	1.4	4.7	7000	1.4	4.2	5000	1.5	3.0		x	200

Technical data and dimensions

Linear actuators "Junior"



Dimension chart

Model	Stroke length	B**	C	D	E	F	G	H ⌀H8	J ⌀H8	K	L SW	M	N	O	P R	R	S □	T	U ⌀	V	W	X
Junior 1	100	172	40	80	25	12	7	8	8	8	17	20	11	8	10	41	40	25	31	17	17	40
	150	172	40	80	69	12	7	8	8	8	17	20	11	8	10	41	40	25	31	17	17	40
	200	172	40	80	117	12	7	8	8	8	17	20	11	8	10	41	40	25	31	17	17	40
Junior 1/S	100	175	47	94	22	12	7	8	8	9	17	23,5	12	12	10	41	47	23	31	17	17	40
	150	175	47	94	69	12	7	8	8	9	17	23,5	12	12	10	41	47	23	31	17	17	40
	200	175	47	94	117	12	7	8	8	9	17	23,5	12	12	10	41	47	23	31	17	17	40
Junior 2	150	211	56	112	40	18	16	12	10	11	26	28	19	15	14	43	56	29	44	17	26	56
	200	211	56	112	90	18	16	12	10	11	26	28	19	15	14	43	56	29	44	17	26	56
	250	211	56	112	140	18	16	12	10	11	26	28	19	15	14	43	56	29	44	17	26	56
	300	211	56	112	190	18	16	12	10	11	26	28	19	15	14	43	56	29	44	17	26	56
	350	211	56	112	240	18	16	12	10	11	26	28	19	15	14	43	56	29	44	17	26	56

Stroke lengths / adjustment range

Model	Stroke length	A* min.	A* max.	Adjustment range A* min.	Adjustment range A* max.
Junior 1	100	235	335	235–245	325–335
	150	285	435	285–295	425–435
	200	335	535	335–345	525–535
Junior 1/S	100	235	335	235–245	325–335
	150	285	435	285–295	425–435
	200	335	535	335–345	525–535
Junior 2	150	305	455	305–315	445–455
	200	355	555	355–365	545–555
	250	405	655	405–415	645–655
	300	455	755	455–465	745–755
	350	505	855	505–515	845–855

* With an adjustable articulated lug attached, dimension "A" increases by:
10 mm (for Junior 1 / Junior 1/S)
15 mm (Junior 2)

with a rotatable articulated lug by:
5 mm (all the models)

with a spring-action articulated lug by:
26 mm (Junior 1 / Junior 1/S)
29 mm (Junior 2)

with a clevis end by:
24 mm (clevis end G8 x 16 for Junior 1 / Junior 1/S)
34 mm (clevis end G12 x 24 for Junior 2)

with a DIN 648 joint rod head by:
28 mm (GISW 8 for Junior 1 / Junior 1/S)
36 mm (GISW 12 for Junior 2)

** With an additional planetary gear stage fitted, dimension "B" increases by:

13 mm (Junior 1)
15 mm (Junior 1/S / Junior 2)

MSX-U23-LCD-IN

SERIES MSX | MAGNESENSE® DIFFERENTIAL PRESSURE TRANSMITTER

MSX with optional LCD

BENEFITS/FEATURES

- **Read LCD values easier with rotatable 180° display**
- **Quick and easy wiring via the optional toolless terminal block**
- **Add safety to variety of applications with UL94 V-0 and plenum ratings**

APPLICATIONS

- Filter monitoring in air handler units
- Building pressure in pharmaceutical/semiconductor clean rooms
- Duct static pressure in commercial buildings
- Air velocity/flow in VAV systems

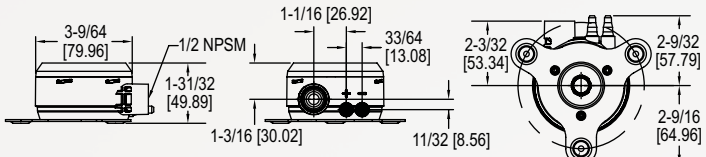
DESCRIPTION

The **Series MSX Magnesense® Differential Pressure Transmitter** combines the stability and versatility of the original Series MS2 Magnesense® II transmitter for use in building control applications. The MSX simplifies the ordering process to deliver the desired configuration, which reduces product setup time. Pressure ranges are available in Pa, mm w.c., and in w.c. All pressure ranges can be configured in unidirectional or bidirectional modes, providing a total of 32 ranges. The MSX transmitter can provide a linear pressure output or a linear velocity output with the square root extraction from the transmitter. Additional parameters have been included to expand the square root capability to calculate flow. Dual voltage and milliamp output signals can be used to provide both control and equipment output signal verification.

SPECIFICATIONS

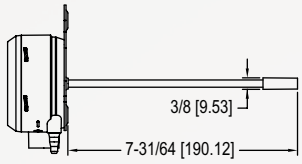
Service	Air and non-combustible, compatible gases.
Wetted Materials	Consult factory.
Accuracy	±1% FSO.
Stability	±1% FSO/year.
Temperature Limits	-4 to 158°F (-20 to 70°C).
Pressure Limits	Ranges 0 and 1: 3.6 psi max operation, 6 psi burst; Ranges 2 and 3: 6 psi max operation, 6 psi burst.
Power Requirements	10-36 VDC (2-wire), 17-36 VDC or isolated 21.6-33 VAC (3-wire).
Output Signals	4-20 mA (2-wire); 0-10 V or 0-5 V selectable (3-wire).
Response Time	Instantaneous (default) or 3 s (selectable).
Zero and Span Adjustments	Digital push-button.
Loop Resistance	Current output: 0-1250 Ω max; Voltage output: min. load resistance 1 kΩ.
Current Consumption	21 mA max continuous.
Electrical Connections	4-wire removable European style terminal block for 16 to 26 AWG.
Electrical Entry	1/2″ NPS thread.
Display (optional)	4 digit LCD.
Process Connections	1/8″, 3/16″, 1/4″, 5 mm, and 6 mm ID flexible tubing.
Enclosure Rating	NEMA 4X (IP66); UL 2043 (Plenum); UL94 V-0.
Mounting Orientation	Pressure sensor measurement unaffected by orientation.
Weight	8.0 oz (230 g).
Agency Approvals	CE.

DIMENSIONS

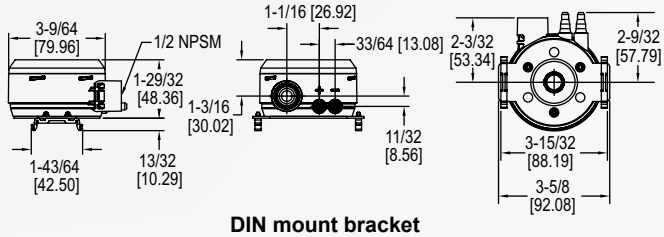


Wall mount bracket

[3] 3/16 [4.57] HOLES EQUALLY SPACED ON A 4-7/64 [104.53] BC

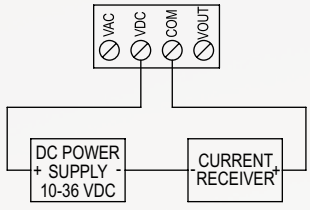


Duct mount bracket

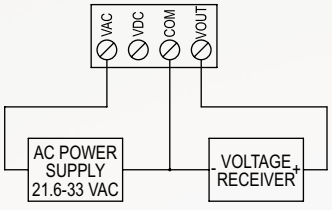


DIN mount bracket

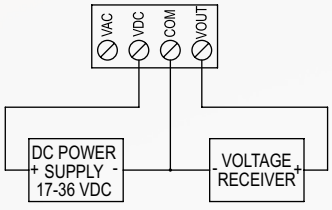
WIRING DIAGRAM



4-20 mA (DC supply only)



3-wire voltage (with AC supply)



3-wire voltage (with DC supply)

HOW TO ORDER

Use the **bold** characters from the chart below to construct a product code.

MSX **-W** **1** **3** **-IN** **-LCD**

SERIES
MSX: Magnesense® differential pressure transmitter

MOUNTING
-W: Wall mount
-U: Universal (wall or duct) mount
-N: DIN rail mount

DIRECTION
1: Unidirectional
2: Bidirectional

RANGE
0: .5 in w.c., 125 Pa, 12.5 mm w.c.
1: 1 in w.c., 250 Pa, 25 mm w.c.
2: 5 in w.c., 1250 Pa, 125 mm w.c.
3: 28 in w.c., 7000 Pa, 700 mm w.c.

OPTIONS
-A481: Installer kit
-FC: Factory calibration certificate
-FP: Filtered pickup with barb
-GLD: Liquid tight cable gland fitting
-LCD: Liquid crystal display
-NIST: NIST traceable calibration certificate
-STX: Two (2) plastic static pressure tips
-TT: Toolless terminal block
-WO: LCD cover without LCD display

PRESSURE UNIT
-IN: Inches water column
-PA: Pascal
-MM: Millimeters water column

ACCESSORIES

Model	Description
A-480	Plastic static pressure tip
A-481	Installer kit, includes 2 plastic static pressure tips and 7 ft (2.1 m) of PVC tubing
A-MSX-LCD	Replacement display for the Series MSX

ORDER ONLINE TODAY!

dwyer-inst.com/Product/SeriesMSX

DWYER INSTRUMENTS, INC.

Printed in U.S.A. 4/21

DS-MSX Rev. 3

Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Differential Pressure Across Blower
PMD55-AA22AD67GGJHA4A1A

Deltabar M PMD55

Differential pressure measurement
Differential pressure transmitter with metal sensor
Communication HART®

Application

The Deltabar M differential pressure transmitter is used for the following measuring tasks:

- Flow measurement (volume or mass flow) in conjunction with primary elements in gases, steam and liquids
- Level, volume or mass measurement in liquids
- Differential pressure monitoring, e.g. of filters and pumps

Your benefits

- Reference accuracy: 0.1%
  as PLATINUM version: up to 0.075%
- Turn down up to 100:1
- Compact transmitter design
- Quick commissioning via DIP switches
- Easy and safe menu-guided operation
  – local via display module
  – via 4 to 20mA with HART
- Continuous modularity for differential pressure, hydrostatic and pressure (Deltabar M, Deltapilot M Cerabar M), e.g.
  – replaceable display
  – universal electronics
- International usage thanks to a wide range of approvals

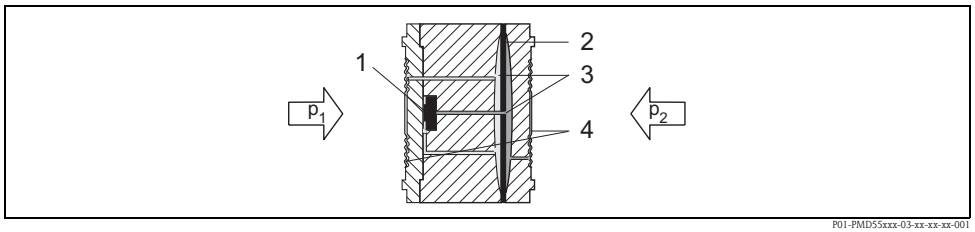
TI00434P/24/EN/13.10

Endress+Hauser
People for Process Automation

Table of contents

Function and system design

Measuring principle



P01-PMD55xxx-03-xx-xx-xx-001

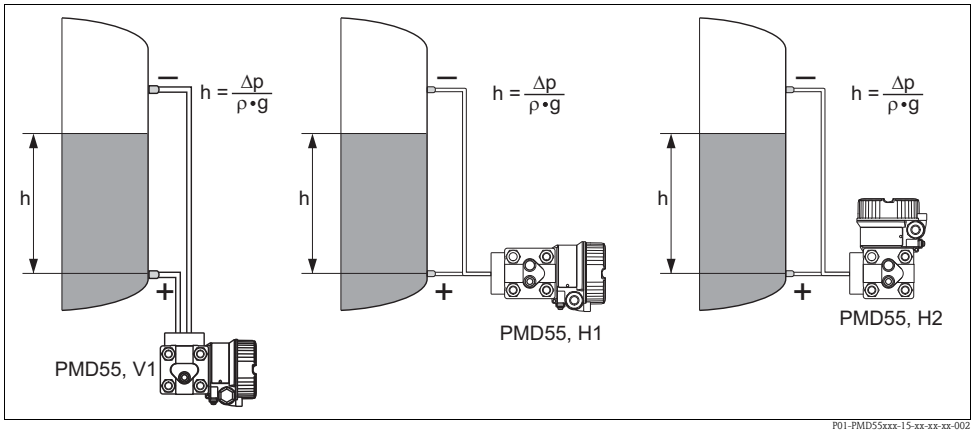
Measuring cell of the Deltabar M

1 Sensing element
2 Overload diaphragm/Middle diaphragm
3 Filling oil
4 Process isolating diaphragm

The separating diaphragms (4) are deflected on both sides by the acting pressures p_1 and p_2. A filling oil (3) transfers the pressure to a resistance circuit bridge (semi-conductor technology). The differential-pressure-dependent change of the bridge output voltage is measured and further processed.

Level measurement (level, volume and mass)

Design and operation mode



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Level measurement with Deltabar M;
left: V1 version; vertical impulse lines; 90° alignment
middle: H1 version; horizontal impulse lines; 180 ° alignment
right: H2 version; horizontal impulse lines; 90° alignment

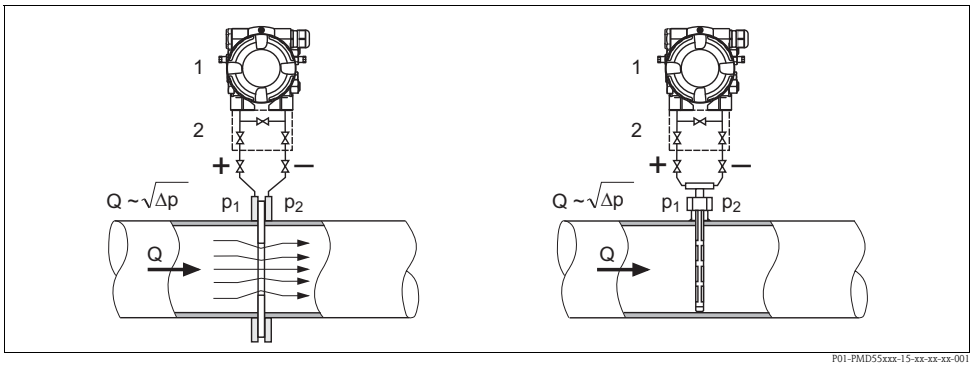
h Height (level)
Δp Differential pressure
ρ Density of the medium
g Gravitation constant

Your benefits

- Volume and mass measurements in any tank shapes by means of a freely programmable characteristic curve
- Choice of diverse level units
- Has a wide range of uses, e.g.
  - for level measurement in tanks with superimposed pressure
  - in the event of foam formation
  - in tanks with agitators of screen fittings
  - in the event of liquid gases
  - for standard level measurement

Flow measurement

Design and operation mode



Flow measurement with Deltabar M PMD55 and primary element, left: Orifice plate and right: Pitot tube

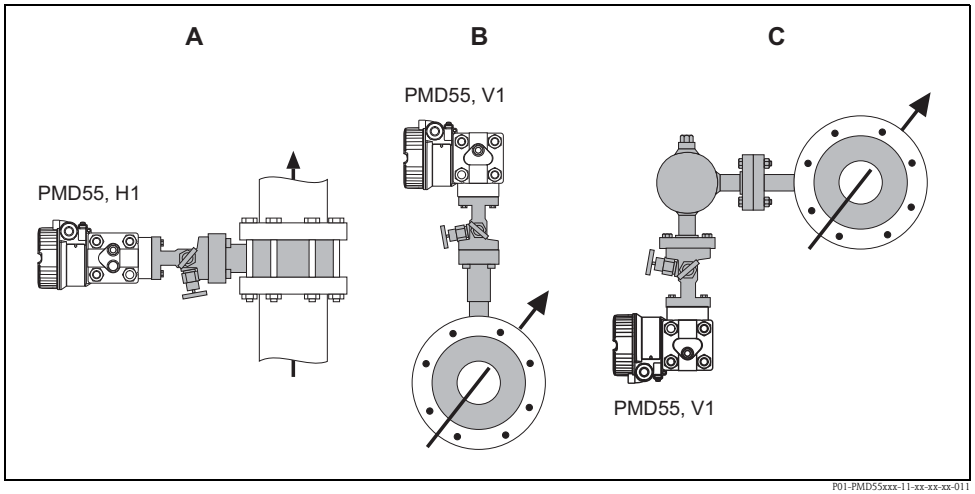
1 Deltabar M PMD55
2 3-valve manifold
Q Flow
Δp Differential pressure, $\Delta p = p_1 - p_2$

Your benefits

- Choice between five flow modes of operation:
  - Volume flow
  - Norm volume flow (European norm conditions)
  - Standard volume flow (American standard conditions)
  - Mass flow
  - %
- Choice of diverse flow units with automatic unit conversion.
- Low flow cut off: when activated, this function suppresses small flows which can lead to large fluctuations in the measured value.
- Contains two totalizers as standard. One totalizer can be reset to zero.
- The totalizing unit can be individually set for each totalizer. This allows independent daily and annual quantity totalizing.

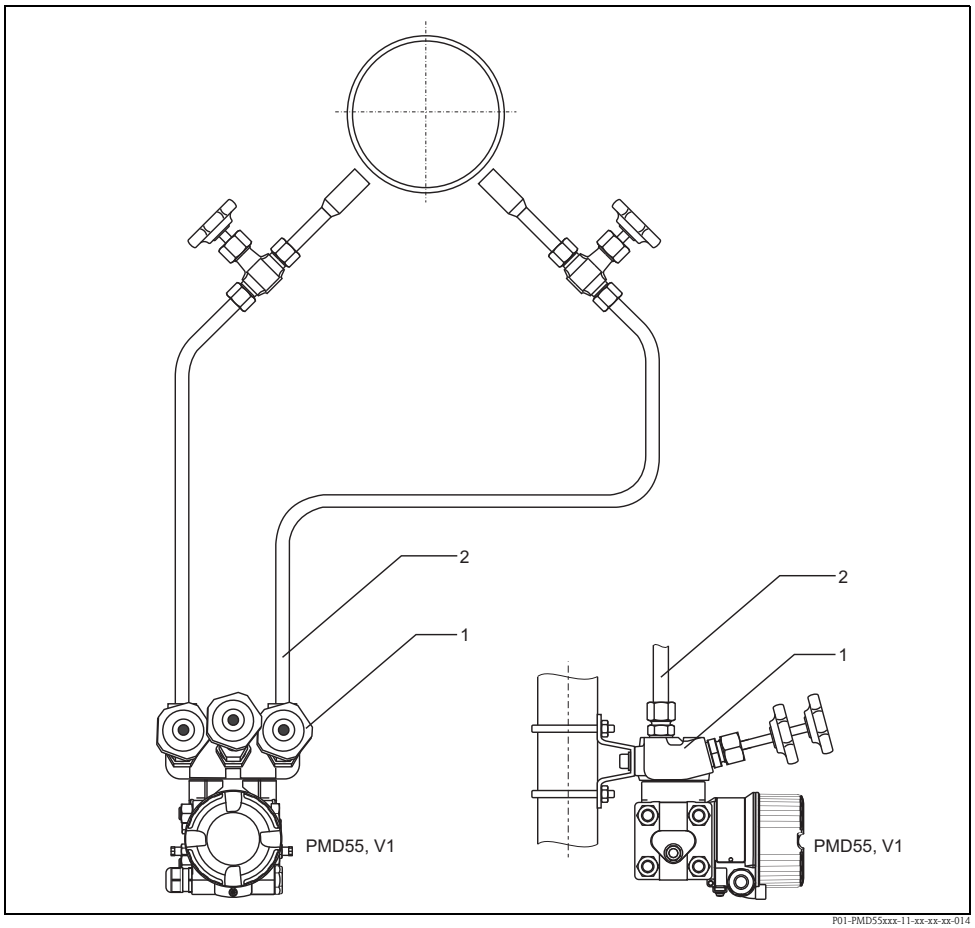
Note!
For more information about the Deltatop flow measurement system, see
- TI422P: Deltatop Differential Pressure Flow Measurement with Orifices
- TI425P: Deltatop Differential Pressure Flow Measurement with Pitot Tubes

Typical arrangements for flow measurements



A: liquid in vertical pipe; H1 version; horizontal impulse line; alignment 180°
B: gas in horizontal pipe; V1 version; vertical impulse line; alignment 90°
C: steam in horizontal pipe; V1 version; vertical impulse line; alignment 90°

Mounting example



1: Valve manifold
2: Impulse line

Input

Measured variable

Differential pressure, from which flow (volume or mass current) and level (level, volume or mass) are derived.

Measuring range

Nominal value	Measurement limit		Smallest span (factory calibration)[1]	MWP[2]	OPL[3]		Min. operating pressure[4]	Version in the Order Code[5] Feature 070
	lower (LRL)	upper (URL)			on one side	on both sides		
mbar (psi)	mbar (psi)	mbar (psi)	mbar (psi)	bar (psi)	bar (psi)	bar (psi)	$mbar_{abs}$ (psi_{abs})	
10 (0.15)	10 (0.15)	–10 (– 0.15)	0.5 (0.0075)	1 (15)	1 (15)	1.5 (22.5)	0.1 (0.0015)	7B
30 (0.45)	30 (0.45)	–30 (– 0.45)	1.5 (0.0225)	1 (15)	1 (15)	1.5 (22.5)	0.1 (0.0015)	7C
100 (1.5)	–100 (– 1.5)	+100 (+ 1.5)	5 (0.075)	160 (2400)	160 (2400)	240 (3600)	0.1 (0.0015)	7D
500 (7.5)	–500 (– 7.5)	+500 (+ 7.5)	25 (0.375)	160 (2400)	160 (2400)	240 (3600)	0.1 (0.0015)	7F
1000 (15)	-1000 (– 15)	+1000 (+ 15)	50 (0.75)	160 (2400)	160 (2400)	240 (3600)	0.1 (0.0015)	7G
3000 (45)	–3000 (– 45)	+3000 (+ 45)	150 (2.25)	160 (2400)	160 (2400)	240 (3600)	0.1 (0.0015)	7H
16000 (240)	–16000 (– 240)	+16000 (+ 240)	800 (12)	160 (2400)	160 (2400)	240 (3600)	0.1 (0.0015)	7L
40000 (600)	–40000 (– 600)	+40000 (+ 600)	2000 (30)	160 (2400)	160 (2400)	240 (3600)	0.1 (0.0015)	7M

1) Recommended Turn down: Max 100:1.
Factory calibration Turn down: Max 20:1, higher on request.

2) The MWP (maximum working pressure; MWP = PN) for the measuring device depends on the weakest element of the components selected with regard to pressure, i.e. the process connection has to be taken into consideration in addition to the measuring cell. Also observe the pressure-temperature dependency. For the appropriate standards and further information Page 22.

3) OPL: over pressure limit; depends on the lowest-rated element, with regard to pressure, of the selected components (Page 22).

4) The minimum operating pressure indicated in the table applies to silicone oil under reference operating conditions.
Minimum operating pressure at 85°C (185°F) for silicone oil: 10 mbar (0.15 psia)

5) See also chapter "Ordering information"

Explanation of terms

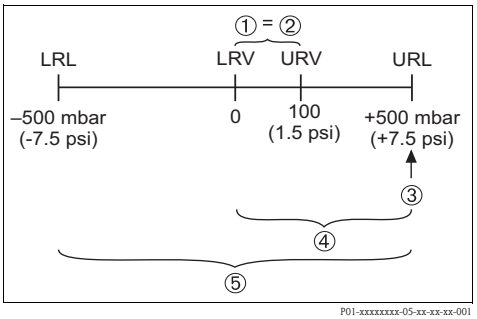
Explanation of the terms: Turn down (TD), set span and zero based span

Case 1:
- |Lower range value| ≤ |Upper range value|

Example:
- Lower range value (LRV) = 0 mbar
- Upper range value (URV) = 100 mbar (1.5 psi)
- Nominal value (URL) = 500 mbar (7.5 psi)

Turn down:
- TD = URL / |URV| = 5:1

set span:
- URV – LRV = 100 mbar (1.5 psi)
  This span is based on the zero point.



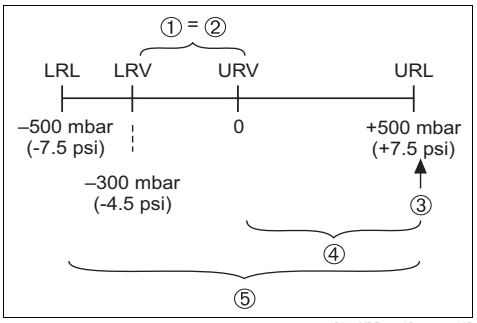
Example: 500 mbar (7.5 psi) sensor

Case 2:
- |Lower range value| ≥ |Upper range value|

Example:
- Lower range value (LRV) = –300 mbar (4.5 psi)
- Upper range value (URV) = 0 bar
- Nominal value (URL) = 500 mbar (7.5 psi)

Turn down:
- TD = URL / |(LRV)| = 1,67:1

set span:
- URV – LRV = 300 mbar (4.5 psi)
  This span is based on the zero point.



Example: 500 mbar (7.5 psi) sensor

1 Set span
2 Zero based span
3 Nominal value ≙ Upper range limit (URL)
4 Nominal measuring range
5 Sensor measuring range
LRL Lower range limit
URL Upper range limit
LRV Lower range value
URV Upper range value

Output

Output signal

4 to 20 mA with superimposed digital communication protocol HART 6.0, 2-wire

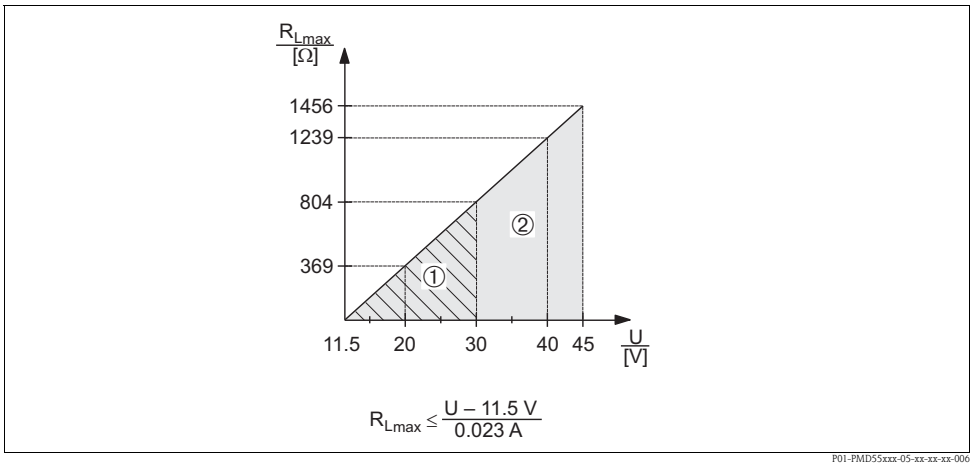
Signal range – 4 to 20 mA HART

3.8 mA to 20.5 mA

Signal on alarm

As per NAMUR NE 43
- 4 to 20 mA HART
  Options:
  – Max. alarm*: can be set from 21 to 23 mA (factory setting: 22 mA)
  – Keep measured value: last measured value is kept
  – Min. alarm: 3.6 mA

Load



Load diagram

1 Supply voltage 11.5 to 30 V DC for intrinsically safe instrument versions
2 Supply voltage 11.5 to 45 V DC (versions with plug-in connector 35 V DC) for other types of protection and for uncertified instrument versions
R_{Lmax} Maximum load resistance
U Supply voltage

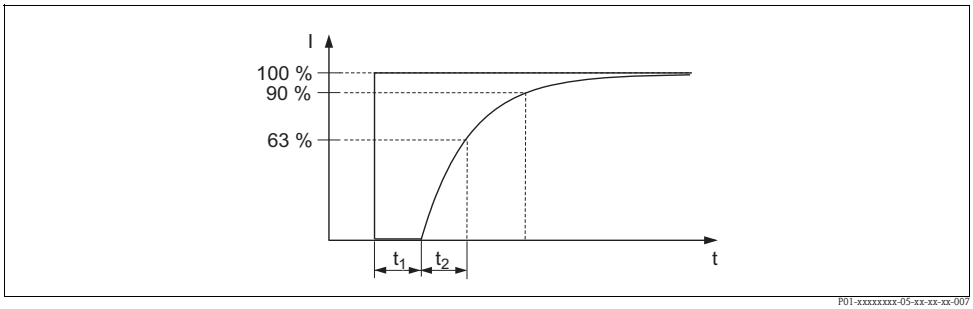
Note!
When operating via a handheld terminal or via PC with an operating program, a minimum communication resistance of 250 Ω must exist within the loop.

Resolution

- Current output: 1 µA
- Display: can be set (factory setting: presentation of the maximum accuracy of the transmitter)

Dynamic behavior: current output

Dead time, Time constant (T63)



Presentation of the dead time and the time constant

Measuring cell	Dead time[ms]	Time constant T63 (= t_2) [ms]
10 mbar (0.15 psi)	60	90
30 mbar (0.45 psi)		
100 mbar (1.5 psi)		
500 mbar (7.5 psi)		
1 bar (15 psi)		
3 bar (45 psi)		
16 bar (240 psi)		
40 bar (600 psi)		

Dynamic behavior: HART

Dead time, Time constant (T63)

Measuring cell	Dead time [ms]	Time constant T63 (= t_2) [ms]
10 mbar (0.15 psi)	370	90
30 mbar (0.45 psi)		
100 mbar (1.5 psi)		
500 mbar (7.5 psi)		
1 bar (15 psi)		
3 bar (45 psi)		
16 bar (240 psi)		
40 bar (600 psi)		

Reading cycle

HART commands: 2 to 3 per second on average.
The Deltabar M commands the BURST MODE function for cyclic value transmission via the HART communication protocol.

Cycle time (Update time)

On average 310 to 520 ms.

Response time

≤ 250 ms

Damping

A damping affects all outputs (output signal, display).

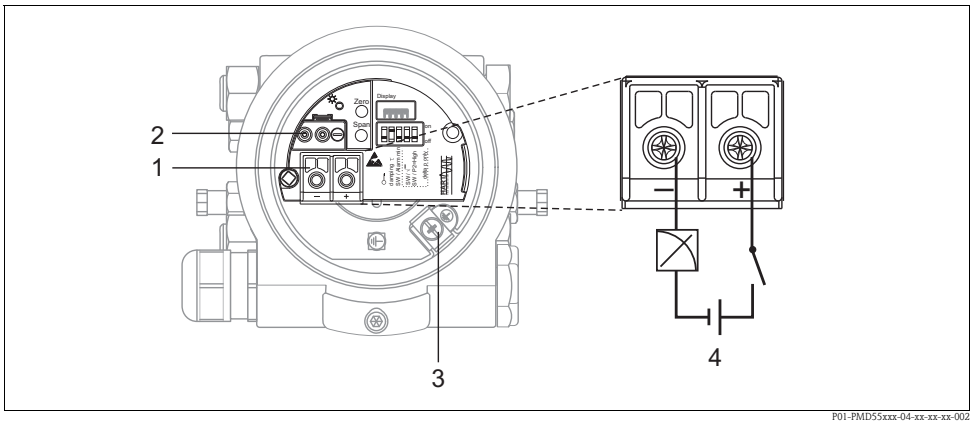
- Via on-site display, handheld terminal or PC with operating program, continuous from 0 to 999 s
- Via DIP-switch on the electronic insert, switch position "on" (= set value) and "off" (= damping switched off)
- Factory setting: 2 s

Power supply

Electrical connection

Note!
- When using the measuring device in hazardous areas, installation must comply with the corresponding national standards and regulations and the Safety Instructions or Installation or Control Drawings Page 36, section "Safety Instructions" and "Installation/Control Drawings".
- According to IEC/EN61010 a suitable disconnector has to be installed for the device.
- Devices with integrated overvoltage protection must be earthed.
- Protective circuits against reverse polarity, HF influences and overvoltage peaks are installed.

4 to 20 mA HART



P01-PMD55xxx-04-xx-xx-xx-002

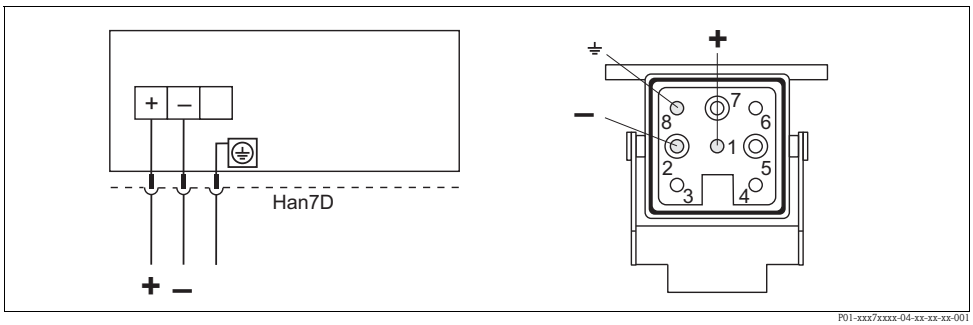
Electrical connection 4 to 20 mA HART

1 Terminals for supply voltage and signal
2 Test terminals
3 Grounding terminal
4 Minimum supply voltage: 11.5 VDC

Taking a 4 to 20mA test signal

A 4 to 20mA test signal may be measured via the test terminals without interrupting the measurement.

Devices with Harting plug Han7D



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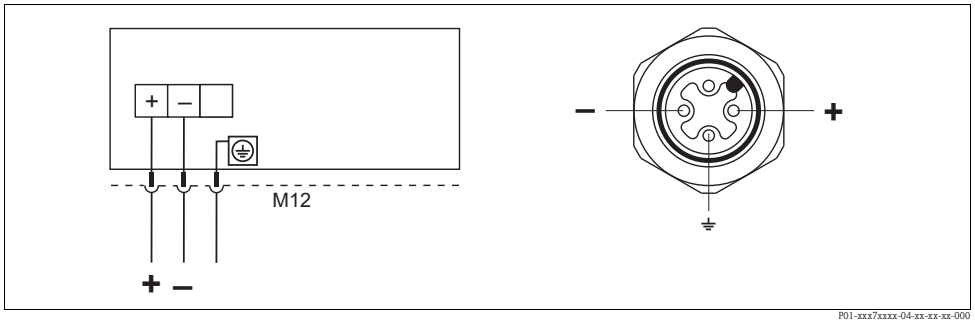
Left: electrical connection for devices with Harting plug Han7D
Right: view of the plug connector at the device

Devices with M12 plug



Left: electrical connection for devices with M12 plug
Right: view of the plug at the device

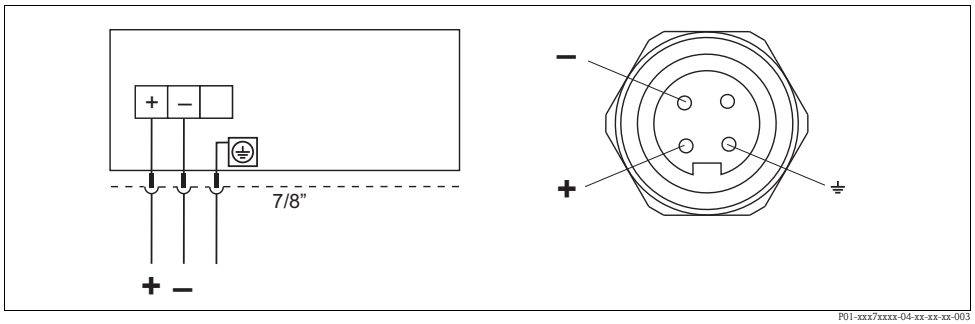
Endress+Hauser offers for devices with M12 plug the following accessories:

Plug-in jack M 12x1, straight
- Material: Body PA; coupling nut CuZn, nickel-plated
- Degree of protection (fully locked): IP67
- Order number: 52006263

Plug-in jack M 12x1, elbowed
- Material: Body PBT/PA; coupling nut Gd-Zn, nickel-plated
- Degree of protection (fully locked): IP67
- Order number: 51006327

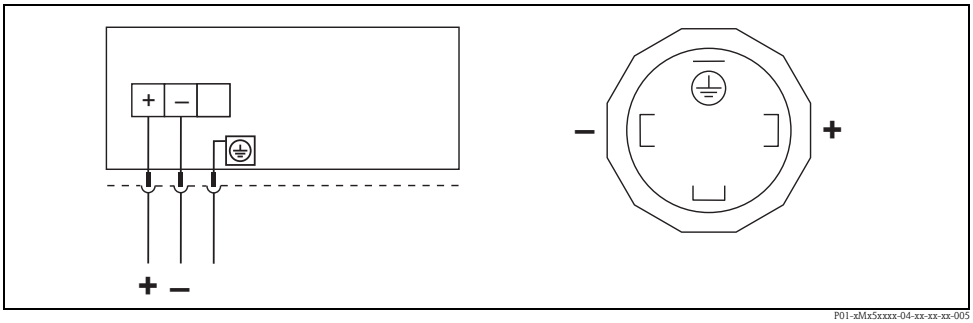
Cable 4x0.34 mm^2 with M12 socket, elbowed, screw plug, 5 m (16 ft) length
- Material: Body PUR; coupling nut CuSn/Ni; cable PVC
- Degree of protection (fully locked): IP67
- Order number: 52010285

Devices with 7/8" plug



Left: electrical connection for devices with 7/8" plug
Right: view of the plug at the device

Devices with valve plug



Left: electrical connection for devices with valve plug
Right: view of the plug at the device

Supply voltage

Note!
- When using the measuring device in hazardous areas, installation must comply with the corresponding national standards and regulations and the Safety Instructions or Installation or Control Drawings.
- All explosion protection data are given in separate documentation which is available upon request. The Ex documentation is supplied as standard with all devices approved for use in explosion hazardous areas Page 36, sections "Safety Instructions" and "Installation/Control drawing".

4 to 20 mA HART

Type of protection	Supply voltage
■ Intrinsically safe	11.5 to 30 V DC
■ Other types of protection ■ Devices without certificate	11.5 to 45 V DC (Versions with plug-in connection 35 V DC)

Start-up current HART

12 mA or 22 mA (selectable)

Cable entry

→ See product structure, Page 33, feature 050 "Electrical connection".

Cable specification

- Endress+Hauser recommends using shielded, twisted-pair two-wire cables.
- Terminals for wire cross-sections 0.5 to 2.5 mm^2 (20 to 14 AWG)
- Cable external diameter: 5 to 9 mm (0.2 to 0.35 in)

Residual ripple

Without influence on 4 to 20 mA signal up to ± 5 % residual ripple within the permitted voltage range [according to HART hardware specification HCF_SPEC-54 (DIN IEC 60381-1)]

Influence of power supply

≤ 0.001% of URL/V

Performance characteristics

Reference operating conditions

- As per IEC 60770 and IEC 61298-1, Sections 5 to 7
- Ambient temperature T_U = constant, in the range of: +21 +33°C (+70 to 91 °F)
- Humidity φ = constant, in the range of: 5...80 % r.H
- Ambient pressure p_U = constant, in the range of: 860 to 1060 mbar (12.47 to 15.37 psi)
- Position of the measuring cell: constant, in the range of: ±1° horizontically and ±1° vertically
- P1 = high pressure side
- Input of "Lo Trim Sensor" and "Hi Trim Sensor" for lower range value and upper range value
- Measuring span URV - LRV
- Membrane material 316L
- Filling oil: silicone oil
- Side flanges material: AISI 316L
- Supply voltage: 24 V DC ± 3 V DC
- Load with HART: 250 Ω

Reference accuracy

The reference accuracy comprises the non-linearity according to limit point setting, hysteresis and non-reproducibility as per IEC 60770.

The following applies for the root-extracting characteristic curve:
The accuracy data of the Deltabar M is taken into the accuracy calculation of the flow rate with a factor of 0.5.

Measuring cell	% of the set span	
	Standard	Platinum
10 mbar (0.15 psi) 30 mbar (0.45 psi)	■ TD 1:1 = ±0.2 ■ TD > 1:1 = ±(0.2 x TD)	in preparation
100 mbar (1.5 psi)	■ TD 1:1 to TD 4:1 = ±0.1 ■ TD > 4:1 = ±(0.012 x TD + 0.052)	■ TD 1:1 to TD 4:1 = ±0.075 ■ TD > 4:1 = ±(0.012 x TD + 0.027)
500 mbar (7.5 psi) 1 bar (15 psi) 3 bar (45 psi) 16 bar (240 psi) 40 bar (600 psi)	■ TD 1:1 to TD 10:1 = ±0.1 ■ TD > 10:1 = ±(0.0015 x TD + 0.085)	■ TD 1:1 to TD 10:1 = ±0.075 ■ TD > 10:1 = ±(0.0015 x TD + 0.060)

TD: Turn Down, Page 7

Thermal stability

Measuring cell	-10 to +60°C (+14 to +140°F)	-40 to -10°C, +60 to +85°C (–40 to +14°F, +140 to +185°F)
	% of the set span	
10 mbar (0.15 psi) 30 mbar (0.45 psi)	±(0.31 x TD + 0.5)	±(0.45 x TD + 0.45)
100 mbar (1.5 psi)	±(0.18 x TD + 0.31)	±(0.3 x TD + 0.36)
500 mbar (7.5 psi) 1 bar (15 psi) 3 bar (45 psi)	±(0.08 x TD + 0.32)	±(0.12 x TD + 0.36)
16 bar (240 psi)	±(0.10 x TD + 0.34)	±(0.15 x TD + 0.39)
40 bar (600 psi)	±(0.08 x TD + 0.32)	±(0.37 x TD + 0.34)

TD: Turn Down, Page 7

Influence of the static pressure

Measuring cell	Influence on zero point	Influence on span
10 mbar (0.15 psi)	±0.2 % v. URL / 1 bar	±0.2 % v. URL / 1 bar
30 mbar (0.45 psi)	±0.07 % v. URL / 1 bar	±0.07 % v. URL / 1 bar
100 mbar (1.5 psi)	±0.15 % of URL / 70 bar	±0.14 % of URL / 70 bar
500 mbar (7.5 psi) 1 bar (15 psi) 3 bar (45 psi) 16 bar (240 psi) 40 bar (600 psi)	±0.075 % of URL / 70 bar	±0.14 %of URL / 70 bar

Note!
The influence of the static pressure on the zero point can be calibrated out.

Total Performance

The "Total performance" specification comprises the non-linearity including hysteresis, non-reproducibility, the thermal change of the zero point as well as the influence of the line pressure p_{st}.
The line pressure p_{st} is
- 1 bar (15 psi) for the 10 mbar and 30 mbar measuring cell
- 70 bar (1050 psi) for the 100 mbar, 500 mbar, 1 bar, 3 bar, 16 bar und 40 bar measuring cell.

Measuring cell	% of the set span			
	Standard, TD 1:1		Platinum, TD 1:1	
	-10 to +60°C (14 to 140°F)	-40 to -10°C; +60 to +85°C (-40 to +14°F; 140 to 185°F)	-10 to +60°C (14 to 140°F)	-40 to -10°C; +60 to +85°C (-40 to +14°F; 140 to 185°F)
100 mbar (1.5 psi)	±0.18	±0.23	±0.17	±0.23
500 mbar (7.5 psi) 1 bar (15 psi) 3 bar (45 psi)	±0.13	±0.16	±0.12	±0.15
16 bar (240 psi)	±0.16	±0.24	±0.15	±0.23
40 bar (600 psi)	±0.13	±0.16	±0.12	±0.15

Long-term stability

Measuring cell	% of URL / 1 year	% of URL / 5 years
10 mbar (0.15 psi) 30 mbar (0.45 psi)	in preparation	
100 mbar (1.5 psi)	±0.18	±0.35
500 mbar (7.5 psi) 1 bar (15 psi) 3 bar (45 psi) 16 bar (240 psi) 40 bar (600 psi)	±0.05	±0.13

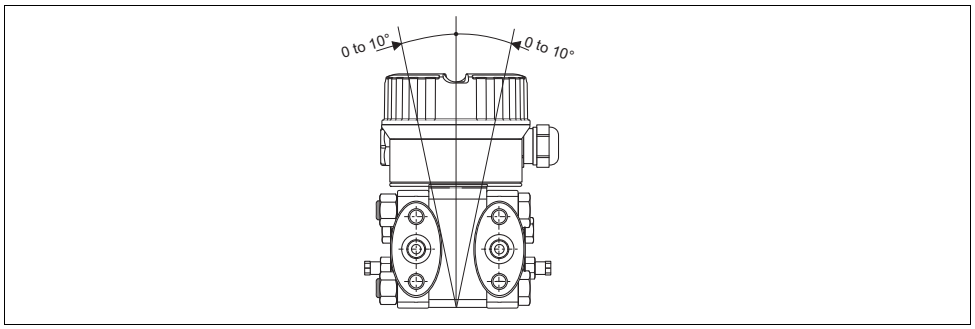
Total Error

Measuring cell	% of URL / 1 year	% of URL / 5 years
10 mbar (0.15 psi) 30 mbar (0.45 psi)	in preparation	
100 mbar (1.5 psi)	±0.26	±0.39
500 mbar (7.5 psi) 1 bar (15 psi) 3 bar (45 psi)	±0.14	±0.18
16 bar (240 psi)	±0.17	±0.20
40 bar (600 psi)	±0.14	±0.18

Influence of the installation position

The recommended maximum angle to the axis of the diaphragm is 10° and results in a measuring error of ±0.72 mbar (0.01 psi). The value is doubled for devices with inert oil.

Note!
Position-dependent zero shift can be corrected Page 16, section "General installation instructions".



P01-PMD55xxx-17-xx-xx-xx-001

Vibration effects

Test standard	Vibration effects
GL	≤ reference accuracy to 10 to18 Hz: ±4 mm (0.16 in); 18 to 500 Hz: 5 g
IEC 61298-3	≤ reference accuracy to 10 to 60 Hz: ±0.35 mm (0.01 in); 60 to 2000 Hz: 5 g

Warm-up period

4 to 20 mA HART : < 5 s

Operating conditions (Installation)

General installation instructions

- The position-dependent zero shift can be corrected directly at the device via operating keys.
- Endress+Hauser offers a mounting bracket for installing the device on pipes or walls Page 17, section "Wall and pipe mounting".
- When measuring in media with solid proportions, such as dirty liquids, installing separators and drain valves is useful for capturing and removing sediment.
- Using a three-valve or five-valve manifold allows for easy commissioning, installation and maintenance without interrupting the process.
- General recommendations for the impulse piping can be found in DIN 19210 "Methods for measurement of fluid flow; differential piping for flow measurement devices" or the corresponding national or international standards.
- Install the impulse piping with a continuous gradient of at least 10 %.
- When routing the impulse piping outdoors, ensure that sufficient anti-freeze protection is used, e.g. by using pipe heat tracing.

Measuring arrangement

Flow measurement

- Measuring arrangement for gases: Mount device above the measuring point.
- Measuring arrangement for liquids and steam: Mount device below tapping point.
- For flow measurement in steam, mount the condensate traps at the same level as the tapping point and at the same distance from Deltabar M.

Level measurement

Measuring arrangement level measurement in open tanks

- Mount device below the lower measuring connection. The low-pressure side is open to atmosphere pressure.

Measuring arrangement level measurement in closed tanks and closed tanks with superimposed steam

- Mount device below the lower measuring connection. Always connect the low-pressure side above the maximum level.
- In the case of level measurement in closed tanks with superimposed steam, a condensate trap ensures pressure which remains constant on the low-pressure side.

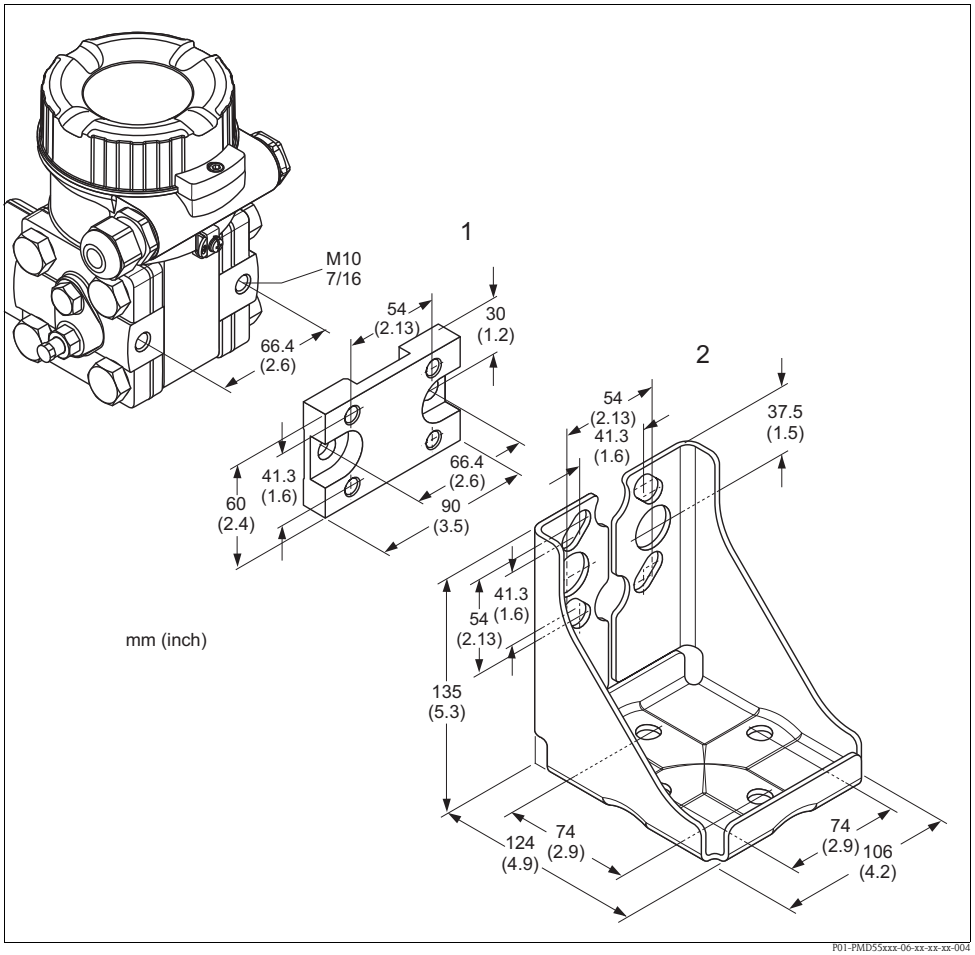
Pressure measurement

- Measuring arrangement for gases: Mount device above the measuring point.
- Measuring arrangement for liquids and steams: Mount device below tapping point.
- For differential pressure measurement in steam, mount the condensate traps at the same level as the tapping point and at the same distance from Deltabar M.

Wall and pipe-mounting (optional)

Endress+Hauser offers a mounting bracket for installing the device on pipes or walls. A bracket with mounting accessories for pipe mounting is included with the device.

Note!
When using a valve block, the block's dimensions must be taken into account.



Mounting bracket for wall and pipe mounting

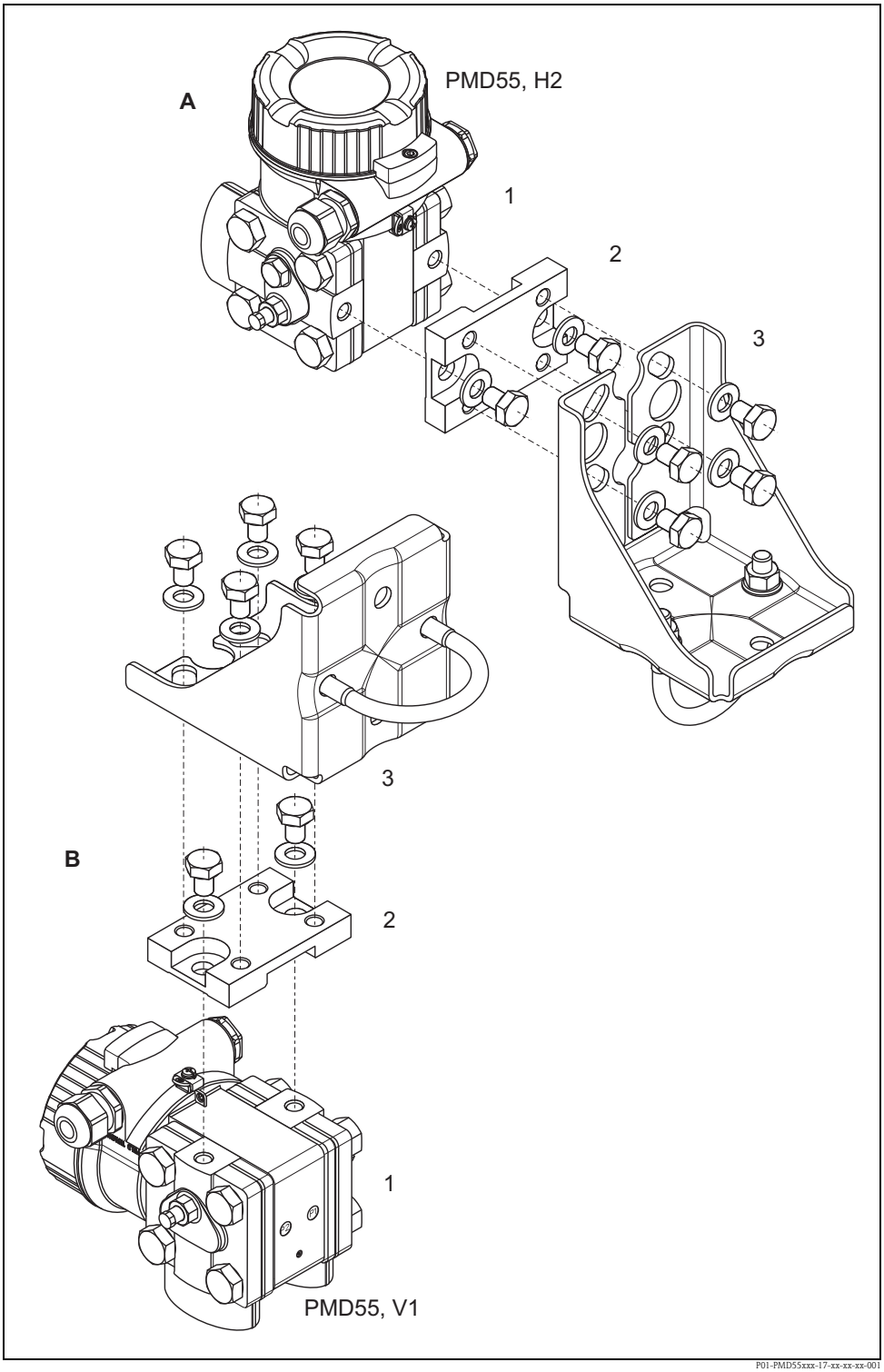
1 Adapter plate (+ six screws and six washers)
2 Mounting bracket (+ bracket for pipe mounting and two nuts)

Please note the following when mounting:
- To prevent the mounting screws from scoring, lubricate them with a multi-purpose grease prior to mounting.
- In the case of pipe mounting, the nuts on the bracket must be tightened uniformly with a torque of at least 30 Nm (22.1 lbf ft).

Ordering information:

- See Product structure Page 33: Feature 620 "Accessory Enclosed", option PB and PC
- As Accessorry:
  - Adapter plate 7/16 - 20 UNF part number: 71098632
  - Adapter plate M10 part number: 71101935
  - Mounting bracket and adapter plate 7/16 - 20 UNF part number: 71098630
  - Mounting bracket and adapter plate M10 part number: 71101934

Typical installation arrangements



A: Installation for horizontal impulse pipes; H2 version
B: Installation for vertical impulse pipes; V1 version
1: Deltabar M; 2: Adapter; 3: Mounting bracket

Oxygen applications

Oxygen and other gases can react explosively to oils, grease and plastics, such that, among other things, the following precautions must be taken:
– All components of the system, such as measuring devices, must be cleaned in accordance with the BAM (DIN 19247) requirements.
  Product structure (Page 33): Feature 570 "Service", option HB "Cleaned for oxygen service"
– Dependent on the materials used, a certain maximum temperature and a maximum pressure for oxygen applications must not be exceeded.

Option 190 "Seal"	P_{max} for Oxygen applications	T_{max} for Oxygen applications
A: FKM Viton	30 bar (450 psi)	-18 to +60°C (0 to 140°F)

Ultra pure gas applications

Endress+Hauser also offers devices for special applications, such as ultra pure gas, cleaned from oil and grease.
Product structure (Page 33): Feature 570 "Service", option HA "Cleaned from oil + grease".
No special restrictions regarding the process conditions apply to these devices.

Operating conditions (Environment)

Ambient temperature range

- –40 to +85°C (–40 to +185°F)
- Local display: -20 to +70°C (-4 to 158°F)
  Enhanced temperature range with limitations concerning display speed and contrast: -40 to +85°C (-40 to +185°F)

For devices for use in hazardous areas, see Safety instructions, Installation or Control Drawing Page 36, sections "Safety Instruction" and "Installation/Control drawings").

Storage temperature range

- –40 to +90°C (–40 to +194°F)
- Local display: –40 to +85°C (–40 to +185°F)

Degree of protection

Page 33, feature 050 "Electrical connection"

Climate class

Class 4K4H (air temperature: –20 to 55°C (–4 to +131°F), relative humidity: 4 to 100%) fulfilled as per DIN EN 60721-3-4 (condensation possible)

Vibration resistance

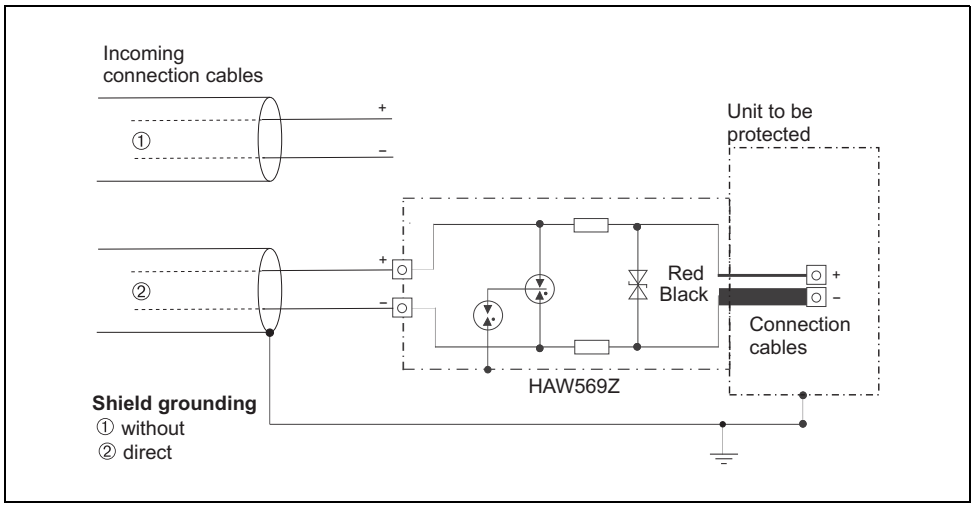
Device	Test standard	Vibration resistance
PMD55	GL	guaranteed for: 2 to 18 Hz: ±4 mm (0.16 in); 18 to 500 Hz: 5 g in all 3 planes
	IEC 61298-3	guaranteed for: 10 to 60 Hz: ±0.35 mm (0.014 in); 60 to 2000 Hz: 5 g in all 3 planes
PMD55 with mounting bracket	IEC 61298-3	guaranteed for: 10 to 60 Hz: ±0.15 mm (0.006 in); 60 to 500 Hz: 2 g in all 3 planes

Electromagnetic compatibility

- Electromagnetic compatibility as per all the relevant requirements of the EN 61326 series and NAMUR Recommendation EMC (NE21). Details can be found in the Declaration of Conformity (in the Download area of "www.de.endress.com", "search area - Approvals and Certificates", "Manufact. Declaration").
- Maximum deviation: < 0.5% of span
- Larger deviations possible with 10 mbar (0.15 psi) measuring cell.

Overvoltage protection (optional)

The device can be fitted with overvoltage protection, → 33 ff "Ordering information" feature 610 "Accessory mounted:" version "NA". The overvoltage protection is mounted at the factory on the housing thread (M20x1.5) for the cable gland and is approx. 70 mm (2.76 in) in length (take additional length into account when installing). The device is connected as illustrated in the following graphic.
For details refer to TI103R/09/EN, XA036R/09/A3 and KA161R/09/A6.



Operating conditions (Process)

Process temperature limits (temperature at transmitter)

- Process connections made of 316L SS:
  –40 to +85°C (–40 to +185°F)
- Process connections made of C22.8:
  –10 to +85°C (+14 to +185°F)

The process temperature at the transmitter can be reduced through the use of pulse lines.

Note!
- For oxygen applications, observe Page 19 "Oxygen applications" section.
- Observe the Process temperature range of the seal.
  → See also the following section "Process temperature range, Seals".

Process temperature range, Seals

Feature 190 of the order code[1]	Seal	Process temperature range[2]
A	FKM Viton	–20 to +85°C (–4 to +185°F)
C	PTFE	–40 to +85°C (–40 to +185°F)
F	NBR	–20 to +85°C (–4 to +185°F)
J	EPDM	–40 to +85°C (–40 to +185°F)

1) See product structure (Page 33)

2) Restricions for oxygen applications, Page 19

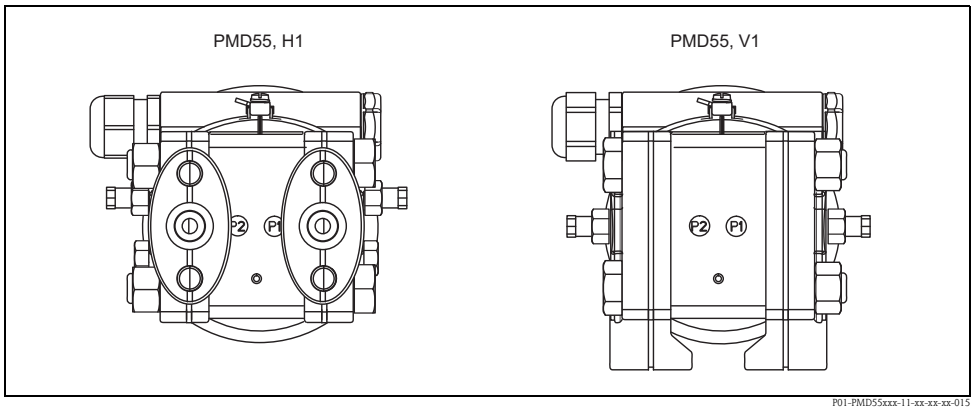
Pressure specifications

- The maximum pressure for the measuring device is dependent on the lowest-rated element with regard to pressure, see the following sections for this:
  – Page 6, section "Measuring range"
  – See chapter "Mechanical construction".
  The MWP (maximum working pressure) is specified on the nameplate. This value refers to a reference temperature of 20°C (68°F) or 100°F (38 °C) for ANSI flanges and may be applied to the device for an unlimited time. Observe pressure-temperature dependency.
- The pressure values permitted at higher temperatures can be found in the following standards:
  – EN 1092-1: 2001 Tab. 18
  – ASME B 16.5a – 1998 Tab. 2-2.2 F316
  – ASME B 16.5a – 1998 Tab. 2.3.8 N10276
  – JIS B 2220
- The MWP applies for the temperature ranges specified in the "Ambient temperature range" (Page 20) and "Process temperature limits" (see above) sections.
- The test pressure corresponds to the over pressure limit of the measuring instrument (Over pressure limits OPL = 1.5 x MWP) and may fit only temporally limited, so that no permanent damage develops.
- The Pressure Equipment Directive (EC Directive 97/23/EC) uses the abbreviation "PS". The abbreviation "PS" corresponds to the MWP (maximum working pressure) of the measuring device.
- In the case of sensor range and process connections where the OPL (Over Pressure Limit) of the pressure connection is smaller than the nominal value of the sensor, the device is set at the factory, at the very maximum, to the OPL value of the process connection. If you want to use the entire sensor range, select a process connection with a higher OPL value (1.5 x PN; PN = MWP).
- In oxygen applications, the values for "p_{max} and T_{max} for oxygen applications" Page 19, "Oxygen applications" may not be exceeded.

Mechanical construction

Process connection

Oval flange, connection 1/4-18 NPT IEC61518

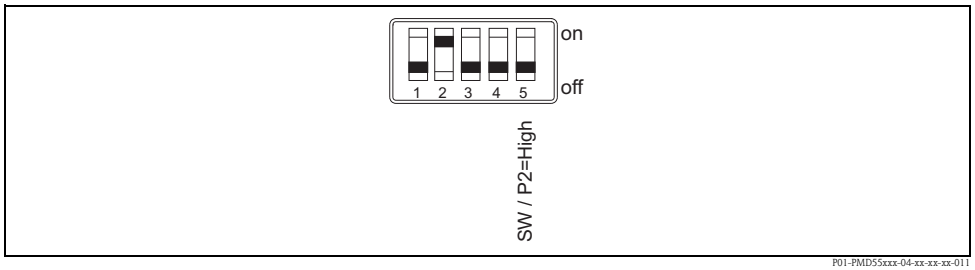


Designation of the process connections "P1" and "P2"

Factory setting

- P1: High pressure side (+)
- P2: Low pressure side (-)

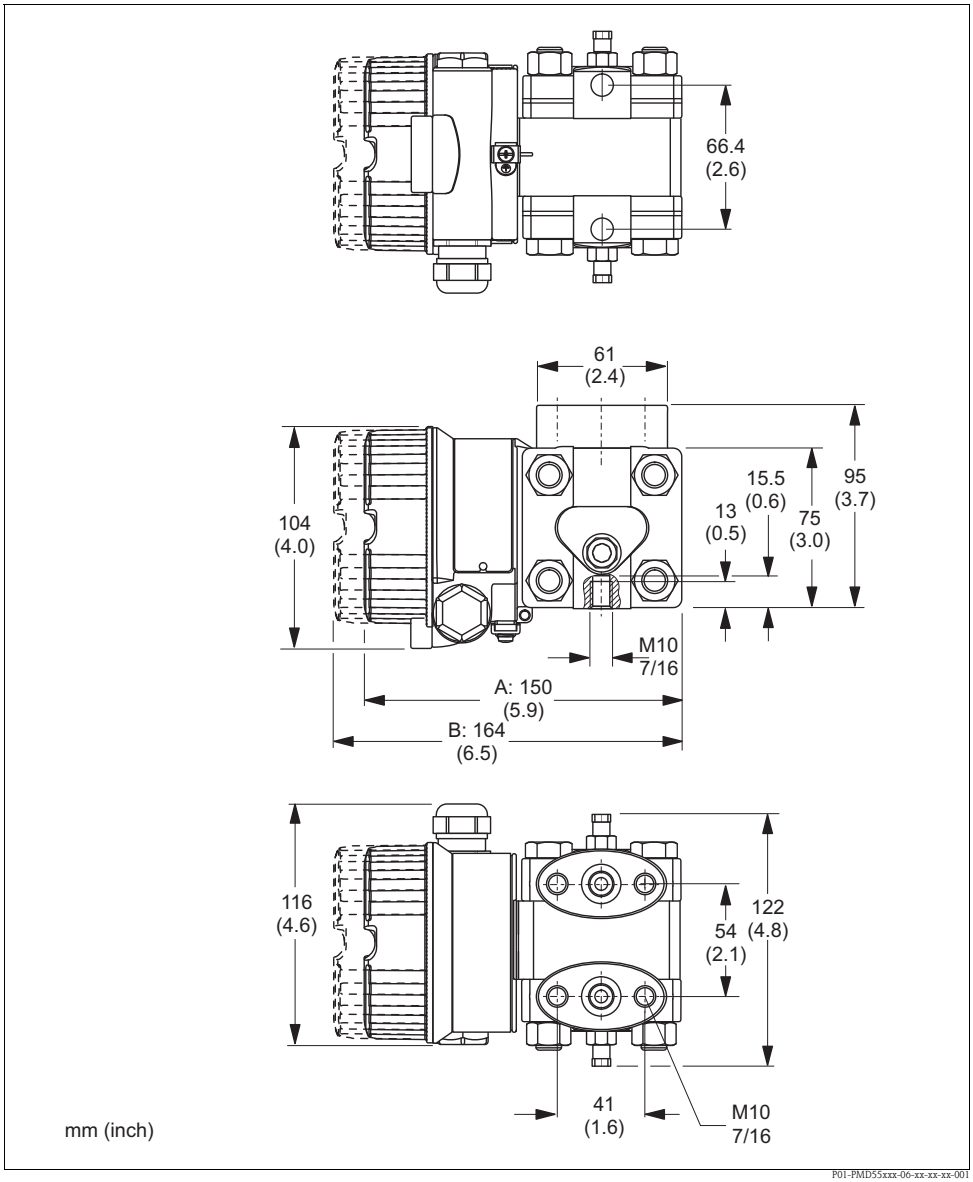
This setting can be changed via a DIP switch in the connection department of the instrument and via the operating menu:



DIP switches in the connection compartment of the device. DIP switch 5 defines the high pressure side.

- DIP5 = off: The high pressure side is defined in the operating menu.
  Menu "Setup", parameter 006: "High pressure side"; default: P1)
- DIP 5 = on: P2 is the high pressure side, independent of the setting in the operating menu.

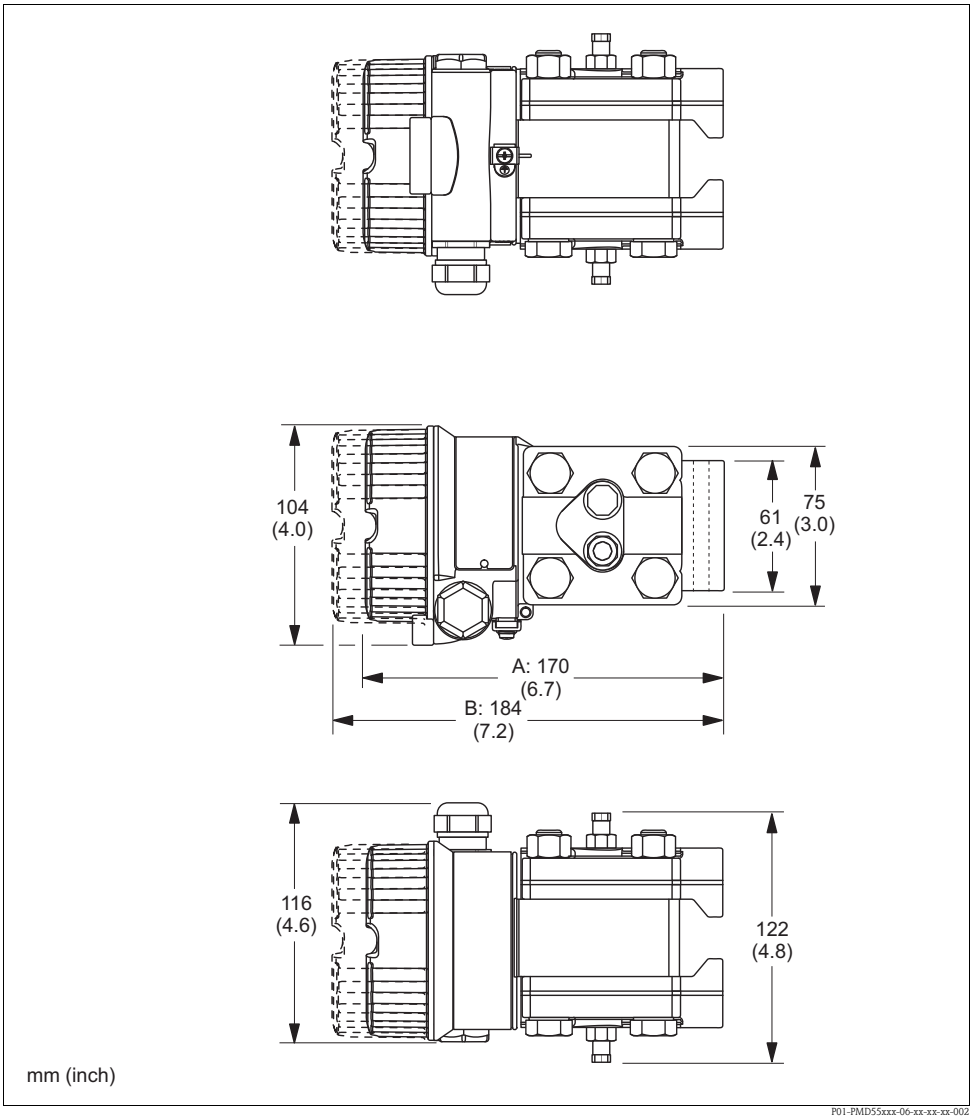
Dimensions V1 version; Impulse pipe vertical; alignment 90°



A: Version cover without window glass
B: Version cover with window glass

This drawing is valid for the following options in feature 110 ("Process Connection") of the product structure:
HAJ, HA4, HBJ, HB4

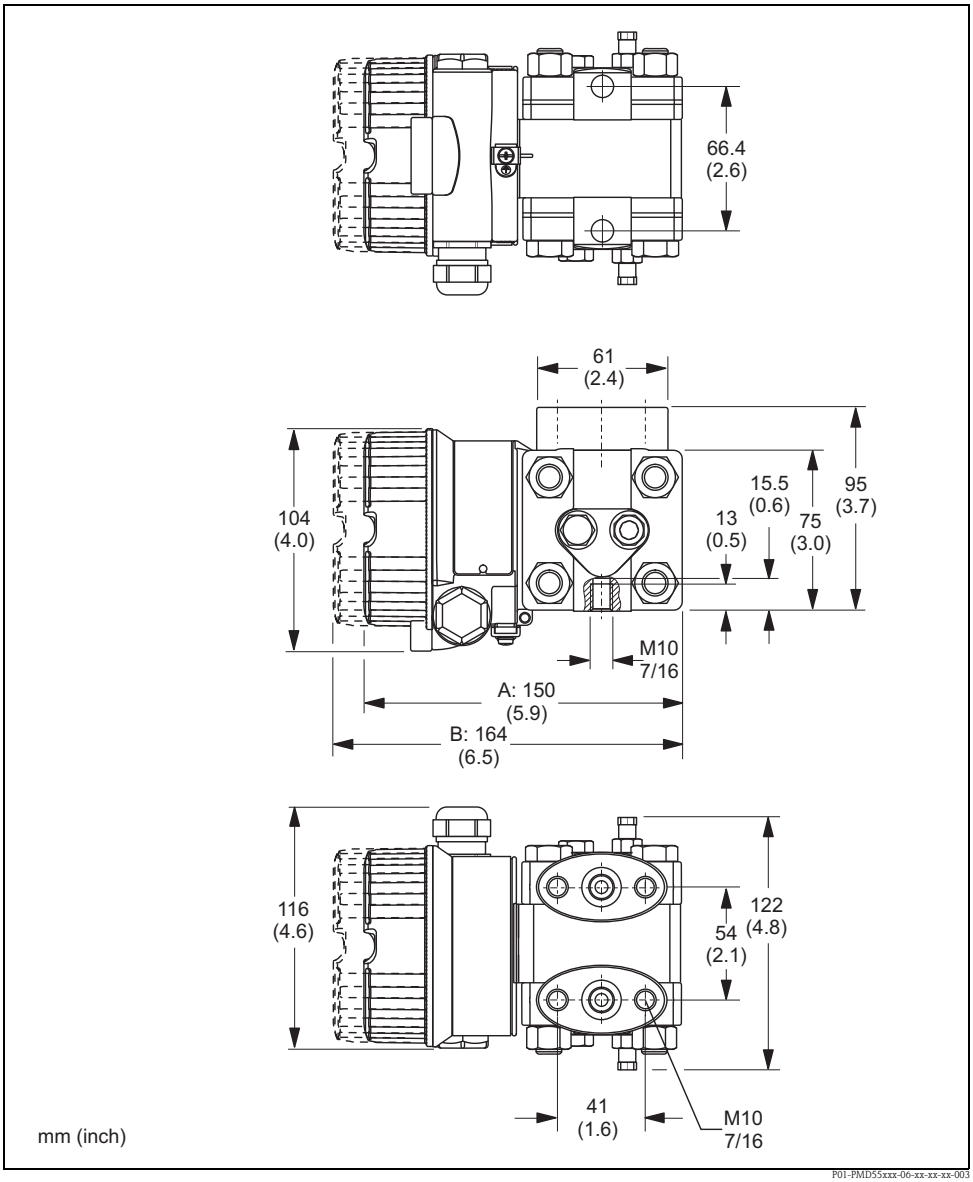
Dimensions H1 version; Impulse pipe horizontal; alignment 180°



A: Version cover without window glass
B: Version cover with window glass

This drawing is valid for the following options in feature 110 ("Process Connection") of the product structure:
HGJ, HG4, HHJ, HH4

Dimensions H2 version; Impulse pipe horizontal; alignment 90°



A: Version cover without window glass
B: Version cover with window glass

This drawing is valid for the following options in feature 110 ("Process Connection") of the product structure:
HNJ, HN4, HOJ, HO4

Weight

Housing

- including electronics and cover without window glass: 1.0 kg (2.21 lbs)
- including electronics and cover with window glass: 1.1 kg (2.43 lbs)

Process connections

in preparation

Material

Housing

- Die-cast aluminum with protective powder-coating on polyester basis: RAL 5012 (blue)

Cover

- Die-cast aluminum with protective powder-coating on polyester basis: RAL 7035 (gray)

Process connections

- in contact with process:
  - AISI 316L SS
  - C22.8
- not in contact with process: AISI 316 SS

Mounting bracket
- AISI 304 SS

Adapter plate
- AISI 304 SS

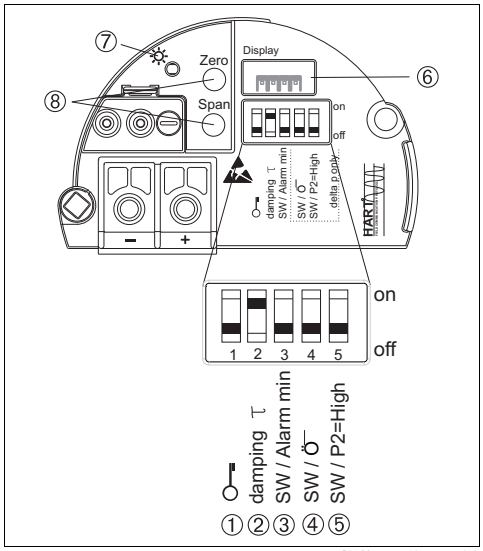
Oval flange adapter
- AISI 316L SS
- C22.8

Vent valves
- AISI 316L SS (1.4404)

Human interface

Local operation

Operating keys and elements located on the electronic insert



HART electronic insert

1 DIP switch for locking/unlocking parameters relevant to the measured value
2 DIP switch for switching damping on/off
3 DIP switch for alarm current SW / Alarm Min (3.6 mA)
4 DIP switch for defining operating mode and output characteristics
5 DIP switch for defining high pressure side
6 Slot for optional local display
7 Green LED to indicate successful operation
8 Operating keys for lower range value (zero) and upper range value (span)

Function of the DIP switches

Switch	Symbol/ label	Switching position	
		"off"	"on"
1	○–	The device is unlocked. Measured-valaue-relevant parameters can be changed.	The device is locked. Measured-value-relevant parameters can not be changed.
2	damping τ	The damping is switched off. The output signal reacts immediately to changes of the measured value.	The damping is switched on. The output signal reacts to changes of the measured value with the delay time τ.[1]
3	SW/Alarm min	The alarm current is as defined in the operating menu.	The alarm current is 3,6 mA irrespective of the setting in the operating menu.
4	SW/√	The output characteristics is as defined in the operating menu.	The output characterisitc is "Square root", irrespective of the settings in the operating menu.
5	SW/P2= High	The high pressure side is as defined in the operating menu.	The high pressure side is allocated to the P2 pressure connection, irrespective of the setting in the operating menu.

1) The value of the delay time can be set in the operating menu. Factory setting: τ = 2 s or as per order specifications.

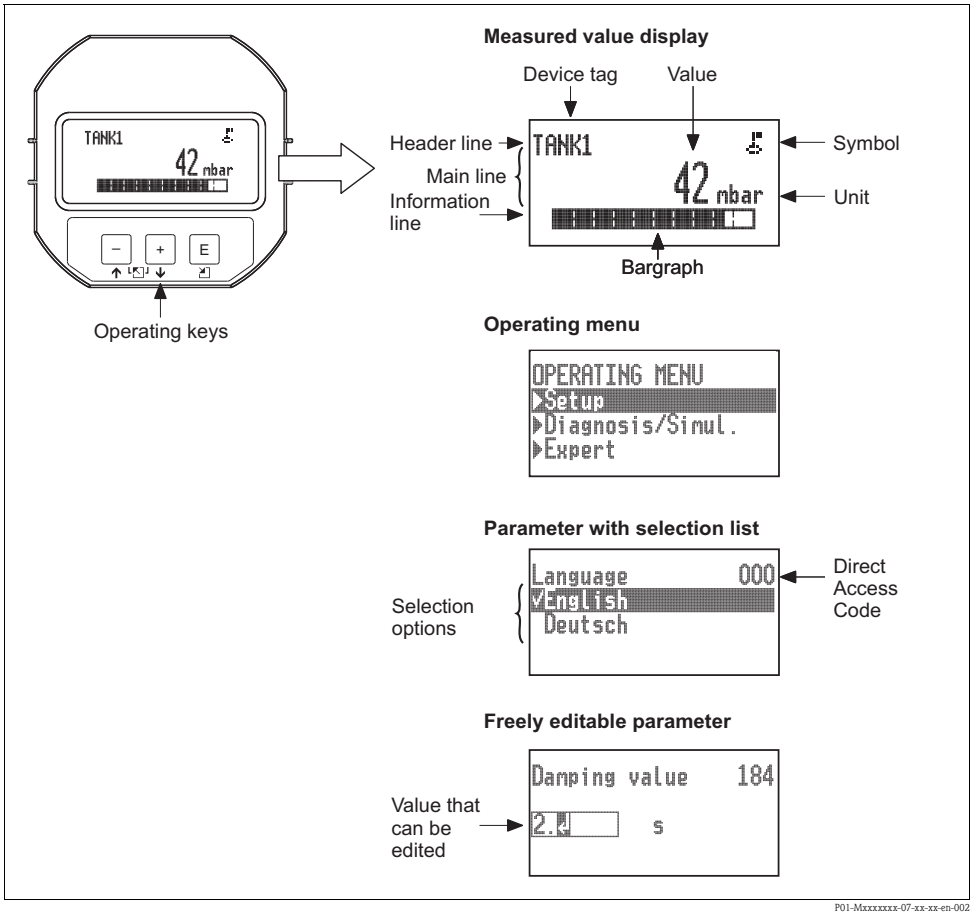
Function of the operating keys

Key(s)	Meaning
"Zero" pressed for at least 3 seconds	Get Lower Range Value (LRV)
"Span" pressed for at least 3 seconds	Get Upper Range Value (URV)
"Zero" and **"Span"** Pressed simultaneously for at least 3 seconds	Position zero adjustment
"Zero" and **"Span"** Pressed simultaneously for at least 12 seconds	Reset

Local display (optional)

A 4-line liquid crystal display (LCD) is used for display and operation. The local display shows measured values, dialog texts as well as fault and notice messages in plain text, thereby supporting the user at every stage of operation. The liquid crystal display of the device can be turned in 90° stages.
Depending on the orientation of the device, this makes it easy to operate the device and read the measured values.

Functions
- 8-digit measured value display including sign and decimal point, bar graph for 4 to 20 mA HART as current display
- Three keys for operation
- Simple and complete menu guidance as parameters are split into several levels and groups
- Each parameter is given a 3-digit ID number for easy navigation
- Possibility of configuring the display to suit individual requirements and preferences, such as language, alternating display, contrast setting, display of other measured values such as sensor temperature etc.
- Comprehensive diagnostic functions (fault and warning message, peak-hold indicators etc.)



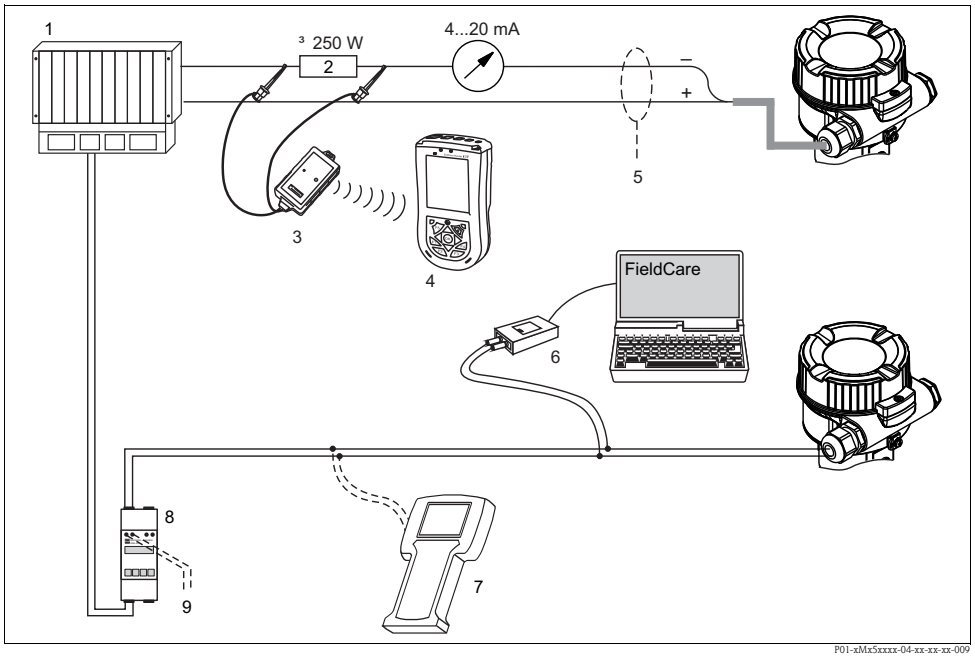
Remote operation

All software parameters are accessible depending on the position of the write protection switch on the device.

HART

Remote operation via:

- Field Communicator 375 handheld terminal. Use the handheld terminal to set all parameters all along the bus cable via menu operation.
- Field Xpert. Field Xpert is an industrial PDA with integrated 3.5" touchscreen from Endress+Hauser based on Windows Mobile. It communicates via wireless with the optional VIATOR Bluetooth modem connected to a HART device point-to-point or wireless via WiFi and Endress+Hauser's Fieldgate FXA520. Field Xpert also works as a stand-alone device for asset management applications. For details refer to BA060S/00/EN.
- FieldCare. FieldCare is an Endress+Hauser asset management tool based on FDT technology. With FieldCare, you can configure all Endress+Hauser devices.
  - FieldCare supports the following functions:
    - Configuration of transmitters in offline and online mode
    - Loading and saving device data (upload/download)
    - Documentation of the measuring point
  - Connection options:
    - By means of the Commubox FXA191 for intrinsically safe HART communication with FieldCare via the RS232C interface of a computer. For details refer to TI237F/00/EN.
    - By means of the Commubox FXA195 for intrinsically safe HART communication with FieldCare via the USB port of a computer. For details refer to TI404F/00/EN.



1 PLC
2 Resistor for HART communication
3 VIATOR Bluetooth Modem with connection cable
4 Field Xpert (Industrial PDA)
5 Shielding
6 Commubox FXA191 (RS232), FXA195 (USB)
7 Handheld terminal DXR375/FC375
8 Transmitter power supply unit RMA422 or RN221N (with integrated communication resistor)
9 Conection for:
- Commubox FXA191 (RS232), FXA195 (USB)
- Handheld terminal DXR375/FC375

Note!
For further information please contact your local Endress+Hauser Sales Center.

Certificates and approvals

CE mark

The device meets the legal requirements of the relevant EC directives. Endress+Hauser confirms that the device has been successfully tested by applying the CE mark.

Ex approvals

- ATEX
- FM
- CSA
- NEPSI
- IECEx

All explosion protection data are given in separate documentation which is available upon request. The Ex documentation is supplied as standard with all devices approved for use in explosion hazardous areas.
Page 36, sections "Safety Instructions" and "Installation/Control Drawings".

Marine certificate (in preparation)

- Germanischer Lloyd (GL)
- American Bureau of Shipping (ABS)

CRN approval (in preparation)

Some device versions have CRN approval. For a CRN-approved device, a CRN-approved process connection has to be ordered with a CSA approval.

Pressure Equipment Directive (PED)

PMD55 corresponds to Article 3 (3) of the EC directive 97/23/EC (Pressure Equipment Directive) and has been designed and manufactured according to good engineering practice.

Standards and guidelines

DIN EN 60770 (IEC 60770):
Transmitters for use in industrial-process control systems
Part 1: Methods for inspection and routine testing

DIN 16086:
Electrical pressure measuring instruments, pressure sensors, pressure transmitters, pressure measuring instruments, concepts, specifications in data sheets

EN 61326-X:
EMC product family standard for electrical equipment for measurement, control and laboratory use.

PMD55-AA22AD67GGJHA4A1A

Ordering information

PMD55

This overview does not mark options which are mutually exclusive.

	010	Approval:
→	AA	Non-hazardous area
	BA	ATEX II 1/2 G Ex ia IIC T6
	BB	ATEX II 1/2 D Ex t IIIC
	BC	ATEX II 2 G Ex d IIC T6
	BD	ATEX II 3G Ex nA IIC T6
	B1	ATEX II 1/2 G Ex ia IIC T6 + ATEX II 1/2 D Ex iaD
	CA	CSA C/US IS Cl. I, II, III Div.1 Gr. A-G, CSA C/US IS Cl. I Div. 2 Gr. A-D, Ex ia
	CB	CSA C/US XP Cl. I Div.1 Gr. B-G, Ex d (conduit seal not required)
	CC	CSA C/US Cl. II, III Div.1 Gr. E-G
	CD	CSA General Purpose
	C1	CSA C/US IS/XP Cl.I,II Div.1 Gr. A-G/B-G
	FA	FM IS Cl. I, II, III Div.1 Gr. A-G, AEx ia, FM NI Cl. I Div.2 Gr. A-D
	FB	FM XP Cl.I,II Div.1 Gr. A-G, AEx d (conduit seal not required)
	FC	FM DIP Cl.II,III Div.1 Gr. E-G
	FD	FM NI Cl.I Div.2 Gr. A-D
	F1	FM IS/XP Cl.I,II Div.1 Gr. A-G
	GA	GOST Ex ia IIC T6 (in preparation)
	IA	IEC Ex ia IIC T6 Ga/Gb
	IB	IEC Ex d IIC T6 Gb (in preparation)
	ID	IEC Ex t IIIC Da/Db (in preparation)
	IE	IEC Ex ic IIC T6 Gc (in preparation)
	I1	IEC Ex ia IIC T6 Ga/Gb + Ex ia IIIC Da/D
	MA	INMETRO Ex ia IIC T6 (in preparation)
	MB	INMETRO Ex d IIC T6 (in preparation)
	NA	NEPSI Ex ia IIC T6
	NB	NEPSI Ex d IIC T6
	8A	ATEX II Ex ia/Ex d + FM/CSA IS + XP, ATEX II 1/2G Ex ia IIC T6 + ATEX II 2G Ex d IIC T6 + FM/CSA IS + XP Cl.I,II Div.1 Gr A-G/B-G
	8B	FM/CSA IS + XP Cl.I,II Div.1 Gr. A-D/B-G, FM IS/FM XP Cl.I/II Div.1 Gr.A-G + CSA IX/XP Cl.I,II Div.1 GrA-G

	020	Output:
→	2	4-20mA HART

	030	Display, Operation:
	1	LCD, push button on display electronics
→	2	W/o LCD, push button on electronics

	040	Housing:
→	A	F30 Alu
	B	F30 Alu, Glass window

	050	Electrical Connection:
	A	Gland M20 IP66/68, NEMA4X/6P
	B	Thread M20 IP66/68, NEMA4X/6P
	C	Thread G1/2 IP66/68, NEMA4X/6P
→	D	Thread NPT1/2 IP66/68, NEMA4X/6P
	I	Plug M12, IP66/68, NEMA4X/6P
	M	Plug 7/8, IP66/68, NEMA4X/6P
	P	Plug Han7D, 90deg, IP65
	V	Ventil plug ISO4400 M16, IP64

	060	Nominal Pressure PN:
	2	1bar/100kPa/14.5psi
→	6	70bar/7MPa/1015psi
	7	160bar/16MPa/2400psi

	070	Sensor Nominal Value:
	7B	10mbar/1kPa/0.15psi
	7C	30mbar/3kPa/0.45psi
	7D	100mbar/10kPa/1.5psi
	7F	500mbar/50kPa/7.5psi
→	7G	1bar/100kPa/15psi
	7H	3bar/300kPa/45psi
	7L	16bar/1.6MPa/240psi
	7M	40bar/4MPa/600psi

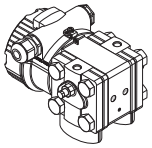
070	Sensor Nominal Value:
88	Prepared for Deltatop

080	Reference Accuracy:
D	Platinum
G	Standard

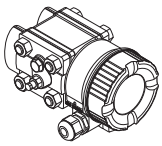
090	Calibration; Unit:
B	Nominal value; mbar/bar
C	Nominal value; kPa/MPa
D	Nominal value; mm/mH2O
E	Nominal value; inH2O/ftH2O
F	Nominal value; psi
J	Customised pressure; see additional spec.
K	Customised level; see additional spec.
L	Customised flow; see additional spec.
8	Adjusted for Deltatop; see additional spec.

110	Process Connection:
HAJ	NPT1/4-18 IEC61518 UNF7/16-20; 316L, V1, Installation impulse line vertical, Alignment 90°
HA4	NPT1/4-18 IEC61518 UNF7/16-20; C22.8, V1, Installation impulse line vertical, Alignment 90°
HBJ	NPT1/4-18 IEC61518 M10, 316L, V1, Installation impulse line vertical, Alignment 90°
HB4	NPT1/4-18 IEC61518 M10; C22.8, V1, Installation impulse line vertical, Alignment 90°
HGJ	NPT1/4-18 IEC61518 UNF7/16-20, 316L, H1, Installation impulse line horizontal, Alignment 180°
HG4	NPT1/4-18 IEC61518 UNF7/16-20, C22.8, H1, Installation impulse line horizontal, Alignment 180°
HHJ	NPT1/4-18 IEC61518 M10, 316L, H1, Installation impulse line horizontal, Alignment 180°
HH4	NPT1/4-18 IEC61518 M10, C22.8, H1, Installation impulse line horizontal, Alignemnt 180°
HNJ	NPT1/4-18 IEC61518 UNF7/16-20, 316L, H2, Installation impulse line horizontal, Alignment 90°
HN4	NPT1/4-18 IEC61518 UNF7/16-20, C22.8, H2, Installation impulse line horizontal, Alignment 90°
HOJ	NPT1/4-18 IEC61518 M10, 316L, H2, Installation impulse line horizontal, Alignment 90°
HO4	NPT1/4-18 IEC61518 M10, C22.8, H2, Installation impulse line horizontal, Alignment 90°

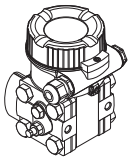
V1:
HAJ, HA4, HBJ, HB4



H1:
HGJ, HG4, HHJ, HH4



H2:
HNJ, HN4, HOJ, HO4



P01-PMD55xxx-11-xx-xx-xx-012

170	Membrane Material:
A	316L
B	AlloyC

180	Fill Fluid:
1	Silicone oil
2	Inert oil

190	Seal:
A	FKM Viton
C	PTFE
F	NBR
J	EPDM

500	Operation Language (optional):
AA	English
AB	German
AC	French
AD	Spanish
AE	Italian
AF	Dutch
AK	Chinese
AL	Japanese

550	Calibration (optional):
F1	Works calib. certificate 5-point
F2	DKD calib. certificate 10-point

570	Service (optional; multiple options can be selected):
HA	Cleaned from oil+grease [1]
HB	Cleaned for oxygen service [1]
HC	Cleaned for silicone free service [1]
IA	Adjusted min alarm current
IB	Adjusted HART Burst Mode PV

1) Only device, not accessory or enclosed accessory

580	Test, Certificate (optional; multiple options can be selected):
JA	EN10204-3.1 material wetted parts, inspection certificate
JB	NACE MR0175 wetted parts
JF	AD2000, pressurized
KD	EN10204-3.1 Helium leak test, inspection certificate
KE	EN10204-3.1 pressure test, inspection certificate

590	Additional Approval (optional; multiple options can be selected):
LA	SIL declaration of conformity (in preparation)
LE	GL marine certificate (in preparation)
LF	ABS marine certificate (in preparation)

610	Accessory Mounted (optional):
NA	Overvoltage protection

620	Accessory Enclosed (optional; multiple options can be selected):
PB	Mounting bracket + adapter plate; wall/pipe mounting, 304
PC	Adapter plate, wall/pipe mounting, 304
P1	Oval flange (PZO), see additional spec.

850	Software version:
78	01.00.zz, HART, DevRev01

895	Marking:
Z1	Tagging (TAG), see additional spec.
Z2	Bus address, see additional spec.

Additional documentation

Operating Instructions

Operating Instructions: BA382P

Brief operating instruction

4 to 20 mA HART: KA1027P

Safety Instructions

Authority	Version in the order code	Approval	Category	Electronics	Documentation
ATEX	BA	Ex ia IIC	II 1/2 G	– 4 to 20 mA HART	– XA457P
	BB	Ex t IIIC	II 1/2 D	– 4 to 20 mA HART	– XA458P
	BC	Ex d IIC	II 2G	– 4 to 20 mA HART	– XA459P
	BD	Ex nA IIC	II 3 G	– 4 to 20 mA HART	– XA461P
	B1	Ex ia IIC Ex ia D	II 1/2 G II 1/2 D	– 4 to 20 mA HART	– XA460P
	8A	Ex ia IIC Ex d IIC	II 1/2 G II 2 G	– 4 to 20 mA HART	– XA505P

Authority	Version in the order code	Approval	EPL	Electronics	Documentation
IECEx	IA	Ex ia IIC	Ga/Gb	– 4 to 20 mA HART	– XA462P
	IB	Ex d IIIC	Gb	– 4 to 20 mA HART	– XA463P
	ID	Ex t IIIC	Da/Db	– 4 to 20 mA HART	– XA490P
	IE	Ex ic IIC	Gc	– 4 to 20 mA HART	– XA492P
	I1	Ex ia IIC Ex ia IIIC	Ga/Gb Da/Db	– 4 to 20 mA HART	– XA491P

Authority	Version in the order code	Approval	Electronics	Documentation
NEPSI	NA	Ex ia IIC	– 4 to 20 mA HART	– XA534P
NEPSI	NB	Ex d IIC	– 4 to 20 mA HART	– XA514P

Installation/Control Drawings

Authority	Version in the order code	Approval	Electronics	Documentation
FM	FA	IS Cl.I,II,III Div.1 Gr. A-G, AEx ia NI Cl. I Div.2 Gr.A-D	– 4 to 20 mA HART	– ZD234P
CSA	CA	C/US IS Cl.I,II,III Div.1 Gr A-G C/US IS Cl.I Div.2 Gr A-D, Ex ia	– 4 to 20 mA HART	– ZD237P

Blower gearbox bearing RTD's

Tag # TE-130
TE-131

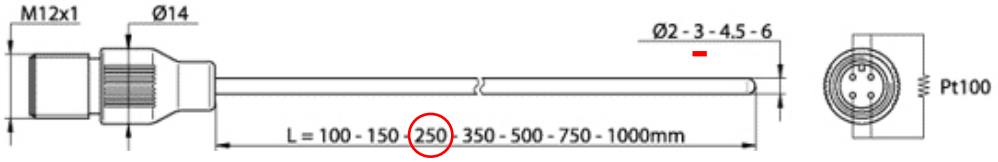
Add to Favorites

TRM (conn. M12)

MULTI PURPOSE RESISTANCE TEMPERATURE DETECTOR

RTD probe manufactured using densely packed magnesium oxide insulated stainless steel sheathed cable. The bendable probe is provided with a MOULDED ON (IP-67) 4 pins connector with M12 thread and is suitable for a great variety of applications. This probe can be a reliable alternative to common assemblies with connection head.

Technical data



Connection	4 pins male connector with body in moulded Nylon and M12X1 steel thread to DIN-VDE 0627. Degree of protection IP 67. Temperature MAX 90°C
Type of costruction	With densely packed magnesium oxide (MgO) insulated cable
Sensing element	Pt 100 ohm at 0° C according to IEC 751 class B, class A o class AA (1/3 B)
Insulation resistance	100 MOm with 100 V DC
Temperature range	CLASS B: -50°C ÷ 500°C CLASS A: -30°C ÷ 350°C CLASS AA: 0°C ÷ 250°C
Marking	Each probe is permanently marked with the exact ohmical calibration test value at 0°C, the manufacturing date and traceability code.
Sheath material	AISI 316 s.s.
Minimum bending radius:	Three times the outer diameter d (except the sensing tip which length is 30 mm)
Accessories	M12 Connectors Extension cables with M12 connector

Prices and availavility of the articles can be seen by the registered users

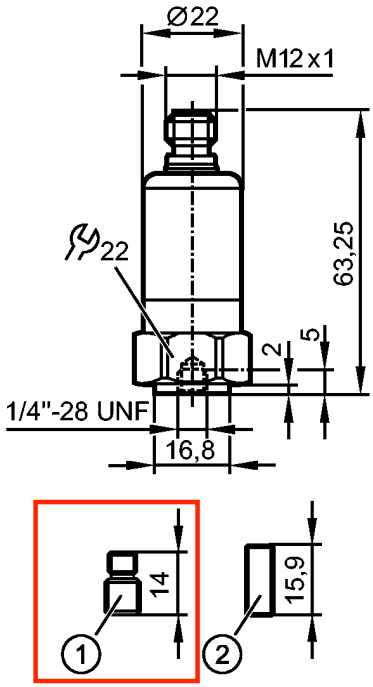
efector800

VT100
Gearbox Vibration Transmitter

VTV122

VIBRATION TRANSMITTER

Diagnostic systems



1: Threaded adapter 1/4"-28 UNF / M8 x 1.25 mm
2: Threaded adapter 1/4"-28 UNF
tightening torque 8 Nm

Product characteristics	
Vibration transmitter	
VTV	
Connection via M12 connector	
Vibration transmitter to ISO 10816	
Measuring range RMS: 0...25 mm/s	
Analog output 4...20 mA	
2-wire connection technology	
Application	
Application	Vibration transmitter Vrms to ISO 10816
Electrical data	
Operating voltage [V]	9.6...32 DC
Protection class	III
Inputs / outputs	
Inputs / outputs total	1
Outputs	
analog	
current output [mA]	4...20
Max. load [Ω]	max. (Ub - 9.6 V) x 50; 720 at Ub = 24 V
Measuring / setting range	
Measuring range [mm/s]	0...25 RMS
Frequency range [Hz]	10...1000
Accuracy / deviations	

Accuracy [% of the final value]	< ± 3
Repeatability	< 0.5 %
Linearity	0.25 %

Environment

Ambient temperature [°C]	-30...125, for UL applications: max. 80 °C
Protection	IP 67 / IP 68 / IP 69K

Tests / approvals

EMC	EN 61000-4-2 ESD:	4 kV CD / 8 kV AD
	EN 61000-4-3 HF radiated:	10 V/m
	EN 61000-4-4 Burst:	2 kV
	EN 61000-4-5 Surge:	1 kV
	EN 61000-4-6 HF conducted:	10 V
Shock resistance	400 g	
MTTF [Years]	881	

Mechanical data

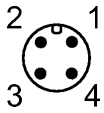
Type of sensor	Microelectromechanical system (MEMS)
Number of measurement axes	1
Housing materials	stainless steel 316L / 1.4404
Type of mounting	set screw
Weight [kg]	0.122

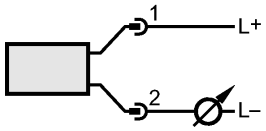
Electrical connection

Connection	M12 connector

Wiring

1: L+
2: 4...20 mA





Remarks

Pack quantity [piece]	1

Limit Switches for linear actuators

Tags: ZSO100; ZSC101; ZSO105; ZSC104

Honeywell

Representative photograph, actual product appearance may vary.

Due to regional agency approval requirements, some products may not be available in your area. Please contact your regional Honeywell office regarding your product of choice.

14CE1-Q

Miniature Enclosed Switches Series 14CE: Top Plunger; 1NC 1NO SPDT Snap Action; 4-Pin DC Micro-Connector

Features

- Compact construction
- Pre-wired or connector versions
- Die-cast Zinc housing
- Wide selection of actuators
- Gang mounting capability
- Cable length variations
- Side and bottom exit cable/connector
- Simple two-screw mounting
- Low temperature variants
- Fluorocarbon sealing (standard)

Typical Applications

- Processing Equipment
- Textile Machinery
- Machine Tools
- Robotics
- Packaging Equipment
- Farm Machinery
- Commercial Laundry Equipment
- Printing Trade Machinery
- Vehicles

Description

All 14CE and 914CE series miniature enclosed switches incorporate fluorocarbon diaphragm sealing to provide reliable protection, meeting NEMA 1, 2, 3, 3R, 4, 6, 6P, and 13 as well as IP66, IP67, and IP68 requirements. Versions with boot seal also meet NEMA 12 requirements (dust, falling dirt, liquid media with solid contaminates). The cable or connector and basic switch terminals are encapsulated in an epoxy compound, offering superior resistance in harsh environments. For low temperature applications (down to -40 degrees C, -40 degrees F), CE switches can be supplied with low temperature seals and lubricant.

The CE switches are a rugged and versatile switch which can be applied indoors in harsh factory floor applications, as well as on outdoor equipment in extreme temperatures. A full range of actuators are available, including plain plungers, roller plungers, side rotary, multi-directional wire, and manually operated. The switches are also available with the industry standard, M12 miniature 4-pin connector. The 14 CE versions are designed for European applications and meet the requirements of the low voltage directive and therefore carry the CE mark. The 914CE

Honeywell

14CE1-Q

Miniature Enclosed Switches Series 14CE: Top Plunger; 1NC 1NO SPDT Snap Action; 4-Pin DC Micro-Connector

Product Specifications	
Availability	Europe; Asia-Pacific
Product Type	Miniature Limit Switches
Actuator	Top Plunger
Lever Style	None
Circuitry	1NC 1NO SPDT Snap Action
Ampere Rating	3 A (Thermal)
Supply Voltage	125 Vac, 250 Vac
Housing Material	Zinc Die-Cast
Termination Type	4-Pin DC Micro-Connector
Series Name	14CE Series
Sealing	IP65, NEMA 1, 3
Approvals	CE Certified
CSA File #	LR15775
UL File #	E41859
Mechanical Life	up to 10 million
Operating Temperature Range	0 °C to 70 °C (35 °F to 160 °F)
Comment	Bottom Exit Connector
Agency Approvals and Standards	IEC947-5-1, EN60947-5-1
UNSPSC Code	302119
UNSPSC Commodity	302119 Switches and controls and relays
Sealed	Industrial

Honeywell

14CE1-Q

Miniature Enclosed Switches Series 14CE: Top Plunger; 1NC 1NO SPDT Snap Action; 4-Pin DC Micro-Connector

⚠ WARNING

IF USED IN APPLICATIONS CONCERNING HUMAN SAFETY

- Only use NC direct opening ("positive opening"/"positive break") contacts, identified by the symbol  .
- Do NOT use flexible/adjustable actuators. Only use actuators designed for safety applications
- Do NOT defeat, tamper, remove, or bypass this switch.
- Hazardous voltage, disconnect power before servicing.
- Strictly adhere to all installation and maintenance instructions.
- Consult with local safety agencies and their requirements when designing a machine-control link, interface and all control elements that affect safety

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING

MISUSE OF DOCUMENTATION

- The information presented in this product sheet (or catalog) is for reference only. DO NOT USE this document as product installation information.
- Complete installation, operation and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

Oil Pressure Transmitter **PMC11-AA1L1PFVXJA+Z1**

Technical Information
Cerabar PMC11, PMC21, PMP11, PMP21

Process pressure measurement

Pressure transducer with ceramic and metal sensors

Application

The Cerabar is a pressure transducer for the measurement of absolute and gauge pressure in gases, vapors, liquids and dust. The Cerabar can be used internationally thanks to a wide range of approvals and process connections.

Your benefits

- High reproducibility and long-term stability
- Reference accuracy: up to 0.3%
- Customized measuring ranges
  - Turn down up to 5:1
  - Sensor for measuring ranges up to 400 bar (6 000 psi)
- Housing and process isolating diaphragm made of 316L

Endress+Hauser
People for Process Automation

Table of contents

Document information

Document function

The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.

Symbols used

Safety symbols

Symbol	Meaning
DANGER	**DANGER!** This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
WARNING	**WARNING!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
CAUTION	**CAUTION!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
NOTICE	**NOTE!** This symbol contains information on procedures and other facts which do not result in personal injury.

Electrical symbols

Symbol	Meaning	Symbol	Meaning
	**Protective ground connection** A terminal which must be connected to ground prior to establishing any other connections.		**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.

Symbols for certain types of information

Symbol	Meaning
	**Permitted** Procedures, processes or actions that are permitted.
	**Forbidden** Procedures, processes or actions that are forbidden.
	**Tip** Indicates additional information.
	Reference to documentation
	Reference to page
	Reference to graphic
	Visual inspection

Symbols in graphics

Symbol	Meaning
1, 2, 3 ...	Item numbers
1., 2., 3. ...	Series of steps
A, B, C, ...	Views

Documentation

The document types listed are available:
In the Download Area of the Endress+Hauser Internet site: www.endress.com → Download

Brief Operating Instructions (KA): getting the 1st measured value quickly

The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.

Operating Instructions (BA): your comprehensive reference

These Operating Instructions contain all the information that is required in various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.

Safety Instructions (XA)

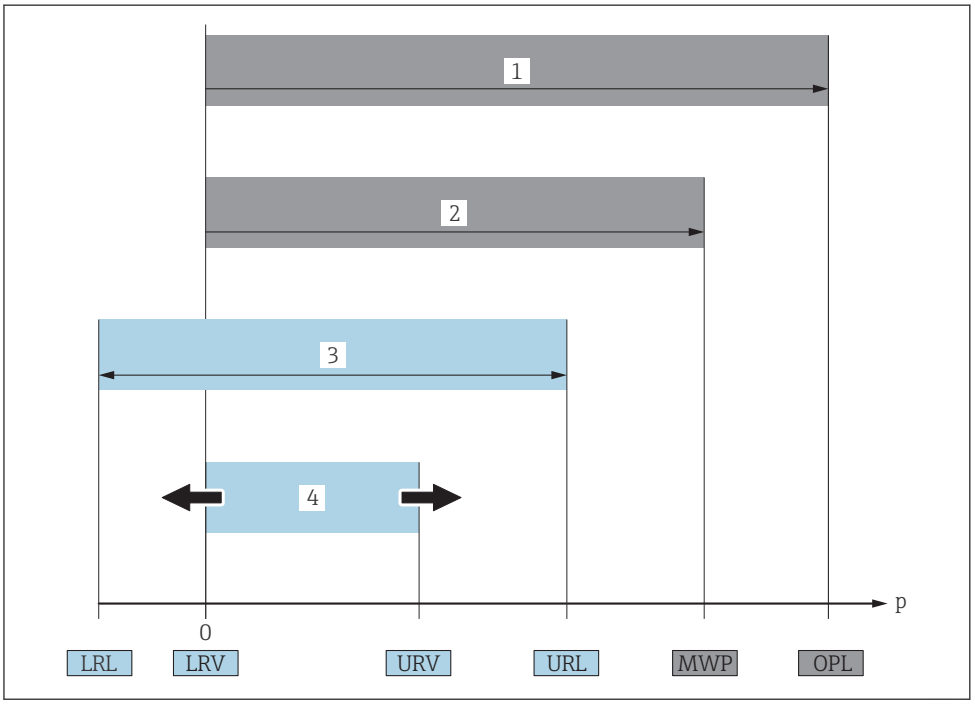
Safety Instructions (XA) are supplied with the device depending on the approval. These instructions are an integral part of the Operating Instructions.

Device	Directive	Documentation	Option [1]
PMP21	ATEX II 1/2G Ex ia IIC T4 Ga/Gb	XA01271P	BA
PMC21	ATEX II 2G Ex ia IIC T4 Gb	XA01271P	BB
PMC21 PMP21	ATEX II 3G Ex ec IIC T4 Gc	XA01533P	BC
PMC21 PMP21	FM IS Cl. I, Div.1 Gr. A-D T4	XA01321P	FA
PMC21 PMP21	CSA C/US IS Cl. I Div. 1 Gr. A-D	XA01322P	CB
PMC21 PMP21	EAC Ex ia IIC T4 Ga/Gb	XA01540P	GA
PMC21 PMP21	IEC Ex ia IIC T4 Ga/Gb	XA01271P	IA
PMC21 PMP21	NEPSI Ex ia IIC T4	XA01363P	NA
PMC21 PMP21	TIIS Ex ia IIC T4	In preparation	TA

1) Product Configurator, order code for "Approval"

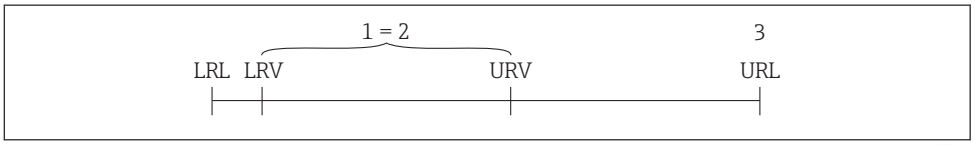
The nameplate provides information on the Safety Instructions (XA) that are relevant for the device.

Terms and abbreviations



Item	Term/ abbreviation	Explanation
1	OPL	The OPL (over pressure limit = sensor overload limit) for the measuring device depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection has to be taken into consideration in addition to the measuring cell. Also observe pressure-temperature dependency. For the relevant standards and additional notes, see the "Pressure specifications" section → 27 . The OPL may only be applied for a limited period of time.
2	MWP	The MWP (maximum working pressure) for the sensors depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection has to be taken into consideration in addition to the measuring cell. Also observe pressure-temperature dependency. For the relevant standards and additional notes, see the "Pressure specifications" section → 27 . The MWP may be applied at the device for an unlimited period. The MWP can also be found on the nameplate.
3	Maximum sensor measuring range	Span between LRL and URL This sensor measuring range is equivalent to the maximum calibratable/adjustable span.
4	Calibrated/ adjusted span	Span between LRV and URV Factory setting: 0 to URL Other calibrated spans can be ordered as customized spans.
p	-	Pressure
-	LRL	Lower range limit
-	URL	Upper range limit
-	LRV	Lower range value
-	URV	Upper range value
-	TD (turn down)	Turn down The turn down is preset at the factory and cannot be changed. Example - see the following section.

Turn down calculation



1 Calibrated/adjusted span
2 Zero point-based span
3 URL sensor

Example

- Sensor:10 bar (150 psi)
- Upper range value (URL) = 10 bar (150 psi)

Turn down (TD):

$$TD = \frac{URL}{|URV - LRV|}$$

$$TD = \frac{10\ \text{bar (150 psi)}}{|5\ \text{bar (75 psi)} - 0\ \text{bar (0 psi)}|} = 2$$

In this example, the TD is 2:1.
This span is based on the zero point.

- Calibrated/adjusted span: 0 to 5 bar (0 to 75 psi)
- Lower range value (LRV) = 0 bar (0 psi)
- Upper range value (URV) = 5 bar (75 psi)

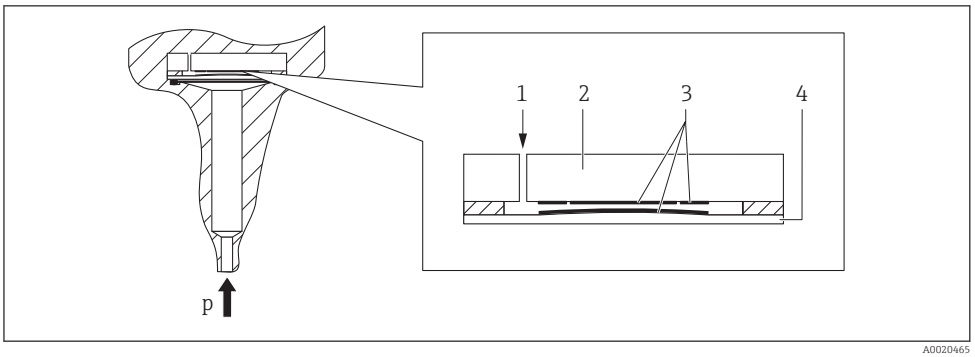
Function and system design

Measuring principle - process pressure measurement

Devices with ceramic process isolating diaphragm (Ceraphire®)

The ceramic sensor is an oil-free sensor, i.e. the process pressure acts directly on the robust ceramic process isolating diaphragm and causes it to deflect. A pressure-dependent change in capacitance is measured at the electrodes of the ceramic substrate and the process isolating diaphragm. The measuring range is determined by the thickness of the ceramic process isolating diaphragm.

Advantages:
- Guaranteed overload resistance up to 40 times the nominal pressure
- The ultrapure 99.9% ceramic (Ceraphire®, see also "www.endress.com/ceraphire") ensures:
  - Extremely high chemical durability
  - High mechanical durability
- Can be used in absolute vacuum
- Small measuring ranges



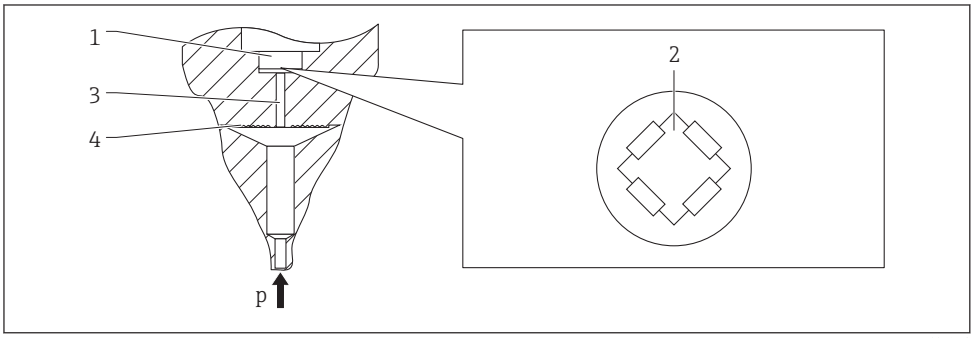
A0020465

1 Air pressure (gauge pressure sensors)
2 Ceramic substrate
3 Electrodes
4 Ceramic process isolating diaphragm

Devices with metallic process isolating diaphragm

The process pressure deflects the metal process isolating diaphragm of the sensor and a fill fluid transfers the pressure to a Wheatstone bridge (semiconductor technology). The pressure-dependent change in the bridge output voltage is measured and evaluated.

Advantages:
- Can be used for high process pressures
- Fully welded sensor
- Slim, flush-mounted process connections available

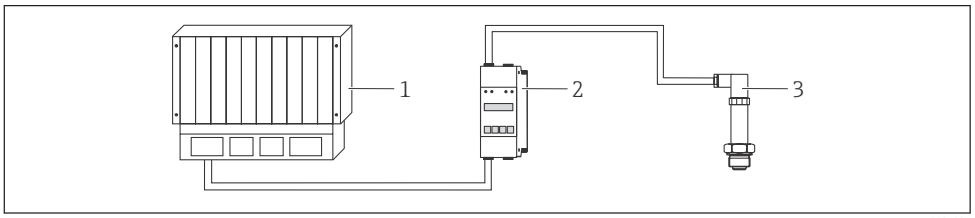


A0016448

1 Silicon measuring element, substrate
2 Wheatstone bridge
3 Channel with fill fluid
4 Metal process isolating diaphragm

Measuring system

A complete measuring system comprises:



1 PLC (programmable logic control)
2 e.g. RN221N / RMA42 (if required)
3 Pressure transducer

Device features

	PMC11
Field of application	Gauge pressure
Process connections	▪ Thread ISO 228 ▪ Thread ASME ▪ DIN 13
Measuring ranges	From −400 to +400 mbar (−6 to +6 psi) to −1 to +40 bar (−15 to +600 psi).
OPL (depends on the measuring range)	Max. 0 to +60 bar (0 to +900 psi)
Process temperature range	−25 to +85 °C (−13 to +185 °F)
Ambient temperature range	−40 to +70 °C (−40 to +158 °F)
Reference accuracy	Up to 0.5 %, TD 5:1, for details see the "Reference accuracy" section.
Supply voltage	▪ 4 to 20 mA output: 10 to 30V DC ▪ 0 to 10 V output: 12 to 30V DC
Output	▪ 4 to 20 mA ▪ 0 to 10 V
Material	▪ Housing made from 316L (1.4404) ▪ Process connections made from 316L ▪ Process isolating diaphragm made from Al_2O_3 aluminum-oxide ceramic, (Ceraphire®), ultrapure 99.9 %
Options	▪ Certificate of calibration ▪ Cleaned from oil+grease

	PMP11
Field of application	Gauge pressure
Process connections	▪ Thread ISO 228, also flush-mount ▪ Thread ASME ▪ DIN 13
Measuring ranges	From −400 to +400 mbar (−6 to +6 psi) to −1 to +40 bar (−15 to +600 psi).
OPL (depends on the measuring range)	Max. 0 to +160 bar (0 to +2 400 psi)
Process temperature range	−25 to +85 °C (−13 to +185 °F)
Ambient temperature range	−40 to +70 °C (−40 to +158 °F)
Reference accuracy	Up to 0.5 %, TD 5:1, for details see the "Reference accuracy" section.
Supply voltage	▪ 4 to 20 mA output: 10 to 30V DC ▪ 0 to 10 V output: 12 to 30V DC
Output	▪ 4 to 20 mA ▪ 0 to 10 V

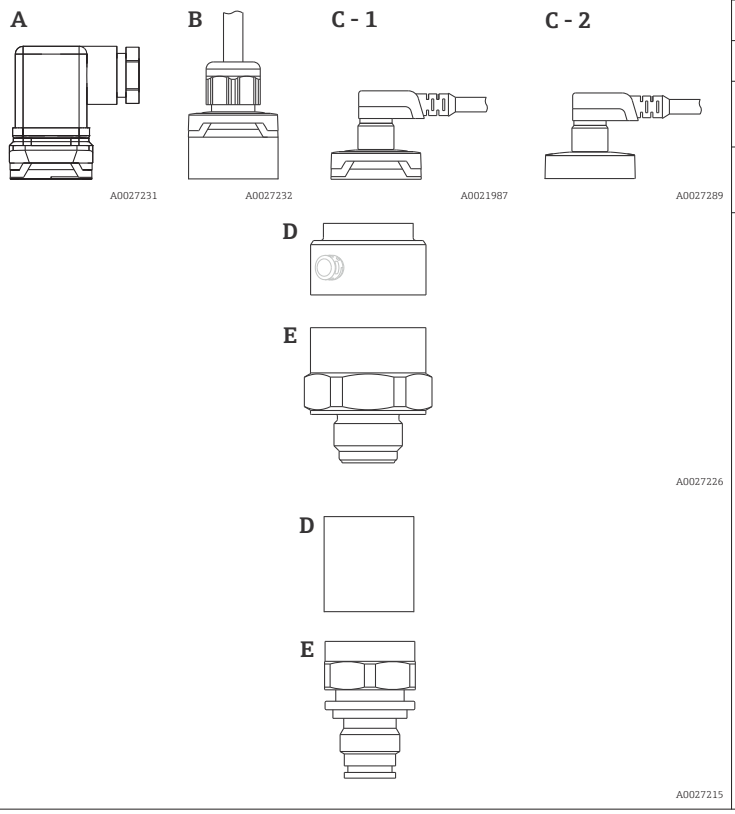
	PMP11
Material	▪ Housing made from 316L (1.4404) ▪ Process connections made from 316L (1.4404) ▪ Process isolating diaphragm made from 316L (1.4435)
Options	▪ Certificate of calibration ▪ Cleaned from oil+grease

	PMC21
Field of application	Gauge pressure and absolute pressure
Process connections	▪ Thread ISO 228 ▪ Thread DIN 13 ▪ Thread ASME ▪ Thread JIS
Measuring ranges	From −100 to +100 mbar (−1.5 to +1.5 psi) to −1 to +40 bar (−15 to +600 psi).
OPL (depends on the measuring range)	Max. 0 to +60 bar (0 to +900 psi)
Process temperature range	−25 to +100 °C (−13 to +212 °F)
Ambient temperature range	▪ −40 to +85 °C (−40 to +185 °F) ▪ Devices for hazardous areas: −40 to +70 °C (−40 to +158 °F)
Reference accuracy	Up to 0.3 %, TD 5:1, for details see the "Reference accuracy" section.
Supply voltage	10 to 30 V DC
Output	4 to 20 mA
Material	▪ Housing made from 316L (1.4404) ▪ Process connections made from 316L ▪ Process isolating diaphragm made from Al_2O_3 aluminum-oxide ceramic, (Ceraphire®), ultrapure 99.9 %
Options	▪ Ex approvals ▪ Marine certificate ▪ Min. alarm current setting ▪ 3.1 Material certificates ▪ Certificate of calibration ▪ Cleaned from oil+grease ▪ Cleaned for O_2 service

	PMP21
Field of application	Gauge pressure and absolute pressure
Process connections	▪ Thread ISO 228, also flush-mount ▪ Thread DIN 13 ▪ Thread ASME ▪ Thread JIS
Measuring ranges	From −400 to +400 mbar (−6 to +6 psi) to −1 to +400 bar (−15 to +6 000 psi).
OPL (depends on the measuring range)	Max. 0 to +600 bar (0 to +9 000 psi)
Process temperature range	−40 to +100 °C (−40 to +212 °F)
Ambient temperature range	−40 to +85 °C (−40 to +185 °F)
Reference accuracy	Up to 0.3 %, TD 5:1, for details see the "Reference accuracy" section.
Supply voltage	10 to 30 V DC
Output	4 to 20 mA

	PMP21
Material	▪ Housing made from 316L (1.4404) ▪ Process connections made from 316L (1.4404) ▪ Process isolating diaphragm made from 316L (1.4435)
Options	▪ Ex approvals ▪ Marine certificate ▪ Min. alarm current setting ▪ 3.1 Material certificates ▪ Certificate of calibration ▪ Cleaned from oil+grease

Product design

Overview	Position	Description
	A	Valve plug
	B	Cable
	C- 1	M12 plug Housing cap made of plastic
	C- 2	M12 plug For Ex ec and IP69: metal housing cap
	D E	Housing Process connection (sample illustration)

System integration

The device can be given a tag name (max. 8 alphanumeric characters).

Description	Option [1]
Measuring point (TAG), see additional specifications	Z1

1) Product Configurator, order code for "Identification"

Input

Measured variable

Measured process variable

- PMC11: gauge pressure
- PMP11: gauge pressure
- PMC21: gauge pressure or absolute pressure
- PMP21: gauge pressure or absolute pressure

Calculated process variable

Pressure

Measuring range

Ceramic process isolating diaphragm

Sensor	Device	Maximum Sensor measuring range		Lowest calibratable span [1]	MWP	OPL	Factory settings [2]	Option [3]
		lower (LRL)	upper (URL)					
		[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]		
Devices for gauge pressure measurement								
100 mbar (1.5 psi) [4]	PMC21	−0.1 (−1.5)	+0.1 (+1.5)	0.02 (0.3)	2.7 (40.5)	4 (60)	0 to 100 mbar (0 to 1.5 psi)	1C
250 mbar (4 psi) [5]	PMC21	−0.25 (−4)	+0.25 (+4)	0.05 (1)	3.3 (49.5)	5 (75)	0 to 250 mbar (0 to 4 psi)	1E
400 mbar (6 psi) [6]	PMC11 PMC21	−0.4 (−6)	+0.4 (+6)	0.08 (1.2)	5.3 (79.5)	8 (120)	0 to 400 mbar (0 to 6 psi)	1F
1 bar (15 psi) [6]	PMC11 PMC21	−1 (−15)	+1 (+15)	0.2 (3)	6.7 (100.5)	10 (150)	0 to 1 bar (0 to 15 psi)	1H
2 bar (30 psi) [6]	PMC11 PMC21	−1 (−15)	+2 (+30)	0.4 (0.6)	12 (180)	18 (270)	0 to 2 bar (0 to 30 psi)	1K
4 bar (60 psi) [6]	PMC11 PMC21	−1 (−15)	+4 (+60)	0.8 (1.2)	16.7 (250.5)	25 (375)	0 to 4 bar (0 to 60 psi)	1M
6 bar (90 psi) [6]	PMC11 PMC21	−1 (−15)	+6 (+90)	2.4 (36)	26.7 (400.5)	40 (600)	0 to 6 bar (0 to 90 psi)	1N
10 bar (150 psi) [6]	PMC11 PMC21	−1 (−15)	+10 (+150)	2 (30)	26.7 (400.5)	40 (600)	0 to 10 bar (0 to 150 psi)	1P
16 bar (240 psi) [6]	PMC11 PMC21	−1 (−15)	+16 (+240)	6.4 (96)	40 (600)	60 (900)	0 to 16 bar (0 to 240 psi)	1Q
25 bar (375 psi) [6]	PMC11 PMC21	−1 (−15)	+25 (+375)	10 (150)	40 (600)	60 (900)	0 to 25 bar (0 to 375 psi)	1R
40 bar (600 psi) [6]	PMC11 PMC21	−1 (−15)	+40 (+600)	8 (120)	40 (600)	60 (900)	0 to 40 bar (0 to 600 psi)	1S

Sensor	Device	Maximum Sensor measuring range		Lowest calibratable span [1]	MWP	OPL	Factory settings [2]	Option [3]
		lower (LRL)	upper (URL)					
		[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]		
Devices for absolute pressure measurement								
100 mbar (1.5 psi) [6]	PMC21	0	+0.1 (+1.5)	0.1 (1.5)	2.7 (40.5)	4 (60)	0 to 100 mbar (0 to 1.5 psi)	2C
250 mbar (4 psi) [6]	PMC21	0	+0.25 (+4)	0.25 (4)	3.3 (49.5)	5 (75)	0 to 250 mbar (0 to 4 psi)	2E
400 mbar (6 psi) [6]	PMC21	0	+0.4 (+6)	0.4 (6)	5.3 (79.5)	8 (120)	0 to 400 mbar (0 to 6 psi)	2F
1 bar (15 psi) [6]	PMC21	0	+1 (+15)	0.4 (6)	6.7 (100.5)	10 (150)	0 to 1 bar (0 to 15 psi)	2H
2 bar (30 psi) [6]	PMC21	0	+2 (+30)	0.4 (0.6)	12 (180)	18 (270)	0 to 2 bar (0 to 30 psi)	2K
4 bar (60 psi) [6]	PMC21	0	+4 (+60)	0.8 (1.2)	16.7 (250.5)	25 (375)	0 to 4 bar (0 to 60 psi)	2M
10 bar (150 psi) [6]	PMC21	0	+10 (+150)	2 (30)	26.7 (400.5)	40 (600)	0 to 10 bar (0 to 150 psi)	2P
40 bar (600 psi) [6]	PMC21	0	+40 (+600)	8 (120)	40 (600)	60 (900)	0 to 40 bar (0 to 600 psi)	2S

1) Highest turn down that can be set at the factory: 5:1. The turn down is preset and cannot be changed.
2) Other measuring ranges (e.g. −1 to +5 bar (−15 to 75 psi)) can be ordered with customer-specific settings (see the Product Configurator, order code for "Calibration; Unit" option "J"). It is possible to invert the output signal (LRV = 20 mA; URV = 4 mA). Prerequisite: URV < LRV
3) Product Configurator, order code for "Sensor range"
4) Vacuum resistance: 0.7 bar (10.5 psi) abs
5) Vacuum resistance: 0.5 bar (7.5 psi) abs
6) Vacuum resistance: 0 bar (0 psi) abs

Maximum turn down which can be ordered for absolute pressure and gauge pressure sensors

Devices for gauge pressure measurement
- 6 bar (90 psi), 16 bar (240 psi), 25 bar (375 psi): TD 1:1 to TD 2.5:1
- All other measuring ranges: TD 1:1 to TD 5:1

Devices for absolute pressure measurement
- 100 mbar (1.5 psi), 250 mbar (4 psi), 400 mbar (6 psi): TD 1:1
- 1 bar (15 psi): TD 1:1 to TD 2.5:1
- All other measuring ranges: TD 1:1 to TD 5:1

Metal process isolating diaphragm

Sensor	Device	Maximum Sensor measuring range		Lowest calibratable span [1]	MWP	OPL	Factory settings [2]	Option [3]
		lower (LRL)	upper (URL)					
		[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]		
Devices for gauge pressure measurement								
400 mbar (6 psi) [4]	PMP11 PMP21	−0.4 (−6)	+0.4 (+6)	0.4 (6)	1 (15)	1.6 (24)	0 to 400 mbar (0 to 6 psi)	1F
1 bar (15 psi) [4]	PMP11 PMP21	−1 (−15)	+1 (+15)	0.4 (6)	2.7 (40.5)	4 (60)	0 to 1 bar (0 to 15 psi)	1H
2 bar (30 psi) [4]	PMP11 PMP21	−1 (−15)	+2 (+30)	0.4 (6)	6.7 (100.5)	10 (150)	0 to 2 bar (0 to 30 psi)	1K
4 bar (60 psi) [4]	PMP11 PMP21	−1 (−15)	+4 (+60)	0.8 (12)	10.7 (160.5)	16 (240)	0 to 4 bar (0 to 60 psi)	1M
6 bar (90 psi) [4]	PMP11 PMP21	−1 (−15)	+6 (+90)	2.4 (36)	16 (240)	24 (360)	0 to 6 bar (0 to 90 psi)	1N
10 bar (150 psi) [4]	PMP11 PMP21	−1 (−15)	+10 (+150)	2 (30)	25 (375)	40 (600)	0 to 10 bar (0 to 150 psi)	1P
16 bar (240 psi) [4]	PMP11 PMP21	−1 (−15)	+16 (+240)	5 (75)	25 (375)	64 (960)	0 to 16 bar (0 to 240 psi)	1Q
25 bar (375 psi) [4]	PMP11 PMP21	−1 (−15)	+25 (+375)	5 (75)	25 (375)	100 (1500)	0 to 25 bar (0 to 375 psi)	1R
40 bar (600 psi) [4]	PMP11 PMP21	−1 (−15)	+40 (+600)	8 (120)	100 (1500)	160 (2400)	0 to 40 bar (0 to 600 psi)	1S
100 bar (1 500 psi) [4]	PMP21	−1 (−15)	+100 (+1500)	20 (300)	100 (1500)	160 (2400)	0 to 100 bar (0 to 1 500 psi)	1U
400 bar (6 000 psi) [4]	PMP21	−1 (−15)	+400 (+6000)	80 (1200)	400 (6000)	600 (9000)	0 to 400 bar (0 to 6 000 psi)	1W
Devices for absolute pressure measurement								
400 mbar (6 psi) [4]	PMP21	0 (0)	0.4 (+6)	0.4 (6)	1 (15)	1.6 (24)	0 to 400 mbar (0 to 6 psi)	2F
1 bar (15 psi) [4]	PMP21	0 (0)	1 (+15)	0.4 (6)	2.7 (40.5)	4 (60)	0 to 1 bar (0 to 15 psi)	2H
2 bar (30 psi) [4]	PMP21	0 (0)	2 (+30)	0.4 (6)	6.7 (100.5)	10 (150)	0 to 2 bar (0 to 30 psi)	2K
4 bar (60 psi) [4]	PMP21	0 (0)	4 (+60)	0.8 (12)	10.7 (160.5)	16 (240)	0 to 4 bar (0 to 60 psi)	2M
10 bar (150 psi) [4]	PMP21	0 (0)	10 (+150)	2 (30)	25 (375)	40 (600)	0 to 10 bar (0 to 150 psi)	2P
40 bar (600 psi) [4]	PMP21	0 (0)	+40 (+600)	8 (120)	100 (1500)	160 (2400)	0 to 40 bar (0 to 600 psi)	2S
100 bar (1 500 psi) [4]	PMP21	0 (0)	+100 (+1500)	20 (300)	100 (1500)	160 (2400)	0 to 100 bar (0 to 1 500 psi)	2U
400 bar (6 000 psi) [4]	PMP21	0 (0)	+400 (+6000)	80 (1200)	400 (6000)	600 (9000)	0 to 400 bar (0 to 6 000 psi)	2W

1) Highest turn down that can be set at the factory: 5:1. The turn down is preset and cannot be changed.
2) Other measuring ranges (e.g. −1 to +5 bar (−15 to 75 psi)) can be ordered with customer-specific settings (see the Product Configurator, order code for "Calibration; Unit" option "J"). It is possible to invert the output signal (LRV = 20 mA; URV = 4 mA). Prerequisite: URV < LRV
3) Product Configurator, order code for "Sensor range"
4) Vacuum resistance: 0.01 bar (0.145 psi) abs

Maximum turn down which can be ordered for absolute pressure and gauge pressure sensors

Device	Range	400 mbar (6 psi)	1 bar (15 psi) 6 bar (90 psi) 16 bar (240 psi)	2 bar (30 psi) 4 bar (60 psi) 10 bar (150 psi) 25 to 400 bar (375 to 6 000 psi)
PMP11	0.5%	TD 1:1	TD 1:1 to TD 2.5:1	TD 1:1 to TD 5:1
PMP21	0.3%	TD 1:1	TD 1:1 to TD 2.5:1	TD 1:1 to TD 5:1

Output

Output signal

Description	Option [1]
4 to 20 mA (2-wire)	1
PMC11: 0 to 10 V output (3-wire) PMP11: 0 to 10 V output (3-wire)	2

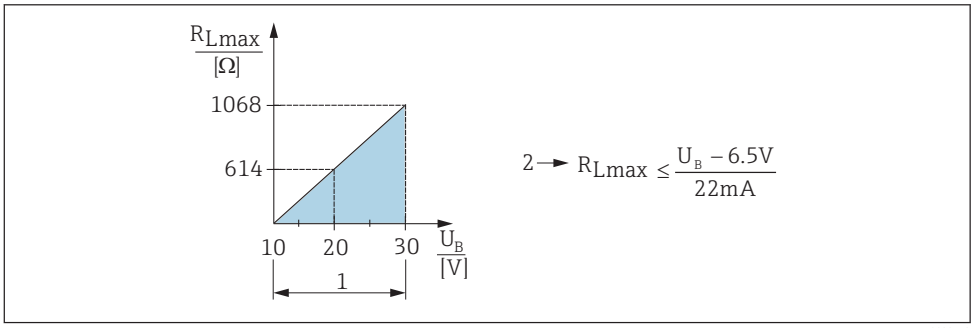
1) Product Configurator, order code for "Output"

Signal range 4 to 20 mA

3.8 mA to 20.5 mA

Load (for 4 to 20 mA devices)

In order to guarantee sufficient terminal voltage in two-wire devices, a maximum load resistance R_L (including line resistance) must not be exceeded, depending on the supply voltage U_B of the supply unit.



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1 Power supply 10 to 30 V DC
2 R_{Lmax} maximum load resistance
U_B Supply voltage

Load resistance (for 0 to 10 V devices)

The load resistance must be ≥ 5 [kΩ].

Signal on alarm 4 to 20 mA

The response of the output to error is regulated in accordance with NAMUR NE43.

Factory setting MAX alarm: >21 mA

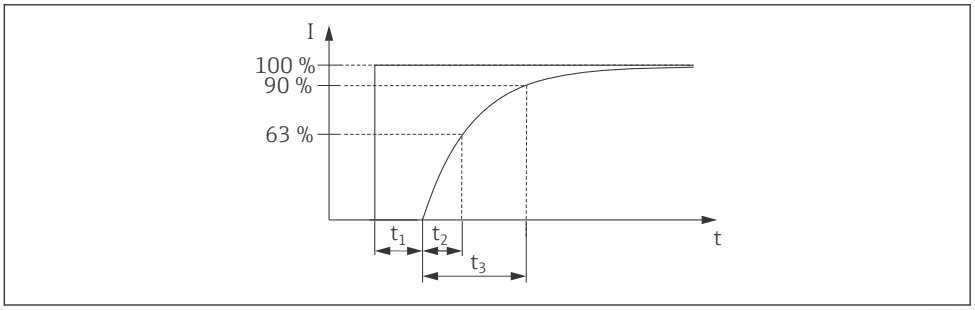
alarm current

Device	Description	Option
PMC21 PMP21	Adjusted min. alarm current	IA [1]

1) Product Configurator order code for "Service"

Dead time, time constant

Presentation of the dead time and the time constant:



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Dynamic behavior

Analog electronics

Dead time (t_1) [ms]	Time constant (T63), t_2 [ms]	Time constant (T90), t_3 [ms]
6 ms	10 ms	15 ms

Power supply

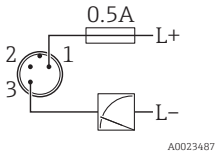
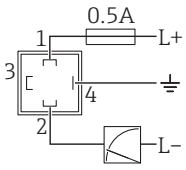
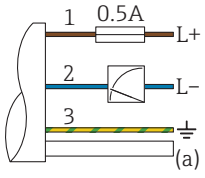
WARNING

Limitation of electrical safety due to incorrect connection!

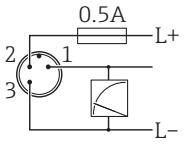
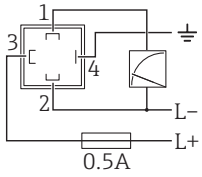
- In accordance with IEC/EN61010 a separate circuit breaker must be provided for the device .
- When using the measuring device in hazardous areas, installation must comply with the corresponding national standards and regulations and the Safety Instructions or Installation or Control Drawings.
- All explosion protection data are given in separate documentation which is available upon request. The Ex documentation is supplied as standard with all devices approved for use in explosion hazardous areas.
- Protective circuits against reverse polarity, HF influences and overvoltage peaks are integrated.
- The device must be operated with a 500 mA fine-wire fuse (slow-blow).

Terminal assignment

4 to 20 mA output

Device	M12 plug	Valve plug	Cable
PMC11 PMP11 PMC21 PMP21			 *1 brown = L+* *2 blue = L-* *3 green/yellow = ground connection* *(a) reference air hose*

0 to 10 V output

Device	M12 plug	Valve plug	Cable
PMC11 PMP11			-

Supply voltage

Electronic version	Device	Supply voltage
4 to 20 mA output	PMC11 PMP11 PMC21 PMP21	10 to 30 V DC
0 to 10 V output	PMC11 PMP11	12 to 30 V DC

Current consumption and alarm signal

Number of wires	Device	Normal operation	Alarm signal [1]
2	PMC11 PMP11 PMC21 PMP21	≤ 26 mA	> 21 mA
3	PMC11 PMP11	< 12 mA	11 V

1) For MAX alarm (factory setting)

Power supply fault

- Behavior in the event of overvoltage (>30 V):
  The device works continuously up to 34 V DC without damage. If the supply voltage is exceeded, the specified characteristics are no longer guaranteed.
- Behavior in the event of undervoltage:
  If the supply voltage falls below the minimum value, the device switches off in a defined manner (status same as for no power supply).

Electrical connection

Degree of protection

Device	Connection	Climate class	Option [1]
PMP21 PMP21	Cable5 m (16 ft)	IP66/68 [2] NEMA type 4X/6P enclosure	A
PMP21 PMP21	Cable10 m (33 ft)	IP66/68 [2] NEMA type 4X/6P enclosure	B
PMP21 PMP21	Cable25 m (82 ft)	IP66/68 [2] NEMA type 4X/6P enclosure	C
PMC11 PMP11	M12 plug	IP65 NEMA type 4X enclosure	L
PMC21 PMP21	M12 plug	IP65/67 NEMA type 4X enclosure	M
PMC11 PMP11 PMC21 PMP21	Valve plug ISO4400 M16	IP65 NEMA type 4X enclosure	U
PMC11 PMP11 PMC21 PMP21	Valve plug ISO4400 NPT ½	IP65 NEMA type 4X enclosure	V

1) Product Configurator, order code for "Electrical connection"
2) IP 68 (1.83m H2O for 24 h)

Cable specification

For valve plug: < 1.5 mm^2 (16 AWG) and Ø3.5 to 6.5 mm (0.14 to 0.26 in)

Residual ripple

The device operates within the reference accuracy up to ±5 % of the residual ripple of the supply voltage, within the permitted voltage range.

Influence of power supply

≤0.005 % of the URL/1 V

Overvoltage protection

The device does not contain any special elements to protect against overvoltage ("wire to ground"). Nevertheless the requirements of the applicable EMC standard EN 61000-4-5 (testing voltage 1kV EMC wire/ground) are met.

Performance characteristics of ceramic process isolating diaphragm

Reference operating conditions

- As per IEC 60770
- Ambient temperature T_A = constant, in the range of:+21 to +33 °C (+70 to +91 °F)
- Humidity φ = constant, in the range of 5 to 80 % rH
- Ambient pressure p_A = constant, in the range of:860 to 1 060 mbar (12.47 to 15.37 psi)
- Position of measuring cell = constant, in range: horizontal ±1° (see also "Influence of the installation position" section → 🖹 22)
- Zero based span
- Material of process isolating diaphragm: Al_2O_3 (aluminum-oxide ceramic, Ceraphire®)
- Supply voltage: 24 V DC ±3 V DC
- Load: 320 Ω (at 4 to 20 mA output)

Measuring uncertainty for small absolute pressure measuring ranges

The smallest extended uncertainty of measurement that can delivered by our standards is:

- in range 1 to 30 mbar (0.0145 to 0.435 psi): 0.4 % of reading
- in range < 1 mbar (0.0145 psi): 1 % of reading.

Influence of the installation position

→ 🖹 22

Resolution

Current output: min. 1.6 µA

Reference accuracy

The reference accuracy contains the non-linearity [DIN EN 61298-2 3.11] including the pressure hysteresis [DIN EN 61298-23.13] and non-repeatability [DIN EN 61298-2 3.11] in accordance with the limit point method as per [DIN EN 60770].

Device	% of the calibrated span to the maximum turn down		
	Reference accuracy	Non-linearity [1]	Non-repeatability
PMC11 [2]	±0.5	±0.1	±0.1
PMC21	±0.3	±0.1	±0.1

1) The non-linearity for the 40 bar (600 psi) sensor can be up to ± 0.15% of the calibrated span up to the maximum turn down.
2) For devices with 0 to 10 V output, a non-linearity of up to max. 0.3 V can occur for signal values below 0.03 V.

Overview of the turn down ranges → 🖹 13

Measuring ranges	Turn down	Device	% of URL
100 mbar (1.5 psi)to 40 bar (600 psi)	1:1 to TD 5:1	PMC11	±0.5
		PMC21	±0.3 [1]

1) For the 100 mbar (1.5 psi) and 250 mbar (4 psi) measuring ranges, the following applies: In the event of heat effects on the initial reference conditions, an additional deviation of max. 0.3 mbar (4.5 psi) from the zero point or the output span is possible.

Thermal change of the zero output and the output span

Measuring cell	−20 to +85 °C (−4 to +185 °F)	−40 to −20 °C (−40 to −4 °F) +85 to +100 °C (+185 to +212 °F)
	% of URL for TD 1:1	
<1 bar (15 psi)	<1	<1.2
≥ 1 bar (15 psi)	<0.8	<1

Long-term stability

1 year	5 years	8 years
% of URL		
±0.2	±0.4	±0.45

Switch-on time

≤2 s (For small measuring ranges, pay attention to the thermal compensation effects.)

Performance characteristics of metallic process isolating diaphragm

Reference operating conditions

- As per IEC 60770
- Ambient temperature T_A = constant, in the range of:+21 to +33 °C (+70 to +91 °F)
- Humidity φ = constant, in the range of 5 to 80 % rH
- Ambient pressure p_A = constant, in the range of:860 to 1 060 mbar (12.47 to 15.37 psi)
- Position of measuring cell = constant, in range: horizontal ±1° (see also "Influence of the installation position" section → 🖹 22)
- Zero based span
- Process isolating diaphragm material: AISI 316L (1.4435)
- Filling oil: NSF-H1 synthetic oil in accordance with FDA 21 CFR 178.3570
- Supply voltage: 24 V DC ±3 V DC
- Load: 320 Ω (at 4 to 20 mA output)

Measuring uncertainty for small absolute pressure measuring ranges

The smallest extended uncertainty of measurement that can delivered by our standards is:

- in range 1 to 30 mbar (0.0145 to 0.435 psi): 0.4 % of reading
- in range < 1 mbar (0.0145 psi): 1 % of reading.

Influence of the installation position

→ 🖹 22

Resolution

Current output: min. 1.6 µA

Reference accuracy

The reference accuracy contains the non-linearity [DIN EN 61298-2 3.11] including the pressure hysteresis [DIN EN 61298-23.13] and non-repeatability [DIN EN 61298-2 3.11] in accordance with the limit point method as per [DIN EN 60770].

Device	% of the calibrated span to the maximum turn down		
	Reference accuracy	Non-linearity	Non-repeatability
PMP11 [1)]	±0.5	±0.1	±0.1
PMP21	±0.3	±0.1	±0.1

1) For devices with 0 to 10 V output, a non-linearity of up to max. 0.3 V can occur for signal values below 0.015 V.

Overview of the turn down ranges → 🖹 14

Thermal change of the zero output and the output span

Measuring cell	−20 to +85 °C (−4 to +185 °F)	−20 to −40 °C (−4 to −40 °F) +85 to +100 °C (+185 to +212 °F)
	% of the calibrated span for TD 1:1	
<1 bar (15 psi)	<1	<1.2
≥ 1 bar (15 psi)	<0.8	<1

Long-term stability

1 year	5 years	8 years
% of URL		
±0.2	±0.4	±0.45

Switch-on time

≤2 s

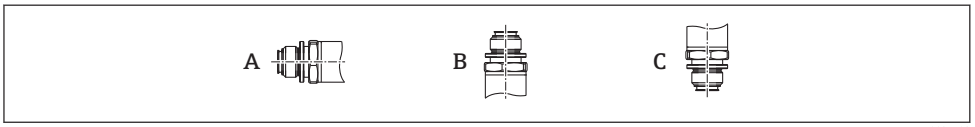
Installation

Installation conditions

- No moisture may enter the housing when installing or operating the device, or when establishing the electrical connection.
- Point the cable and connector downwards where possible to prevent moisture from entering (e.g. rain or condensation water).

Influence of the installation position

Any orientation is possible. However, the orientation may cause a zero point shift i.e. the measured value does not show zero when the vessel is empty or partially full.



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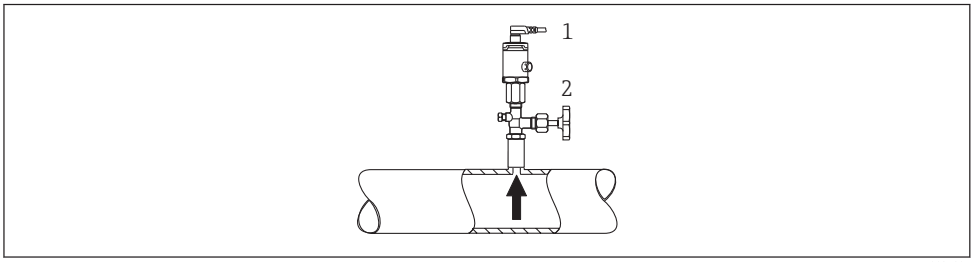
Type	Process isolating diaphragm axis is horizontal (A)	Process isolating diaphragm pointing upwards (B)	Process isolating diaphragm pointing downwards (C)
PMP11 PMP21	Calibration position, no effect	Up to +4 mbar (+0.058 psi)	Up to −4 mbar (−0.058 psi)
PMC11, PMC21 < 1 bar (15 psi)	Calibration position, no effect	Up to +0.3 mbar (+0.0044 psi)	Up to −0.3 mbar (−0.0044 psi)
PMC11, PMC21 ≥1 bar (15 psi)	Calibration position, no effect	Up to +3 mbar (+0.0435 psi)	Up to −3 mbar (−0.0435 psi)

Mounting location

Pressure measurement

Pressure measurement in gases

Mount the device with shutoff device above the tapping point so that any condensate can flow into the process.



A0021904

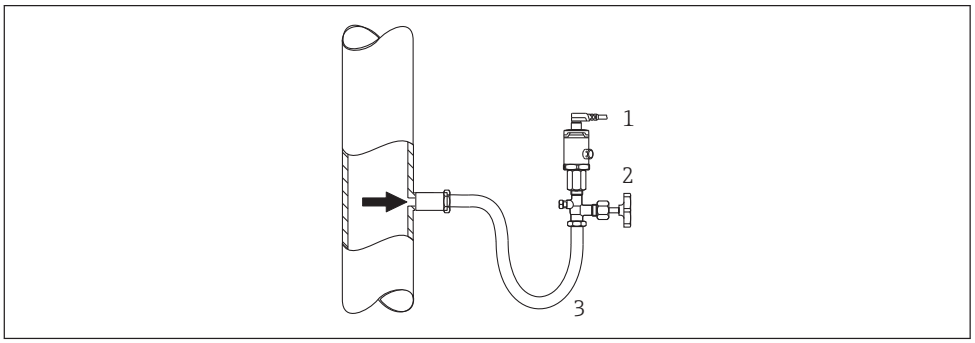
1 Device
2 Shutoff device

Pressure measurement in vapors

For pressure measurement in vapors, use a siphon. The siphon reduces the temperature to almost ambient temperature. Mount the device with a shutoff device at the same height as the tapping point.

Advantage:
only minor/negligible heat effects on the device.

Note the max. permitted ambient temperature of the transmitter!

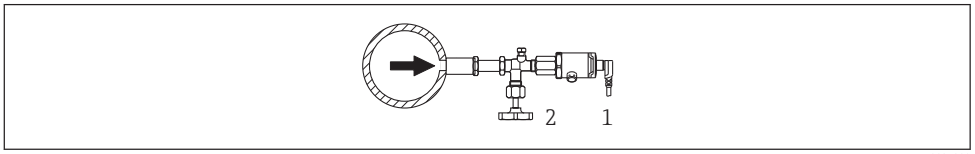


A0024395

1 *Device*
2 *Shutoff device*
3 *Siphon*

Pressure measurement in liquids

Mount the device with a shutoff device at the same height as the tapping point.

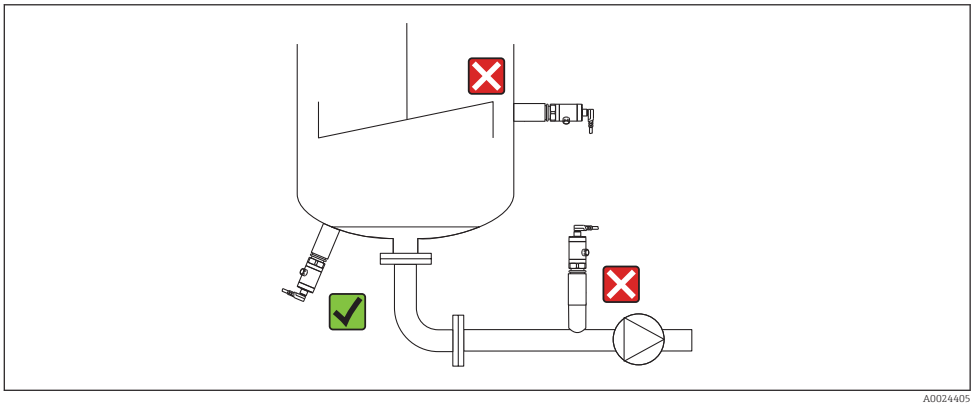


A0024399

1 *Device*
2 *Shutoff device*

Level measurement

- Always install the device below the lowest measuring point.
- Do not install the device at the following positions:
  - In the filling curtain
  - In the tank outlet
  - In the suction area of a pump
  - Or at a point in the tank which could be affected by pressure pulses from the agitator.



A0024405

Mounting instructions for oxygen applications

Oxygen and other gases can react explosively to oils, grease and plastics, such that, among other things, the following precautions must be taken:

- All components of the system, such as measuring devices, must be cleaned in accordance with the BAM requirements.
- Dependent on the materials used, a certain maximum temperature and a maximum pressure for oxygen applications must not be exceeded.
- The following table lists devices (devices only, not accessories or enclosed accessories), which are suitable for gaseous oxygen applications.

Device	p_{max} for oxygen applications	T_{max} for oxygen applications	Option [1]
PMC21	40 bar (600 psi)	−10 to +60 °C (+14 to +140 °F)	HB

1) Product Configurator, order code for "Service"

Environment

Ambient temperature range

Device	Ambient temperature range [1]
PMC11 PMP11	−40 to +70 °C (−40 to +158 °F)
PMC21 PMP21	−40 to +85 °C (−40 to +185 °F)
PMC21 PMP21	Devices for hazardous areas: −40 to +70 °C (−40 to +158 °F)

1) Exception: the following cable is designed for an operating temperature range of −25 to +70 °C (−13 to +158 °F): Product Configurator order code for "Accessory enclosed", option "RZ".

Storage temperature range

−40 to +85 °C (−40 to +185 °F)

Climate class

Device	Climate class	Note
PMC11 PMP11 PMC21 PMP21	Class 3K5	Air temperature: −5 to +45 °C (+23 to +113 °F), relative humidity: 4 to 95 % satisfied according to IEC 721-3-3 (condensation not possible)

Degree of protection

Device	Connection	Climate class	Option [1]
PMP21 PMP21	Cable5 m (16 ft)	IP66/68 [2] NEMA type 4X/6P enclosure	A
PMP21 PMP21	Cable10 m (33 ft)	IP66/68 [2] NEMA type 4X/6P enclosure	B
PMP21 PMP21	Cable25 m (82 ft)	IP66/68 [2] NEMA type 4X/6P enclosure	C
PMC11 PMP11	M12 plug	IP65 NEMA type 4X enclosure	L
PMC21 PMP21	M12 plug	IP65/67 NEMA type 4X enclosure	M
PMC11 PMP11 PMC21 PMP21	Valve plug ISO4400 M16	IP65 NEMA type 4X enclosure	U
PMC11 PMP11 PMC21 PMP21	Valve plug ISO4400 NPT ½	IP65 NEMA type 4X enclosure	V

1) Product Configurator, order code for "Electrical connection"
2) IP 68 (1.83m H2O for 24 h)

Vibration resistance

Test standard	Vibration resistance
IEC 60068-2-64:2008	Guaranteed for 5 to 2000Hz: 0.05 g^2/Hz

Electromagnetic compatibility

- Interference emission as per EN 61326-1 equipment B
- Interference immunity as per EN 61326-1 (industrial environment)
- NAMUR recommendation EMC (NE21)
- Maximum deviation: 1.5% for TD 1:1

For more details, refer to the Declaration of Conformity.

Process

Process temperature range for devices with ceramic process isolating diaphragm

Device	Process temperature range
PMC11	−25 to +85 °C (−13 to +185 °F)
PMC21	−25 to +100 °C (−13 to +212 °F)
PMC21 for oxygen applications	−10 to +60 °C (+14 to +140 °F)

- For saturated steam applications, use a device with a metal process isolating diaphragm, or provide a siphon for temperature isolation when installing.
- Pay attention to the process temperature range of the seal. See also the following table.

Seal	Notes	Process temperature range	Option
FKM	-	−20 to +100 °C (−4 to +212 °F)	A [1]
FKM	Cleaned for oxygen service	−10 to +60 °C (+14 to +140 °F)	A [1] and HB [2]
EPDM 70	-	−25 to +100 °C (−13 to +212 °F)	J [1]

1) Product Configurator, order code for "Seal"
2) Product Configurator, order code for "Service"

Applications with changes in temperature

Frequent extreme changes in temperatures can temporarily cause measuring errors. Temperature compensation takes place after a few minutes. Internal temperature compensation is faster the smaller the change in temperature and the longer the time interval.

For further information please contact your local Endress+Hauser Sales Center.

Process temperature range for devices with metallic process isolating diaphragm

Device	Process temperature range
PMP11	−25 to +85 °C (−13 to +185 °F)
PMP21	−40 to +100 °C (−40 to +212 °F)

Applications with changes in temperature

Frequent extreme changes in temperatures can temporarily cause measuring errors. Internal temperature compensation is faster the smaller the change in temperature and the longer the time interval.

For further information please contact your local Endress+Hauser Sales Center.

Pressure specifications

WARNING

The maximum pressure for the measuring device depends on the lowest-rated element with regard to pressure.

- For pressure specifications, see the "Measuring range" section and the "Mechanical construction" section.
- The Pressure Equipment Directive (2014/68/EU) uses the abbreviation "PS". The abbreviation "PS" corresponds to the MWP (maximum working pressure) of the measuring device.
- MWP (maximum working pressure): The MWP (maximum working pressure) is specified on the nameplate. This value is based on a reference temperature of +20 °C (+68 °F) and may be applied to the device for an unlimited period of time. Observe the temperature dependency of the MWP.
- OPL (over pressure limit): The test pressure corresponds to the over pressure limit of the sensor and may only be applied temporarily to ensure that the measurement is within the specifications and no permanent damage develops. In the case of sensor range and process connections where the over pressure limit (OPL) of the process connection is smaller than the nominal value of the sensor, the device is set at the factory, at the very maximum, to the OPL value of the process connection. If you want to use the entire sensor range, select a process connection with a higher OPL value.
- Oxygen applications: In oxygen applications, the values for "p_{max} and T_{max} for oxygen applications may not be exceeded .
- Devices with ceramic process isolating diaphragm: avoid steam hammering! Steam hammering can cause zero point drifts. Recommendation: Residue (water droplets or condensation) may remain on the process isolating diaphragm following CIP cleaning and can result in local steam hammering the next time steam cleaning takes place. In practice, drying the process isolating diaphragm (e.g. by blowing) has proved to prevent steam hammering.

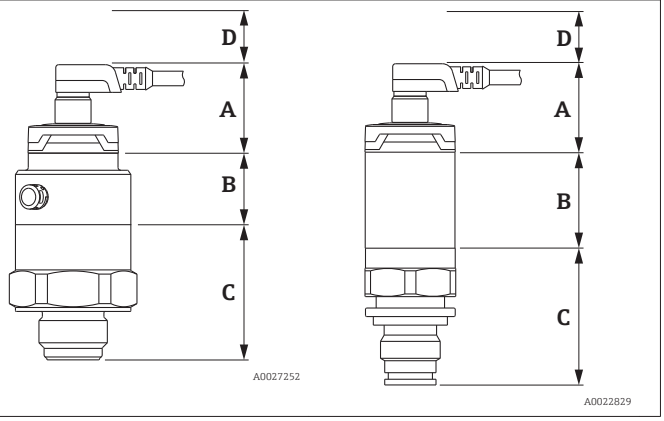
Mechanical construction

Design, dimensions

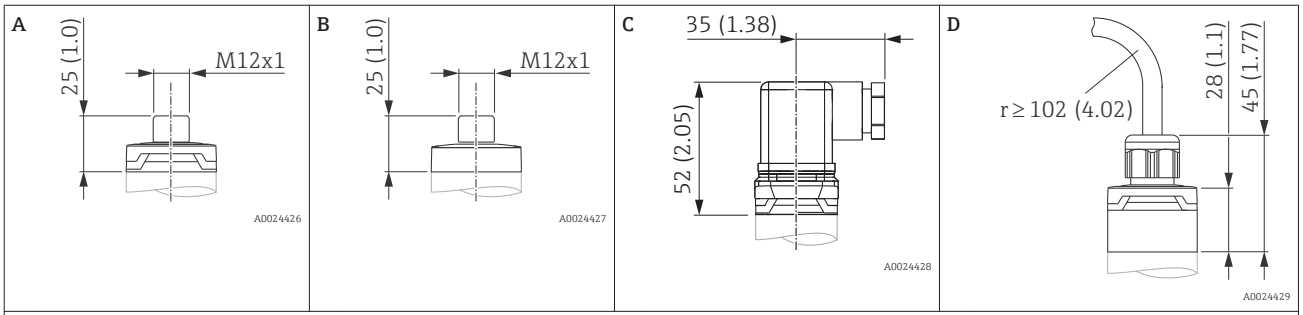
Device height

The device height is calculated from
- the height of the electrical connection
- the height of the housing and
- the height of the individual process connection.

The individual heights of the components are listed in the following sections. To calculate the device height simply add up the individual heights of the components. Where applicable also take into consideration the installation distance (space that is used to install the device). You can use the following table for this purpose:

Section	Page	Height	Example
Electrical connection	→ 28	(A)	
Housing height	→ 29	(B)	
Process connection height	→ 30 → 33	(C)	
Installation distance	-	(D)	

Electrical connection



Engineering unit mm (in)

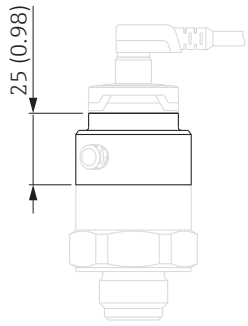
Position	Description	Material	Weight kg (lbs)	Device	Option [1]
A	M12 plug IP65 (Additional dimensions → 45)	Housing cap made of plastic	0.012 (0.03)	PMC11 PMP11	L
A	M12 plug IP65/67 (Additional dimensions → 45)	Housing cap made of plastic	0.012 (0.03)	PMC21 PMP21	M Plug connector with cable can be ordered as an accessory → 45
B	M12 plug IP66/67	Housing cap made of metal	0.030 (0.07)	PMC21 PMP21	In the case of Ex ec type of protection, the housing cap is made of metal.
C	M16 valve plug	Plastic PPSU	0.060 (0.14)	PMC11 PMP11 PMC21 PMP21	U

Position	Description	Material	Weight kg (lbs)	Device	Option [1]
C	NPT ½ valve plug	Plastic PPSU	0.060 (0.14)	PMC11 PMP11 PMC21 PMP21	V
D	Cable5 m (16 ft)	PUR (UL94V0)	0.280 (0.62)	PMC21 PMP21	A
D	Cable10 m (33 ft)	PUR (UL94V0)	0.570 (1.26)	PMC21 PMP21	B
D	Cable25 m (82 ft)	PUR (UL94V0)	1.400 (3.09)	PMC21 PMP21	C

1) Product Configurator, order code for "Electrical connection"

Housing

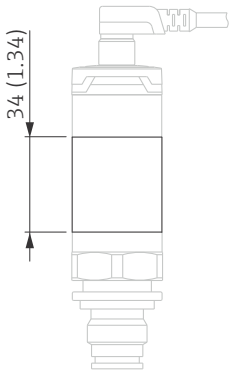
A



A0022243

Engineering unit mm (in)

B



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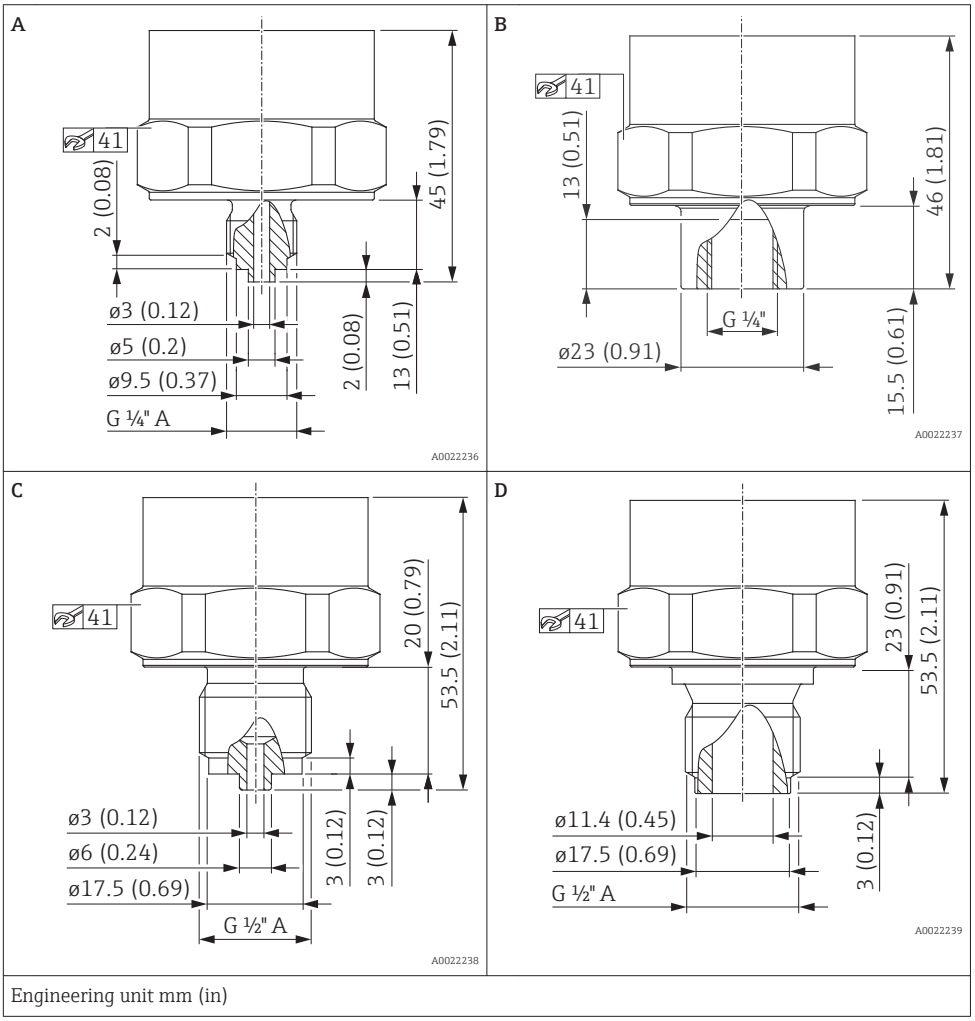
Engineering unit mm (in)

Item	Device	Material	Weight kg (lbs)
A	PMC11 PMC21	Stainless steel 316L	0.150 (0.33)
B	PMP11 PMP21	Stainless steel 316L	0.090 (0.20)

Process connections with internal, ceramic process isolating diaphragm

Thread ISO 228 G



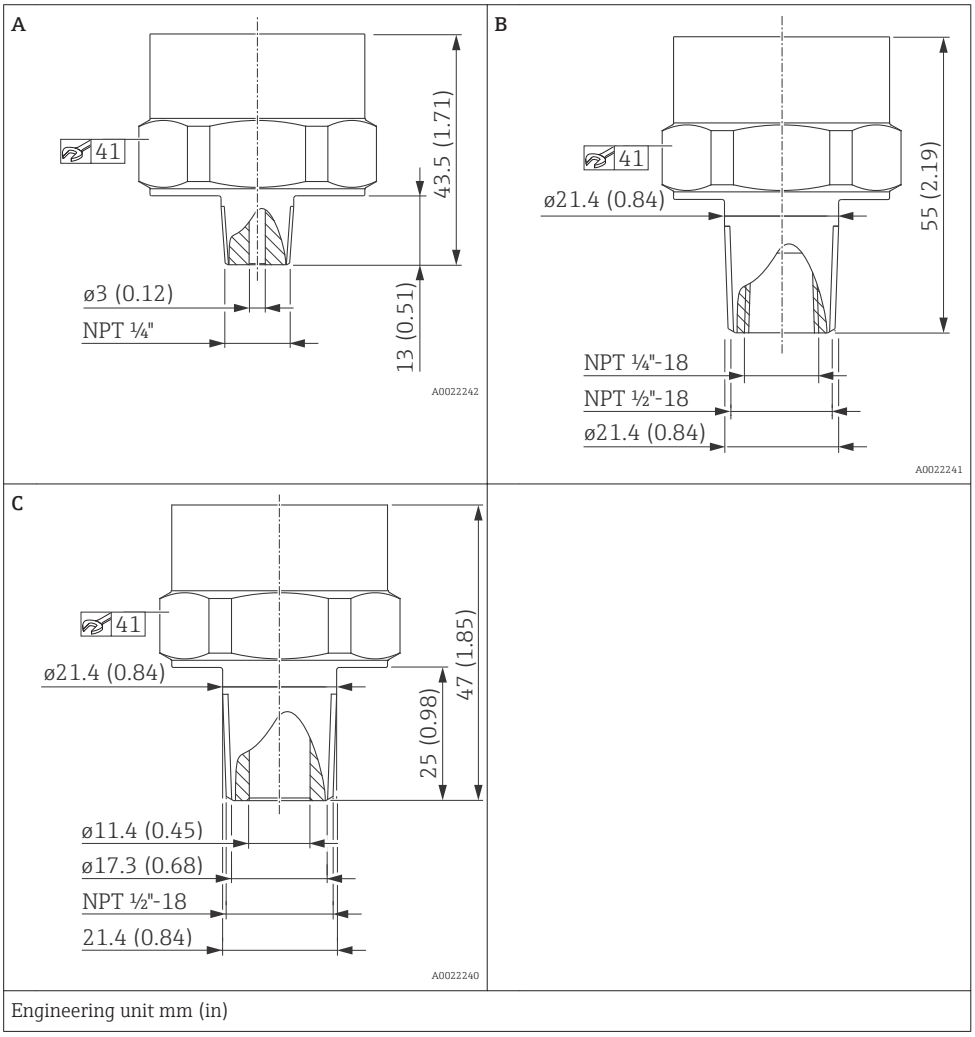
Engineering unit mm (in)

Device	Item	Description	Material	Weight	Option [1]
				kg (lbs)	
▪ PMC11 ▪ PMC21	A	Thread ISO 228 G ¼" A, EN 837	316L	0.160 (0.35)	WTJ
▪ PMC11 ▪ PMC21	B	Thread ISO 228 G ¼" (female)	316L	0.180 (0.40)	WAJ
▪ PMC11 ▪ PMC21	C	Thread ISO 228 G ½" A, EN 837	316L	0.180 (0.40)	WBJ
▪ PMC11 ▪ PMC21	D	Thread ISO 228 G ½" A, bore11.4 mm (0.45 in)	316L	0.180 (0.40)	WWJ

1) Product Configurator, order code for "Process connection"

Process connections with internal, ceramic process isolating diaphragm

Thread ASME



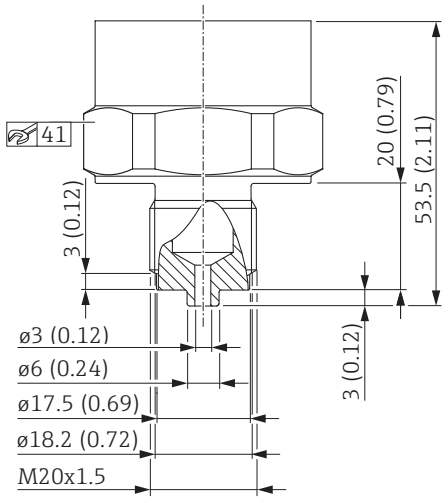
Engineering unit mm (in)

Device	Item	Description	Material	Weight	Approval	Option [1]
				kg (lbs)		
▪ PMC11 ▪ PMC21	A	ASME ¼" MNPT, bore3 mm (0.12 in)	316L	0.160 (0.35)	CRN	VUJ
▪ PMC11 ▪ PMC21	B	ASME ½" MNPT, ¼" FNPT (female)	316L	0.190 (0.42)	CRN	VXJ
▪ PMC11 ▪ PMC21	C	ASME ½" MNPT, bore11.4 mm (0.45 in)	316L	0.190 (0.42)	CRN	VWJ

1) Product Configurator, order code for "Process connection"

Process connections with internal, ceramic process isolating diaphragm

Thread DIN13



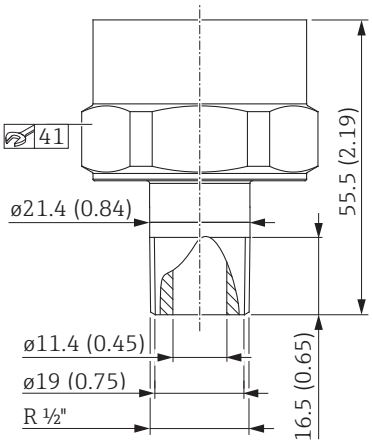
Engineering unit mm (in)

Device	Description	Material	Weight	Option [1]
			kg (lbs)	
▪ PMC11 ▪ PMC21	DIN 13 M20 x 1.5, EN 837, bore 3 mm (0.12 in)	316L	0.180 (0.40)	X4J

1) Product Configurator, order code for "Process connection"

Process connections with internal, ceramic process isolating diaphragm

Thread JIS B0203



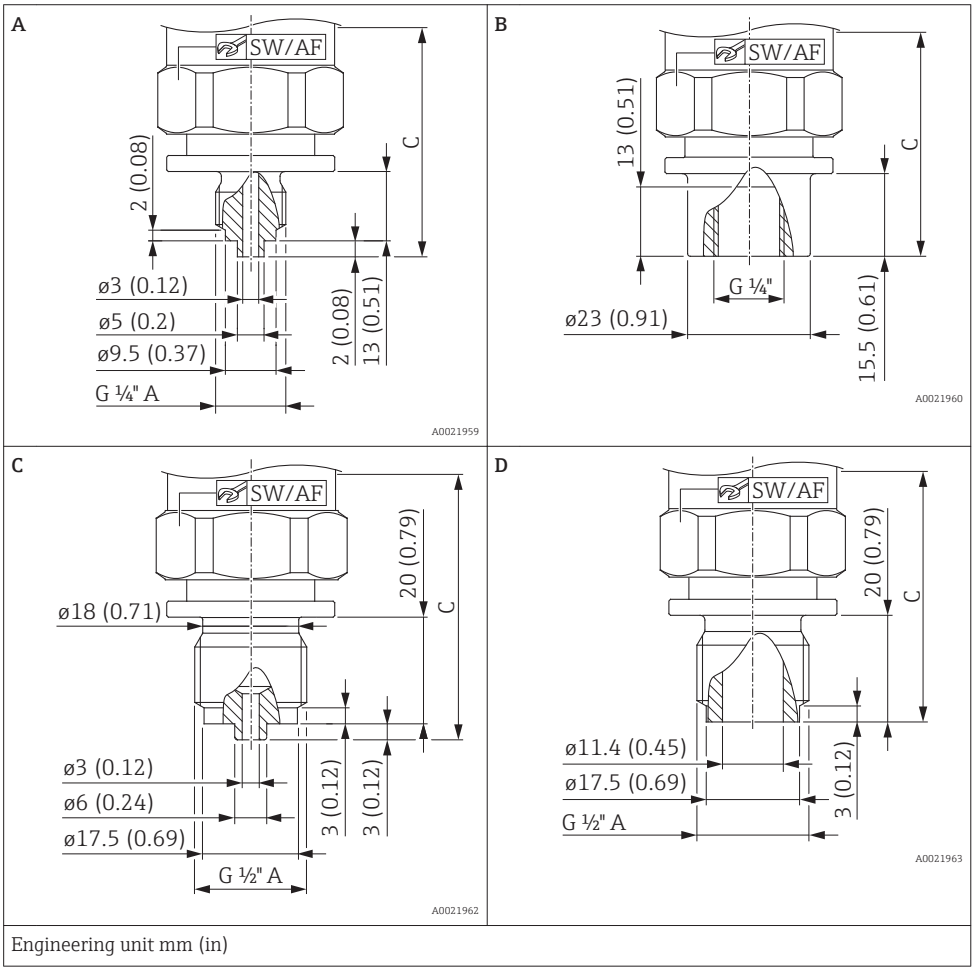
Engineering unit mm (in)

Device	Description	Material	Weight	Option [1]
			kg (lbs)	
PMC21	JIS B0203 R 1/2 (male)	316L	0.180 (0.40)	ZJJ

1) Product Configurator, order code for "Process connection"

Process connections with internal, metal process isolating diaphragm

Thread ISO 228 G



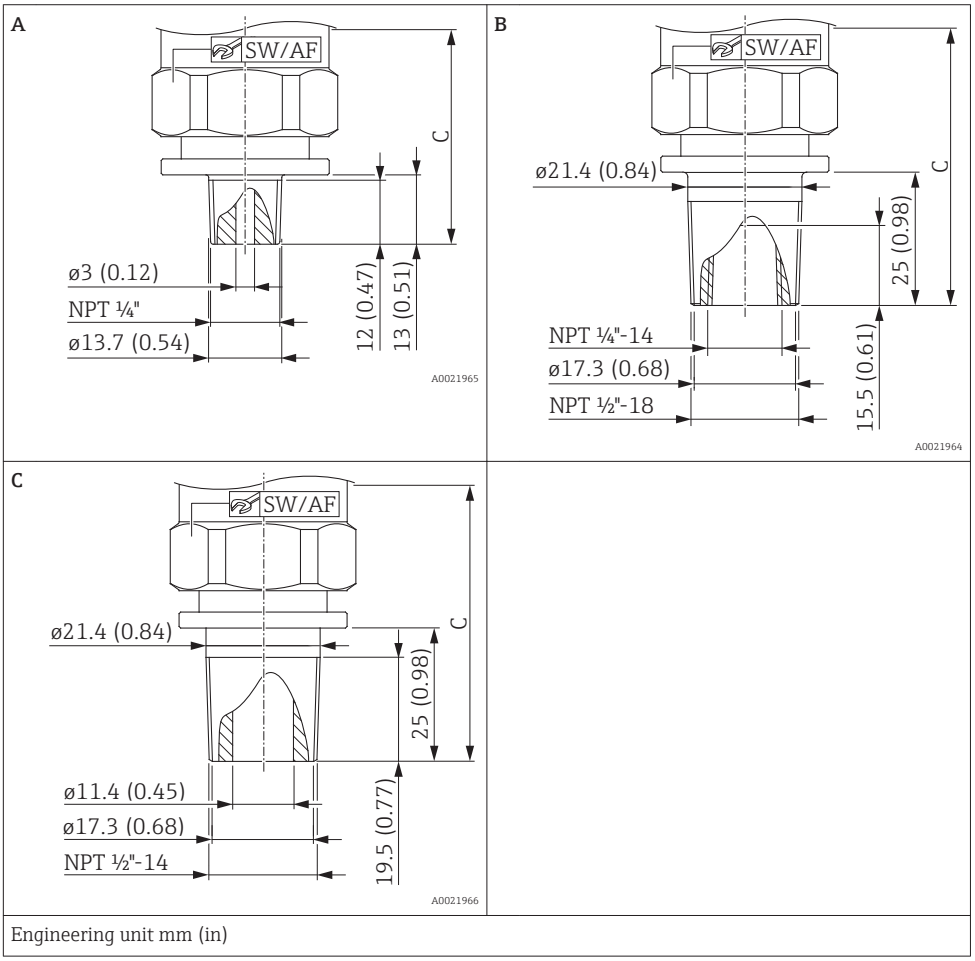
Engineering unit mm (in)

Position	Device	Description	Material	Nominal value to 100 bar (1 500 psi)			Nominal value 400 bar (6 000 psi)			Option [1]
				Weight kg (lbs)	Height C	SW/ AF	Weight kg (lbs)	Height C	SW/ AF	
A	PMP11 PMP21	Thread ISO 228 G ¼" A, EN 837	316L	0.200 (0.44)	57 (2.24)	32	0.240 (0.53)	69 (2.72)	27	WTJ
B	PMP11 PMP21	Thread ISO 228 G ¼" (female)	316L	0.220 (0.49)	57 (2.24)	32	0.260 (0.57)	69 (2.72)	27	WAJ
C	PMP11 PMP21	Thread ISO 228 G ½" A, EN 837	316L	0.220 (0.49)	65 (2.56)	32	0.270 (0.60)	77 (3.03)	27	WBJ
D	PMP11 PMP21	Thread ISO 228 G ½" A, bore11.4 mm (0.45 in)	316L	0.220 (0.49)	62 (2.44)	32	0.260 (0.57)	74 (2.91)	27	WWJ

1) Product Configurator, order code for "Process connection"

Process connections with internal, metal process isolating diaphragm

Thread ASME



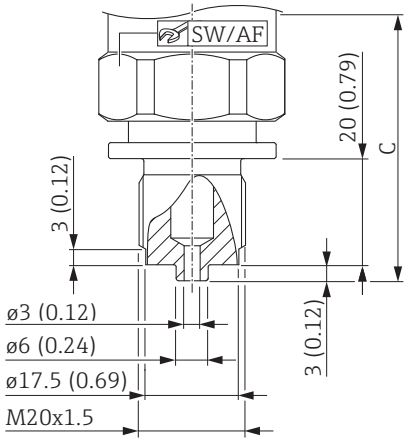
Engineering unit mm (in)

Position	Device	Description	Material	Nominal value to 100 bar (1 500 psi)			Nominal value 400 bar (6 000 psi)			Approval	Option [1]
				Weight kg (lbs)	Height C	SW/ AF	Weight kg (lbs)	Height C	SW/ AF		
A	PMP11 PMP21	ASME ¼" MNPT, bore3 mm (0.12 in)	316L	0.200 (0.44)	55 (2.17)	32	0.240 (0.53)	67 (2.64)	27	CRN	VUJ
B	PMP11 PMP21	ASME ½" MNPT, ¼" FNPT (female)	316L	0.230 (0.51)	67 (2.64)	32	0.260 (0.57)	79 (3.11)	27	CRN	VXJ
C	PMP11 PMP21	ASME ½" MNPT, bore11.4 mm (0.45 in)	316L	0.230 (0.51)	67 (2.67)	32	0.270 (0.60)	79 (3.11)	27	CRN	VWJ

1) Product Configurator, order code for "Process connection"

Process connections with internal, metal process isolating diaphragm

Thread DIN13



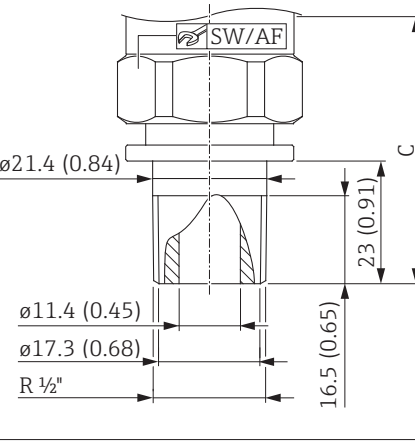
Engineering unit mm (in)

Description	Device	Material	Nominal value to 100 bar (1 500 psi)			Nominal value 400 bar (6 000 psi)			Option [1]
			Weight kg (lbs)	Height C	SW/ AF	Weight kg (lbs)	Height C	SW/ AF	
DIN 13 M20 x 1.5, EN 837, bore 3 mm (0.12 in)	PMP11 PMP21	316L	0.220 (0.49)	65 (2.56)	32	0.260 (0.57)	77 (3.03)	27	X4J

1) Product Configurator, order code for "Process connection"

Process connections with internal, metal process isolating diaphragm

Thread JIS B0203



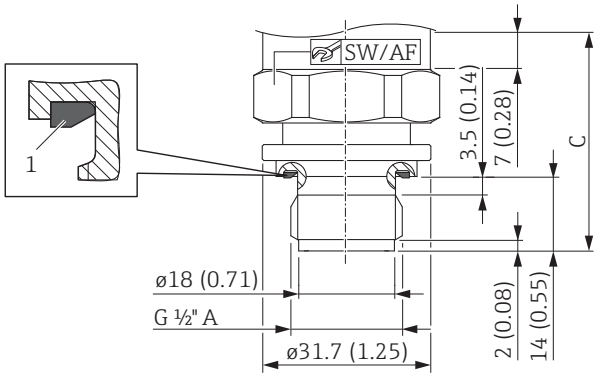
Engineering unit mm (in). Diameter of process isolating diaphragm: 17.2 mm (0.68 in)

Description	Device	Material	Nominal value to 100 bar (1 500 psi)			Nominal value 400 bar (6 000 psi)			Option [1]
			Weight kg (lbs)	Height C	SW/ AF	Weight kg (lbs)	Height C	SW/ AF	
JIS B0203 R ½" (male)	PMP21	316L	0.230 (0.51)	65 (2.56)	32	0.260 (0.57)	77 (3.03)	27	ZJJ

1) Product Configurator, order code for "Process connection"

Process connections with flush-mounted, metal process isolating diaphragm

Thread ISO 228 G

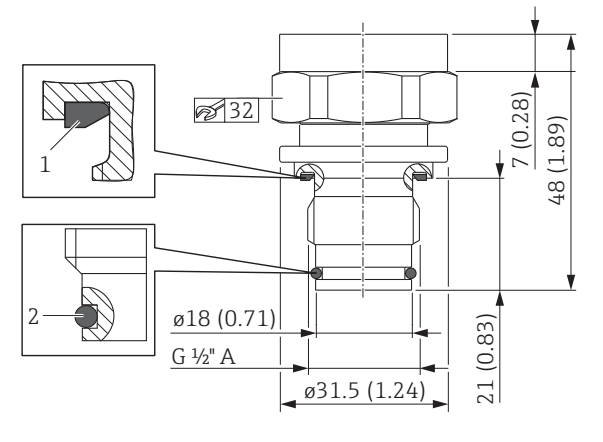


1 FKM form seal, pre-mounted

Engineering unit mm (in). Diameter of process isolating diaphragm: 17.2 mm (0.68 in)

Device	Description	Material	Nominal value to 100 bar (1 500 psi)			Nominal value 400 bar (6 000 psi)			Option [1]
			Weight	Height C	SW/ AF	Weight	Height C	SW/ AF	
			kg (lbs)			kg (lbs)			
PMP11 PMP21	Thread ISO 228 G ½" A DIN3852	316L	0.140 (0.31)	41 (1.61)	32	0.120 (0.26)	35 (1.38)	32	WJJ

1) Product Configurator, order code for "Process connection"



1 FKM form seal, pre-mounted
2 FKM O-ring, pre-mounted

Engineering unit mm (in). Diameter of process isolating diaphragm: 17.2 mm (0.68 in)

Device [1]	Description	Material	Weight	Option [2]
			kg (lbs)	
PMP11 PMP21	Thread ISO 228 G ½" A O-ring seal, flush-mounted	316L	0.150 (0.33)	WUJ

1) Suitable for weld-in adapter 52002643 and 52010172
2) Product Configurator, order code for "Process connection"

Materials in contact with process

NOTICE

- Device components in contact with the process are listed in the "Mechanical construction" and "Ordering information" sections.

TSE Certificate of Suitability

The following applies to all device components in contact with the process:

- They do not contain any materials derived from animals.
- No additives or operating materials derived from animals are used in production or processing.

Process connections

Endress+Hauser supplies a threaded connection made of stainless steel in accordance with AISI 316L (DIN/ EN material number 1.4404 or 1.4435). With regard to their stability-temperature property, the materials 1.4404 and 1.4435 are grouped together under 13E0 in EN 1092-1: 2001 Tab. 18. The chemical composition of the two materials can be identical.

Process isolating diaphragm

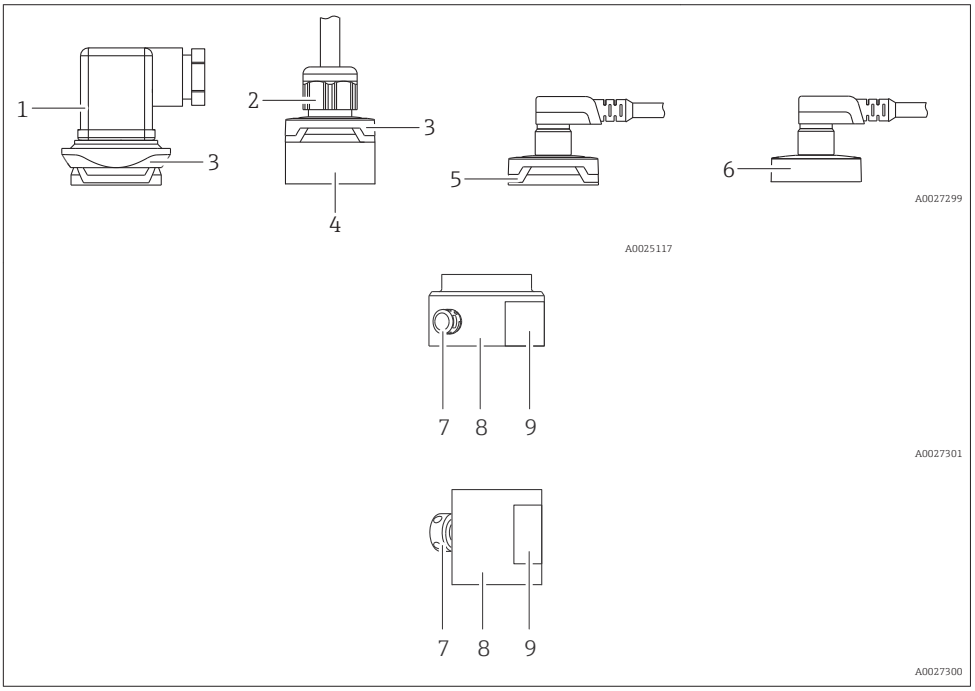
Description	Material
Ceramic process isolating diaphragm	Al_2O_3 aluminum-oxide ceramic, Ceraphire® FDA, ultrapure 99.9 % (see also www.endress.com/ceraphire) The US Food & Drug Administration (FDA) has no objections to the use of ceramics made from aluminum oxide as a surface material in contact with foodstuffs. This declaration is based on the FDA certificates of our ceramic suppliers.
Metal process isolating diaphragm	AISI 316L (DIN/EN material number 1.4435)

Seals

See the specific process connection.

Materials not in contact with process

Housing



Item number	Component part	Material
1	Valve plug	▪ Seal: NBR ▪ Plug: PA ▪ Screw: V2A
2	Cable	▪ Pressure screw: PVDF ▪ Seal: TPE-V ▪ Cable: PUR (UL 94 V0)
3	Design element	PBT/PC
4	Connection	PPSU
5	M12 plug	Plastic: PPSU
6	M12 plug	Metal 316L (1.4404) For Ex ec: metal housing cap
7	Pressure compensation element	PMP11: PBT/PC PMP21 standard: PBT/PC PMP21 with Ex ec approval: 1.4404
8	Housing	316L (1.4404)
9	Nameplates	Plastic foil (attached to housing) or directly lasered onto the housing

Filling oil

Device	Filling oil
PMP11 PMP21	NSF-H1 synthetic oil in accordance with FDA 21 CFR 178.3570

Cleaning

Device	Description	Option [1]
PMC11 PMP11 PMC21 PMP21	Cleaned from oil+grease	HA
PMC21	Cleaned for oxygen service	HB

1) Product Configurator, order code for "Service"

Operability

Plug-on display PHX20 (optional)

No display or other operation facility is required to operate the device. However, devices with a valve plug can be fitted with the optional local display PHX20.

Description	Option [1]
Plug-on display PHX20, IP65	RU

1) Product Configurator, order code for "Accessories"

A 1-line liquid crystal display (LCD) is used. The local display shows measured values, fault messages and information messages. The device display can be turned in 90° steps. Depending on the orientation of the device, it is therefore easy to read the measured values.

Technical data

Display:	4-digit, red LED display
Digit height:	7.62 mm; programmable decimal point setting
Display range:	-1999 to 9999
Accuracy:	0.2% of the span ±1 digit
Electrical connection:	To transmitter with 4 to 20 mA output and elbow plug DIN 43 650, reverse polarity protection
Display power supply:	Not required, powered automatically from the power loop
Voltage drop:	≤ 5 V (corresponds to load: max. 250 Ω)
Rate of conversion:	3 measurements per second
Damping:	0.3 to 20 s (configurable)
Data backup:	Non-volatile EEPROM
Error message:	▪ HI: overrange ▪ LO: below range
Programming:	Via 2 keys, menu-guided, display range scaling, decimal point, damping, error message
Degree of protection:	IP 65
Influence of temperature on the display:	0.1% / 10 K
Electromagnetic compatibility (EMC):	Interference emission as per EN 50081, interference immunity as per EN 50082
Permitted current load:	Max. 60 mA
Ambient temperature:	0 to +60 °C (+32 to +140 °F)
Housing material:	Pa6 GF30 plastic, blue Front screen made from red PMMA
Order number:	52022914

Certificates and approvals

CE mark

The device meets the legal requirements of the relevant EC directives. Endress+Hauser confirms that the device has been successfully tested by applying the CE mark.

RoHS

The measuring system complies with the substance restrictions of the Restriction on Hazardous Substances Directive 2011/65/EU (RoHS 2).

RCM-Tick marking

The supplied product or measuring system meets the ACMA (Australian Communications and Media Authority) requirements for network integrity, interoperability, performance characteristics as well as health and safety regulations. Here, especially the regulatory arrangements for electromagnetic compatibility are met. The products are labelled with the RCM- Tick marking on the name plate.

A0029561

EAC conformity

The PMC21, PMP21 and PMP23 devices meet the legal requirements of the applicable EAC directives. These are listed in the corresponding EAC Declaration of Conformity along with the standards applied.

Endress+Hauser confirms successful testing of the device by affixing to it the EAC mark.

Approval

CSA C/US General Purpose

Safety Instructions (XA)

Safety Instructions (XA) are supplied with the device depending on the approval. These instructions are an integral part of the Operating Instructions.

Device	Directive	Documentation	Option [1]
PMP21	ATEX II 1/2G Ex ia IIC T4 Ga/Gb	XA01271P	BA
PMC21	ATEX II 2G Ex ia IIC T4 Gb	XA01271P	BB
PMC21 PMP21	ATEX II 3G Ex ec IIC T4 Gc	XA01533P	BC
PMC21 PMP21	FM IS Cl. I, Div.1 Gr. A-D T4	XA01321P	FA
PMC21 PMP21	CSA C/US IS Cl. I Div. 1 Gr. A-D	XA01322P	CB
PMC21 PMP21	EAC Ex ia IIC T4 Ga/Gb	XA01540P	GA
PMC21 PMP21	IEC Ex ia IIC T4 Ga/Gb	XA01271P	IA
PMC21 PMP21	NEPSI Ex ia IIC T4	XA01363P	NA
PMC21 PMP21	TIIS Ex ia IIC T4	In preparation	TA

1) Product Configurator, order code for "Approval"

The nameplate provides information on the Safety Instructions (XA) that are relevant for the device.

Marine approval (pending)

Device	Description	Option [1]
PMC21 PMP21	DNV GL	LE
PMC21 PMP21	ABS	LF

1) Product Configurator, order code for "Additional approval"

Pressure Equipment Directive 2014/68/EU (PED)

Pressure equipment with allowable pressure ≤ 200 bar (2 900 psi)

Pressure equipment (with a maximum allowable pressure PS ≤ 200 bar (2 900 psi)) can be classified as pressure accessories in accordance with Pressure Equipment Directive 2014/68/EU. If the maximum allowable pressure is ≤ 200 bar (2 900 psi) and the pressurized volume of the pressure equipment is ≤ 0.1 l, the pressure equipment is subject to the Pressure Equipment Directive (cf. Pressure Equipment Directive 2014/68/EU, Article 4, point 3). The Pressure Equipment Directive only requires that the pressure equipment shall be designed and manufactured in accordance with the "sound engineering practice of a Member State".

Reasons:

- Pressure Equipment Directive (PED) 2014/68/EU Article 4, point 3
- Pressure equipment directive 2014/68/EU, Commission's Working Group "Pressure", Guideline A-05 + A-06

Note:

A partial examination shall be performed for pressure instruments that are part of safety equipment for the protection of a pipe or vessel from exceeding allowable limits (safety accessory in accordance with Pressure Equipment Directive 2014/68/EU, Article 2, point 4).

Pressure equipment with allowable pressure > 200 bar (2 900 psi)

Pressure equipment designated for application in every process fluid having a pressurized volume of <0.1 l and a max. allowable pressure PS > 200 bar (2 900 psi) shall satisfy the essential safety requirements set out in Annex I of the Pressure Equipment Directive 2014/68/EU. According to Article 13 pressure equipment shall be classified by category in accordance with Annex II. The conformity assessment of the pressure equipment shall be determined by the category I under consideration of the above-mentioned low pressurized volume. These devices shall be provided with CE marking.

Reasons:

- Pressure Equipment Directive 2014/68/EU, Article 13, Annex II
- Pressure equipment directive 2014/68/EU, Commission's Working Group "Pressure", Guideline A-05

Note:

A partial examination shall be performed for pressure instruments that are part of safety equipment for the protection of a pipe or vessel from exceeding allowable limits (safety accessory in accordance with Pressure Equipment Directive 2014/68/EU, Article 2, point 4).

The following also applies:

PMP21 with threaded connection and internal process isolating diaphragm PN > 200 :

Suitable for stable gases in group 1, category I, module A

Other standards and guidelines

The applicable European guidelines and standards can be found in the relevant EU Declarations of Conformity. The following were also applied:

DIN EN 60770 (IEC 60770):

Transmitters for use in industrial process control systems Part 1: Methods for performance evaluation

Methods for evaluating the performance of transmitters for control and regulation in industrial process control systems.

DIN 16086:

Electrical pressure measuring instruments, pressure sensors, pressure transmitters, pressure measuring instruments, concepts, specifications on data sheets

Procedure for writing specifications in data sheets for electrical pressure measuring instruments, pressure sensors and pressure transmitters.

EN 61326-X:

EMC product family standard for electrical equipment for measurement, control and laboratory use.

EN 60529:

Degrees of protection provided by enclosures (IP code)

NAMUR - User association of automation technology in process industries.

NE21 - Electromagnetic Compatibility (EMC) of Industrial Process and Laboratory Control Equipment.

NE43 - Standardization of the Signal Level for the Failure Information of Digital Transmitters.

NE44 - Standardization of Status Indicators on PCT Instruments with the Help of Light Emitting Diodes

NE53 - Software of Field Devices and Signal-processing Devices with Digital Electronics

CRN approval

A CRN approval is available for some device versions. A CRN-approved process connection with a CSA approval must be ordered for a CRN-approved device. The CRN-approved devices are assigned the registration number 0F18141.5C.

Ordering information: Product Configurator, order code for "Process connection" (the CRN process connections are indicated appropriately in the "Mechanical construction" section.)

Calibration unit

Description	Option [1]
Sensor range; %	A
Sensor range; mbar/bar	B
Sensor range; kPa/MPa	C
Sensor range; psi	F
Customer-specific; see additional spec.	J

1) Product Configurator, order code for "Calibration; unit"

Calibration

Description	Option [1]
3-point certificate of calibration	F3

1) Product Configurator order code for "Calibration"

Inspection certificates

Device	Description	Option [1]
PMC21 PMP21	3.1 Material documentation, wetted metal parts, EN10204-3.1 inspection certificate	JA

1) Product Configurator, order code for "Test, Certificate"

Ordering information

Detailed ordering information is available from the following sources:
- In the Product Configurator on the Endress+Hauser website: www.endress.com -> Click "Corporate" -> Select your country -> Click "Products" -> Select the product using the filters and search field -> Open product page -> The "Configure" button to the right of the product image opens the Product Configurator.
- From your Endress+Hauser Sales Center: www.addresses.endress.com

Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

Scope of delivery
- Measuring device
- Optional accessories
- Brief Operating Instructions
- Certificates

Accessories

Weld-in adapter

Various weld-in adapters are available for installation in vessels or pipes.

Device	Description	Option [1]	Order number
PMP21	Weld-in adapter G½, 316L	QA	52002643
PMP21	Weld-in adapter G½, 316L 3.1 EN10204-3.1 material, inspection certificate	QB	52010172
PMP21	Weld-in tool adapter G½, brass	QC	52005082

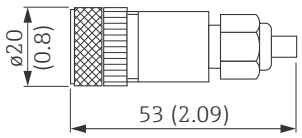
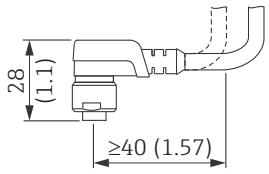
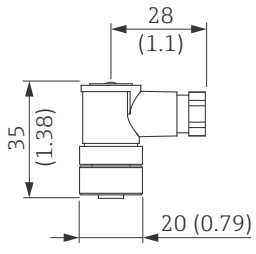
1) Product Configurator, order code for "Enclosed accessories"

If installed horizontally and weld-in adapters with a leakage hole are used, ensure that the leakage hole is pointing down. This allows leaks to be detected as quickly as possible.

Plug-on display PHX20

→ 40

M12 plug connectors

Connector	Degree of protection	Material	Option [1]	Order number
M12 (self-terminated connection at M12 plug) 	IP67	▪ Union nut: Cu Sn/Ni ▪ Body: PBT ▪ Seal: NBR	R1	52006263
M12 90 degrees with 5m (16 ft) cable 	IP67	▪ Union nut: GD Zn/Ni ▪ Body: PUR ▪ Cable: PVC	RZ	52010285
M12 90 degrees (self-terminated connection at M12 plug) 	IP67	▪ Union nut: GD Zn/Ni ▪ Body: PBT ▪ Seal: NBR	RM	71114212

1) Product Configurator, order code for "Enclosed accessories"

Documentation

Field of Activities

Pressure measurement, powerful instruments for process pressure, differential pressure, level and flow:

FA00004P/00/EN

Technical Information

- TI00241F/00/EN: EMC test procedures
- TI00426F/00/EN: Weld-in adapters, process adapters and flanges (overview)

Operating Instructions

BA01271P/00/EN

Brief Operating Instructions

KA01164P/00/EN

Safety Instructions (XA)

Safety Instructions (XA) are supplied with the device depending on the approval. These instructions are an integral part of the Operating Instructions.

Device	Directive	Documentation	Option [1]
PMP21	ATEX II 1/2G Ex ia IIC T4 Ga/Gb	XA01271P	BA
PMC21	ATEX II 2G Ex ia IIC T4 Gb	XA01271P	BB
PMC21 PMP21	ATEX II 3G Ex ec IIC T4 Gc	XA01533P	BC
PMC21 PMP21	FM IS Cl. I, Div.1 Gr. A-D T4	XA01321P	FA
PMC21 PMP21	CSA C/US IS Cl. I Div. 1 Gr. A-D	XA01322P	CB
PMC21 PMP21	EAC Ex ia IIC T4 Ga/Gb	XA01540P	GA
PMC21 PMP21	IEC Ex ia IIC T4 Ga/Gb	XA01271P	IA
PMC21 PMP21	NEPSI Ex ia IIC T4	XA01363P	NA
PMC21 PMP21	TIIS Ex ia IIC T4	In preparation	TA

1) Product Configurator, order code for "Approval"

The nameplate provides information on the Safety Instructions (XA) that are relevant for the device.

Clogging Indicators

Oil Filter Clogging Indicator

Tag: PDSI300

Clogging indicators are devices that check the life time of the filter elements. They measure the pressure drop through the filter element directly connected to the filter housing.
These devices trip when the clogging of the filter element causes a pressure drop increasing across the filter element.
Filter elements are efficient only if their Dirt Holding Capacity is fully exploited. This is achieved by using filter housings equipped with clogging indicators. The indicator is set to alarm before the element becomes fully clogged.

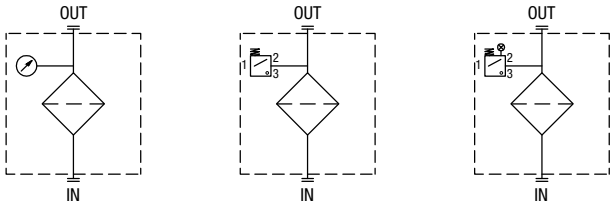
MP Filtri can supply indicators of the following designs:
- Vacuum switches and gauges
- Pressure switches and gauges
- Differential pressure indicators

These type of devices can be provided with a visual, electrical or both signals.
The electronic differential pressure clogging indicator is also available.
It provides both analogical 4-20 mA output and digital warning (75% of clogging) and alarm (clogging) outputs.

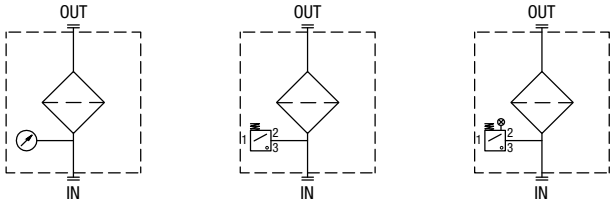
Clogging indicators

Suitable indicator types

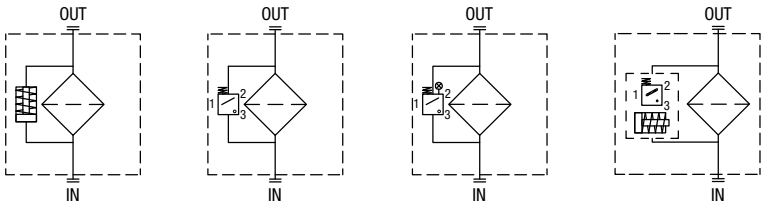
VACUUM INDICATORS
Vacuum indicators are used on the Suction line to check the efficiency of the filter element.
They measure the pressure downstream of the filter element.
Standard items are produced with R 1/4" EN 10226 connection.
Available products with R 1/8" EN 10226 to be fitted on MPS series.



BAROMETRIC INDICATORS
Pressure indicators are used on the Return line to check the efficiency of the filter element.
They measure the pressure upstream of the filter element.
Standard items are produced with R 1/8" EN 10226 connection.



DIFFERENTIAL INDICATORS
Differential indicators are used on the Pressure line to check the efficiency of the filter element.
They measure the pressure upstream and downstream of the filter element (differential pressure).
Standard items are produced with special connection G 1/2" size.
Also available in Stainless Steel models.

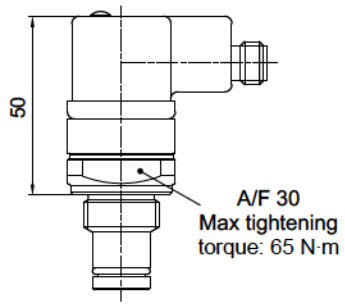


Dimensions

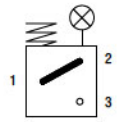
DLA*71

Electrical/Visual Differential Indicator

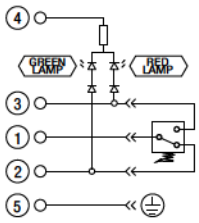
Settings	Ordering code
1.2 bar ±10%	DL A 12 x A 71 P01
2.0 bar ±10%	DL A 20 x A 71 P01
5.0 bar ±10%	DL A 50 x A 71 P01
7.0 bar ±10%	DL A 70 x A 71 P01
9.5 bar ±10%	DL A 95 x A 71 P01



Hydraulic symbol



Electrical symbol



Materials
- Body: Brass
- Base: Black Nylon
- Contacts: Silver
- Seal: HNBR - FPM

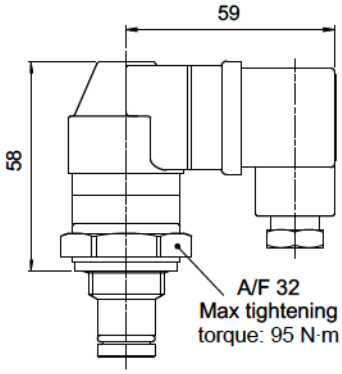
Technical data
- Max working pressure: 420 bar
- Proof pressure: 630 bar
- Burst pressure: 1260 bar
- Working temperature: From -25 °C to +110 °C
- Compatibility with fluids: Mineral oils, Synthetic fluids HFA, HFB, HFC according to ISO 2943
- Degree protection: IP65 according to EN 60529 IP69K according to ISO 20653

Electrical data
- Electrical connection: IEC 61076-2-101 D (M12)
- Lamps 24 Vdc
- Resistive load: 0.4 A / 24 Vdc

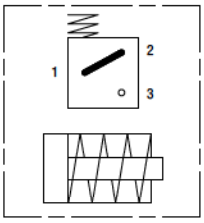
DLE*A50

Electrical/Visual Differential Indicator

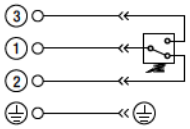
Settings	Ordering code
1.2 bar ±10%	DL E 12 x A 50 P01
2.0 bar ±10%	DL E 20 x A 50 P01
5.0 bar ±10%	DL E 50 x A 50 P01
7.0 bar ±10%	DL E 70 x A 50 P01
9.5 bar ±10%	DL E 95 x A 50 P01



Hydraulic symbol



Electrical symbol



Materials
- Body: Brass
- Base: Black Nylon
- Contacts: Silver
- Seal: HNBR - FPM

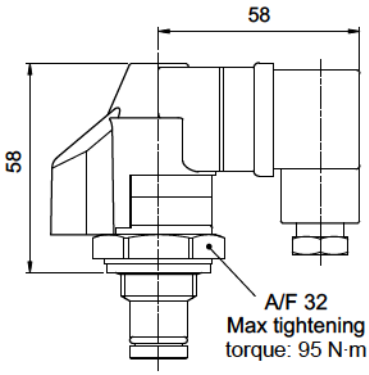
Technical data
- Max working pressure: 420 bar
- Proof pressure: 630 bar
- Burst pressure: 1260 bar
- Working temperature: From -25 °C to +110 °C
- Compatibility with fluids: Mineral oils, Synthetic fluids HFA, HFB, HFC according to ISO 2943
- Degree protection: IP65 according to EN 60529

Electrical data
- Electrical connections: EN 175301-803
- Resistive load: 5 A / 250 Vac
- Available the connector with lamps

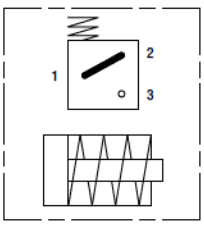
DLE*F50

Electrical/Visual Differential Indicator

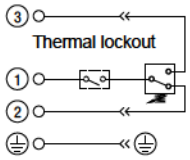
Settings	Ordering code
1.2 bar ±10%	DL E 12 x F 50 P01
2.0 bar ±10%	DL E 20 x F 50 P01
5.0 bar ±10%	DL E 50 x F 50 P01
7.0 bar ±10%	DL E 70 x F 50 P01
9.5 bar ±10%	DL E 95 x F 50 P01



Hydraulic symbol



Electrical symbol



Materials
- Body: Brass
- Base: Black Nylon
- Contacts: Silver
- Seal: HNBR - FPM

Technical data
- Max working pressure: 420 bar
- Proof pressure: 630 bar
- Burst pressure: 1260 bar
- Working temperature: From -25 °C to +110 °C
- Compatibility with fluids: Mineral oils, Synthetic fluids HFA, HFB, HFC according to ISO 2943
- Degree protection: IP65 according to EN 60529

Electrical data
- Electrical connections: EN 175301-803
- Resistive load: 5 A / 250 Vac
- Thermal lockout setting: +30 °C

DIFFERENTIAL INDICATORS

Configuration example							
Configuration example 1:	DE	H	50	F	A	70	P01
Configuration example 2:	DE	M	50	H	F	50	P01
Configuration example 3:	DE	S	25	H	A	10	P01
Configuration example 4:	DL	E	70	V	A	71	P01
Configuration example 5:	DT	A	50	H	F	70	P01
Configuration example 6:	DV	M	95	V			P01
Configuration example 7:	DV	S	40	H			P01

Series

- **DE** Electrical or Electronic differential indicator
- **DL** Electrical / Visual differential indicator
- **DT** Electronic differential indicator
- **DV** Visual differential indicator

Type DE - DL - DT	DE	DL	DT
A Standard type	•	•	•
E For high power supply		•	
H Hazardous area	•		
M With wired electrical connection	•		
S Compact version	•		

Type DV

- **A** With automatic reset
- **M** With manual reset
- **S** Compact version

Pressure setting	DEA	DEH	DEM	DES	DLA	DLE	DTA	DVA	DVM	DVS
12 1.2 bar	•		•		•	•	•	•	•	
20 2.0 bar	•		•		•	•	•	•	•	
25 2.5 bar				•						•
40 4.0 bar				•						•
50 5.0 bar	•	•	•		•	•	•	•	•	
70 7.0 bar	•	•	•		•	•	•	•	•	
95 9.5 bar	•		•		•	•	•	•	•	

Seals	DEA	DEH	DEM	DES	DLA	DLE	DTA	DVA	DVM	DVS
F MFQ		•								
H HNBR	•		•	•	•	•	•	•	•	•
V FPM	•	•	•		•	•	•	•	•	

Thermostat	DEA	DEH	DEM	DES	DLA	DLE	DTA
A Without	•	•	•	•	•	•	
F With thermostat			•			•	•

Electrical connections	DEA	DEH	DEM	DES	DLA	DLE	DTA
10 Connection AMP Superseal series 1.5			•	•			
20 Connection AMP Timer Junior			•				
30 Connection Deutsch DT-04-2-P			•	•			
35 Connection Deutsch DT-04-3-P			•				
48 Connection M20		•					
49 Connection 1/2" NPT		•					
50 Connection EN 175301-803	•					•	
51 Connection EN 175301-803, transparent base with lamps 24 Vdc					•		
52 Connection EN 175301-803, transparent base with lamps 110 Vdc					•		
70 Connection IEC 61076-2-101 D (M12)		•					•
71 Connection IEC 61076-2-101 D (M12), black base with lamps 24 Vdc					•		
80 Connection Stud #10-32 UNF				•			

Option

- **P01** MP Filtri standard
- **Pxx** Customized

DESIGNATION & ORDERING CODE - DIFFERENTIAL INDICATOR PLUG

Configuration example		
	T2	H

Series

- **T2** Indicator plug

Seals

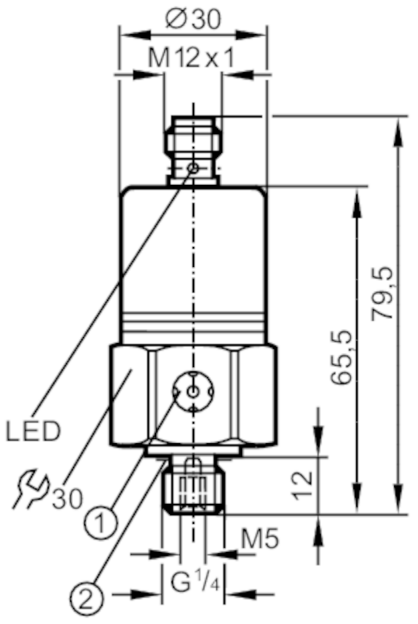
- **H** HNBR
- **V** FPM

Oil Pressure - PSLL100

PP7554

Pressure switch with ceramic measuring cell

PP-010-RBG14-QFPKG/US/ /V



1 ventilation
2 Sealing

Product characteristics				
Output signal	switching signal; IO-Link; (configurable)			
Measuring range	-1...10 bar	-14.5...145 psi	-100...1000 kPa	-0.1...1 MPa
Process connection	threaded connection G 1/4 external thread internal thread:M5			
Application				
Application	for industrial applications			
Media	liquids and gases			
Medium temperature [°C]	-25...90			
Min. bursting pressure	150 bar	2175 psi	15 MPa	
Pressure rating	75 bar	1087 psi	7.5 Mpa	
Type of pressure	relative pressure; vacuum			
Electrical data				
Operating voltage [V]	9.6...36 DC; (communication mode: 18...32)			
Current consumption [mA]	< 45			
Min. insulation resistance [MΩ]	100; (500 V DC)			
Protection class	III			
Reverse polarity protection	yes			
Power-on delay time [s]	0.3			
Inputs / outputs				
Number of inputs and outputs	Number of digital outputs: 2			

PP7554

Pressure switch with ceramic measuring cell

PP-010-RBG14-QFPKG/US/ /V

Outputs					
Total number of outputs		2			
Output signal		switching signal; IO-Link; (configurable)			
Electrical design		PNP			
Number of digital outputs		2			
Output function		normally open / normally closed; (parameterisable)			
Max. voltage drop switching output DC	[V]	2			
Permanent current rating of switching output DC	[mA]	250			
Switching frequency DC	[Hz]	170			
Short-circuit protection		yes			
Type of short-circuit protection		pulsed			
Overload protection		yes			

Measuring/setting range					
Measuring range	-1...10 bar	-14.5...145 psi	-100...1000 kPa	-0.1...1 MPa	
Set point SP	-0.9...10 bar	-13...145 psi	-0.09...1 MPa		
Reset point rP	-0.95...9.95 bar	-14...144 psi	-0.095...0.995 MPa		
In steps of	0.05 bar	1 psi	0.005 MPa		
Factory setting		SP1 = 2.50 bar	rP1 = 2.30 bar		
		SP2 = 7.50 bar	rP2 = 7.30 bar		
		OUT1 = Hno	OUT2 = Hno		

Accuracy / deviations		
Switch point accuracy	[% of the span]	< ± 0,5
Repeatability	[% of the span]	< ± 0,1; (with temperature fluctuations < 10 K)
Characteristics deviation	[% of the span]	< ± 0,25 (BFSL) / < ± 0,5 (LS); (BFSL = Best Fit Straight Line; LS = limit value setting)
Hysteresis deviation	[% of the span]	< ± 0,1
Long-term stability	[% of the span]	< ± 0,1; (per year)
Temperature coefficient zero point	[% of the span / 10 K]	0,2; (0...80 °C)
Temperature coefficient span	[% of the span / 10 K]	0,2; (0...80 °C)

Response times		
Response time	[ms]	< 3
Damping for the switching output dAP in steps	[s]	0,003 - 0,006 - 0,010 - 0,017 - 0,060 - 0,125 - 0,250 - 0,500

PP7554

Pressure switch with ceramic measuring cell

PP-010-RBG14-QFPKG/US/ /V

Interfaces			
Communication interface		IO-Link	
Transmission type		COM2 (38,4 kBaud)	
IO-Link revision		1.0	
Profiles		no profile	
SIO mode		yes	
Required master port type		A	
Process data analogue		1	
Process data binary		2	
Min. process cycle time	[ms]	2.3	
Supported DeviceIDs		Type of operation	DeviceID
		Default	6
Operating conditions			
Ambient temperature	[°C]	-25...85	
Storage temperature	[°C]	-40...100	
Protection		IP 68; (7 days / 1 m water depth / 0.1 bar)	
Tests / approvals			
EMC		immunity	EN 61000-6-2
		EN 61000-4-2 ESD	4 kV contact discharge / 15 kV air discharge
		EN 61000-4-3 HF radiated	20 V/m
		EN 61000-4-4 Burst	4 kV coupling clamp
		EN 61000-4-5 Surge	0,5 kV supply / 1 kV signal for DC units
		EN 61000-4-6 HF conducted	10 V
		immunity	according to the automotive directive 1995/54/EC / 04/104EG / 05/83/EG
		absorber chamber test to ISO 11452-2:	80 V/m
		EN 50155	Klasse T3, C1, S1
Shock resistance		DIN IEC 60068-2-27 / DIN IEC 60068-2-29	1000 g
		DIN EN 61373	category 3
Vibration resistance		DIN IEC 68-2-6	20 g (10...2000 Hz)
		DIN EN 60068-2-64	14 g
		DIN EN 61373	category 2
MTTF	[years]	310	
Pressure Equipment Directive		Sound engineering practice; can be used for group 2 fluids; group 1 fluids on request	
Mechanical data			
Weight	[g]	226	
Materials		stainless steel (1.4301 / 304); FKM; EPDM/X; PA	
Materials (wetted parts)		stainless steel (1.4305 / 303); ceramics; FKM	
Min. pressure cycles		100 million	
Process connection		threaded connection G 1/4 external thread internal thread:M5	
Restrictor element integrated		no (can be retrofitted)	
Displays / operating elements			
Display		operation	2 x LED, green
		switching status	2 x LED, yellow
Teach function		yes	

PP7554

Pressure switch with ceramic measuring cell

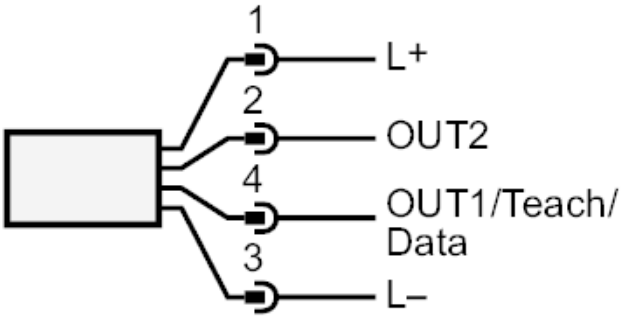
PP-010-RBG14-QFPKG/US/ /V

Remarks	
Remarks	with reference to UL: "limited voltage" with overcurrent protection in accordance with UL508
Pack quantity	1 pcs.

Electrical connection

Connector: 1 x M12

Connection



OUT1	switching output
OUT2	switching output
	Diagnostic output

Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical information

Easytemp® TMR31, TMR35

Compact thermometer
Pt100, Class A. Optionally with integrated 4 to 20 mA transmitter, programmable via PC.

Inlet Air Temperature Tansmitter — **TT-100 = TMR31-A1DBACAE1AAA**
Outlet Air Temperature Tansmitter — **TT-101 = TMR31-A1EBACAH1AAA**
Oil Temperature Tansmitter — **TT-200 = TMR31-A1DBACAB1AAA**

Application

The Easytemp® TMR31 and TMR35 compact thermometers are used to measure temperatures from -50 °C to 150 °C (-58 °F to 302 °F), or up to 200 °C (392 °F) with neck. The most common installation locations are tanks and pipes.

- TMR31 with process connections for general applications.
- TMR35 with process connections for hygienic applications.

Benefits at a glance

Quick installation and easy commissioning:
- Small, compact design made entirely of stainless steel
- M12 connector with IP 66/67 for an easy electrical connection
- 4-wire, Pt100 or PC-programmable transmitter with 4 to 20 mA output
- Configuration and visualization with ReadWin® 2000 PC operating software, which is free of charge
- Preset measuring range is available for order
- Variable insertion lengths from 40 mm to 600 mm (1.6 to 23.6 ")

Outstanding metrological properties thanks to innovative sensor technology:
- Extremely short response times
- Highly accurate even with short insertion lengths
- Thin-layer sensor element Pt100, accuracy class A (IEC 60751)

Safe operation with approvals and certificates:
- UL recognized component to UL 61010B-1
- Meets all EMC requirements according to NAMUR NE21
- Breakdown information in event of sensor break or sensor short-circuit, adjustable as per NAMUR NE43
- TMR35: Hygienic compatible design with 3-A marking and EHEDG certification
- GL (Germanischer Lloyd) ship building approval

CE GL 3A 74-03 c UL us EHEDG

TI123R/09/en
71006018

Endress+Hauser
People for Process Automation

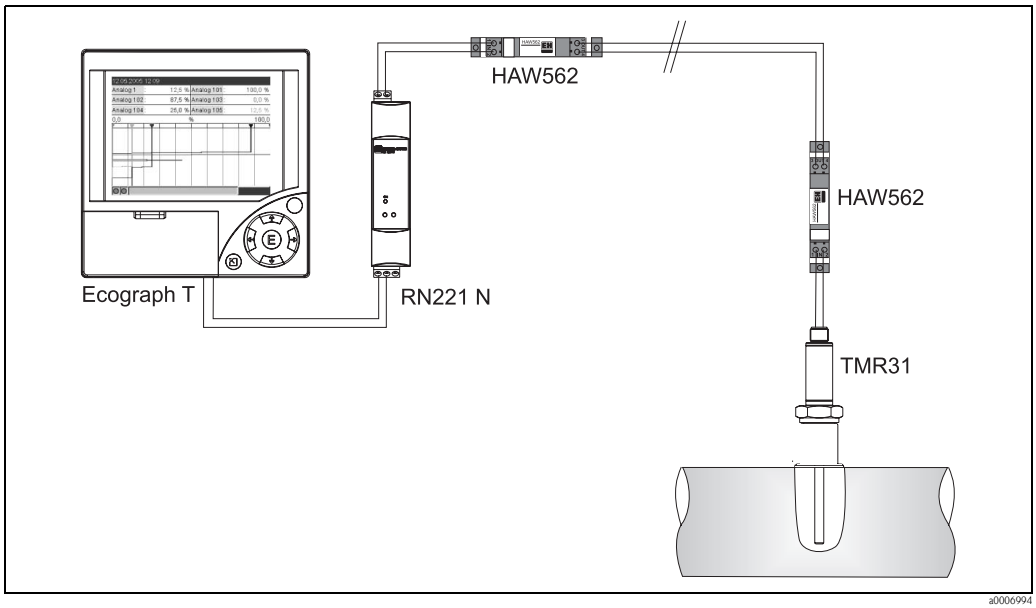
Function and system design

Measuring principle

Electronic recording and conversion of Pt100 input signals in industrial temperature measurement.

Measuring system

The compact thermometer uses a Pt100 (Class A) sensor element for measurement. The device is available with a Pt100 4-wire connection or, optionally, with an analog, temperature-linear 4 to 20 mA output signal. A built-in transmitter in the device converts the Pt100 input signal into the 4 to 20 mA signal and can be programmed using a PC via the M12 connector. The compact thermometer has different process connections for general (TMR31) and hygienic applications (TMR35).
The Easytemp® TMR31, TMR35 has a new kind of thin-layer sensor element that is soldered directly into the sensor tip. This innovative sensor design ensures ideal heat transfer from the process to the sensor element. This means that extremely fast response times and high levels of accuracy can be achieved even with short insertion lengths.



Measuring point layout (example) for Easytemp® compact thermometer TMR31 with additional Endress+Hauser components Ecograph T, active barrier RN221 N and HAW562 surge arrester

Multi Channel Recorder Ecograph T

Multi-channel recorder Ecograph T in 144x144 mm (5.7 x 5.7") panel-mounted housing for the electronic detection, display, recording, analysis, remote transmission and archiving of analog and digital input signals. Data recording system on CompactFlash card, multi-colored LCD display, 120 mm (4.72 ") screen size. Configuration and measured value display via interfaces (USB, Ethernet, RS232/485) and ReadWin® 2000 PC operating software.

Active barrier RN221 N

Active barrier with power supply for the safe separation of 4 to 20 mA standard signal circuits with optional intrinsically safe input. The current applied by the transmitter of the compact thermometer in the input circuit (4 to 20 mA) is transmitted linearly to the output.

Surge arrester HAW562

Protects consumer installations or measuring devices as well as signal lines and components against overvoltage which is induced by lightning striking in the distance or through switching operations. The HAW562 module acts as an overvoltage protection system in terminal block systems to protect signal lines and components and is installed on a module carrier (HAW560).

Input

Measuring principle

Temperature (temperature-linear transmission behavior)

Measuring range

Designation	Measuring range limits	Min. span
Pt100 as per IEC 60751	-50 to 150 °C (-58 to 302 °F) without neck -50 to 200 °C (-58 to 392 °F) with neck	10 K (18 °F)

Output

Output signal

- Standard: Pt100, Class A, 4-wire
- Optional: 4 to 20 mA or 20 to 4 mA

Signal on alarm

Signal on alarm as per NAMUR NE43
- Underranging: Linear drop to 3.8 mA
- Overranging: Linear rise to 20.5 mA
- Sensor break; sensor short-circuit:
  ≤ 3.6 mA or ≥ 21.0 mA (at settings ≥ 21.0 mA, 21.5 mA output is guaranteed)

Maximum load

($U_{power\ supply}$ - 10 V) / 0.023 A (current output)

Min. current consumption

≤ 3.5 mA

Current limit

≤ 23 mA

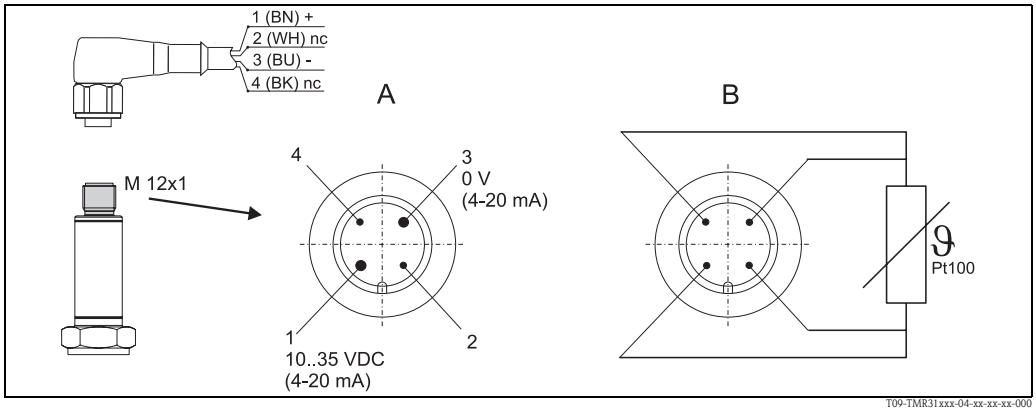
Switch-on delay

2 s

Power supply

Electrical connection cables must comply with 3-A® standard, must be smooth, corrosion resistant and cleanable.

Electrical connection



Pos. A: with electronics, M12 plug, 4-pin
Pin 1: power supply 10 to 35 V DC; current output 4 to 20 mA (cable connection, wire color brown = BN)
Pin 2: connection of PC configuration cable - shortened pin (cable connection, wire color white = WH)
Pin 3: power supply 0 V DC; current output 4 to 20 mA (cable connection, wire color blue = BU)
Pin 4: connection of PC configuration cable - shortened pin (cable connection, wire color black = BK)

Pos. B: without electronics, Pt100, 4-wire connection

Supply voltage

U_b= 10 to 35 V DC

Residual ripple

Permitted residual ripple $U_{ss} \leq 3$ V at $U_b \geq 13$ V, $f_{max.} = 1$ kHz

Performance characteristics

Response time

≤ 3 s

Reference operating conditions

- Calibration temperature (ice bath) 0 °C (32 °F) for Pt100 sensor[1)]
- Ambient temperature 25 °C ± 5 °C (77 °F ± 9 °F) for transmitter

Maximum measured error

Electronics

0.1 K (0.18 °F) or 0.08%. % relates to the set span. The larger value applies.

Sensor (Pt100) for version without transmitter

- Tolerance class A as per IEC 60751, operating temperature range -50 to 200 °C (-58 to 392 °F) with neck
- Maximum measured error in °C = $0.15 + 0.002 \cdot |T|$

$|T|$ = Numerical value of the temperature in °C without regard to the leading sign.

Total deviation of electronics + sensor

- Operating temperature range:
  -50 to 150 °C (-58 to 302 °F) without neck
  -50 to 200 °C (-58 to 392 °F) with neck
- $0.25 \text{ K} + 0.002 \cdot |T|$

With calibration and sensor transmitter matching: ≤ 0.2 K over the entire measuring range

Long-term stability of electronics

≤ 0.1 K (0.18 °F)/year or ≤ 0.05%/year
Data under reference conditions. % relates to the set span. The larger value applies.

Influence of ambient temperature (temperature drift)

- Pt100 resistance thermometer:
  $T_d = \pm(15 \text{ ppm/K} * (\text{full scale value of measuring range} + 200) + 50 \text{ ppm/K} * \text{set measuring range}) * \Delta\vartheta$

$\Delta\vartheta$ = deviation of ambient temperature from the reference operating condition.

Influence of load

± 0.02%/100 Ω
Specifications refer to the full scale value of the measuring range.

Transmitter response time

1 s

Sensor response time

Measured as per IEC 60751, in water flowing at 0.4 m/s (1.3 ft/s)

t_{50}	t_{90}
< 1.0 s	< 2.0 s

Influence of supply voltage

≤ ±0.01%/V deviation from 24 V
Specifications in percent refer to the full scale value of the measuring range.

Self-heating

Negligible small

Sensor current

≤ 0.6 mA

1) Note: For calibration of the compact thermometer a minimum insertion length of 50 mm (1.97") is required.

Installation conditions

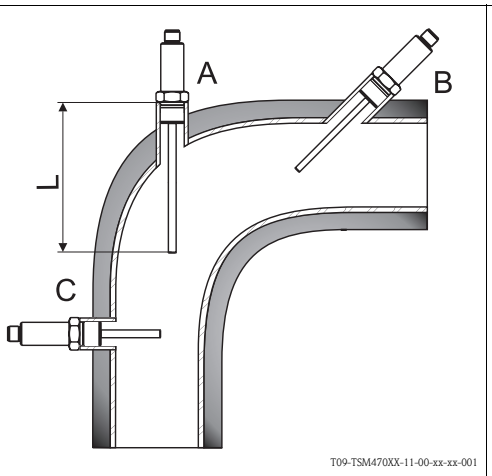
Orientation

No restrictions, but self draining. If applicable leak detection hole must be at the lowest point.

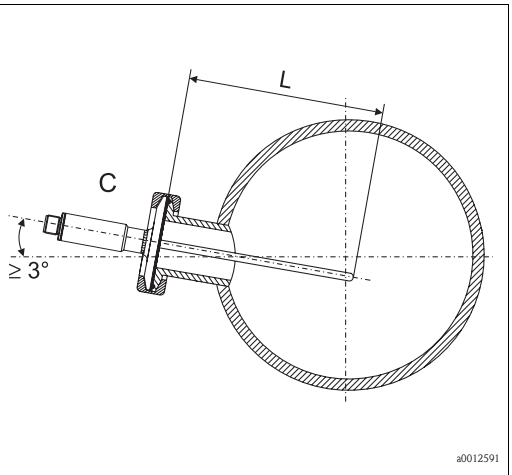
Installation instructions

Mounting location

Note!
The insertion length of the compact thermometer can have a substantial influence on the accuracy. If the insertion length is insufficient, heat dissipation via the process connection and the container wall can cause measurement errors. To minimize errors caused by heat dissipation, a minimum insertion length of L_{min} = 40 mm (1.6") is recommended.



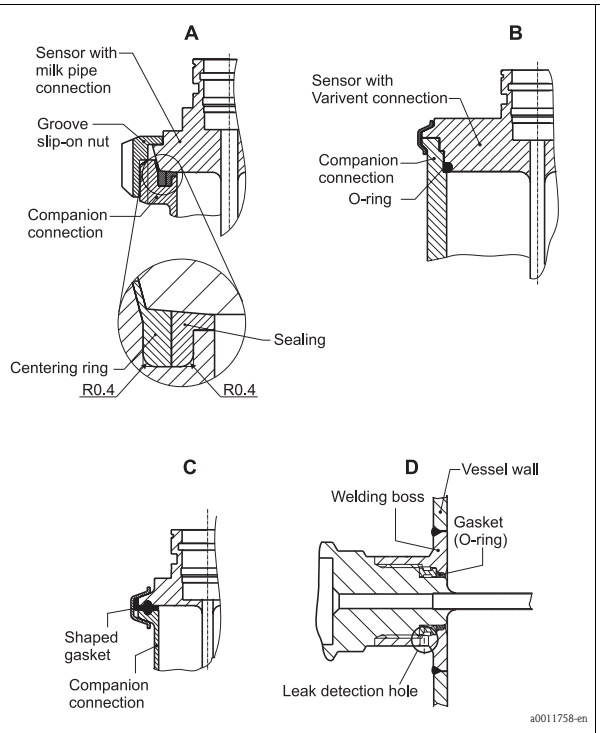
TMR31 – general applications



TMR35 – hygienic applications

Pipe installation of the compact thermometer:

- Pos. A: On angle brackets
- Pos. B: In smaller pipes, inclined
- Pos. C: Perpendicular to the direction of flow, TMR35 with minimal 3° inclination because of self draining
- L = Insertion length



Mounting instructions for installation in various hygienic processes

A Milk pipe connection as per DIN 11851 only in linkage EHEDG certified and self centering ring
B Varivent® – process connection
C Clamp as per ISO 2852
D Liquiphant-M G1" process connection, horizontal installation

The matches for the process connections as well as the gaskets are not included in the scope of delivery of this assembly. Welding adapter for process connections with associated O-ring sets are available as accessories, → 16.
Care should be taken by the user in the execution of the welding on the process side:

- Suitable weld material.
- Flush welding or with welding radius > 3.2 mm.
- Absence of pits, folds, crevices.
- Ground and polished surface ($R_a \leq 0.8$ µm).

As a general rule, the thermometers should be installed in such a way that does not adversely affect their cleanability (3-A® requirements must be adhered to). The required flush-mounting can be achieved by the connection Varivent®, Liquiphant (+ weld-in adapter).

Environment conditions

Ambient temperature limits

-40 to +85 °C (-40 to 185 °F)

Storage temperature

-40 to +85 °C (-40 to 185 °F)

Climate class

As per IEC 60654-1, Class C

Degree of protection

IP 66/67

Shock resistance

4g / 2 to 150 Hz as per IEC 60068-2-6

Vibration resistance

Refer to 'Shock resistance'

Electromagnetic compatibility (EMC)

CE Electromagnetic Compatibility Compliance
EMC meets all relevant requirements listed under IEC 61326 Series and NAMUR NE21. Details as per declaration of conformity.

This recommendation is a uniform and practical way of determining whether the devices used in laboratories and process control are immune to interference with an objective to increase its functional safety.

ESD (Electrostatic discharge)	IEC 61000-4-2	6 kV cont., 8 kV air	
Electromagnetic fields	IEC 61000-4-3	0.08 to 2 GHz	10 V/m
Burst (fast transient)	IEC 61000-4-4	2 kV	
surge	IEC 61000-4-5	0.5 kV sym.	
Conducted RF	IEC 61000-4-6	0.01 to 80 MHz	10 V

Condensation

Permitted

Process conditions

Process temperature limits

The electronics of the TMR31 and TMR35 must be protected from temperatures above 85 °C (185 °F) by a neck of appropriate length. TMR31 and TMR35 compact thermometers without electronics (Pt100, 4-wire) do not require a neck.

- -50 to 150 °C (-58 to 302 °F) without neck
- -50 to 200 °C (-58 to 392 °F) with neck
- -50 to 200 °C (-58 to 392 °F) without electronics

Caution!
Restrictions depending on process connection and ambient temperature:

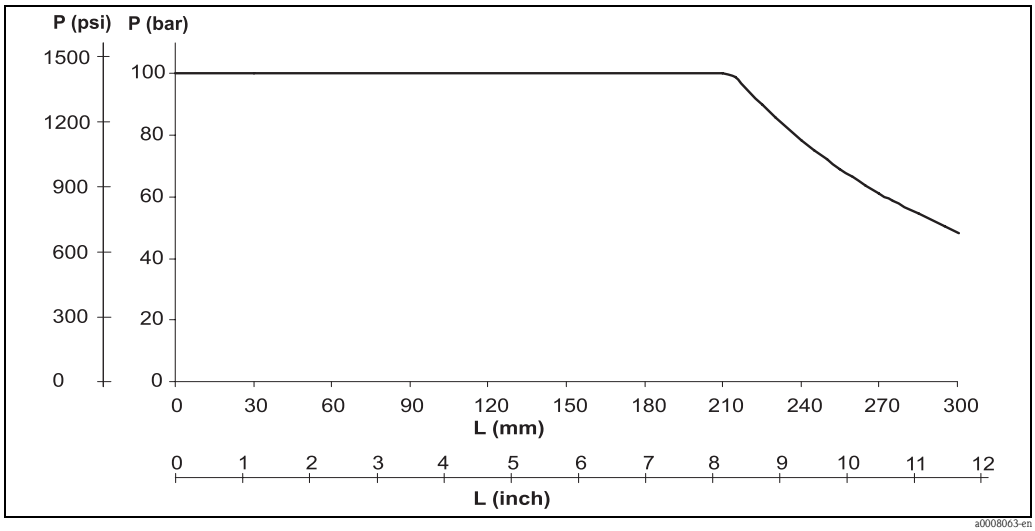
- For installation with adjustable insertion length (welding boss with sealing taper, Order No. **51004751**; collar welding boss Order No. **51004752**; compression fitting with sealing taper, Order No. **51004753**) provide a neck with an appropriate length.

- For TMR31 with process connection:

Max. ambient temperature	Max. process temperature	
	Without neck	With neck
Up to 25 °C (77 °F)	150 °C (302 °F)	200 °C (392 °F)
Up to 40 °C (104 °F)	135 °C (275 °F)	180 °C (356 °F)
Up to 60 °C (140 °F)	120 °C (248 °F)	160 °C (320 °F)
Up to 85 °C (185 °F)	100 °C (212 °F)	133 °C (271 °F)

Process pressure limits

Maximum permitted process pressure depending on the insertion length. It is limited further by the process connection in question. Follow the designs of process connection in section 'Mechanical construction' and section 'Accessories'.

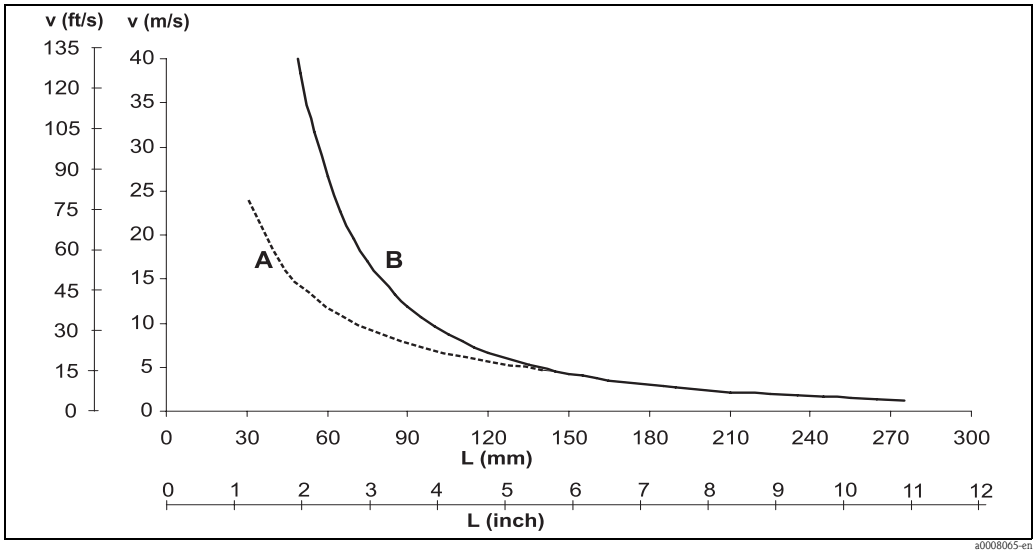


Maximum permitted process pressure

L = insertion length
p = process pressure

The diagram takes into consideration not only the overpressure but also the pressure load caused by the flow, whereby a safety factor of 1.9 has been specified for operation with flow. The maximum permitted static operating pressure is lower at greater insertion lengths due to the increased bending load caused by the flow. The calculation assumes the maximum permitted medium velocity for the respective insertion length (see diagram below).

Permitted flow velocity depending on the insertion length



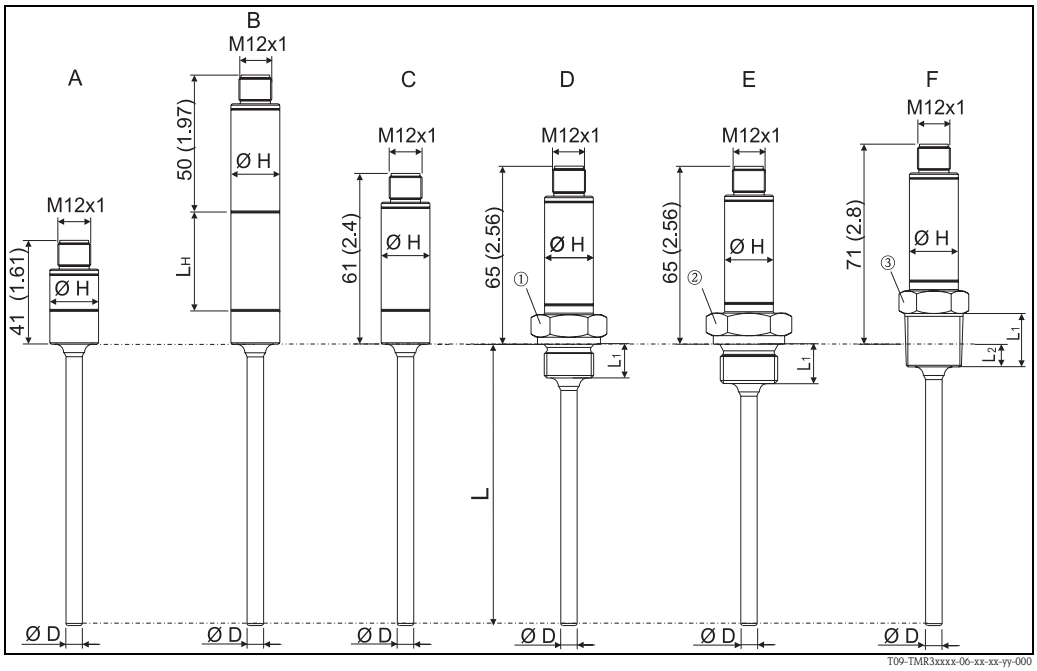
Permitted flow velocity

L	Insertion length, during flow	A	Medium water at T = 50 °C (122 °F)
v	Flow velocity	B	Medium superheated steam at T = 200 °C (392 °F)

The permitted flow velocity is the minimum from resonance velocity (resonance distance 80%) and load or buckling caused by flow, which would lead to failure of the thermometer tube or to exceedance of the safety factor (1.9). Calculation was performed for the specified limit operating conditions of 200 °C (392 °F) and ≤ 100 bar (1450 PSI) process pressure.

Mechanical construction

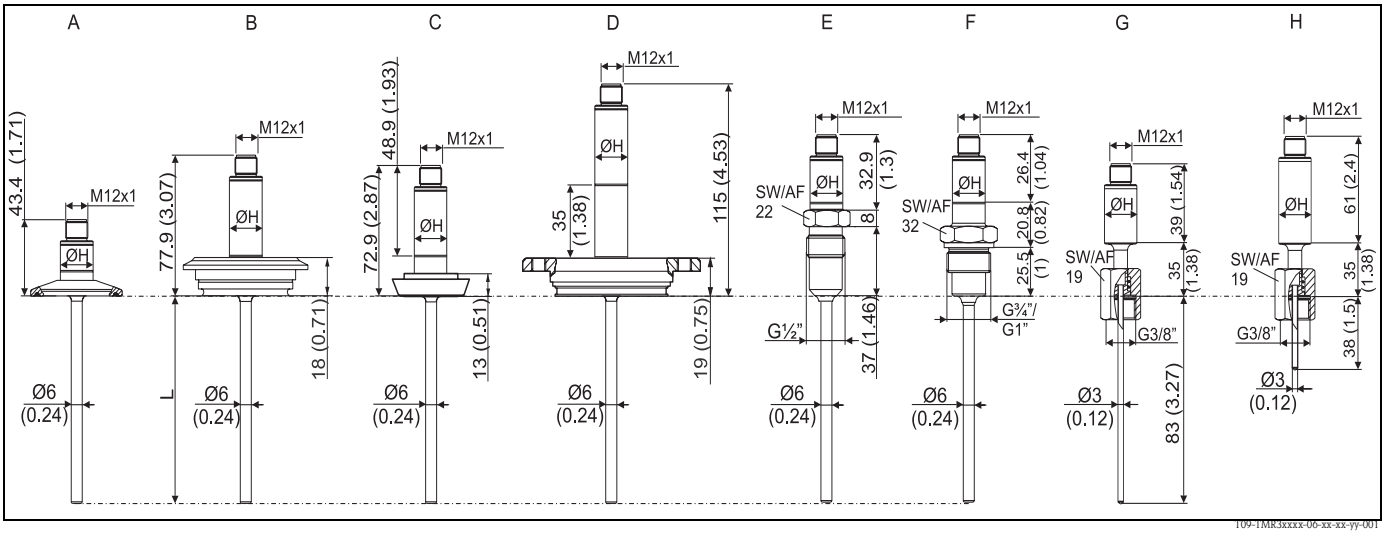
TMR31 design, dimensions



TMR31 - dimensions in mm (inch)
L = Insertion length L variable from 40 to 600 mm (1.6 to 23.6") (see order information TMR31, Pos. 060)
Ø D = Diameter D (see order information TMR31, Pos. 060)
Ø H = Sleeve diameter 18 mm (0.71")

Item No.	TMR31 version	Thread length L_1	Thread length L_2	See order information TMR31-...	$P_{max.}$
A	Short sleeve (without built-in transmitter, without neck, without process connection). Refer to chapter 'accessories' for matching welding bosses and compression fittings.	-	-	Pos. 030 = 1 Pos. 040 = A Pos. 050 = AA	-
B	With neck; L_H = neck length 35 mm or 50 mm (1.38" or 1.97"), without process connection. Refer to chapter 'accessories' for matching welding bosses and compression fittings.	-	-	Pos. 030 = A, B, C, D, E, F, X Pos. 040 = B, C Pos. 050 = AA	-
C	Without neck, without process connection. Refer to chapter 'accessories' for matching welding bosses and compression fittings.	-	-	Pos. 030 = A, B, C, D, E, F, X Pos. 040 = A Pos. 050 = AA	-
D	Without neck; Metric thread process connection: M14x1.5 (① = AF19) M18x1.5 (① = AF24)	 12 mm (0.47")	 -	Pos. 030 = A, B, C, D, E, F, X Pos. 040 = A Pos. 050 = MA Pos. 050 = MB	100 bar (1450 PSI), → 🖹 7
E	Without neck; Inch thread process connection, cylindrical, as per ISO 228: G ¼" (② = AF19) G ½" (② = AF27)	 12 mm (0.47") 14 mm (0.55")	 - -	Pos. 030 = A, B, C, D, E, F, X Pos. 040 = A Pos. 050 = BA, BC Pos. 050 = BB	
F	Without neck; Inch thread process connection, conical: ANSI NPT ¼" (③ = AF19) ANSI NPT ½" (③ = AF27) BSPT R ½" (③ = AF22)	 14.3 mm (0.56") 19 mm (0.75") 19 mm (0.75")	 5.8 mm (0.23") 8.1 mm (0.32") 8.1 mm (0.32")	Pos. 030 = A, B, C, D, E, F, X Pos. 040 = A Pos. 050 = AB Pos. 050 = AC Pos. 050 = JA	

TMR35 design, dimensions



TMR35 - dimensions in mm (inch)
L = Insertion length L variable from 40 to 600 mm (1.6" to 23.6") (see order information TMR35, Pos. 060)
Ø H = Sleeve diameter 18 mm (0.71")

Item No.	TMR35 version	See order information TMR35-...
A	Short sleeve (without built-in transmitter, without neck), with 1" process connection (exemplarily for minimum length)	Pos. 030 = A, B, C, D, E, F, X Pos. 040 = A Pos. 050 = DB
B	Without neck; Process connection Varivent F	Pos. 030 = A, B, C, D, E, F, X Pos. 040 = A Pos. 050 = LB
C	Without neck; Process connection to DIN 11851	Pos. 030 = A, B, C, D, E, F, X Pos. 040 = A Pos. 050 = PG
D	With neck 35 mm (1.38"), with APV-INLINE process connection (exemplarily for maximum length)	Pos. 030 = A, B, C, D, E, F, X Pos. 040 = B Pos. 050 = HL
E	Short sleeve (without built-in transmitter, without neck); Conical metal-metal for hygienic processes, G½" thread. Suitable welding boss available as accessory (→ 🖹 16).	Pos. 030 = A, B, C, D, E, F, X Pos. 040 = A Pos. 050 = MB
F	Short sleeve (without built-in transmitter, without neck); Process connection for hygienic processes, G¾" or G1" thread, material SS316L (1.4404). Suitable Liquiphant process fitting available as accessory (→ 🖹 16).	Pos. 030 = 1 Pos. 040 = A Pos. 050 = AB, AC, AD
G	Short sleeve (without built-in transmitter), with neck, Insertion length = 83 mm (3.27")	Pos. 030 = 1 Pos. 040 = C Pos. 050 = R1
H	With neck; Insertion length = 38 mm (1.5")	Pos. 030 = A, B, C, D, E, F, X Pos. 040 = C Pos. 050 = R1

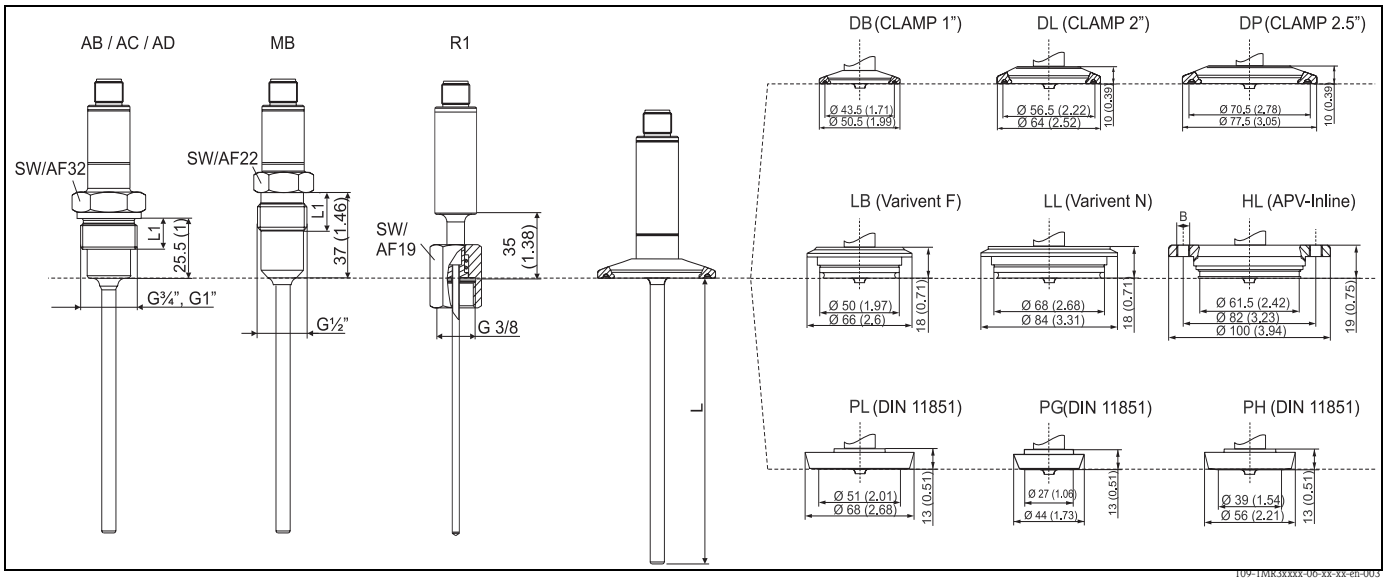
Weight

Version with L = 100 mm (3.94")	Weight
TMR31 with G½", ISO 228 process connection	116 g (4.1 oz)
TMR35 with ISO2852 DN25-38, with clamp process connection (DB) 1 to 1½"	305 g (10.76 oz)

Material

- Transmitter housing: SS 304
- Parts in contact with process and process connection: SS 316L, $R_a \leq 0.8$ µm (31.5 µinch). Optionally for TMR35 $R_a \leq 0.4$ µm (15.74 µinch), electro-polished.

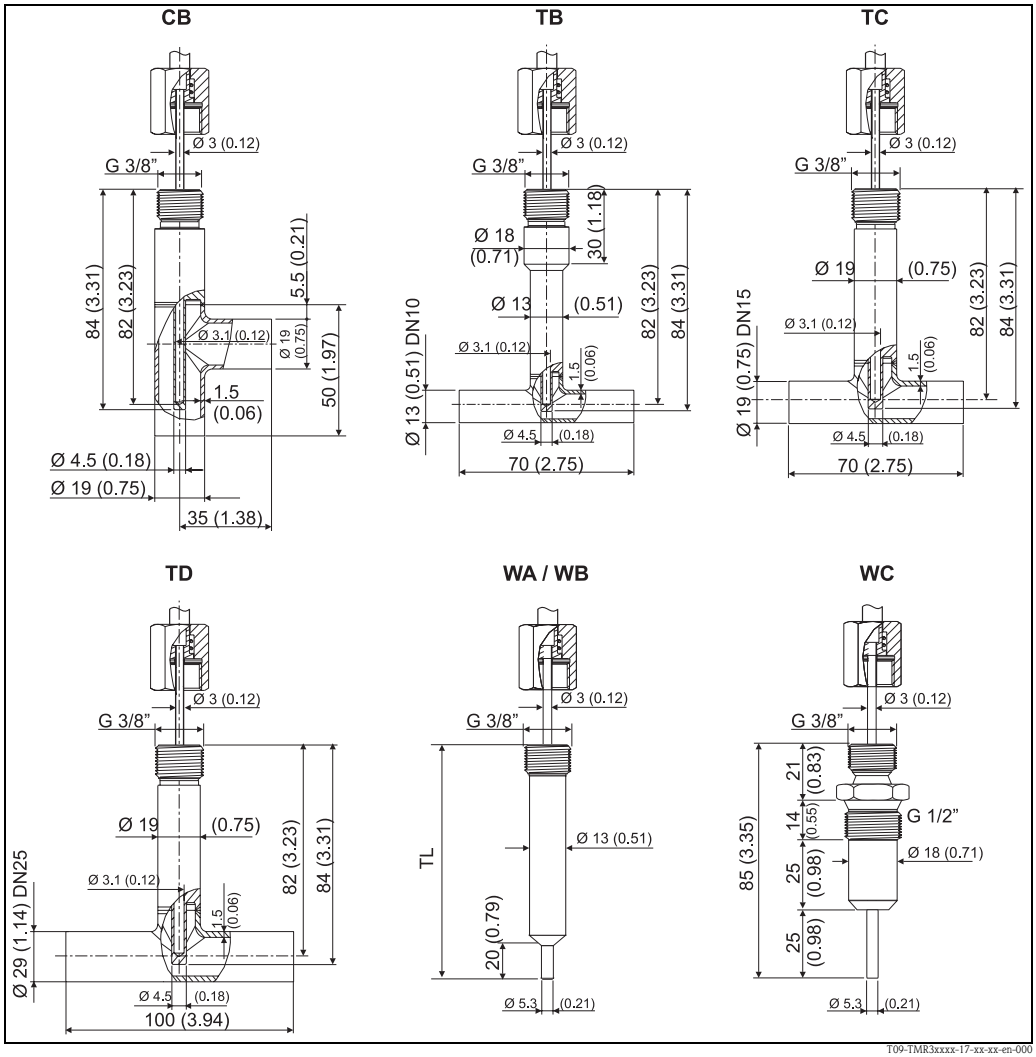
TMR35 design, dimensions for process connections



L = Insertion length L (see order information TMR35, Pos. 060)
All dimensions in mm (inch).

Item No.	Process connection versions TMR35 (see order information TMR35, Pos. 050)		P max.
AB	Weld-in for Liquiphant FTL50, thread G 3/4"/D6, thread length L1 = 14.6 mm (0.6")	3-A® marked	See section 'Accessories', → 🖹 16
AC	Weld-in for Liquiphant FTL20, thread G 3/4"/D6, thread length L1 = 14.6 mm (0.6")		
AD	Weld-in for Liquiphant FTL50, thread G 1"/D6, thread length L1 = 18.7 mm (0.78")		
MB	Conical metal to metal, thread G 1/2", Thread length L1 = 14 mm (0.55")	-	16 bar (232 PSI)
R1	Spring loaded cap-nut for mounting in thermowell, thread G 3/8"	-	-
DB	Clamp 1"...1½" (ISO 2852) or DN 25...DN 40 (DIN 32676)	3-A® marked and EHEDG certified (in combination with with the Hyjoin PEEK/stainless steel gasket or Dupont de Nemours Kalrez/stainless steel gasket)	16 bar (232 PSI)
DL	Clamp 2" (ISO 2852) or DN 50 (DIN 32676)		
DP	Clamp 2½" (ISO 2852)		
LB	Varivent F DN25-32, PN40	3-A® marked and EHEDG certified	40 bar (580 PSI)
LL	Varivent N DN40-162, PN40		
HL	APV inline, DN50, PN40, 316L, (B = 6 x Ø8.6 (0.34") bores + 2 x M8 thread)		
PL	DIN 11851, DN50, PN40 (including cap-nut)	3-A® marked and EHEDG certified (in combination with Siersema gasket)	
PG	DIN 11851, DN25, PN40 (including cap-nut)		
PH	DIN 11851, DN40, PN40 (including cap-nut)		

TMR35 design, dimensions thermowells



TMR35 thermowells - All dimensions in mm (inch) (see order information TMR35, Pos. 060)

Item No.	TMR35 version			$P_{max.}$
CB	Version with spring-loaded cap-nut G3/8" (see product structure TMR35, Pos. 050, option **R1**)	Thermowell version corner piece DN15	-	25 bar (363 PSI)
TB		Thermowell version T-piece DN10	-	
TC		Thermowell version T-piece DN15	-	
TD		Thermowell version T-piece DN25	-	
WA		Thermowell cylindric, TL = 70 mm (2.76")	3-A® marked	250 bar (3626 PSI)[1]
WB		Thermowell cylindric, TL = 85 mm (3.35")		
WC		Thermowell metal to metal	-	16 bar (232 PSI)

1) Permitted flow velocity = 40 m/s (131 ft/s)

Human interface

Display elements

No display elements are present directly on the device.
The measured value and other displays can be called up using the ReadWin® 2000 PC software.

Operating elements

No operating elements are present directly on the display. The temperature transmitter is configured by remote operation, without an additional power supply using the ReadWin® 2000 PC software.

Remote operation

Configuration
Configuration kit TXU10-BA with PC operating program (ReadWin® 2000).

Interface
PC interface: TTL/USB connecting cable with plug connector.

Configurable parameters
Measurement dimension (°C/°F), Measuring range, fail-safe mode, output signal (4 to 20 mA / 20 to 4 mA), filter, offset, tag name (8 characters), output simulation.

Certificates and approvals

CE-Mark

The device meets the legal requirements of the EC directives. Endress+Hauser confirms that the device has been successfully tested by applying the CE mark.

Hygiene standard

- EHEDG Type EL certification (TNO report n. 207/20.08.2009).
  EHEDG accepted process connections are: Varivent®, APV-Inline, DIN 11851, ISO 2852
- 3-A® Authorization no. 1354 for the declaration of compliance with standard 74-03
- 3-A® accept the process connections, marked in the product structure of TMR35, → 15

GL

Ship building approval (Germanischer Lloyd) to maximum insertion length of 300 mm (11.81")

Other standards and guidelines

- IEC 60751: Industrial platinum resistance thermometers
- IEC 60529: Degree of protection provided by housing (IP code)
- IEC 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use
- IEC 61326 Series: Electromagnetic compatibility (EMC requirements)
- NAMUR: Standards working group for measurement and control technology in the chemical industry

UL

UL recognized component to UL 61010B-1

Note!
The UL applies only for the compact thermometers TMR31, TMR35 with electronics and 4 to 20 mA output signal.

Ordering information

Product structure TMR31

This information provides an overview of the order options available. The information is not exhaustive, however, and may not be fully up to date. **More detailed** information is available from your local Endress+Hauser representative.

Easytemp® TMR31 compact thermometer
Pt100/4-wire compact thermometer, Cl. A, PC-programmable, M12 connector, 4 to 20 mA analog output 4-wire, fail safe mode as per NAMUR NE43, process connection for general applications.

Pos. 010	**Approval:**	
	A	Non-hazardous area
Pos. 020	**Electrical connection:**	
	1	Plug M12, IP66/67
Pos. 030	**Output; Measuring range:**	
	A	4 to 20 mA; 0 to 100 °C (32 to 212 °F)
	B	4 to 20 mA; 0 to 150 °C (32 to 302 °F)
	C	4 to 20 mA; -50 to 100 °C (-58 to 212 °F)
	D	4 to 20 mA; -50 to 150 °C (-58 to 302 °F)
	E	4 to 20 mA; -50 to 200 °C (-58 to 392 °F)
	F	4 to 20 mA; 0 to 200 °C (32 to 392 °F)
	X	4 to 20 mA; to be specified
	1	Pt100, DIN class A, 4-wire
Pos. 040	**Neck:**	
	A	without
	B	35 mm (1.38")
	C	50 mm (1.97")
Pos. 050	**Process Connection:**	
	AA	Compr. fitting, 316L, L ≥ 100 mm (3.94") Insertion length
	AB	Thread ANSI NPT ¼", 316L
	AC	Thread ANSI NPT ½", 316L
	BA	Thread ISO 228 G¼", 316L
	BB	Thread ISO 228 G½", 316L
	BC	Thread ISO 228 G¼", 316L, thermal isolated
	JA	Thread BSPT R½", JIS 0203, 316L
	MA	Thread M14x1.5, 316L
	MB	Thread M18x1.5, 316L
Pos. 060	**Insertion Length L; Diameter D:**	
	AB	50 mm; 6 mm (1.97"; 0.24")
	AC	100 mm; 6 mm (3.94"; 0.24")
	AD	120 mm; 6 mm (4.72"; 0.24")
	AE	150 mm; 6 mm (5.9"; 0.24")
	AG	200 mm; 6 mm (7.87"; 0.24")
	AH	250 mm; 6 mm (9.84"; 0.24")
	AJ	300 mm; 6 mm (11.81"; 0.24")
	AX	... mm; 6 mm (40 to 300 mm) / ..."; 0.24" (1.6" to 11.81")
	BA	20 mm; 4 mm (0.79"; 0.16")
	BX	... mm; 6 mm (301 to 600 mm) / ..."; 0.24" (11.85" to 23.62")
Pos. 070	**Material; surface roughness:**	
	1	316L, $R_a \leq 0.8$ µm (31.5 µinch)
Pos. 080	**Material certificate:**	
	A	Without
	B	EN10204-3.1 cast analysis, short form
	C	EN10204-3.1 cast analysis, long form
	D	EN10204-3.1 cast analysis + R, short form; R = surface roughness
	E	EN10204-3.1 cast analysis + R, long form; R = surface roughness
Pos. 090	**Calibration:**	
	A	without
	B	Work; 2-point: 0 °C (32°F), 1x variable -20 to 150 °C (-4 to 302 °F) from > 40 mm (>1.57")
	C	Work; 3-point: 0 °C (32°F), 2x variable -20 to 150 °C (-4 to 302 °F) from > 40 mm (>1.57")
	D	ISO/IEC17025; 2-point: 0 °C (32°F), 1x variable -20 to 150 °C (-4 to 302 °F) from > 40 mm (>1.57")

Pos. 090										Calibration:
										E ISO/IEC17025; 3-point: 0 °C (32°F), 2x variable -20 to 150 °C (-4 to 302 °F) from > 40 mm (>1.57")

Pos. 100											Version:
											A Standard

Pos. 995												Marking:
												A Tagging (TAG), metal
												B Tagging (TAG), on device
												C Commissioning label, paper
												D Tagging (TAG), Fieldbus
												F Tagging (TAG), by customer

TMR31-	A	1					1			A		⇒ **Order code**

Product structure TMR35

This information provides an overview of the order options available. The information is not exhaustive, however, and may not be fully up to date. **More detailed** information is available from your local Endress+Hauser representative.

Easytemp® TMR35 compact thermometer
Pt100/4-wire compact thermometer, cl. A, PC-programmable, M12 connector, 4 to 20 mA analog output 4-wire, fail safe mode as per NAMUR NE43, hygienic applications. Conforms to 3-A 74-03 (depends on the selected process connection).

Pos. 010	Approval:
	A Non-hazardous areas

Pos. 020		Electrical connection:
		1 Plug M12, IP66/67

Pos. 030			Output; Measuring range:
			A 4 to 20 mA; 0 to 100 °C (32 to 212 °F)
			B 4 to 20 mA; 0 to 150 °C (32 to 302 °F)
			C 4 to 20 mA; -50 to 100 °C (-58 to 212 °F)
			D 4 to 20 mA; -50 to 150 °C (-58 to 302 °F)
			E 4 to 20 mA; -50 to 200 °C (-58 to 392 °F)
			F 4 to 20 mA; 0 to 200 °C (32 to 392 °F)
			X 4 to 20 mA; to be specified
			1 Pt100, DIN class A, 4-wire

Pos. 040				Neck:
				A without
				B 35 mm (1.38")
				C 35 mm (1.38"), union nut-version

Pos. 050					Process Connection:
					AB Process fitting for Liquiphant (FTL50) G¾"/D6, weld-in adapter 316L, 3-A
					AC Process fitting for Liquiphant (FTL20) G¾"/D6, weld-in adapter 316L, 3-A
					AD Process fitting for Liquiphant (FTL50) G1"/D6, weld-in adapter 316L, 3-A
					DB Clamp ISO2852 DN25 to 38, 1 to 1½", 316L, 3-A, DIN32676 DN25 to 40
					DL Clamp ISO2852 DN40 to 51, 2", 316L, 3-A, DIN32676 DN50
					DP Clamp ISO2852 2½", 316L, 3-A
					HL APV-Inline DN50 PN40, 316L, 3-A
					LB Varivent F DN25 to 32, PN40, 316L, 3-A
					LL Varivent N DN40 to 162, PN40, 316L, 3-A
					MB Conical metal-to-metal G½A, 316L
					PG DIN11851 DN25, PN40, 316L, 3-A
					PH DIN11851 DN40, PN40, 316L, 3-A
					PL DIN11851 DN50, PN40, 316L, 3-A
					R1 Spring-loaded cap-nut for mounting in the thermowell G3/8"

Pos. 060						Insertion Length L; Diameter D:
						AA 30 mm; 6 mm (1.18"; 0.24")
						AB 50 mm; 6 mm (1.97"; 0.24")
						AC 100 mm; 6 mm (3.94"; 0.24")
						AE 150 mm; 6 mm (5.9"; 0.24")
						AG 200 mm; 6 mm (7.87"; 0.24")
						AX ... mm; 6 mm (40 to 300 mm) / ..."; 0.24", (1.57" to 11.81")
						BA 38 mm; 3 mm (1.5"; 0.12")
						BB 83 mm; 3 mm (3.27"; 0.12")
						BC 68 mm; 3 mm (2.68"; 0.12")
						BD 98 mm; 3 mm (3.86"; 0.12")

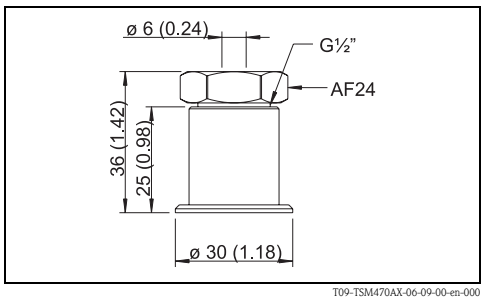
Pos. 060						**Insertion Length L; Diameter D:**						
						BX	... mm; 6 mm (301 to 600 mm) / ..."; 0.24", (11.85" to 23.62")					
						CB	DN15, L = 82 mm; 3 mm (3.23"; 0.12") corner piece					
						TB	DN10, L = 82 mm; 3 mm (3.23"; 0.12") T-piece					
						TC	DN15, L = 83 mm; 3 mm (3.27"; 0.12"), T-piece					
						TD	DN25, L = 83 mm; 3 mm (3.27"; 0.12"), T-piece					
						WA	68 mm; 3 mm (2.68"; 0.12"), incl. thermowell cyl. 70 mm (2.76"), 3-A					
						WB	83 mm; 3 mm (3.27"; 0.12"), incl. thermowell cyl. 85 mm (3.35"), 3-A					
						WC	83 mm; 3 mm (3.27"; 0.12"), incl. thermowell metal to metal 85 mm (3.35")					
Pos. 070							**Material; surface roughness:**					
							1	316L, $R_a \leq 0.8$ µm (31.5 µinch)				
							2	316L, $R_a \leq 0.4$ µm (15.74 µinch)				
							3	316L, $R_a \leq 0.4$ µm (15.74 µinch), electro-polished				
Pos. 080								**Material certificate:**				
								A	Without			
								B	EN10204-3.1 cast analysis, short form			
								C	EN10204-3.1 cast analysis, long form			
								D	EN10204-3.1 cast analysis + R, short form; R = surface roughness			
								E	EN10204-3.1 cast analysis + R, long form; R = surface roughness			
Pos. 090									**Calibration:**			
									A	without		
									B	Work; 2-point: 0 °C (32°F), 1x variable -20 to 150 °C (-4 to 302 °F) from > 40 mm (>1.57")		
									C	Work; 3-point: 0 °C (32°F), 2x variable -20 to 150 °C (-4 to 302 °F) from > 40 mm (>1.57")		
									D	ISO/IEC17025; 2-point: 0 °C (32°F), 1x variable -20 to 150 °C (-4 to 302 °F) from > 40 mm (>1.57")		
									E	ISO/IEC17025; 3-point: 0 °C (32°F), 2x variable -20 to 150 °C (-4 to 302 °F) from > 40 mm (>1.57")		
Pos. 100										**Version:**		
										A	Standard	
Pos. 995											**Marking:**	
											A	Tagging (TAG), metal
											B	Tagging (TAG), on device
											C	Commissioning label, paper
											D	Tagging (TAG), Fieldbus
											F	Tagging (TAG), by customer
TMR35-	**A**	**1**								**A**		⇒ **Order code**

Accessories

All dimensions in mm (inches).
EN10204-3.1 = Material certificate (melt analysis)

Welding boss with sealing taper for TMR31

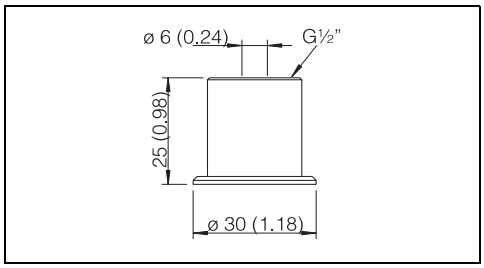
Collar welding boss moveable with sealing taper and pressure screw;
material of parts in contact with the process: 316L, PEEK, max. process pressure 10 bar (145 PSI)
Order number: 51004751



T09-TSM470AX-06-09-00-en-000

Collar welding boss for TMR31

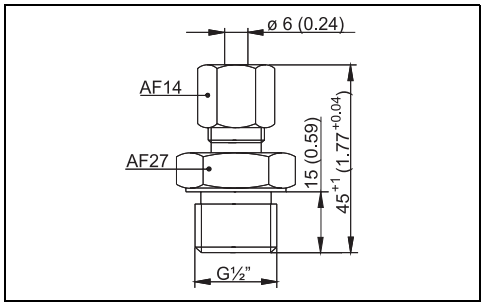
Material of parts in contact with process: 316L
Order no. 51004752



T09-TSM470BX-06-09-00-en-000

Coupling for TMR31

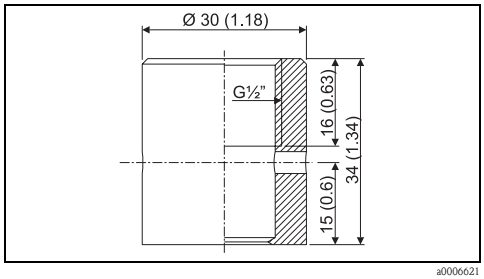
Moveable coupling, G½" process connection,
coupling and parts in contact with process: 316L
Max. process pressure 40 bar (580 PSI)
Order no. 51004753



T09-TSM470AX-06-09-00-en-001

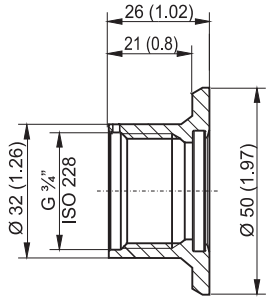
Welding boss with sealing taper (metal-metal) for TMR35

Welding boss for G½" thread
Seal, metal-metal,
Material of parts in contact with process: 316L/ 1.4435
Max. process pressure 16 bar (232 PSI)
Order no. 60021387



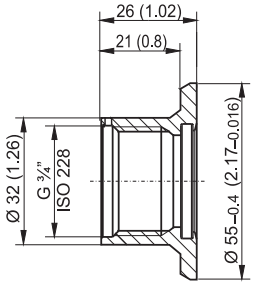
a0006621

Weld-in adapter for TMR35 Liquiphant FTL20 process connection

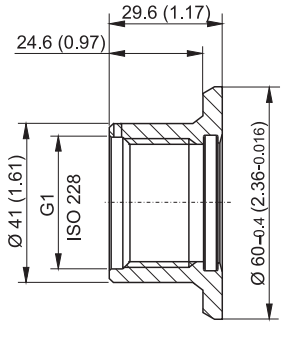
Dimensions	Version	Order number
 a0012605 ■ max. 25 bar (362 PSI) / max. 150 °C (302 °F) ■ max. 40 bar (580 PSI) / max. 100 °C (212 °F)	AISI 316L (1.4435) with inspection certificate EN10204-3.1 material	52018765
	Silicone O-ring ∅ 14.9 x 2.7 mm (0.59 x 0.11"), material: VMQ75, FDA ■ For this version a simple replacement of the seal is possible.	52021717 (5 pieces)
	FDA approved materials according to 21 CFR Part 175–178 3-A® marked	
	Alternative seals	**Order number**
	∅ 15.08 x 2.62 mm (0.62 x 0.1") Material: EPDM, FDA	MVT2L1934 (5 pieces)
	∅ 15.08 x 2.62 mm (0.62 x 0.1") Material: Viton, FDA	MVT2L1942 (5 pieces)
	∅ 14.9 x 2.7 mm (0.59 x 0.11") Material: Silicone, VMQ80, FDA, USP Class VI	71086117 (3 pieces)
	Pressure ring, material: 316L ■ The seal with pressure ring enables easy exchange of defective sealing rings.	52027421

Weld-in adapter for TMR35 Liquiphant FTL50 process connection

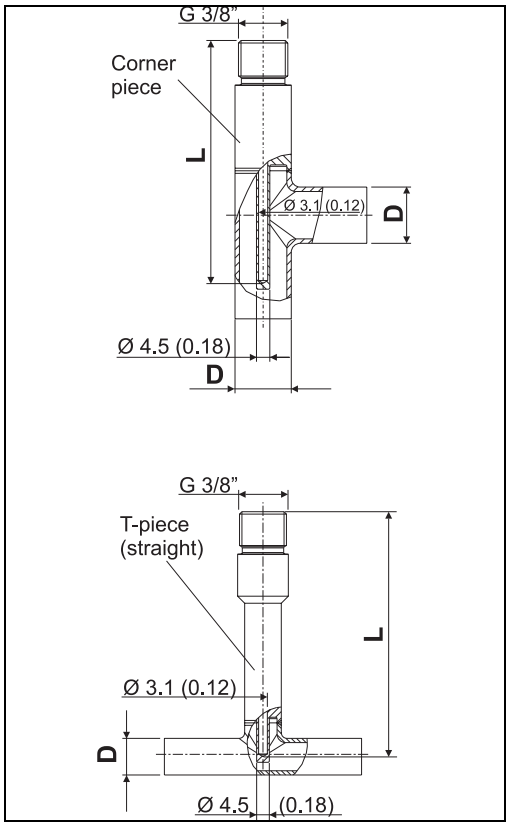
Welding boss G¾", d=55 with flange for flush-mounted installation for sealing surface.

Dimensions	Version	Order number
 a0012603 ■ max. 25 bar (362 PSI) / max. 150 °C (302 °F) ■ max. 40 bar (580 PSI) / max. 100 °C (212 °F)	AISI 316L (1.4435)	52001052
	AISI 316L (1.4435) with inspection certificate EN10204-3.1 material	52011897
	Silicone O-ring, ∅ 21.89 x 2.62 mm (0.86 x 0.10") Material: VMQ70, FDA	52014473 (5 pieces)
	Sensor dummy for welding the welding boss	MVT2L0692
	FDA approved materials according to 21 CFR Part 177.1550/ 2600, 3-A® marked	
	Alternative seals ∅ 21.89 x 2.62 mm (0.86 x 0.1")	**Order number**
	Material: EPDM, FDA	MVT2L1148
	Material: Kalrez Comp. 2035	MVT2L0666
	Material: Viton	MVT2L0655
	Material: Viton/FEP-FEK 75 Shore	MVT2L1748
	Material: Silicone, VMQ23-70, FDA, USP Class VI	71086100 (3 pieces)

Welding boss G1", d=60 with flange for flush-mounted installation with sealing surface.

Dimensions	Version	Order number
 a0008957 ■ max. 25 bar (363 PSI) / max. 150 °C (302 °F) ■ max. 40 bar (580 PSI) / max. 100 °C (212 °F)	AISI 316L (1.4435)	52001051
	AISI 316L (1.4435) with inspection certificate EN10204-3.1 material	52011896
	Silicone O-ring, ∅ 28.17 x 3.53 (1.11 x 0.14"), material: VMQ70, FDA	52014472 (5 pieces)
	Sensor dummy for welding the welding boss	MVT2L0691
	FDA approved materials according to 21 CFR Part 177.1550/ 2600; EHEDG, 3-A® marked	
	Alternative seals ∅ 28.17 x 3.53 (1.11 x 0.14")	**Order number**
	Material: EPDM70, FDA	MVT2L0920
	Material: Viton665, FDA	MVT2L0705 (5 pieces)
	Material: Viton971, V, FDA	MVT2L1682
	Material: Kalrez comp. 4079	MVT2L0567
	Material: Silicone, VMQ23-70, FDA, USP Class VI	71086102 (3 pieces)

Weld-in pipe + thermowell TMR35F

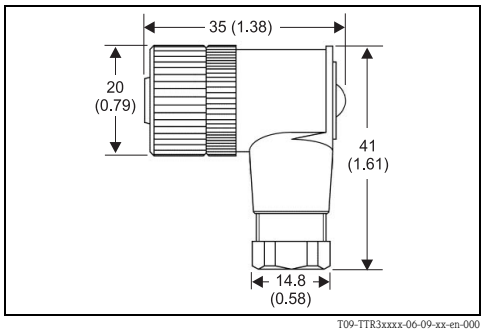


Product structure

Connection thermometer:								
R1	Thread 3/8"							
	Process connection (D):							
	A	DN10, PN25, DIN 11865-A						
	B	DN15, PN25, DIN 11865-A						
	C	DN20, PN25, DIN 11865-A						
	D	DN25, PN25, DIN 11865-A						
	E	DN8, PN25, DIN 11865-A						
	F	DN13, PN25, DIN 11865-B						
		Form:						
		1	Corner piece					
		2	T piece straight					
			Thermowell length (L); ∅:					
			B	84 mm; 4,5 mm for sensor length 83 mm				
				Material:				
				1	1.4435/316 L			
					Material certificate:			
					1	not needed		
					2	EN 10204 short form		
					3	EN 10204		
						Test report:		
						A	not needed	
TMR35F-	**R1**			**B**	**1**		**A**	⇒ **order code**

Coupling

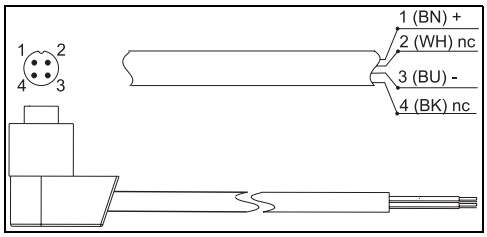
Coupling M12x1 for simple user installable assembly of the connecting cable; elbowed;
connection to M12x1 housing connector
IP 67, PG7
Order number: 51006327



T09-TTR3xxxx-06-09-xx-en-000

Connecting cable (pre-assembled)

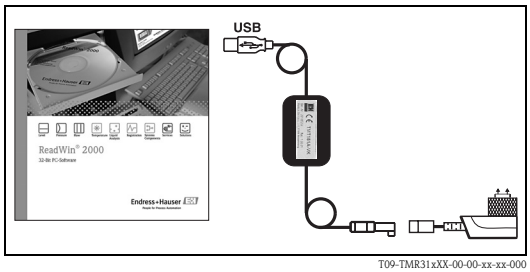
PVC cable, 4 x 0.34 mm^2 (22 AWG) with M12x1 coupling, elbowed, screw plug,
length 5 m (16.4 ft), IP 67
Order number: 51005148
Core colours:
- 1 = BN brown
- 2 = WH white
- 3 = BU blue
- 4 = BK black



T09-TMR31xXX-00-00-xx-xx-001

Configuration kit

- Configuration kit for PC-programmable transmitters - ReadWin® 2000 setup program and interface cable (4 pin plug) for PCs with USB port; with adapter for compact thermometers with M12x1 thread;
  Order code: TXU10-BA
- ReadWin® 2000 can be downloaded free of charge directly from the internet at the following address: **www.endress.com/readwin**



T09-TMR31xXX-00-00-xx-xx-000

Documentation

❑Operating manual "Easytemp® TMR31, TMR35" (BA215R/09)

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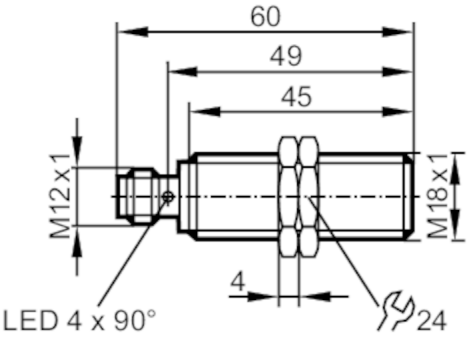
TI123R/09/en/12.09
71006018
FM+SGML6.0 ProMoDo

Surge Detector - PSH200

IGS240

Inductive sensor

IGK3008BAPKG/US-104



Product characteristics		
Electrical design		PNP
Output function		normally closed
Sensing range	[mm]	8
Housing		Threaded type
Dimensions	[mm]	M18 x 1 / L = 60
Application		
System		gold-plated contacts; Increased sensing range
Application		Suitable for industrial, mobile, cooling and lubricating applications; Industrial applications
Electrical data		
Operating voltage	[V]	10...30 DC
Current consumption	[mA]	< 10
Protection class		III
Reverse polarity protection		yes
Outputs		
Electrical design		PNP
Output function		normally closed
Max. voltage drop switching output DC	[V]	2.5
Permanent current rating of switching output DC	[mA]	100
Switching frequency DC	[Hz]	400
Short-circuit protection		yes
Overload protection		yes
Monitoring range		
Sensing range	[mm]	8
Real sensing range Sr	[mm]	8 ± 10 %
Operating distance	[mm]	0...6.48
Increased sensing range		yes

IGS240

Inductive sensor

IGK3008BAPKG/US-104

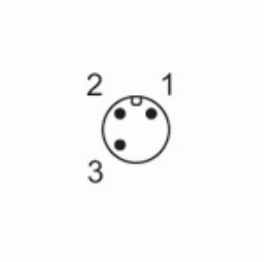
Accuracy / deviations			
Correction factor		steel: 1 / stainless steel: 0.7 / brass: 0.5 / aluminum: 0.4 / copper: 0.3	
Hysteresis	[% of Sr]	3...15	
Switch-point drift	[% of Sr]	-10...10	
Operating conditions			
Ambient temperature	[°C]	-40...85	
Protection		IP 65; IP 66; IP 67; IP 68; IP 69K	
Tests / approvals			
EMC		EN 61000-4-2 ESD	4 kV CD / 8 kV AD
		EN 61000-4-3 HF radiated	10 V/m
		EN 61000-4-4 Burst	2 kV
		EN 61000-4-6 HF conducted	10 V
		EN 55011	class B
Vibration resistance		EN 60068-2-6 Fc	20 g (10...3000 Hz) / 50 sweep cycles per frequency; 1 octave per minute in 3 axes
Shock resistance		EN 60068-2-27 Ea	100 g 11 ms half-sine; 3 shocks each in every direction of the 3 coordinate axes
Continuous shock resistance		EN 60068-2-27	40 g 6 ms; 4000 shocks each in every direction of the 3 coordinate axes
Fast temperature changes		EN 60068-2-14 Na	TA = -40 °C; TB = 85 °C; t1 = 30 min; t2 = < 10 s; 50 cycles
Salt spray test		EN 60068-2-52 Kb	severity level 5 (4 test cycles)
MTTF	[years]	1570	
Embedded software included		yes	
UL approval		Ta	-25...70 °C
		Enclosure type	Type 1
		voltage supply	Limited Voltage/Current
		UL approval number	A001
		File number UL	E174191
Mechanical data			
Weight	[g]	48.1	
Housing		Threaded type	
Mounting		flush mountable	
Dimensions	[mm]	M18 x 1 / L = 60	
Thread designation		M18 x 1	
Material		brass white bronze coated; sensing face: PBT orange; LED window: PEI; lock nuts: brass white bronze coated	
Displays / operating elements			
Display		Switching status	4 x LED, yellow
Accessories			
Items supplied		lock nuts: 2	
Remarks			
Pack quantity		1 pcs.	
Electrical connection - plug			

Connector: 1 x M12; Contacts: gold-plated

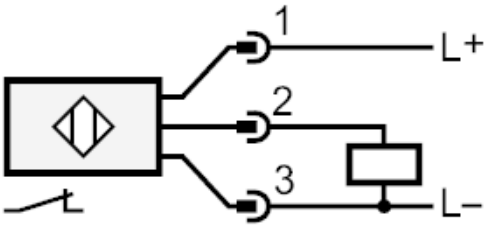
IGS240

Inductive sensor

IGK3008BAPKG/US-104



Connection



Discharge Air Pressure: 213.53-E-PG321Z-ND-3ZZZ-ZZZZ
Oil Pressure: 213.53-B-PG410Z-NB-UZZZ-ZZZ

Bourdon tube pressure gauge
Model 213.53, liquid filling, stainless steel case

for further approvals
see page 2

Applications

- For measuring points with high dynamic pressure loads or vibrations
- For gaseous and liquid media that are not highly viscous or crystallising and will not attack copper alloy parts
- Hydraulics
- Compressors, shipbuilding

Special features

- Vibration and shock resistant
- Especially sturdy design
- NS 63 and 100 with German Lloyd and Gosstandart approval
- Scale ranges up to 0 ... 1,000 bar

Bourdon tube pressure gauge, model 213.53.100, lower mount

Description

Design
EN 837-1

Nominal size in mm
50, 63, 100

Accuracy class
NS 50, 63: 1.6
NS 100: 1.0

Scale ranges
NS 50: 0 ... 1 to 0 ... 400 bar
NS 63, 100: 0 ... 0.6 to 0 ... 1,000 bar
or all other equivalent vacuum or combined pressure and vacuum ranges

Pressure limitation

NS 50, 63:	Steady:	3/4 x full scale value
	Fluctuating:	2/3 x full scale value
	Short time:	Full scale value
NS 100:	Steady:	Full scale value
	Fluctuating:	0.9 x full scale value
	Short time:	1.3 x full scale value

Permissible temperature
Ambient: -20 ... +60 °C
Medium: +60 °C maximum

Temperature effect
When the temperature of the measuring system deviates from the reference temperature (+20 °C):
Max. ±0.4 %/10 K of the span

Ingress protection
IP 65 per EN 60529 / IEC 60529

Data sheets showing similar products:
Standard version with liquid filling; model 113.53; see data sheet PM 01.08

Standard version

Process connection
Copper alloy,
lower mount (LM) or back mount (BM),
NS 50, 63: G ¼ B (male), 14 mm flats
NS 100: G ½ B (male), 22 mm flats

Pressure element
NS 50:
Copper alloy, C-type or helical type

NS 63:
≤ 400 bar: Copper alloy, C-type or helical type
> 400 bar: Stainless steel 316L, helical type

NS 100:
< 100 bar: Copper alloy, C-type
≥ 100 bar: Stainless steel 316L, helical type

Movement
Copper alloy

Dial
NS 50, 63: Plastic ABS, white, with pointer stop pin
NS 100: Aluminium, white, black lettering

Pointer
NS 50, 63: Plastic, black
NS 100: Aluminium, black

Window
Plastic, crystal-clear

Case
Natural finish stainless steel, with blow-out device with
NS 50: in case back, 12 o'clock
NS 63, 100: at case circumference, 12 o'clock
O-ring seal between case and connection.
Scale ranges ≤ 0 ... 16 bar with compensating valve to vent case.

Bezel ring
Crimp ring, glossy finish stainless steel, triangular bezel

Filling liquid
Glycerine

Options

- Other process connection
- Sealings (model 910.17, see data sheet AC 09.08)
- Measuring system and movement from stainless steel (model 233.53)
- NS 100: Zero adjustment (in front)
- Increased medium temperature with special soft solder
  - NS 50, 63: 100 °C
  - NS 100: 150 °C
- Ambient temperature resistant -40 ... +60 °C with silicone oil filling
- NS 50: Higher scale ranges up to 0 ... 1,000 bar
- Panel mounting flange, stainless steel, for back connection
- Surface mounting flange, stainless steel (not NS 50)
- Mounting clamp (for back connection)

CE conformity

Pressure equipment directive
97/23/EC, PS > 200 bar, module A, pressure accessory

Approvals

- **GL**, ships, shipbuilding (e.g. offshore), Germany
- **EAC**, import certificate, customs union Russia/Belarus/Kazakhstan
- **GOST**, metrology/measurement technology, Russia
- **KBA,** automotive, European Community
- **CRN**, safety (e.g. electr. safety, overpressure, ...), Canada

Certificates [1)]

- 2.2 test report per EN 10204 (e.g. state-of-the-art manufacturing, material proof, indication accuracy)
- 3.1 inspection certificate per EN 10204 (e.g. indication accuracy)

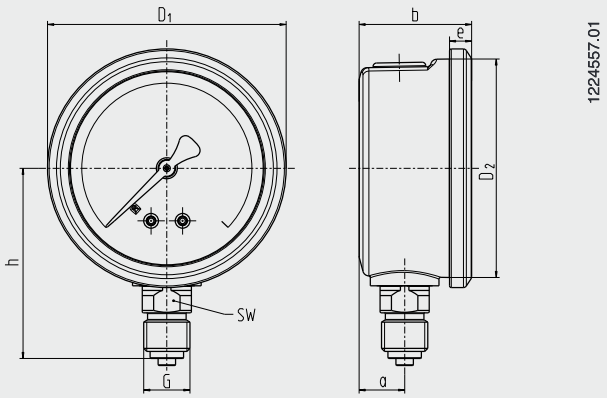
1) Option

Approvals and certificates, see website

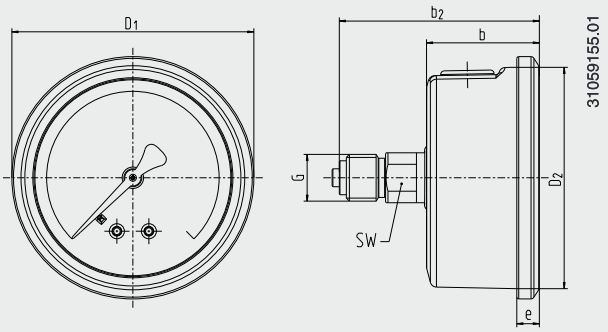
Dimensions in mm

Standard version

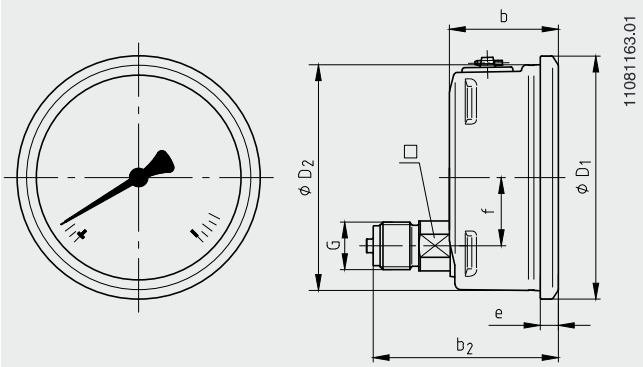
Lower mount (LM)



NS 50, 63, centre back mount (CBM)



NS 100, lower back mount (LBM)



NS	Dimensions in mm										Weight in kg
	a	b ±0.5	b_2 ±0.5	D_1	D_2	e	f	G	h ±1	SW	
50	12	30	55	55	50	5.5	-	G ¼ B	48	14	0.15
63	13	32	56	68	62	6.5	-	G ¼ B	54	14	0.21
100	15.5	48	81.5	107	100	8	30	G ½ B	87	22	0.80

Process connection per EN 837-1 / 7.3

Ordering information

Model / Nominal size / Scale range / Connection size / Connection location / Options

WIKA Alexander Wiegand SE & Co. KG
Alexander-Wiegand-Straße 30
63911 Klingenberg/Germany
Tel. +49 9372 132-0
Fax +49 9372 132-406
info@wika.de
www.wika.de

Bimetal thermometer
Process version per ASME B40.200
Model TG53

for further approvals
see page 9

Applications

- General process instrumentation in the chemical and petrochemical industries, oil and gas industries, power generation and water/wastewater industries
- Temperature measurement in harsh and aggressive environments
- Suitable for applications with high vibrations

Special features

- Robust, hermetically sealed case
- Accuracy: ±1 % of full scale value ASME B40.200 (grade A)
- External reset for reference temperature adjustment
- Dished dial (anti-parallax) for ease of reading
- Adjustable stem and dial version enables optimal process connection

Fig. left: Back mount (axial)
Fig. right: Back mount, adjustable stem and dial

Description

The model TG53 bimetal thermometer has been developed and manufactured in accordance with the ASME B40.200 standard. The thermometer provides high quality and performance, and is an ideal choice in the process industries.

The robust, hermetically sealed case with standard IP66 (NEMA 4X) ingress protection enables use within harsh external conditions.

Specifically designed for use in the chemical and petrochemical, oil and gas, power engineering and shipbuilding industries, the TG53 satisfies the rigorous requirements for resistance to aggressive media. As an available option, the case, stem and process connection can be made from 316 stainless steel.

The TG53 offers the widest variety of dampening options in the industry, allowing it to operate in situations where severe vibration conditions exist. These options include case filling and a dampened packed bearing to minimize pointer oscillation.

An easily accessible reset screw on the back of the case allows quick, limited reference temperature adjustment, reducing maintenance and re-calibration costs.

The TG53 is also available in an assortment of stem lengths (insertion length L_1) to optimize its application-specific fit and performance.

Specifications

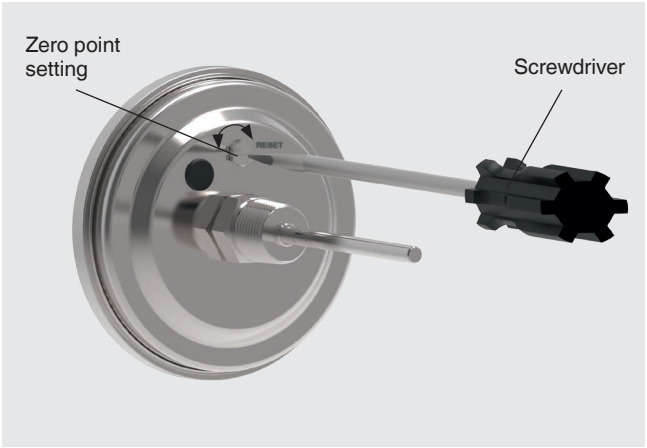
Bimetal thermometer, model TG53			
Measuring element	Bimetal coil		
Nominal size in inch [mm]	■ 3" [80 mm] ■ 4" [100 mm] ■ 5" [127 mm] ■ 6" [160 mm]		
Connection location	■ Back mount (axial) ■ Lower mount (radial) ■ Back mount, adjustable stem and dial		
Unit (scale range)	■ °F ■ °C Option: ■ °F/°C (dual scale) ■ °C/°F (dual scale)		
Process connection	■ Plain, without thread ■ G ½ B ■ ½ NPT ■ G ½ female ■ ½ NPT female ■ M20 x 1.5 ■ M24 x 1.5 female others on request		
Accuracy class	Grade A per ASME B40.200		
Stem diameter	■ ¼" [6.35 mm] ■ ⅜" [9.53 mm]		
Insertion length L_1	2.5" ... 39" [63 ... 1,000 mm] Other lengths > 39" [1,000 mm] on request		
	Minimum/maximum length is dependent on the measuring range and diameter		
Window	Instrument glass Option: ■ Laminated safety glass ■ Polycarbonate (shatterproof)		
Damping	Without Option: ■ With silicone oil case filling, up to max. 482 °F [250 °C] (at the probe) ■ Dampened packed bearing (with inert gel)		
Versions (option)	■ Oil and grease-free version ■ Silicone-oil-free version		
Materials			
Case, ring	Stainless steel 304 (option: stainless steel 316L)		
Stem, process connection (wetted)	Stainless steel 304 (option: stainless steel 316L)		
Elbow behind the case	Stainless steel 304 (option: stainless steel 316L), only with lower mount		
Dial	Aluminium, white, black lettering		
Pointer	Aluminium, black, adjustable pointer		
Joint	Stainless steel 304 (option: stainless steel 316L)		
Ingress protection IEC/EN 60529	IP66 (NEMA 4X) Option: ■ IP67 ■ IP68 (continuous immersion up to 5 m)		
Permissible ambient temperature at case	unfilled	filled	Option
Instrument glass	-40 ... +212 °F [1)] [-40 ... +100 °C]	-	-60 ... +160 °F [-50 … +70 °C]
Laminated and polycarbonate window	-40 ... +160 °F [1)] [-40 ... +70 °C]	-40 ... +160 °F [-40 ... +70 °C]	-60 ... +160 °F [-50 … +70 °C]

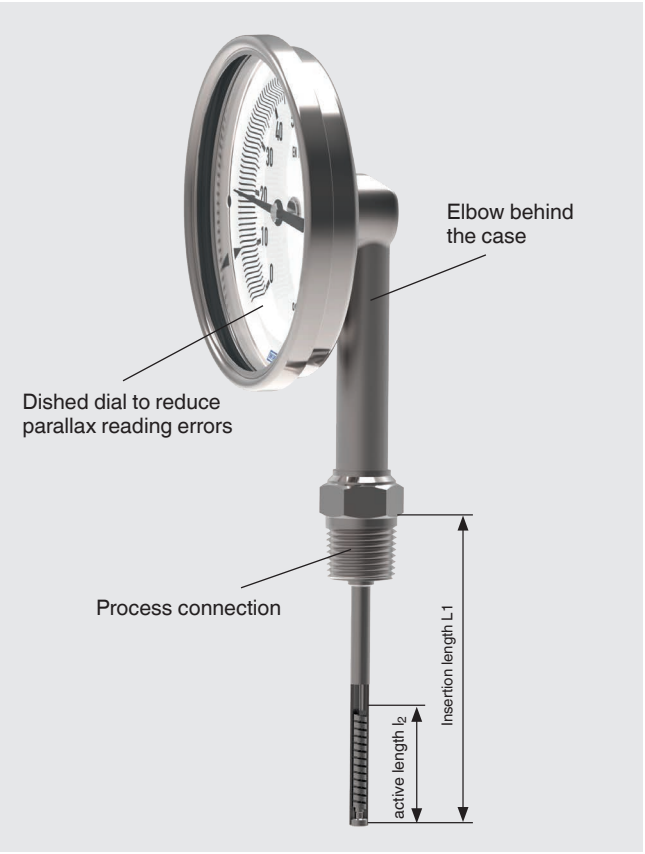
1) For ambient temperatures < 32 °F [0 °C] the measuring system and the window may fog up and possibly ice over.

Bimetal thermometer, model TG53	
Temperature limits for storage and transport	
Without liquid damping	-60 ... +160 °F [-50 … +70 °C]
With liquid damping	-50 ... +160 °F [-40 … +70 °C]
Option: Dampened pointer	-60 ... +160 °F [-50 … +70 °C]
Overtemperature stability [2)]	
Scale range -94 ... +250 °F [-70 ... +120 °C]	100 % overload safety of scale range
Scale range 250 ... 550 °F [120 ... 280 °C]	50 % overload safety of scale range
Scale range 550 ... 750 °F [280 ... 400 °C]	max. 800 °F [430 °C] of scale range
Scale range 750 ... 1,000 °F [400 ... 600 °C]	max. full scale value

2) Overtemperature stability only in non-Ex area

Detailed views





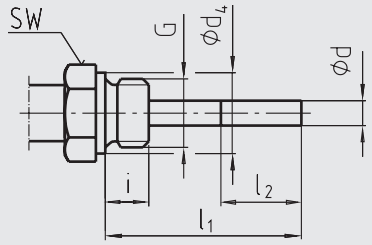
Scale ranges and scale graduation per WIKA factory standard

Scale range in °C	Scale spacing in °C	Standard
-70 ... +70	2	
-70 ... +30	1	●
-60 ... +50	1	
-50 ... +50	1	
-50 ... +100	2	
-50 ... +200	5	
-50 ... +300	5	
-50 ... +400	5	
-50 ... +500	10	
-40 ... +40	1	●
-40 ... +60	1	●
-40 ... +80	2	
-40 ... +160	2	
-30 ... +30	1	●
-30 ... +50	1	●
-30 ... +70	1	●
-20 ... +40	1	●
-20 ... +60	1	
-20 ... +80	1	
-20 ... +100	2	
-20 ... +120	2	●
-20 ... +140	2	
-10 ... +50	1	
0 ... 60	1	●
0 ... 80	1	●
0 ... 100	1	●
0 ... 120	2	●
0 ... 150	2	●
0 ... 160	2	●
0 ... 200	2	●
0 ... 250	5	●
0 ... 300	5	●
0 ... 400	5	
0 ... 500	5	
0 ... 600	5	

Scale range in °F	Scale spacing in °F	Standard
-100 ... +150	5	●
-80 ... +120	2	
-80 ... +240	5	
-40 ... +120	2	
0 ... 140	2	●
0 ... 200	2	
0 ... 250	5	●
30 ... 300	2	●
30 ... 400	5	
50 ... 400	5	●
100 ... 800	10	
150 ... 750	5	●
200 ... 1,000	10	

Connection designs

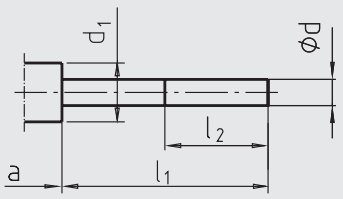
Standard design (male thread connection)



Connection, male: ¼ NPT, ½ NPT, G ¼ B, G ½ B
Standard insertion length l_1 = 2.5", 4", 6", 9", 12", 15", 18", 24"
Recommendation: For applications with vibration on the process side

Nominal size	Process connection		Dimensions in mm / inch		
NS	G	i	SW	d_4	Ø d
3", 4", 5", 6"	G ½ B	14	27	26	¼" or ⅜"
	½ NPT	19	22	-	¼" or ⅜"

Design 1, plain stem (without thread)



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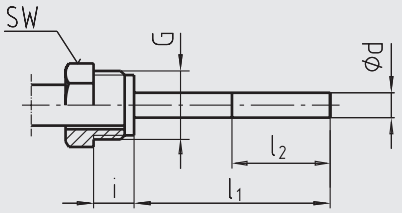
Standard insertion length l_1 = 6", 7", 9", 11"
Basis for design 4, compression fitting

Nominal size	Dimensions in mm / inch			
NS	d_1	Ød	a for axial	a for adjustable stem and dial
3", 4", 5", 6"	18	0.31"	15	25

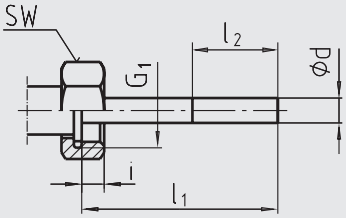
Design 2, male nut



Standard insertion length l_1 = 3", 5", 7", 9"
Non-sealed process connection, thus use with thermowell.

Nominal size	Process connection		Dimensions in mm / inch	
NS	G	i	SW	Ø d
3", 4", 5", 6"	G ½ B	20	27	¼" or ⅜"

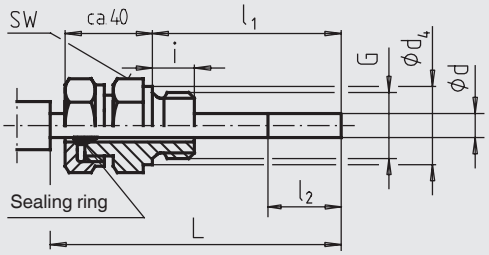
Design 3, union nut



Standard insertion length l_1 = 4", 5", 7", 9", 10"

Nominal size	Process connection		Dimensions in mm / inch	
NS	G	i	SW	Ø d
3", 4", 5", 6"	G ½ B	8.5	27	¼" or ⅜"
	M24 x 1.5	13.5	32	¼" or ⅜"

Design 4, compression fitting (sliding on stem)



Insertion length l_1 = 2.5", 4", 6", 7", 10"
Length L = l_1 + 40 mm

Nominal size	Process connection		Dimensions in mm / inch		
NS	G	i	SW	d_4	Ø d
3", 4", 5", 6"	G ½ B	14	27	26	¼" or ⅜"
	½ NPT	19	22	-	¼" or ⅜"

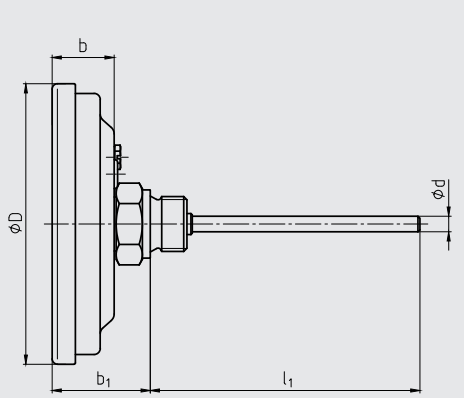
Legend:

G	Male thread
G_1	Female thread
i	Thread length (incl. collar)
a	Distance to the case/articulated joint
Ø d_4	Diameter of the sealing collar
SW	Spanner width
Ø d	Stem diameter
l_2	Active length

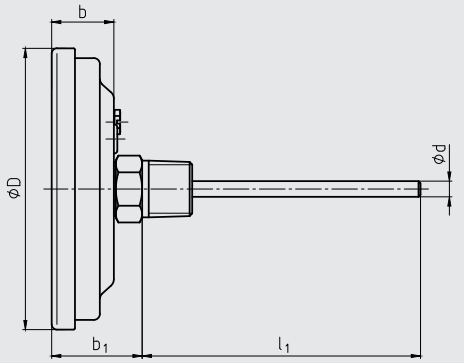
Dimensions in mm / inch

Back mount (axial)

G thread



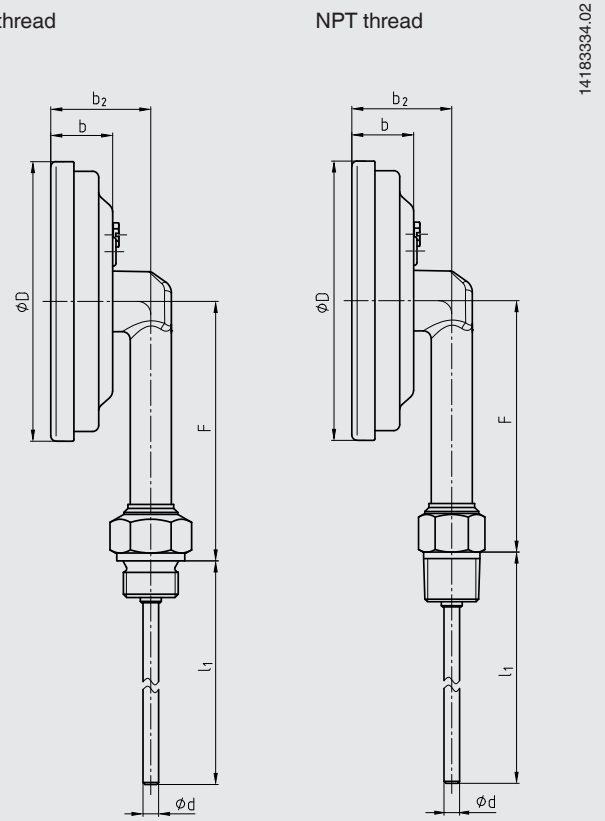
NPT thread



Lower mount (radial)

G thread

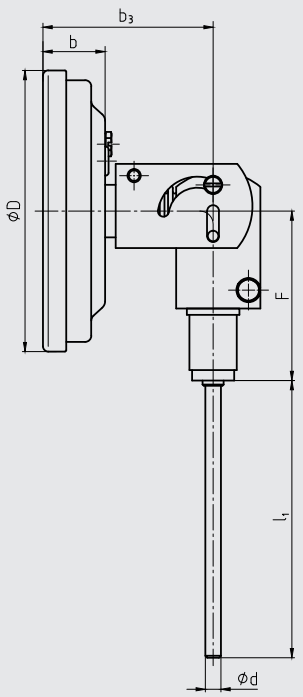
NPT thread



Nominal size	Dimensions in mm / inch							
NS	Ø D	Ø d	b	b_1 1)		b_2	F	
				G thread	NPT thread		G thread	NPT thread
3"	83	1/4" or 3/8"	23	44	37	38	88	84
4"	107	1/4" or 3/8"	24	45	38	39	100	95
5"	134	1/4" or 3/8"	23	44	37	38	113	109
6"	167	1/4" or 3/8"	24	45	38	39	130	125

1) With scale ranges ≥ 0 ... 300 °C the dimensions increase by 40 mm

Back mount, adjustable stem and dial



Nominal size	Dimensions in mm / inch				
NS	Ø D	Ø d	b	b_3	F
3"	83	1/4" or 3/8"	23	64	67
4"	107	1/4" or 3/8"	24	65	67
5"	134	1/4" or 3/8"	23	64	67
6"	167	1/4" or 3/8"	24	65	67

Thermowell

In principle, the operation of a mechanical thermometer is possible without a thermowell with low process-side loading (low pressure, low viscosity and low flow velocities).

However, in order to enable exchanging the thermometer during operation (e.g. instrument replacement or calibration) and to ensure a better protection of the measuring instrument and also the plant and the environment, it is advisable to use a thermowell from the extensive WIKA thermowell portfolio.

For further information on the wake frequency calculation, see Technical information IN 00.15.

Common thermowells for mechanical thermometers

Thermowell with flange (solid-machined), model TW10

Data sheets: TW 95.10, TW 95.11, TW 95.12

Threaded thermowell (solid-machined), model TW15

Data sheet: TW 95.15

Weld-in thermowell (solid-machined), socket-weld design, model TW20

Data sheet: TW 95.20

Weld-in thermowell (solid-machined), model TW25

Data sheet: TW 95.25

Thermowell for lap flanges (solid-machined), Vanstone design, model TW30

Data sheet: TW 95.30

Thermowell in ScrutonWell® design

Data sheet: SP 05.16

Special thermowells on request

Approvals

Logo	Description	Country
	EU declaration of conformity (option) ATEX directive Hazardous areas Ignition protection type “c” with instrument category 2G and 2D (marking, see instrument)	European Union
	GOST (option) Metrology, measurement technology	Russia
	KazInMetr (option) Metrology, measurement technology	Kazakhstan
-	**MTSCHS (option)** Permission for commissioning	Kazakhstan
	BelGIM (option) Metrology, measurement technology	Belarus
	Uzstandard (option) Metrology, measurement technology	Uzbekistan
-	**CRN (option)** Safety (e.g. electr. safety, overpressure, ...)	Canada
	DNV GL (option) Type approval for the shipbuilding industry - Nominal size: 3" [80 mm], 4" [100 mm] - Damping: with liquid damping - Maximum insertion length: 500 mm Location classification: Humidity DNVGL-CG-0339, section 3, class B Salt mist DNVGL-CG-0339, section 3, class D Vibration DNVGL-CG-0339, section 3, class B Using a thermowell is absolutely necessary.	International

Certificates (option)

- 2.2 test report
- 3.1 inspection certificate with 3 test points (optionally with 5 test points)

Approvals and certificates, see website

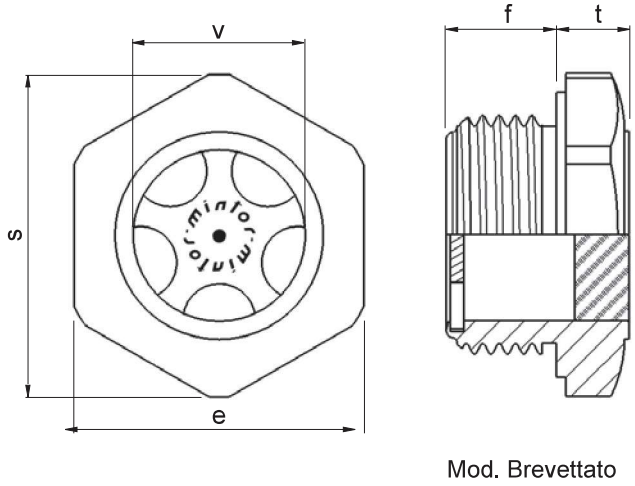
Ordering information

Model / Nominal size / Connection location / Connection design / Unit / Scale range / Process connection / Stem diameter / Insertion length l_1 / Approvals / Certificates / Options

WIKA Alexander Wiegand SE & Co. KG
Alexander-Wiegand-Straße 30
63911 Klingenberg/Germany
Tel. +49 9372 132-0
Fax +49 9372 132-406
info@wika.de
www.wika.de

Oil Level Indicator
Tag: LI100

TLAXP



Mod. Brevettato

TLAXP / Indicatore di livello a vista in acciaio con vetro per alte pressioni
Corpo in acciaio nichelato e parte trasparente in vetro. Indicato per alte pressioni max 30 bar. Resistente alle alte e basse temperature da – 30°C a +250°C max. Campo di impiego: **Compressori, Motocompressori, Macchine Edili e Movimento Terra.**

TLAXP / Visual level indicator in steel with glass for high pressure
Body made in nichel-plated steel and transparent inspection window in glass. Suitable for high pressures max 30 bar. Suitable for high and low temperatures from -30°C till +250°C max. Application: **Compressors, Construction Machinery and Earth Moving.**

TLAXP/ Sicht-Standanzeiger aus Stahl mit Glas für hoch Drücke
Stahl venickelt Körper und transparentem Glas. Geeignet für hohe Druck 30 bar max. Resistent gegen hohe und niedrige Temperaturen -30°C bis +250°C max. Einsatzbereich: **Kompressoren, Baumaschinen und Erdbewegungsmaschinen.**

TLAXP / Indicateur de niveau à vue en acier avec verre
Corps en acier nickelé et voyant transparent en verre. Apte pour haute pression 30 bar max. Résistant à des températures élevées et à faible -30°C à +250°C max. Application: **Compresseurs, Machines pour la construction et de terrassement.**

TIPO	COD.	GAS	f	t	v	e	s
TLAXP3G	1GTLXP3A	½"	9	9,5	14	27	30,2
TLAXP4G	1GTLXP4A	¾"	12,5	8	19	32	35,7
TLAXP5G	1GTLXP5A	1"	15,5	8,5	25	40	44,5

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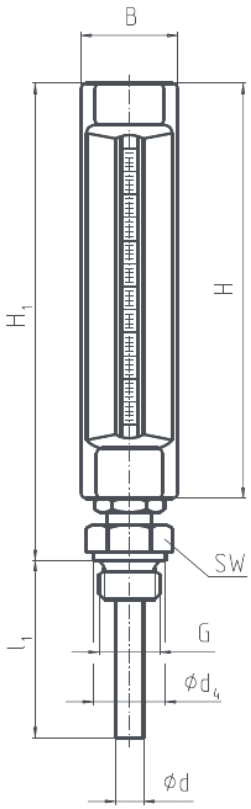
Oil Thermometer



Materials

1. ***Case:*** aluminum, brass colored, anodized
2. ***Design:*** Straight DIN 16185
3. ***Scale:*** 0…160°C – 40 – 240°F
4. ***Threated connection:*** M16 x 1,5
5. ***Insertion length:*** 63mm (2,5”)

Model/Dimensions (mm)/[inch]

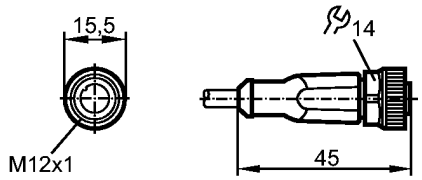
Brand	Model	D	H1	H	B	L_1
Wika	TM32.02 NS110	M16 x 1,5	(130)/ [5”1/8]	(110)/ [4”21/64]	(30)/ [1”3/16]	(63)/ [2”31/64]

ecomat 400

EVC002

ADOGH040MSS0005H04

Connection technology

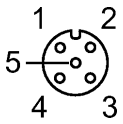


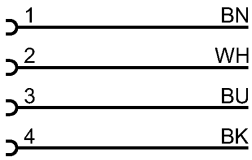
Product characteristics		
Socket		
For sensors with		
M12 connector		
Free from silicone		
Free from halogen		
gold-plated contacts		
Electrical data		
Electrical design	AC/DC	
Operating voltage [V]	250 AC / 300 DC	
Current rating [A]	4	
Protection class	II	
Environment		
Ambient temperature [°C]	-25...90, cULus: max. 75 °C	
Ambient temperature (moving) [°C]	-25...90, cULus: max. 75 °C	
Protection	IP 65 / IP 67 / IP 68 / IP 69K	
Mechanical data		
Design	straight	
Material body	housing: TPU (urethane) orange; sealing: Viton	
Material nut	brass; nickel-plated	
Tightening torque for knurled nut [Nm]	0.6...1.5	
Drag chain suitability	Bending radius for flexible applications:	min. 10 x cable diameter
	Travel speed:	max. 3.3 m/s for a horizontal travel length of 5 m and max. acceleration of 5 m/s²
	Bending cycles:	> 5 million
	Torsional strain:	± 180 °/m
Weight [kg]	0.173	
Electrical connection		
Connection	PUR cable / 5 m; 4 x 0.34 mm² (42 x Ø 0.1 mm); Ø 4.9 mm; halogen-free	
Sheath color	black	

Wiring

Core colors

BK	black
BN	brown
BU	blue
WH	white





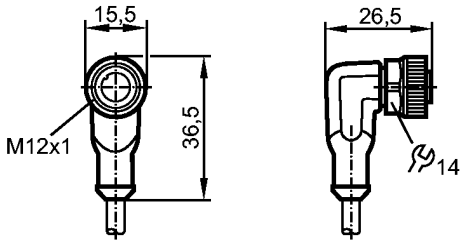
Remarks	
Pack quantity [piece]	1

ecomat 400

EVC005

ADOAH040MSS0005H04

Connection technology

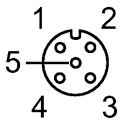


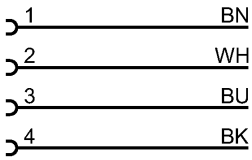
Product characteristics		
Socket		
For sensors with		
M12 connector		
Free from silicone		
Free from halogen		
gold-plated contacts		
Electrical data		
Electrical design	AC/DC	
Operating voltage [V]	250 AC / 300 DC	
Current rating [A]	4	
Protection class	II	
Environment		
Ambient temperature [°C]	-25...90, cULus: max. 75 °C	
Ambient temperature (moving) [°C]	-25...90, cULus: max. 75 °C	
Protection	IP 65 / IP 67 / IP 68 / IP 69K	
Mechanical data		
Design	angled	
Material body	housing: TPU (urethane) orange; sealing: Viton	
Material nut	brass; nickel-plated	
Tightening torque for knurled nut [Nm]	0.6...1.5	
Drag chain suitability	Bending radius for flexible applications:	min. 10 x cable diameter
	Travel speed:	max. 3.3 m/s for a horizontal travel length of 5 m and max. acceleration of 5 m/s²
	Bending cycles:	> 5 million
	Torsional strain:	± 180 °/m
Weight [kg]	0.177	
Electrical connection		
Connection	PUR cable / 5 m; 4 x 0.34 mm² (42 x Ø 0.1 mm); Ø 4.9 mm; halogen-free	
Sheath color	black	

Wiring

Core colors

BK	black
BN	brown
BU	blue
WH	white

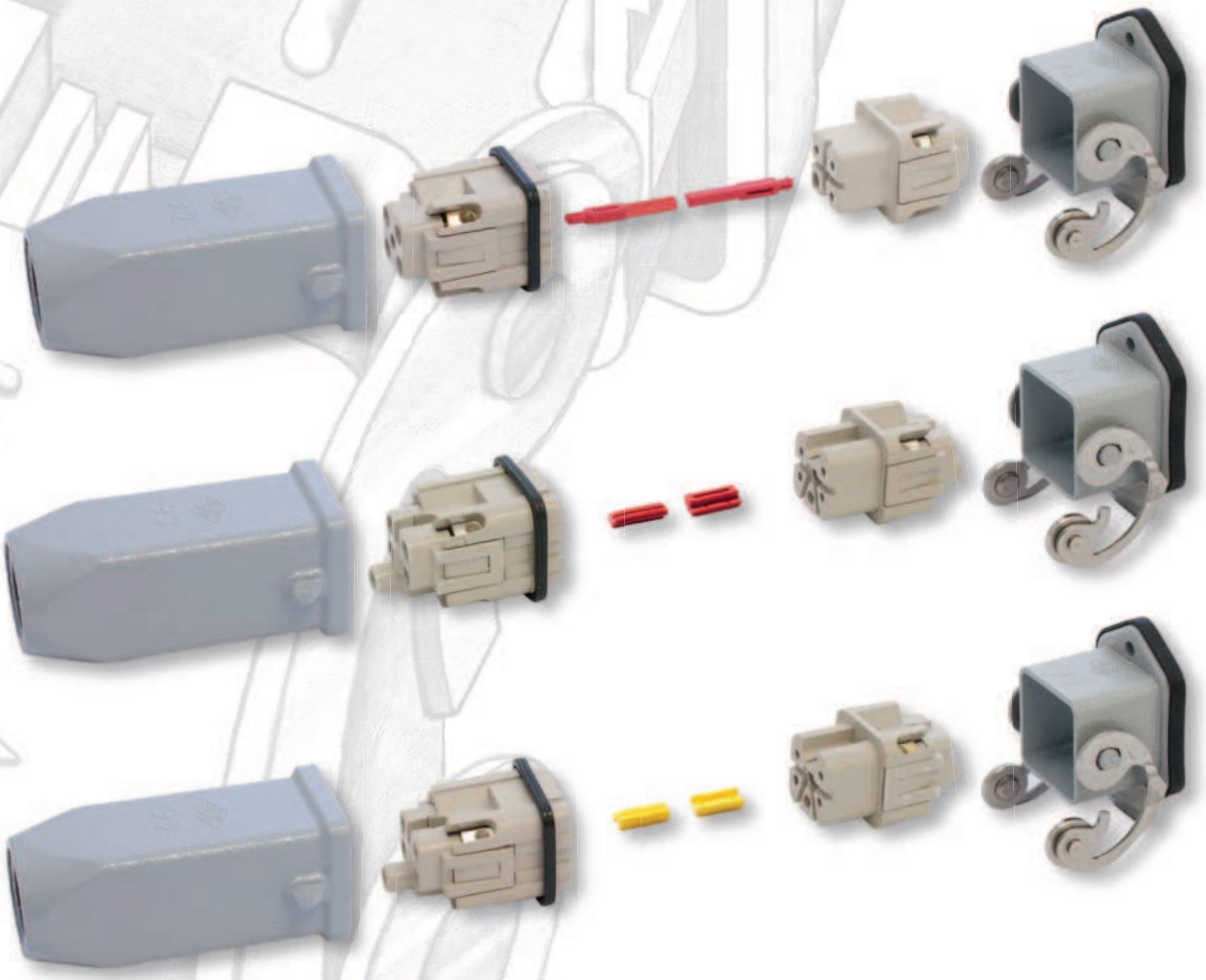




Remarks	
Pack quantity [piece]	1

CK and CKS with coding pins

avoid incorrect connections



CKS 3 and 4 poles + ⏚ 10A - 400V

enclosures:
size "21.21" page:

- can be mated with CK inserts

inserts, 3 poles + ⏚
connection with spring terminal

silver plated contacts

NEW

inserts, 4 poles + ⏚
connection with spring terminal

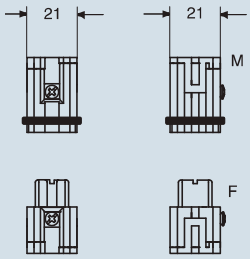
silver plated contacts

NEW

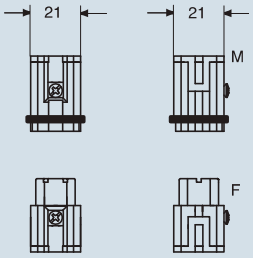
description	part No.	part No.
female inserts with female contacts male inserts with male contacts	**CKSF 03** **CKSM 03**	
female inserts with female contacts male inserts with male contacts		**CKSF 04** **CKSM 04**

- characteristics according to EN 61984:
  10A 400V 4kV 3
- certifications: cUL - UL for USA and Canada, (CSA), (CCC), (EAC); the certifications shown in brackets are being applied for.
- rated voltage according to UL/CSA: 600V
- insulation resistance: ≥ 10 GΩ
- ambient temperature limit: -40 °C ... +125 °C
- are made of self-extinguishing thermoplastic resin UL 94 V0
- mechanical life: ≥ 500 cycles
- contact resistance: ≤ 1 mΩ
- for maximum current load, see the following load curves inserts, for more information see page 492 catalogue CN.12

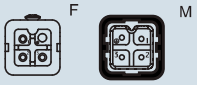
dimensions in mm



dimensions in mm



contacts side (front view)



contacts side (front view)

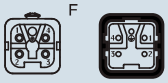
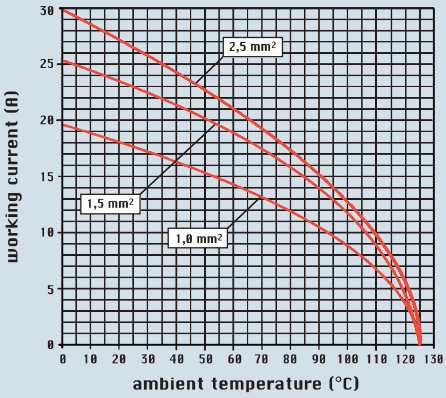


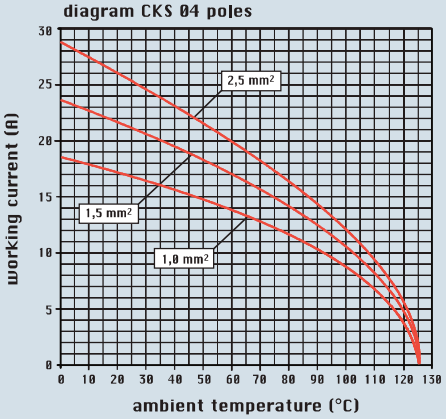
diagram CKS 03 poles



- inserts for wires with the following sections:
  0,14 - 2,5 mm² - AWG 26 - 14
  for prepared wires
  usable section: up to 1,5 mm² (AWG 16)
- conductor stripping lenght: 9...11 mm

- inserts for wires with the following sections:
  0,14 - 2,5 mm² - AWG 26 - 14
  for prepared wires
  usable section: up to 1,5 mm² (AWG 16)
- conductor stripping lenght: 9...11 mm

diagram CKS 04 poles



coding pins:
CR K03 (page 4)

coding pins:
CR K04R and CR K04G (page 4)

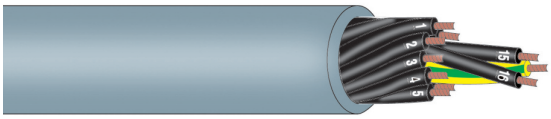
dimensions shown are not binding
and may be changed without notice

AGENCAVI S.r.l.

OR FLEX-EXPORT

Multiconductor oil resistant cables, UL-CSA approved

UL/CSA CABLES FOR STATIC APPLICATION



OIL RESISTANT

TECHNICAL DATA	
Minimum bending radius	≥ 10 x cable diameter
Conductor	Flexible bare copper complying with: UL 1581 Tab. 20.1 IEC 60228 Class 5 VDE 0295 Class 5
Insulation	PVC complying with UL 1581 Cl. 43 - CSA - IEC
Code colour	Black numbered + yellow/green
Jacket	PVC O.R. HD 505.2.1 part 10 colour: grey RAL 7001
Voltage	UL AWM 90°C - 1000 V CSA AWM 90°C - 600 V
Dielectric strength	3000 V
Insulation resistance	≥ 200 MΩ x km
Storage temperature	-40°C +90°C
Service temperature	-25°C +90°C per UL-CSA
Specifications	CSA C.22.2 n. 210.2-M90 UL: UL 1581 - 758 CE: Low Voltage Directive

APPLICATIONS

Power supply or signalling
Machine tools
Woodworking machinery
Marble working machinery

RIFERIMENTO NORMATIVO

Oil resistance
VDE 0472 Part. 803/B
IRM 902 - ASTM n. 2
HD 505.2.1 Part. 10
UL 1581 Cl. 43 (only 60°C)
IEC 60811-2-1

Flame resistance
IEC 60332-1
EN 50265-2-1
UL 1581
UL VW-1
CSA FT 1
VDE 0472 Part. 804 B

UL-CSA Standard
Style 20886
UL 1581
UL 758
CSA C.22 n. 210.2

Code		Formation n° × mmq	Diam. mm	Cu kg/km
20 AWG				
ORM0,5/02		2x0.5	5.6	9
ORM0,5/03		3G0.5	5.9	14
ORM0,5/03X		3x0.5	5.9	14
ORM0,5/04		4G0.5	6.4	18
ORM0,5/04X		4x0.5	6.4	18
ORM0,5/05		5G0.5	7.0	23
ORM0,5/05X		5x0.5	7.0	23
ORM0,5/07		7G0.5	7.6	32
ORM0,5/08		8G0.5	8.0	43
ORM0,5/12		12G0.5	10.1	54
ORM0,5/19		19G0.5	12.8	85
ORM0,5/25		25G0.5	14.5	113
ORM0,5/34		34G0.5	16.2	186
ORM0,5/37		37G0.5	16.4	203
ORM0,5/41		41G0.5	17.6	225
18 AWG				
ORM1,0/02		2x1	6.4	18
ORM1,0/03	*	3G1	6.8	27
ORM1,0/03X		3x1	6.8	27
ORM1,0/04		4G1	7.4	36
ORM1,0/04X		4x1	7.4	36
ORM1,0/05		5G1	8.1	45
ORM1,0/05X		5x1	8.1	45
ORM1,0/07	*	7G1	8.8	63
ORM1,0/12	*	12G1	11.8	108
ORM1,0/19		19G1	15.4	171
ORM1,0/25		25G1	17.2	225
ORM1,0/34		34G1	19.6	310
ORM1,0/37		37G1	19.8	338
ORM1,0/41		41G1	21.7	375
16 AWG				
ORM1,5/02		2x1.5	7.0	27
ORM1,5/03	*	3G1.5	7.4	41
ORM1,5/03UNEL		3G1.5	7.4	41
ORM1,5/03X		3x1.5	7.4	41
ORM1,5/04	*	4G1.5	8.1	54
ORM1,5/04X		4x1.5	8.1	54
ORM1,5/05		5G1.5	8.9	68
ORM1,5/05X		5x1.5	8.9	68
ORM1,5/07		7G1.5	10.1	95
ORM1,5/12		12G1.5	13.4	162
ORM1,5/19		19G1.5	17.0	257
ORM1,5/25		25G1.5	19.4	338
ORM1,5/34		34G1.5	22.4	473
14 AWG				
ORM2,5/02		2x2.5	8.0	45
ORM2,5/03		3G2.5	8.5	68
ORM2,5/03X		3x2.5	8.5	68
ORM2,5/04	*	4G2.5	9.7	90
ORM2,5/04X		4x2.5	9.7	90
ORM2,5/05		5G2.5	10.6	113
ORM2,5/05X		5x2.5	10.6	113
ORM2,5/07		7G2.5	11.6	158
ORM2,5/12		12G2.5	15.5	270
ORM2,5/19		19G2.5	19.0	435
ORM2,5/25		25G2.5	23.1	562
ORM2,5/34		34G2.5	25.6	735

Code	Formation n° × mmq	Diam. mm	Cu kg/km
12 AWG			
ORM4,0/03	3G4	10.8	110
ORM4,0/04	4G4	11.6	144
ORM4,0/05	5G4	12.8	180
10 AWG			
ORM6,0/03	3G6	11.5	162
ORM6,0/04	4G6	14.1	216
ORM6,0/05	5G6	14.3	270
8 AWG			
ORM10/03	3G10	16.0	270
ORM10/04	4G10	17.5	360
6 AWG			
ORM16/04	4G16	21.5	576
ORM16/05	5G16	23.5	720
4 AWG			
ORM25/04	4G25	27.0	900
2 AWG			
ORM35/04	4G35	30.5	1260
0 AWG			
ORM50/04	4G50	37.5	1830
2/0 AWG			
ORM70/04	4G70	40.0	2520

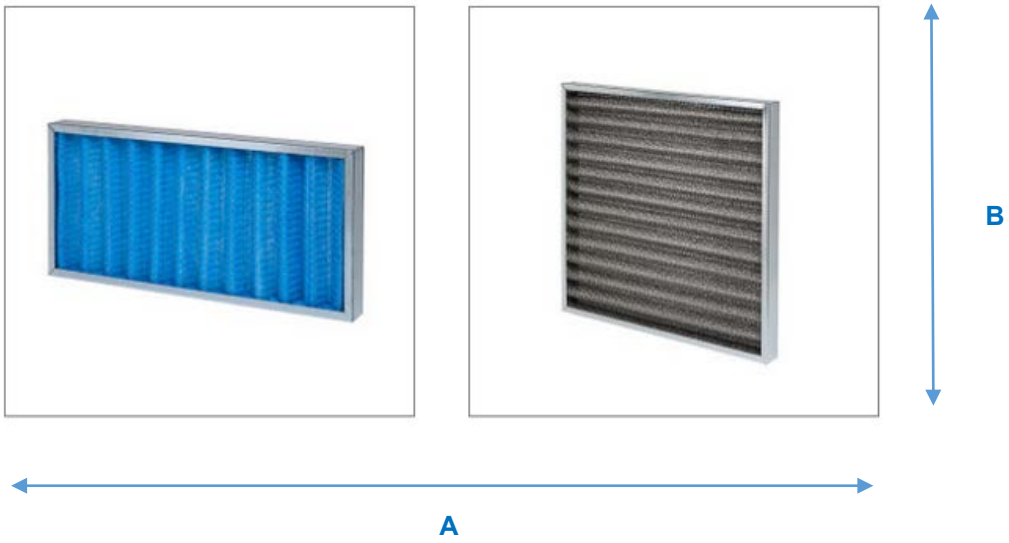
X = without yellow/green conductor
* = available m 100 packaging

N.B. Cables can be also produced with coloured conductors

1.4 Part list

1.4.1 Inlet air filter coarse C-0100

Inlet filter coarse type



Materials & Data

- ***Filter type:*** Compact pocket filters G2, EN779
- ***Filtration***: 65% ASH 52.1 1992
- ***Filter Media:*** polyester

All Compact pocket filters are glass-fiber-free, non-corroding, moisture-resistant up to 100% rel. humidity, self-extinguishing to DIN 53438 (Fire Class F1) as well as microbiologically inactive and meet all hygiene requirements for HVAC systems to EN 779. The pocket filters are easy to replace from outside the silencer hood

Model/Dimensions (mm) / Weight (kg)

Airgam Model	Qty	Filter type	A	B	Weight
600x600x50	1	TZS-48	592	592	1
600x290x50	2	TZS-48	592	290	0,8

1.4.2 Inlet air filter fine C-0101

Inlet filter fine type G4/EN 779

Materials & Data

- ***Filter type:*** Compact pocket filters G4, EN779
- ***Filtration:*** 95%
- ***Filter Media:*** synthetic-organic, nonwoven
- ***Front frame:*** Polyurethane
- ***Dust holding capacity (ASHRAE dust):*** 590 gram

All Compact pocket filters are glass-fiber-free, non-corroding, moisture-resistant up to 100% rel. humidity, self-extinguishing to DIN 53438 (Fire Class F1) as well as microbiologically inactive and meet all hygiene requirements for HVAC systems to EN 779. The pocket filters are easy to replace from outside the silencer hood

Dimensions for mounting frame (mm) / Weight (kg)

Brand	Qty	Model	A	B	Weight
Freudenberg	**1**	**F45S – G4**	**610**	**610**	**1,2**
Freudenberg	**2**	**F45S – G4**	**305**	**610**	**0,8**

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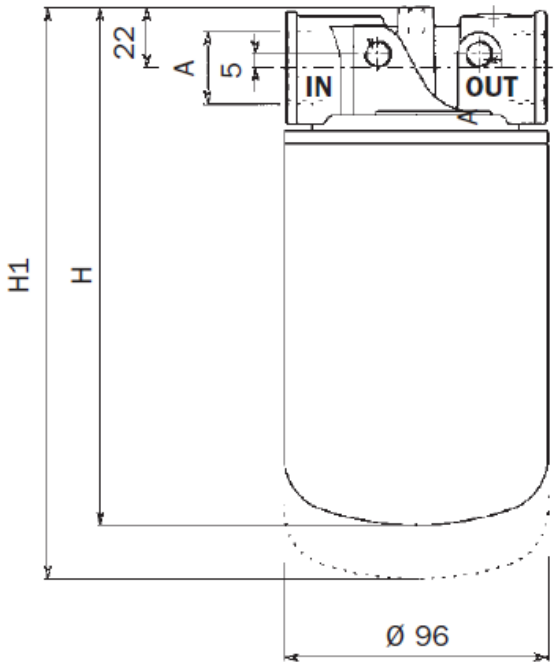
Oil filter



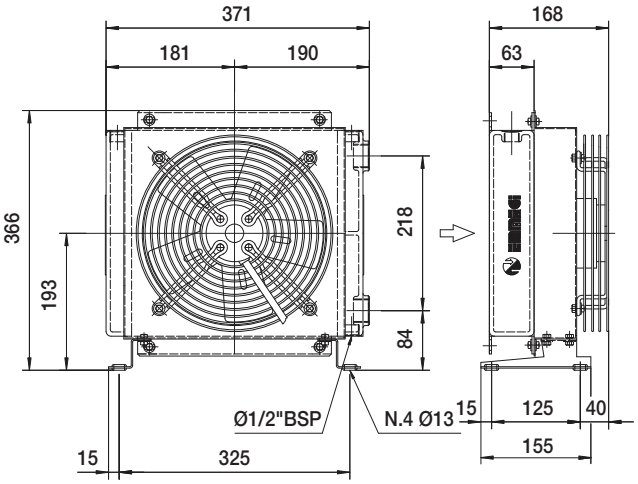
Data

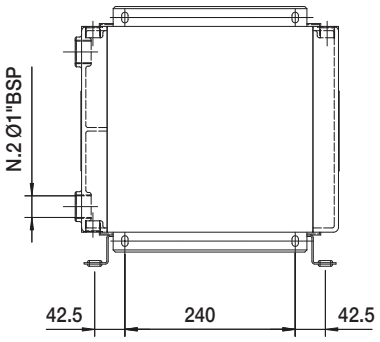
- ***Filter element:*** inorganic microfiber
- ***Filtration:*** 10 micron
- ***Seal material:*** Viton
- ***Thread connection :*** ¾" BSP

Model/ Dimensions (mm)/[inch] / Weight (kg)/[lb]

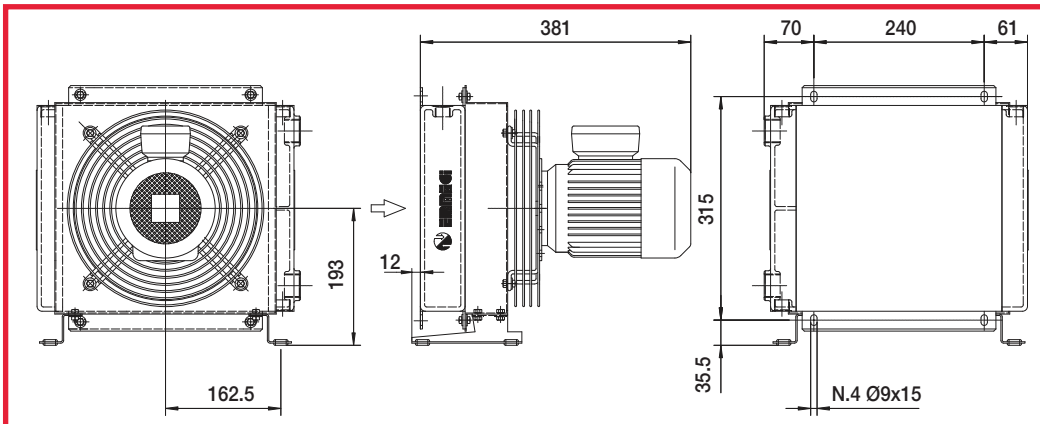
Brand	Model	H1	H	Ø	Weight
MP filter	**CS050 A 10V**	**(200) [7"7/8]**	**(180) [7"3/32]**	**(96) [3"25/32]**	**(1) [2.2]**

Dimensioni *Dimensions*

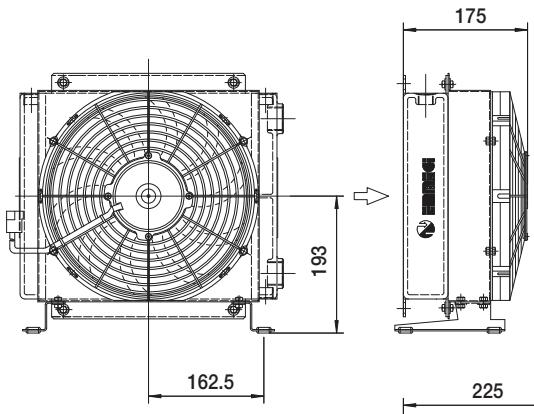


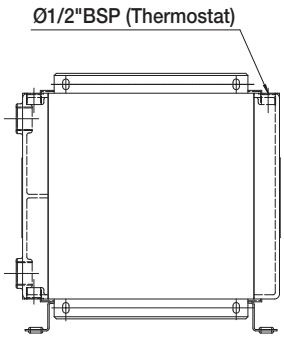


P/N 252501###
P/N 252503###

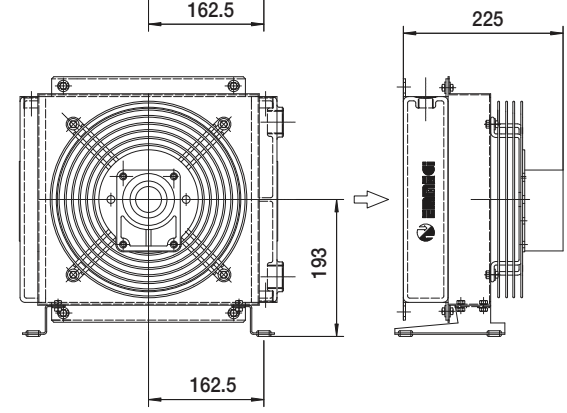


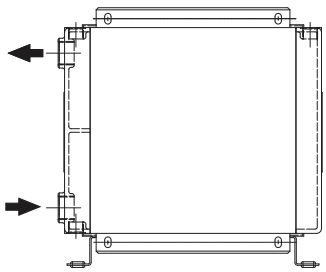
P/N 252504###





P/N 252512###
P/N 252524###





P/N 252556###

Le dimensioni di ingombro e le caratteristiche tecniche non sono impegnative
Over-all dimensions and technical characteristic are not binding

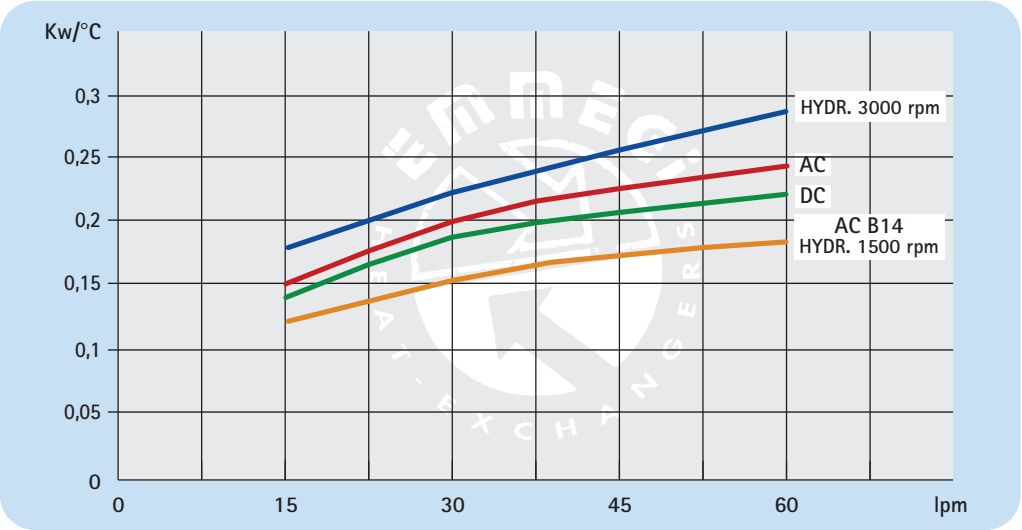
MG2024K 2PASS

Dati tecnici *Technical Data*

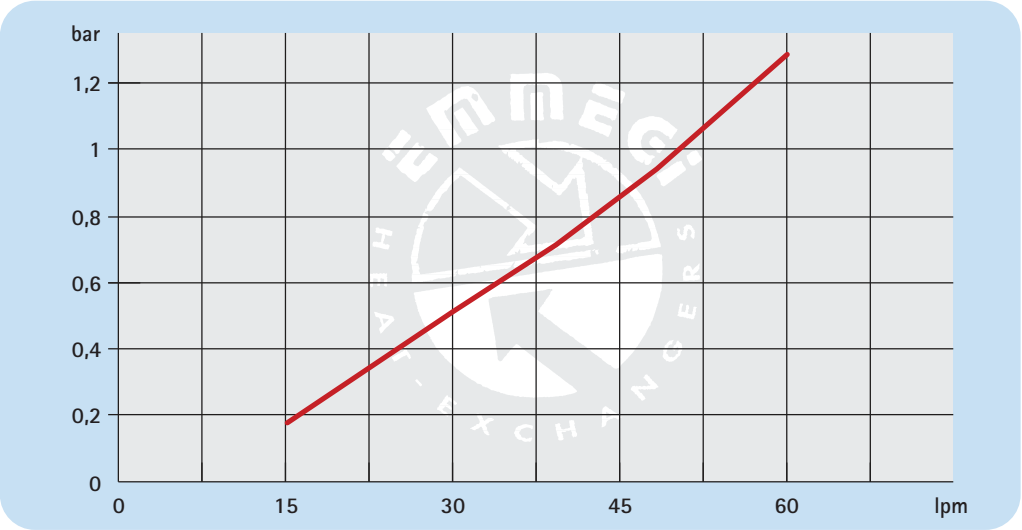
P/N	V	Hz	kW	A	rpm	ø Fan	dB(A)	(m³/h)	IP	It	Kg
252501###	230 AC	50	0,108	0,48	2525	250	72	1350	44		11
252503###	230-400 AC	50/60	0,105	0,22	2500	250	72	1300	44		11
252504###	230-400 AC B14	50/60	0,250	0,71	1450	250	64	1000	55	1	16
252512###	12 DC	/	0,110	7,1	3000	280	72	1180	68		10
252524###	24 DC	/	0,110	3,8	3000	280	74	1280	68		10
252556###	Prepared for Gr.2 hydraulic motor				☎	250	☎	☎	/		10

☎ Contattare EMMEGI *Contact EMMEGI*

Diagramma rendimento *Performance diagram*



Perdite di carico *Pressure drop* (ISO VG 32)



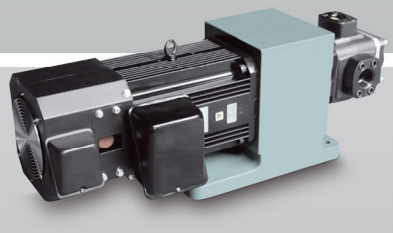
Fattore di correzione - F - (perdite di carico) *Correction factor - F - (Pressure drop)*

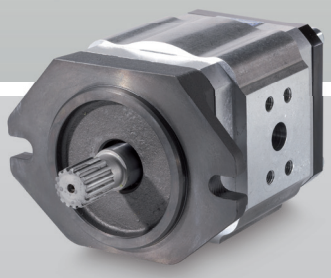
cst	10	15	20	30	40	50	60	80	100	200	300
F	0,5	0,65	0,77	1	1,2	1,4	1,6	1,9	2,1	3,3	4,3

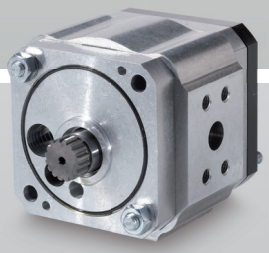
MG2024K 2PASS

EIPC3
EIPC5
EIPC6

Internal gear pumps







eckerle.com

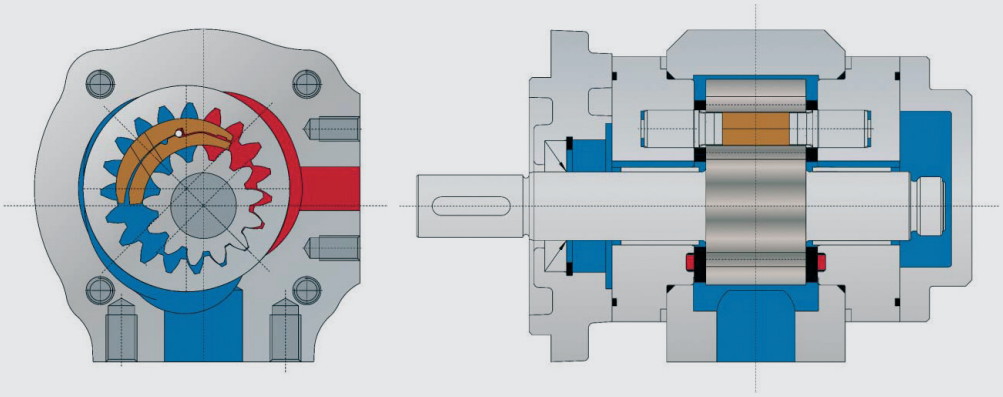
ECKERLE
HYDRAULIC DIVISION

Internal gear pump
Type EIPC3 for industrial applications with constant displacement volume

EIPC3

Characteristics

- Internal gear pump with axial and radial gap compensation
- Radial compensation with segments
- Suction and pressure port radial
- Field of application: Industrial hydraulic
- Low noise
- Long time life
- Low pulsation (pressure pulsation ~2 %)
- Multi flow combinations



Technical Data

Rated Size	020	025	032	040	050	063	064
Spec. volume Vth [cm³/rev]***	20,0	24,8	32,1	40,1	50,3	63,1	64,4
Continuous operating pressure [bar]**	250					180	250
Peak operating pressure [bar] max. 10 sec 15 % duty cycle**	320			300	280	210	280
Cut-in pressure peak [bar]**	350			325	300	210	300
Nominal speed [min⁻¹]	200 – 3.400	200 – 3.200	200 – 3.000	100 – 2.500	100 – 1.800		100 – 1.800
Max. speed [min⁻¹]	3.900	3.800	3.700	2.500	1.800		1.800
Nominal speed [min⁻¹]****	For rated size 040-064 avalible			100 – 3.200	100 – 3.000	200 – 2.200	100 – 2.200
Max. speed [min⁻¹]****	For rated size 040-064 avalible			3.600	3.600	2.400	2.400
Operating viscosity [mm²/s]	10 – 300						
Starting viscosity [mm²/s]	2.000						
Operating temperature [°C]	-20 to +100						
Operating medium	HL – HLP DIN 51 524 part 1/2						
Max. medium temperature [°C]	120						
Min. medium temperature [°C]	-40						
Max. ambient temperature [°C]	80						
Min. ambient temperature [°C]	-40						
Max. admission pressure (intake side) [bar]	2 bar absolute						
Min. admission pressure (intake side) [bar]	0.8 bar absolute (Start 0.6)						
Weight appr. [kg]	8,3	8,6	9,2	9,8	10,5	10,5	11,5
Degree of filtration	Class 20/18/15 due to ISO 4406						
Life expectancy	not less than 1x 10^7 load cycles against peak operating pressure						
Efficiency η vol:	93	93	94	95	95	94	95
Efficiency η hm:	91	92	92	93	93	92	93
Pump noise* (measured in sound chamber) dB[A]	62	63	64	65	66	64	68

n = 1.450 min⁻¹ Δ p = 250 bar (180 bar at size 063) T = 50 °C Medium: HLP 46 Brugger value min. 30N/mm² recommended 50N/mm² for servo applications

* Measured in anechoic room of Eckerle Hydraulic Division; Axial microphone distance 1.0 m
** For acceptable pressure at 400–1.800 rpm. Further rpm on request.
*** Due to manufacturing tolerances the displacement volume could vary.
**** 2" suction port

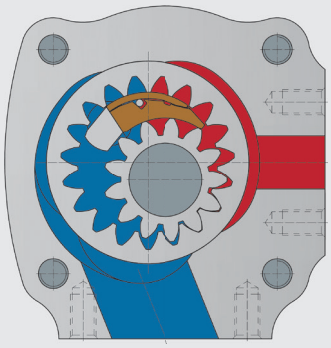
The pumps have no corrosion protection. The max. permissible values must not be applied cumulatively. Please contact us.

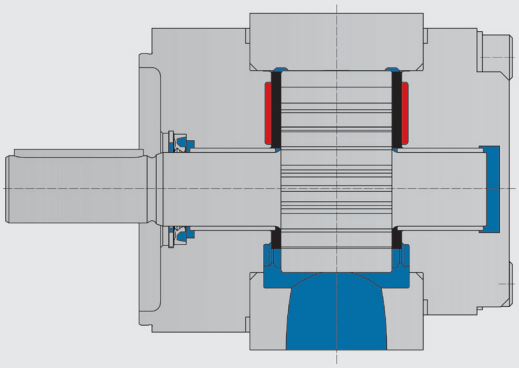
Internal gear pump
Type EIPC5 for industrial applications with constant displacement volume

EIPC5

Characteristics

- Internal gear pump with axial and radial gap compensation
- Radial compensation with segments
- Suction and pressure port radial
- Field of application: Industrial hydraulic
- Low noise
- Long time life
- Low pulsation (pressure pulsation ~2 %)
- Multi flow combinations on request





Technical Data

Rated Size	064	080	100
Spec. volume Vth [cm³/rev]***	65,3	80,4	100,5
Continuous operating pressure [bar]**	250		
Peak operating pressure [bar] max. 10 sec 15 % duty cycle**	270		
Cut-in pressure peak [bar]**	280		
Nominal speed [min⁻¹]	100 – 2.800	100 – 2.800	100 – 2.500
Max. speed [min⁻¹]	3.000	3.000	3.000
Operating viscosity [mm²/s]	10 – 300		
Starting viscosity [mm²/s]	2.000		
Operating temperature [°C]	-20 to +100		
Operating medium	HL – HLP DIN 51 524 part 1/2		
Max. medium temperature [°C]	120		
Min. medium temperature [°C]	-40		
Max. ambient temperature [°C]	80		
Min. ambient temperature [°C]	-40		
Max. admission pressure (intake side) [bar]	2 bar absolute		
Min. admission pressure (intake side) [bar]	0,8 bar absolute (Start 0,6)		
Weight appr. [kg]	11,5	13,0	13,5
Degree of filtration	Class 20/18/15 due to ISO 4406		
Life expectancy	not less than 1x 10^7 load cycles against peak operating pressure		
Efficiency η vol:	94	95	95
Efficiency η hm:	92	93	93
Pump noise* (measured in sound chamber) dB[A]	69	70	71

n = 1.450 min⁻¹ Δ p = 250 bar T = 50 °C Medium: HLP 46

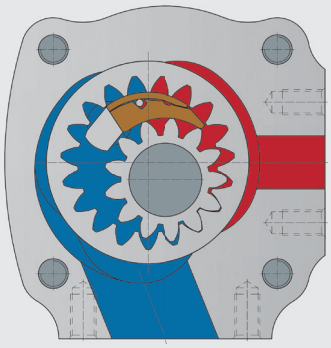
* Measured in anechoic room of Eckerle Hydraulic Division; Axial microphone distance 1.0 m
** For acceptable pressure at 400–1.800 rpm. Further rpm on request.
*** Due to manufacturing tolerances the displacement volume could vary.
The pumps have no corrosion protection. The max. permissible values must not be applied cumulatively. Please contact us.

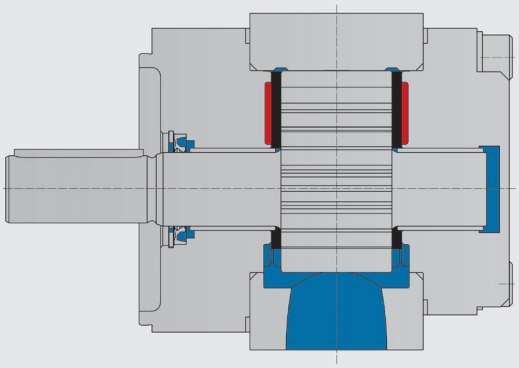
Internal gear pump
Type EIPC6 for industrial applications with constant displacement volume

EIPC6

Characteristics

- Internal gear pump with axial and radial gap compensation
- Radial compensation with segments
- Suction and pressure port radial
- Field of application: Industrial hydraulic
- Low noise
- Long time life
- Low pulsation (pressure pulsation ~2 %)
- Multi flow combinations on request





Technical Data

Rated Size	125	160	200	250
Spec. volume Vth [cm^3/rev]***	125,7	160,1	200,9	249,9
Continuous operating pressure [bar]**	250		160	140
Peak operating pressure [bar] max. 10 sec 15 % duty cycle**	280		210	150
Cut-in pressure peak [bar]**	300		220	160
Nominal speed [min^{-1}]****	400 – 2.500	400 – 2.000		
Max. speed [min^{-1}]	2.800	2.200		
Operating viscosity [mm^2/s]	10 – 300			
Starting viscosity [mm^2/s]	2.000			
Operating temperature [°C]	-20 to +100			
Operating medium	HL – HLP DIN 51 524 part 1/2			
Max. medium temperature [°C]	80			
Min. medium temperature [°C]	-20			
Max. ambient temperature [°C]	80			
Min. ambient temperature [°C]	-20			
Max. admission pressure (intake side) [bar]	2 bar absolute			
Min. admission pressure (intake side) [bar]	0.8 bar absolute (Start 0.6)			
Weight appr. [kg]	27,5	30	43	54
Degree of filtration	Class 20/18/15 due to ISO 4406			
Life expectancy	not less than 1x 10^7 load cycles against peak operating pressure			
Efficiency η vol:	94	94	93	93
Efficiency η hm:	90		91	
Pump noise* (measured in sound chamber) dB[A]	76	77	77	78

n = 1.450 min^{-1} Δ p = 250 bar (160 bar at size 200 and 140 bar at size 250) T = 50 °C Medium: HLP 46

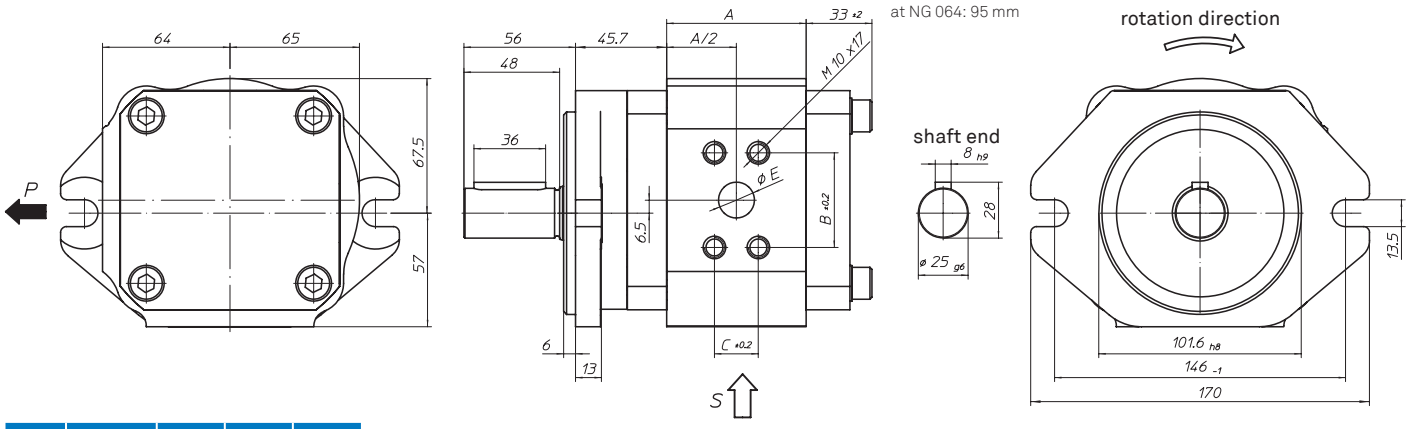
* Measured in anechoic room of Eckerle Hydraulic Division; Axial microphone distance 1.0 m
** For acceptable pressure at 400–1.800 rpm. Further rpm on request.
*** Due to manufacturing tolerances the displacement volume could vary.
**** Further rpm on request.

The pumps have no corrosion protection. The max. permissible values must not be applied cumulatively. Please contact us.

Dimension

Pump with SAE-2B-bolt flange and straight keyed shaft

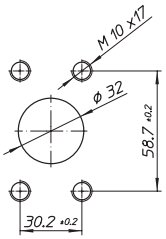
Order example: EIPC3-___RA23-1X



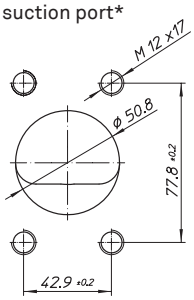
Size	A	B	C	E
020	58,5	47,5	22	18
025	65,0	47,5	22	18
028	70,0	47,5	22	18
032	75,0	47,5	22	18
040	86,0	52,4	26,2	20
050	100,0	52,4	26,2	20
063	118,0	52,4	26,2	25,4
064	100,0	52,4	26,2	20

* is suitable for speed controlled drive applications (available only for size 040, 050, 063, 064)

suction port

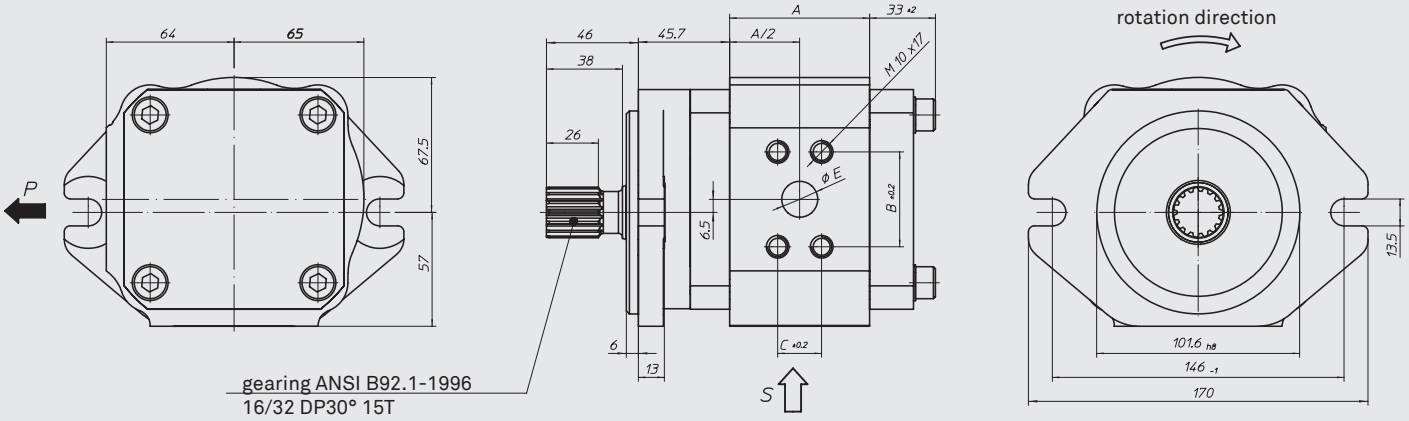


oversized suction port*



Pump with SAE-2B-bolt flange and splined shaft

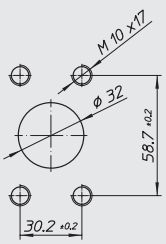
Order example: EIPC3-___RB23-1X



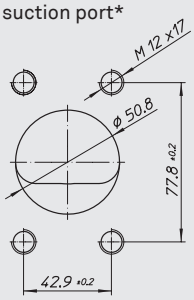
Size	A	B	C	E
020	58,5	47,5	22	18
025	65,0	47,5	22	18
028	70,0	47,5	22	18
032	75,0	47,5	22	18
040	86,0	52,4	26,2	20
050	100,0	52,4	26,2	20
063	118,0	52,4	26,2	25,4
064	100,0	52,4	26,2	20

* is suitable for speed controlled drive applications (available only for size 040, 050, 063, 064)

suction port

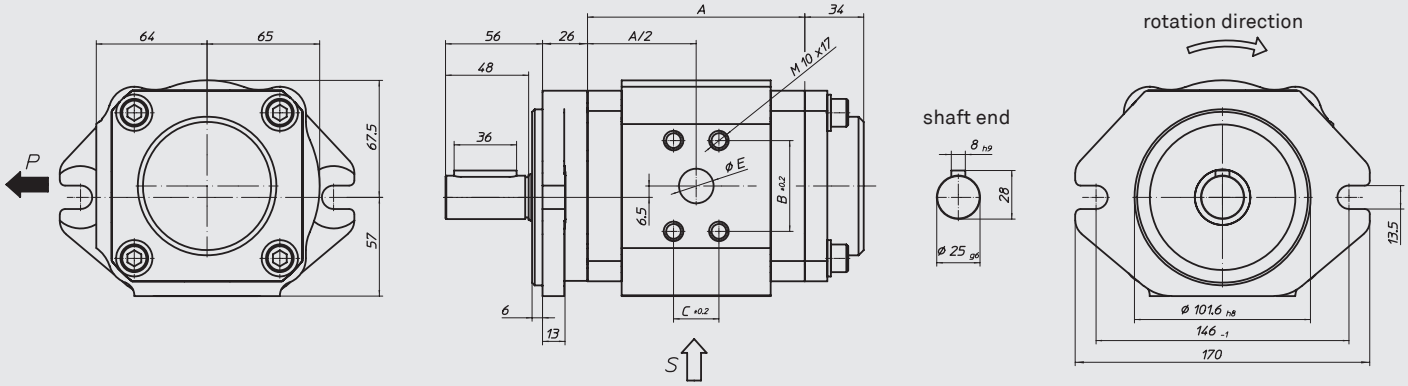


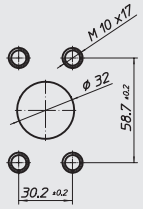
oversized suction port*



Pump with SAE-B2-bolt flange and straight keyed shaft with PTO

Order example: EIPC3-___RK23-1X

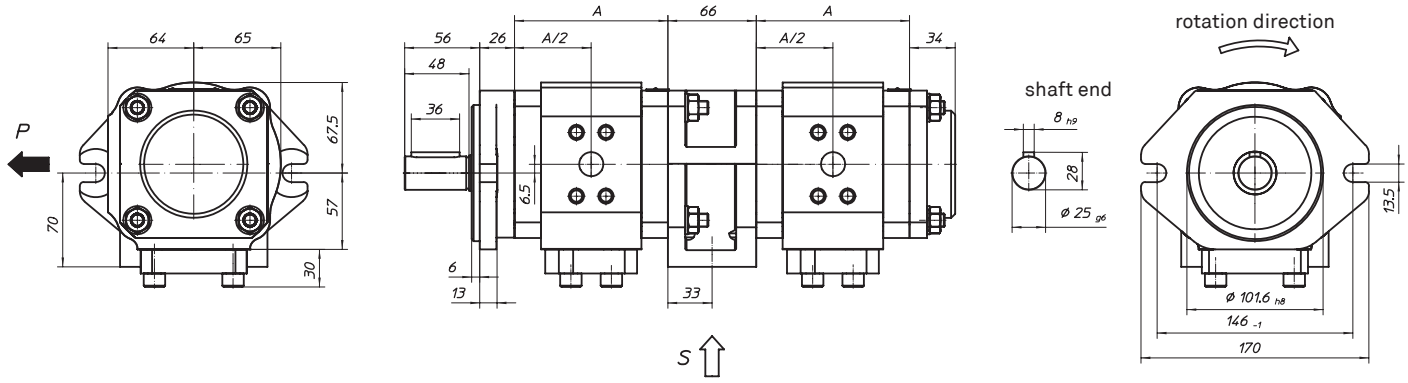




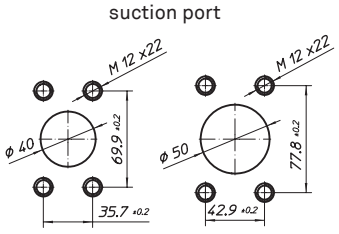
Size	A	B	C	E
020	97,9	47,5	22	18
025	104,4	47,5	22	18
032	114,4	47,5	22	18
040	125,4	52,4	26,2	20
050	139,4	52,4	26,2	20

Double pump with SAE-B2-bolt flange and straight keyed shaft

Order example: EIPC3-___RK20-1X+
EIPC3-___RP30-1X



Size	A
020	97,9
025	104,4
032	114,4
040	125,4
050	139,4



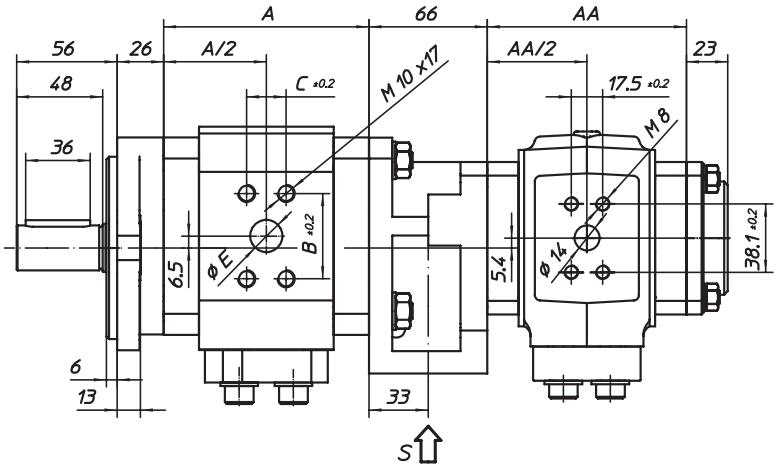
Pressure connections see single pump

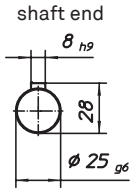
size 020-032 size 040-050

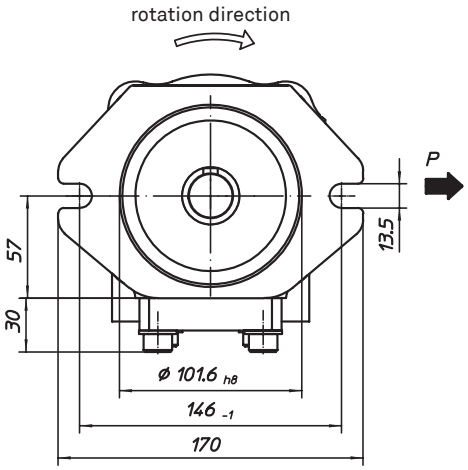
Dimensions

Double pump with SAE-B2-bolt flange and straight keyed shaft

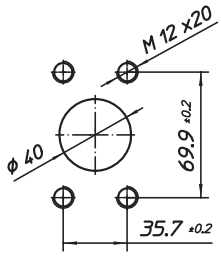
Order example: EIPC3-___RK20-1X+
EIPH2-___RP30-1X

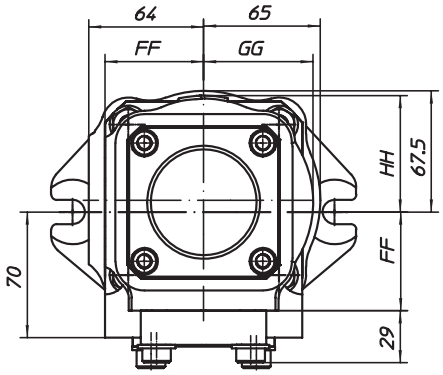






common
suction port





EIPC3

Size	A	B	C	E
020	97,9	47,5	22	18
025	104,4	47,5	22	18
032	114,4	47,5	22	18
040	125,4	52,4	26,2	20
050	139,4	52,4	26,2	20

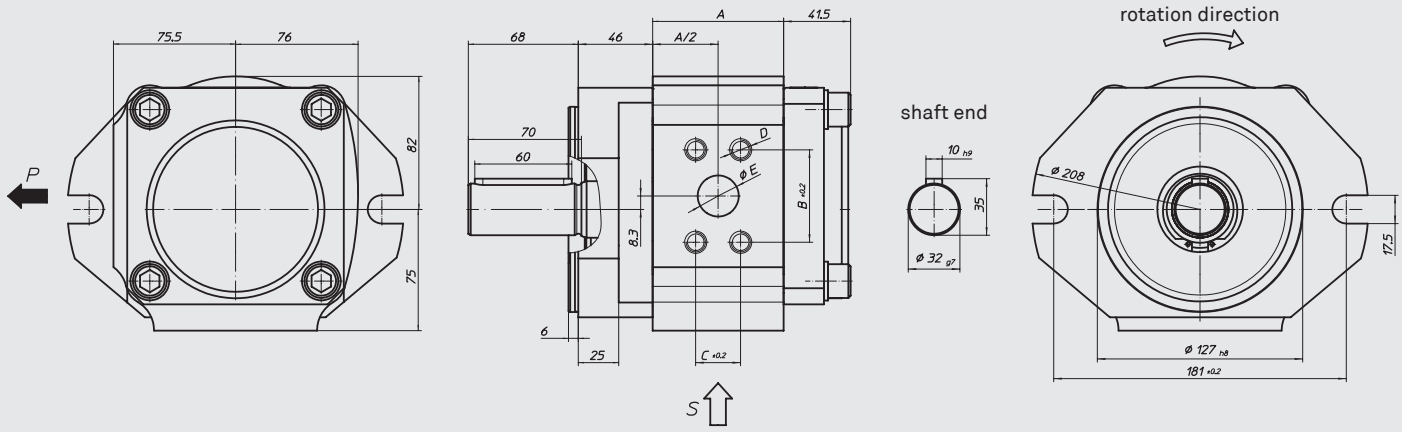
EIPH2

Size	AA	FF	GG	HH
004	71	50	55	59
005	71	50	55	59
006	73	50	55	59
008	76	50	55	59
011	82	50	55	59
013	87	50	55	60
016	92	50	55	60
019	99	55	61	65
022	105	55	61	65
025	111	55	61	65

The single pumps of a multiple pump assembly are internally connected, even if you connect to the pump inlet.
It is therefore no operating with different fluids possible.

Pump with SAE-C2-bolt flange and straight keyed shaft

Order example: EIPC5-___RA23-1X

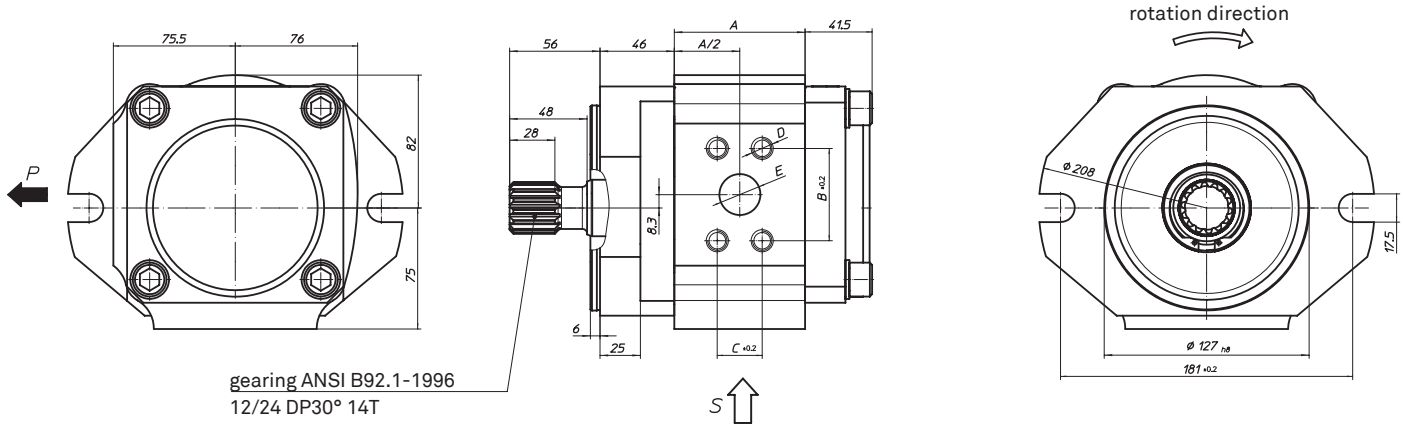


Size	A	B*	C*	D	E	L**	M**	N
064	81	57,2	27,8	M12x22	25,4	77,8	42,9	47,2
080	93	66,7	31,8	M14x24	31,8	77,8	42,9	47,2
100	109	66,7	31,8	M14x24	31,8	88,9	50,8	63,5

* Pressure port: SAE J518, high pressure series (code 62)
** Suction port: SAE J518, standard pressure series (code 61)

Pump with SAE-C2-bolt flange and splined shaft

Order example: EIPC5-___RB23-1X



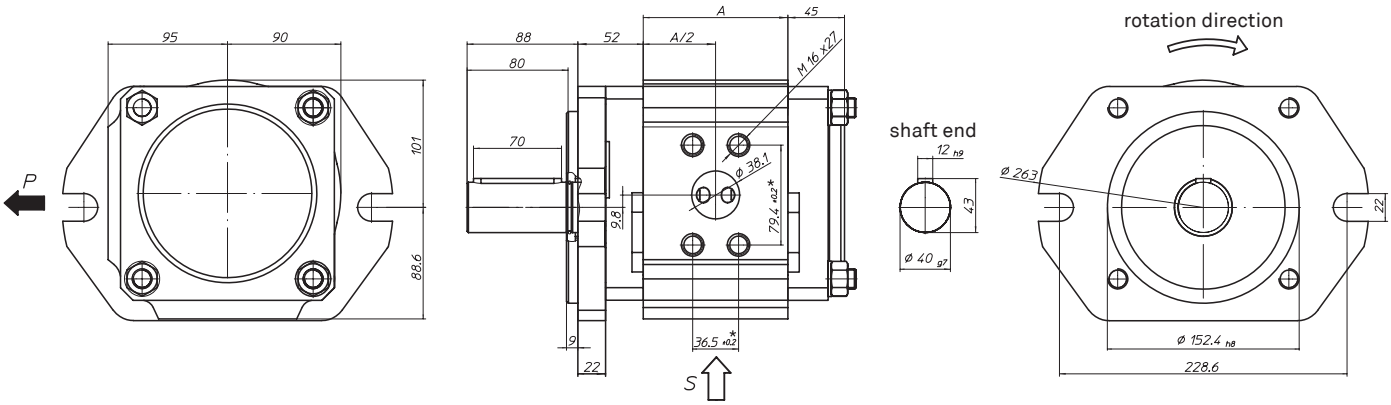
Size	A	B*	C*	D	E	L**	M**	N
064	81	57,2	27,8	M12x22	25,4	77,8	42,9	47,2
080	93	66,7	31,8	M14x24	31,8	77,8	42,9	47,2
100	109	66,7	31,8	M14x24	31,8	88,9	50,8	63,5

* Pressure port: SAE J518, high pressure series (code 62)
** Suction port: SAE J518, standard pressure series (code 61)

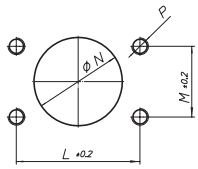
Dimensions

Pump with SAE-D2-bolt flange and straight keyed shaft

Order example: EIPC6-___RA23-1X



suction port

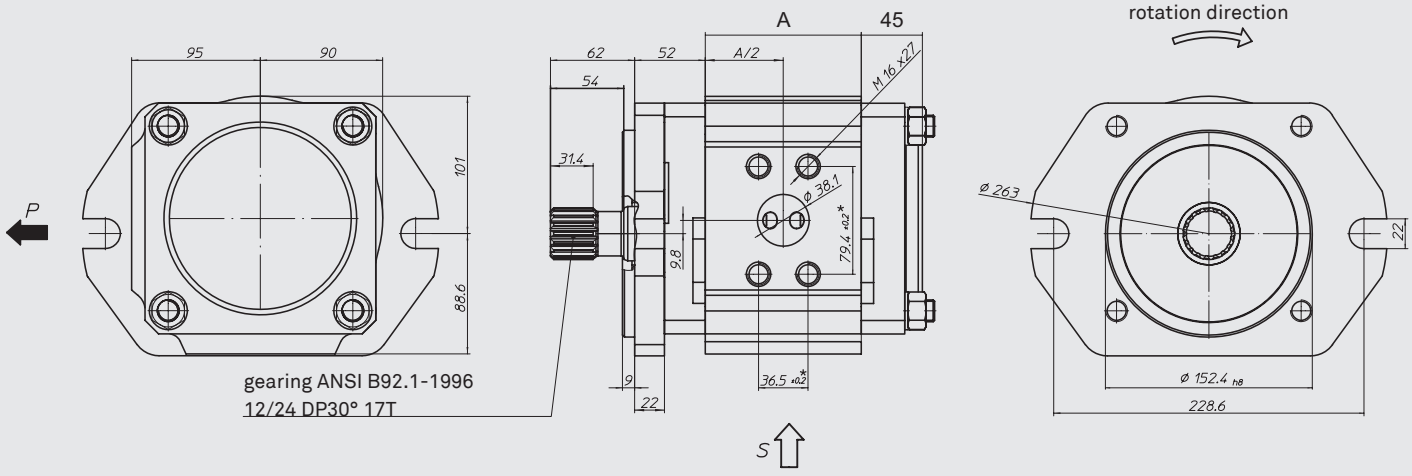


Size	A	L**	M**	N	P
125	115	88,9	50,8	63,5	M12x22
160	136	106,4	61,9	76,2	M16x25
200	161	120,7	69,9	88,9	M16x25
250	191	120,7	69,9	88,9	M16x25

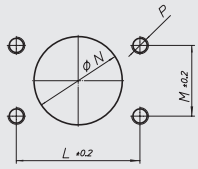
* Pressure port: SAE J518, high pressure series (code 62)
** Suction port: SAE J518, standard pressure series (code 61)

Pump with SAE-D2-bolt flange and splined shaft

Order example: EIPC6-___RB23-1X



suction port



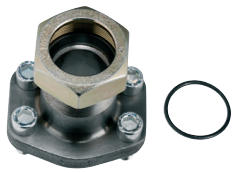
Size	A	L**	M**	N	P
125	115	88,9	50,8	63,5	M12x22
160	136	106,4	61,9	76,2	M16x25
200	161	120,7	69,9	88,9	M16x25
250	191	120,7	69,9	88,9	M16x25

* Pressure port: SAE J518, high pressure series (code 62)
** Suction port: SAE J518, standard pressure series (code 61)

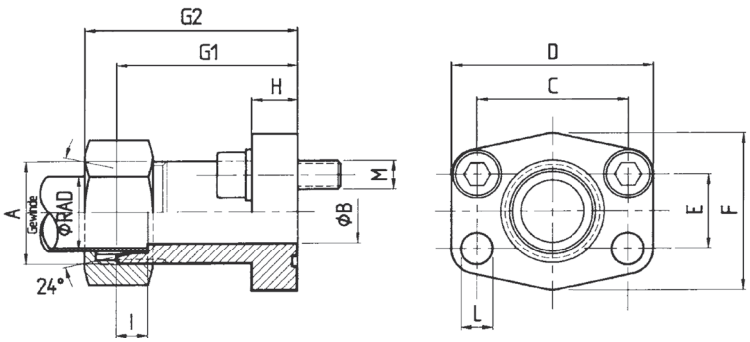
Connecting flanges SAE

EIPC

SAE flange metric tapped

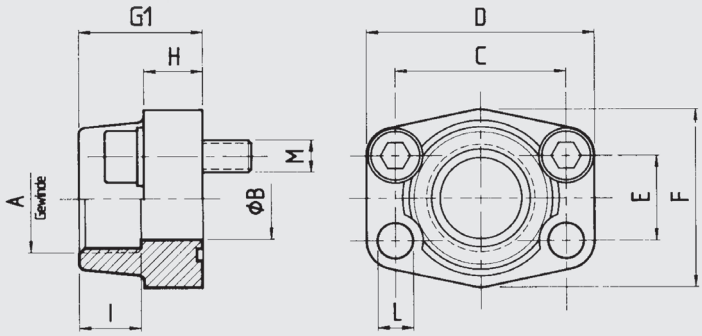


Version a



SAE pipe threaded flange

Version b



Nr.	Article number	Type	pmax	AD	A	B	C	D	E	F	G1	G2	H	I	L	M
1a	07 07 04 0030	AD15-SAE12M22x1,5	315	15	M22x1,5	12	38,1	54	17,48	46	52	60	13	7	9	M8x25
1b	07 07 04 0026	EFG1/2-SAE12	350		G1/2"	13	38,1	54	17,48	46	36		19	19	9	M8x30
2a	07 07 04 0031	AD22-SAE34M30x2	160	22	M30x2	19	47,63	65	22,23	50	60	69	14	7,5	11,5	M10x30
2b	07 07 04 0027	EFG3/4-SAE34	350		G3/4"	19	47,63	65	22,23	50	36		18	19	11	M10x35
3a	07 07 04 0032	AD28-SAE100M36x2	160	28	M36x2	24	52,37	70	26,19	55	63	72	16	7,5	11,5	M10x30
3b	07 07 04 0028	EFG1-SAE100	315		G1"	25	52,37	70	26,19	55	38		18	22	11	M10x35
4a	07 07 04 0033	AD35-SAE114M45x2	160	35	M45x2	29	58,72	79	30,18	68	65	76	14	10,5	11,5	M10x30
4b	07 07 04 0029	EFG1 1/4-SAE114	250		G1 1/4"	32	58,72	79	30,18	68	41		21	22	11,5	M10x40
5a	07 07 04 0037	AD42-SAE112M52x2	160	42	M52x2	36	69,85	94	35,71	78	70	82	16	11	13,5	M12x35
5b	07 07 04 0034	EFG1 1/2-SAE112	200		G1 1/2"	38	69,85	94	35,71	78	45		25	24	13,5	M12x45
6b	07 07 04 0036	EFG2-SAE200	200		G2"	51	77,77	102	42,88	90	45		25	30	13,5	M12x45
7b	07 07 04 0041	EFG2 1/2-SAE212	160		G2 1/2"	63	88,9	114	50,8	105	50		25	30	13,5	M12x45
8a	07 07 04 0042	AD30-SAE100M42x2HD	400	30	M42x2	25	57,2	81	27,8	70	82	95	24	13,5	13	M12x45
9a	07 07 04 0043	AF6-404M/S38M	400	38	M52x2	29	66,6	95	31,8	78	92		27	16	15	M14x50
10b	07 07 04 0050	EFG3-SAE300-C	160		G3"	73	106,4	134	61,9	116	50		27	38	17,5	M16x50

Connecting flanges SAE for Double pump EIPC3

Summary of SAE Pressure- and Suction flange SAE J518C, ISO 6162

Type	Inlet	Nr.	Version a	Version b	Outlet	Nr.	Version a	Version b	
EIPC3-020-032	1 1/4"	4	•	•	3/4"	2	•	•	
EIPC3-040-064	1 1/4"	4	•	•	1"	3	•	•	1)
EIPC3-040-064	2"	6		•	1"	3	•	•	2)
EIPC5-064	2"	6		•	1"*	8	•		
EIPC5-080	2"	6		•	1 1/4"*	9	•		
EIPC5-100	2 1/2"	7		•	1 1/4"*	9	•		
EIPC6-125	2 1/2"	7		•	1 1/2"*		○	○	
EIPC6-160	3"	10		•	1 1/2"*		○	○	
EIPC6-200	3 1/2"		○	○	1 1/2"*		○	○	
EIPC6-250	3 1/2"		○	○	1 1/2"*		○	○	

* High pressure range
1) EIPC3-063 not available with 1 1/4" suction flange
2) Pumps with enlarged suction ports

Suction flange for Intermediate housing

Type	Inlet	Nr.	Version a	Version b
EIPC3/3 up to 032	1 1/2"	5	•	•
EIPC3/3 from size 040	2"	6		•

• = available ○ = on request

Ordering Code

EIP C3 - 016 RK23 - 1X SXXX

Special version number
Tailor made design - No standard

Revision code
1st number: Change of external dimensions
2nd number: internal modifications

Intake and outlet connection - with metric threads
3: According to SAE J 518 - Code 61 / 62
6: According to SAE J 518 - Code 61 / 62 with oversized suction port for variable speed drives
0: suction port closed; common inlet
– other flanges on request –

Mounting flange
2: SAE/B 2-bolt flange, centring collar Ø 101,6 / at EIPC3
2: SAE/C 2-bolt flange, centring collar Ø 127 / at EIPC5
2: SAE/D 2-bolt flange, centring collar Ø 152,4 / at EIPC6
3: Direct mounting
5: VDMA flange on request
– other flanges on request –

Shaft end
A: straight keyed shaft
K: straight keyed shaft with PTO
B: SAE splined shaft end
L: SAE splined shaft end with PTO
P: SAE splined shaft end on both sides*
Secondary pump section - not usable as single pump

Rotation direction
R: Clockwise (S:CW size 5/3 I T: CW size 5/2)
L: counterclockwise)

Rated size
Three digits

Frame size
3, 5 or 6

Type
C: Industrial pump with aluminium housing

Eckerle internal gear pump

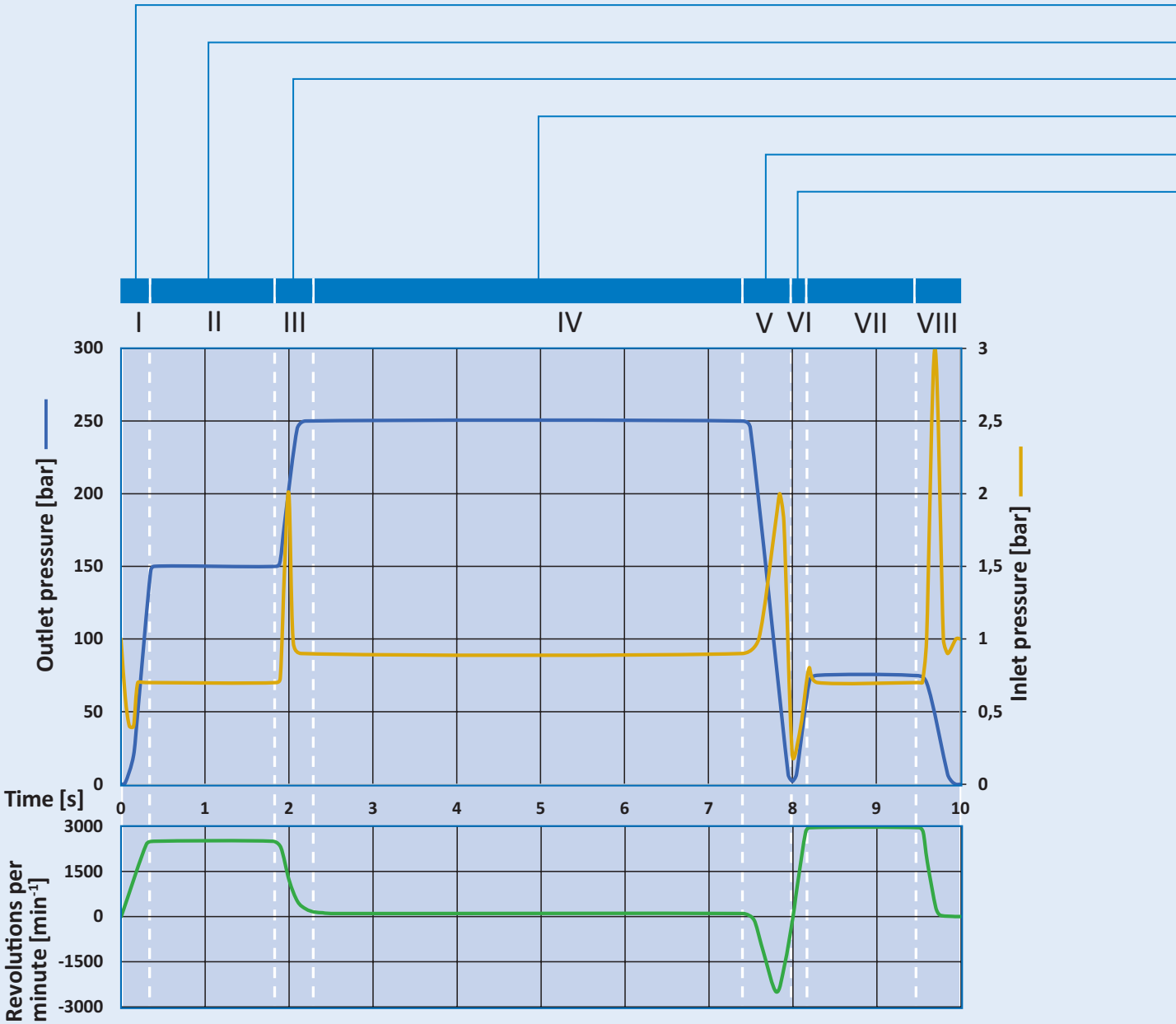
Order example
EIPC3-032 RK23-1X

for industrial applications, frame size 3 with 32.1 cm^3/rev., clockwise rotation, straight keyed shaft with PTO, SAE/B2-bolt flange, SAE type suction and pressure port,revision code 1X

Variable-speed operation

As a matter of principle, Eckerle internal gear pumps are eminently suited for variable speed operation. Even at low viscosities and high temperatures of the pumping medium, the pumps run extremely energy efficiently and highly dynamically over a wide speed range due to the radial and axial gap compensation.

However, with variable speed operation certain boundary conditions should be observed. The exemplary cycle shown below illustrates this clearly.



I. Start:

Eckerle internal gear pumps are able to build up pressure from standstill. This happens smoothly when the pump starts from an unpressurized state. Please talk to Eckerle, if due to the system design the pump is pressurized at standstill.

II. + VII. Pump operation:

Eckerle internal gear pumps are capable of providing a speed-dependent volumetric flow at any pressure level during pump operation. However, application limits of the respective sizes must be observed. [2)]

III. + VIII. Deceleration:

With Eckerle internal gear pumps very high decelerations can be achieved. It must be ensured though that line-dependent pressure peaks can develop within the suction side. These should not exceed the maximum permissible inlet pressure. [2) 3)]

IV. Pressure Holding Operation:

Eckerle internal gear pumps are able to build up high pressures even at very low speeds due to the gap compensation. Hold pressure operation is thus extremely energy-efficient. Pump operation should follow after the hold pressure operation to flush out the pump.

V. Reverse operation:

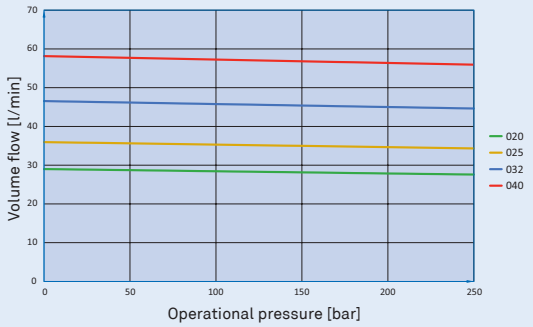
Eckerle internal gear pumps are usually able to run highly dynamically in the opposite direction of rotation in order to lower pressure peaks, or by means of a hydraulic motor. However, it must be ensured that the output pressure is always higher than the input pressure. [1) 3)]

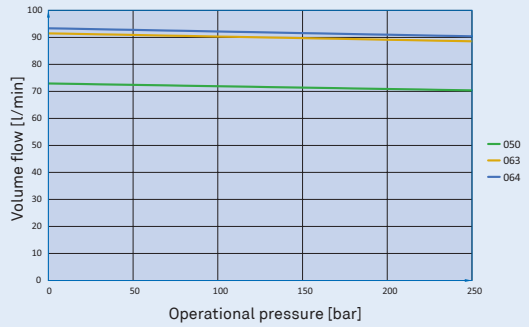
VI. Acceleration:

With Eckerle internal gear pumps very large speed-ups can be run. These are limited by inlet pressure, geometry of the suction line and viscosity. However, these may not drop below the specified minimum inlet pressure of the series. [1) 3)]

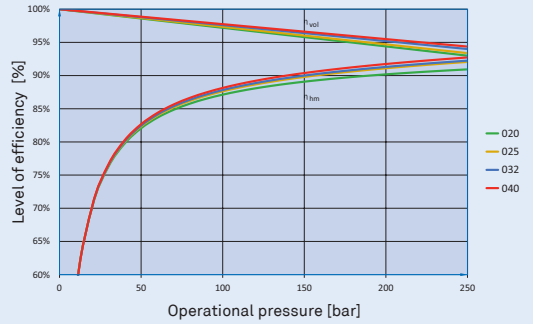
1) See Characteristics
2) See Technical data
3) To avoid critical operating points, we recommend taking measurements of the pump's inlet and outlet pressure near the pump with a scanning rate of at least 1 kHz when a new pump cycle starts.

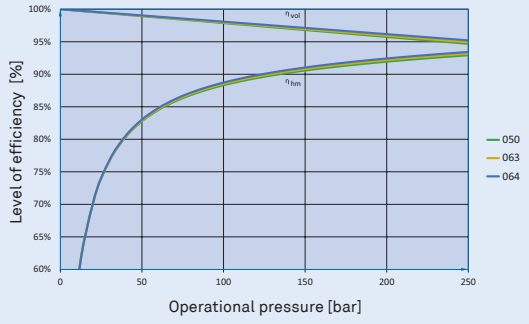
Volume flow



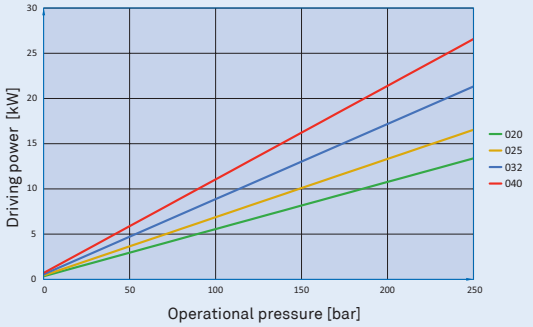


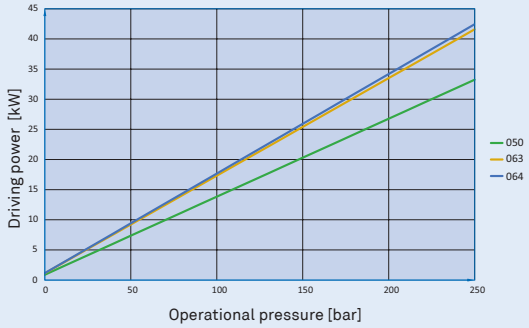
Level of efficiency



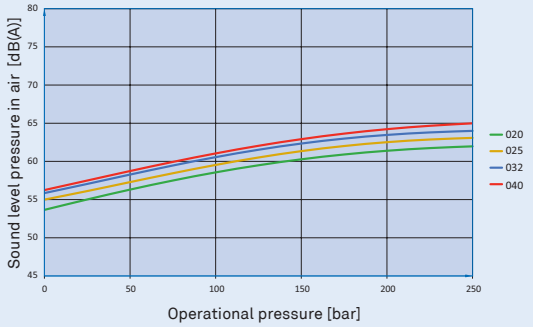


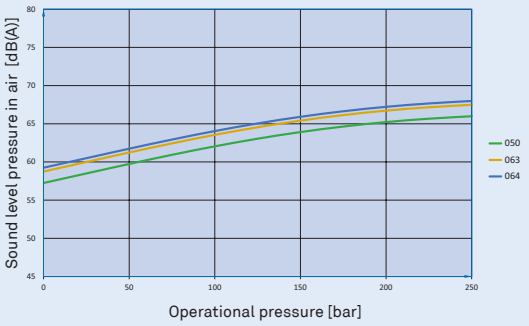
Driving power





Sound level pressure in air

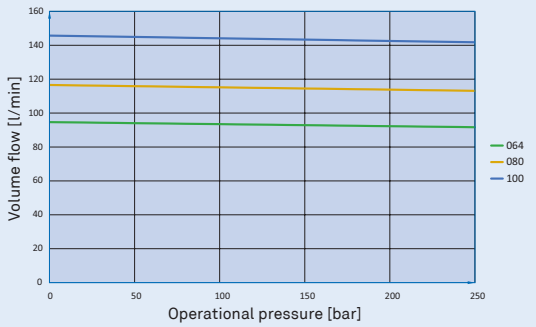




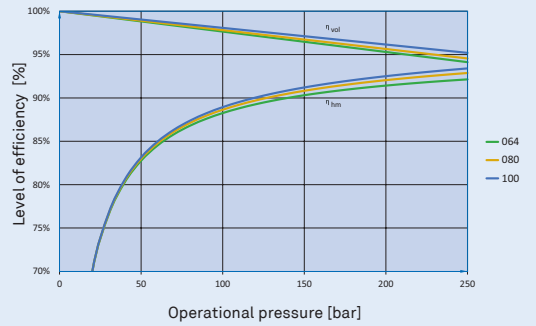
Measurement conditions: Speed 1450 rpm, viscosity 46 mm²/sec., operating temperature 40 °C, Sound pressure measured in low-reflection anechoic room in accordance with DIN 45 635 sheet 26; Microphone distance 1.0 m axial.

EIPC5

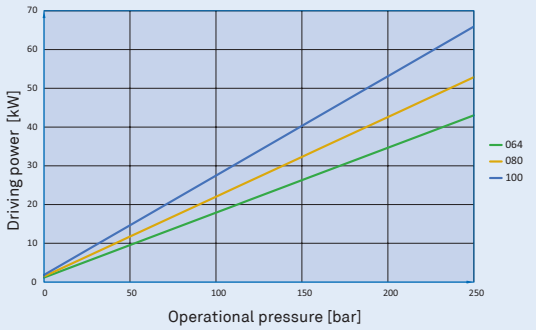
Volume flow



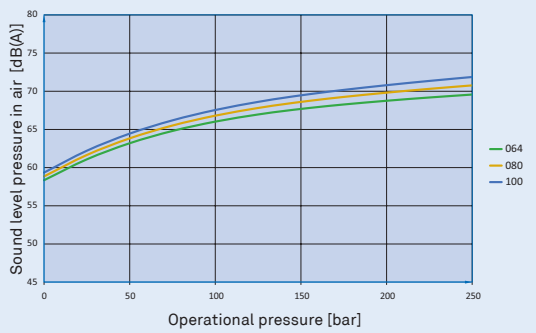
Level of efficiency



Driving power

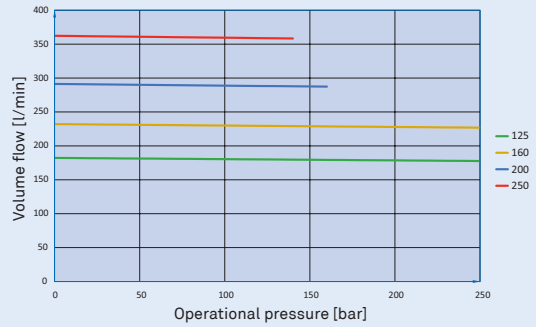


Sound level pressure in air

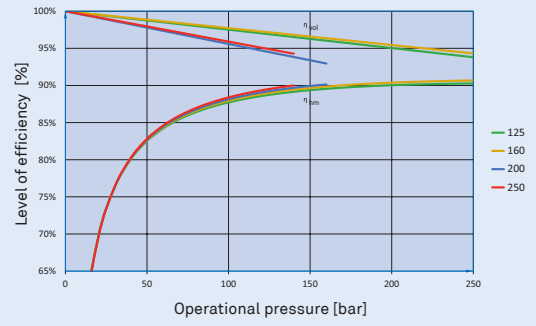


EIPC6

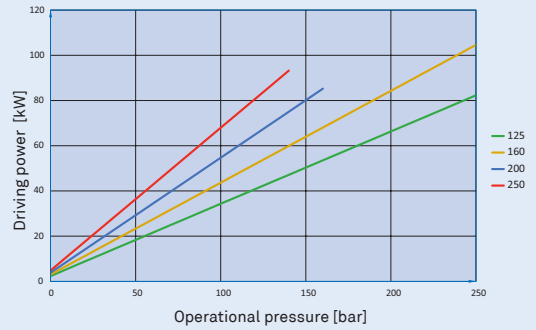
Volume flow



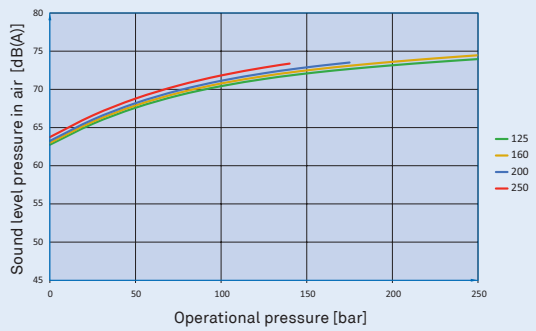
Level of efficiency



Driving power



Sound level pressure in air

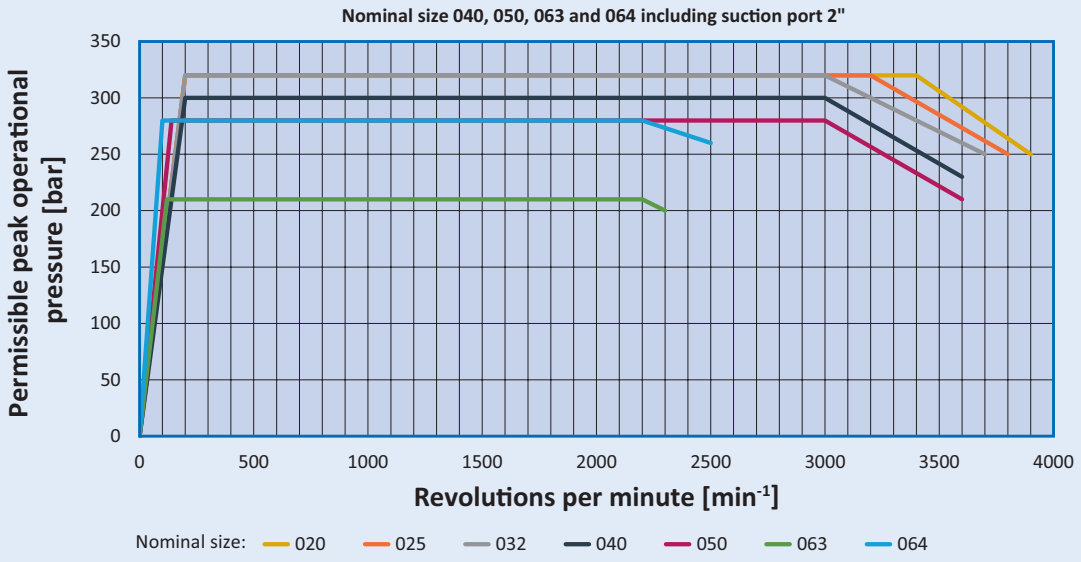


Measurement conditions: Speed 1450 rpm, viscosity 46 mm²/sec., operating temperature 40 °C, Sound pressure measured in low-reflection anechoic room in accordance with DIN 45 635 sheet 26; Microphone distance 1.0 m axial.

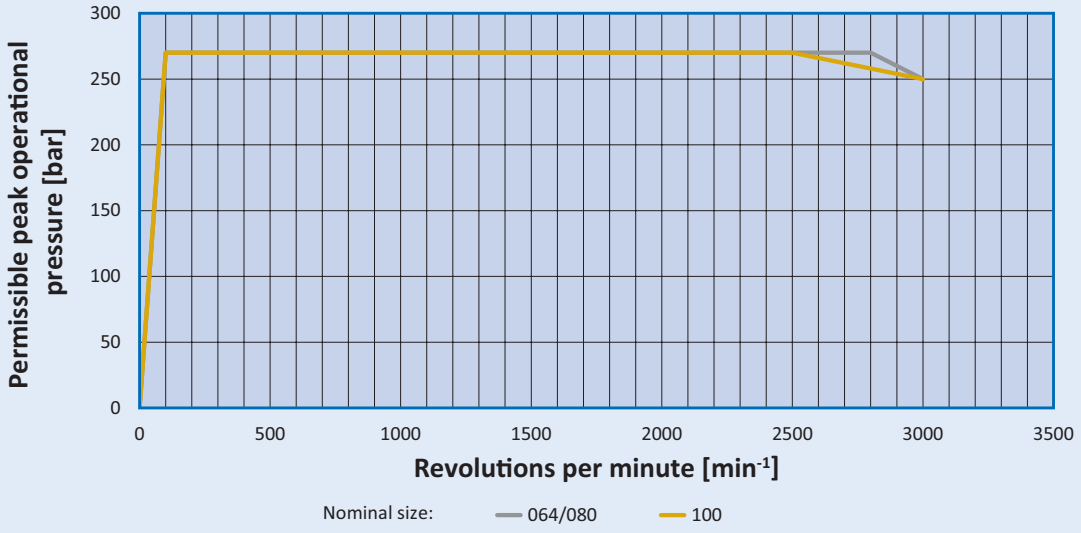
Characteristics

Permissable peak operational pressure dependent on speed

EIPC3

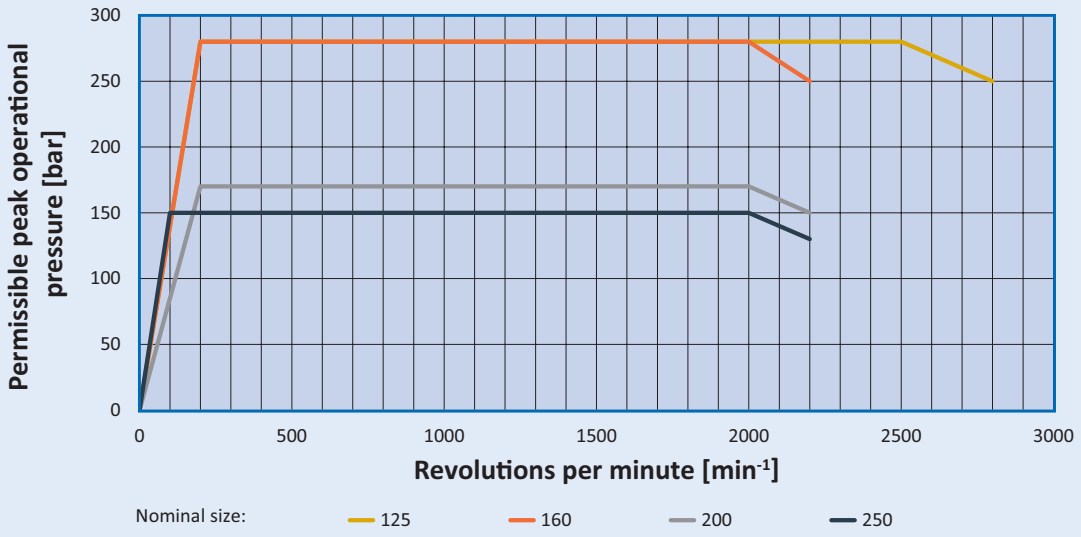


EIPC5



Peak operating pressures are permitted for a maximum of 10 seconds or 15% of the duty cycle

EIPC6


Permissible peak operational pressure [bar]
300
250
200
150
100
50
0
0
500
1000
1500
2000
2500
3000
Revolutions per minute [min-1]
Nominal size:
125
160
200
250

For further information please visit:
eckerle.com

All indicated data serve alone the product description and are not as characteristics in the legal sense to be understood. Subject to alterations.

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sales.EHD@eckerle.com

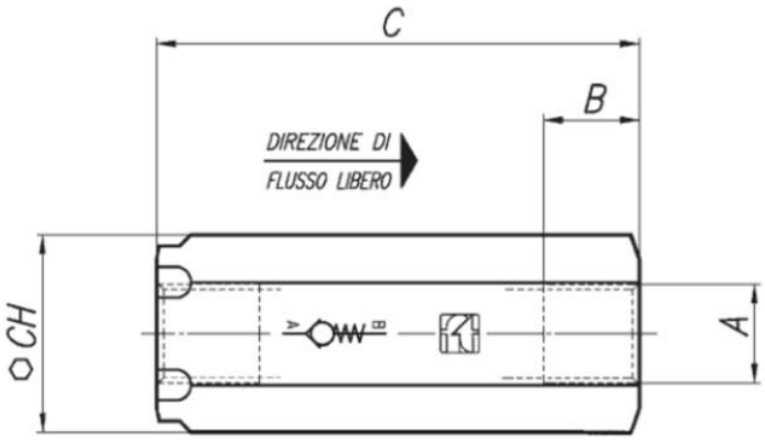
eckerle

Artikel-Nr. 0202010266/0120

Next Turbo Technologies S.p.A.
Via San Francesco 62
21020 INARZO (VA) – ITALY
info@next-turbo.com

Oil safety valve

(check valve piston)



Materials

1. ***Body:*** 9S Mn Pb 23 – UNI 5105
2. ***Check valve:*** 38 Ni Cr Mo 4 – UNI – EN 10083
3. ***Spring:*** C72 UNI3545
4. ***Threated found.:*** 35 S Mn Pb 10 – UNI 5105

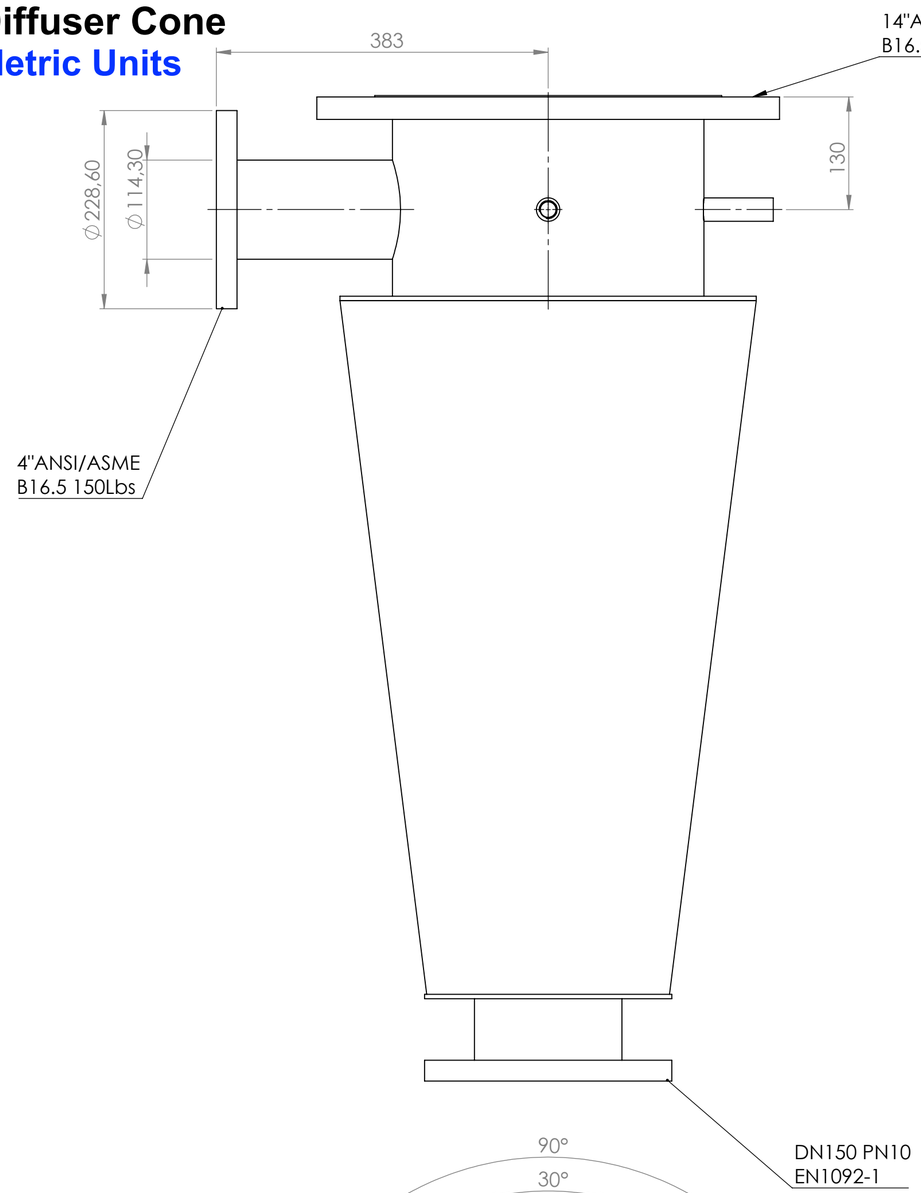
Inserted in branches of the circuit where the free flow in one direction is allowed and the return flow in the opposite direction is not possible.

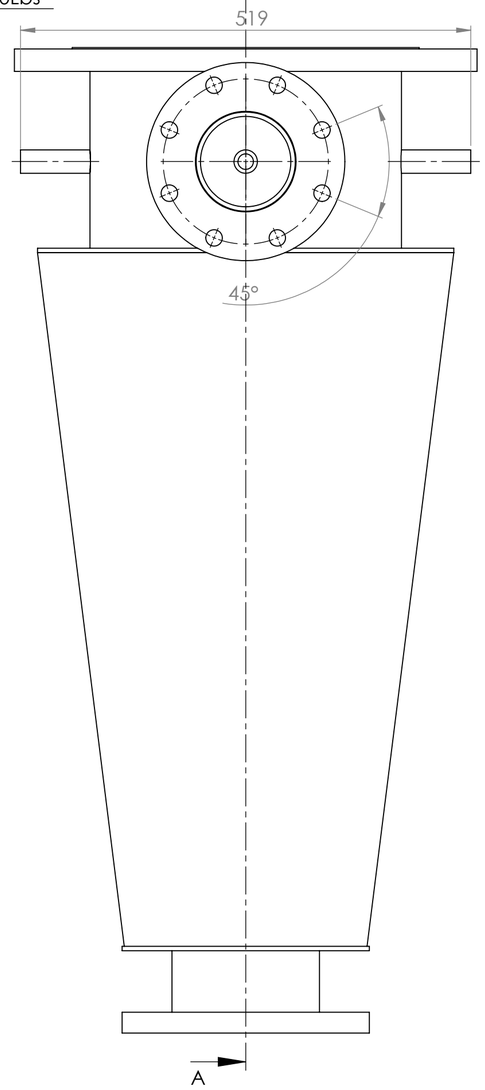
Model/Dimensions (mm)/[inch”]

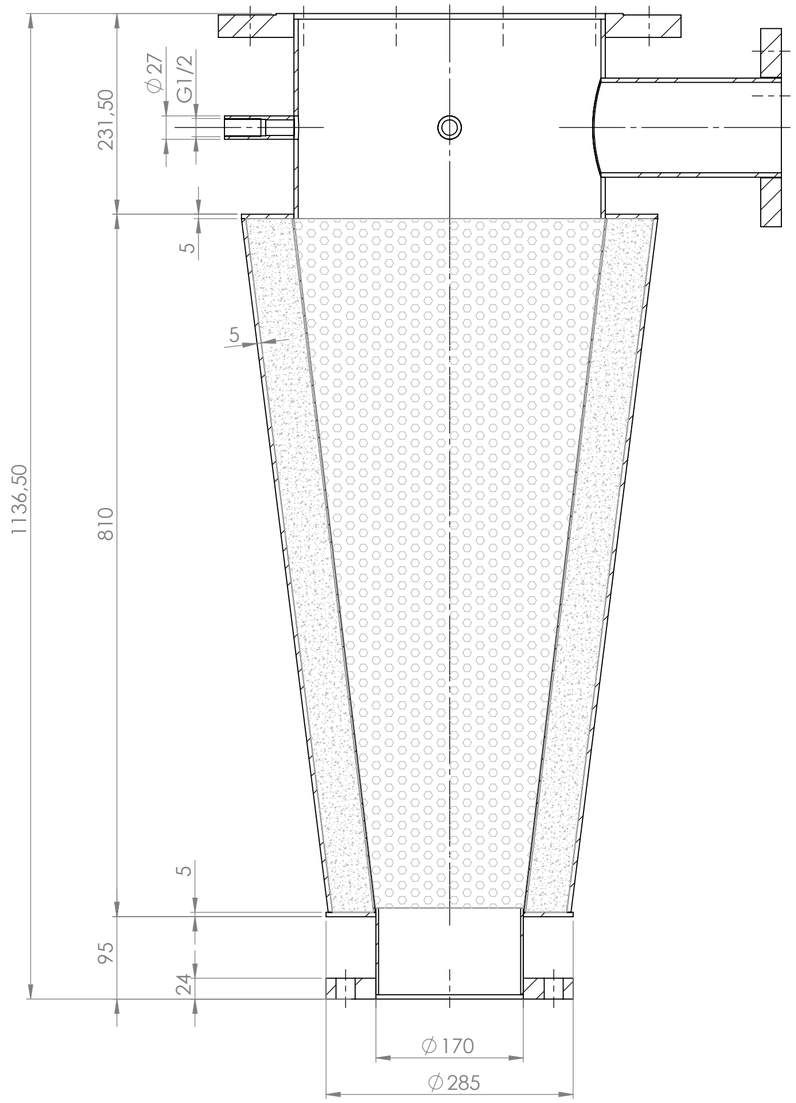
Brand	Model	A	B	C	CH
Tognella	**Steel 256/6-12**	**½”**	**(15,5)/ [39/64”]**	**(80,5)/ [3”11/64]**	**(32)/ [1”17/64]**

Diffuser Cone

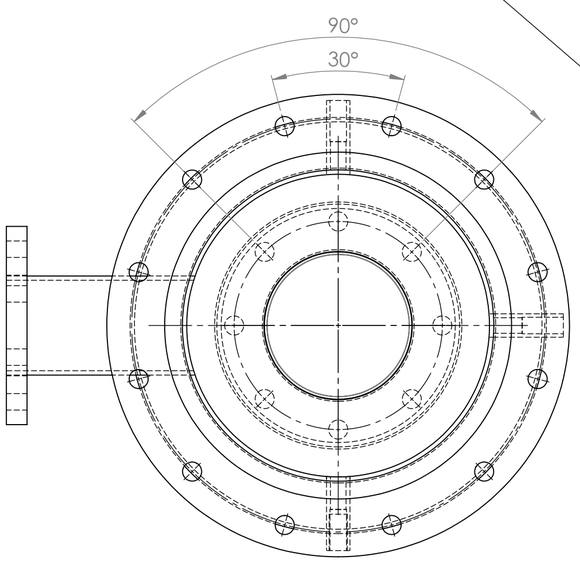
Metric Units







SEZIONE A-A

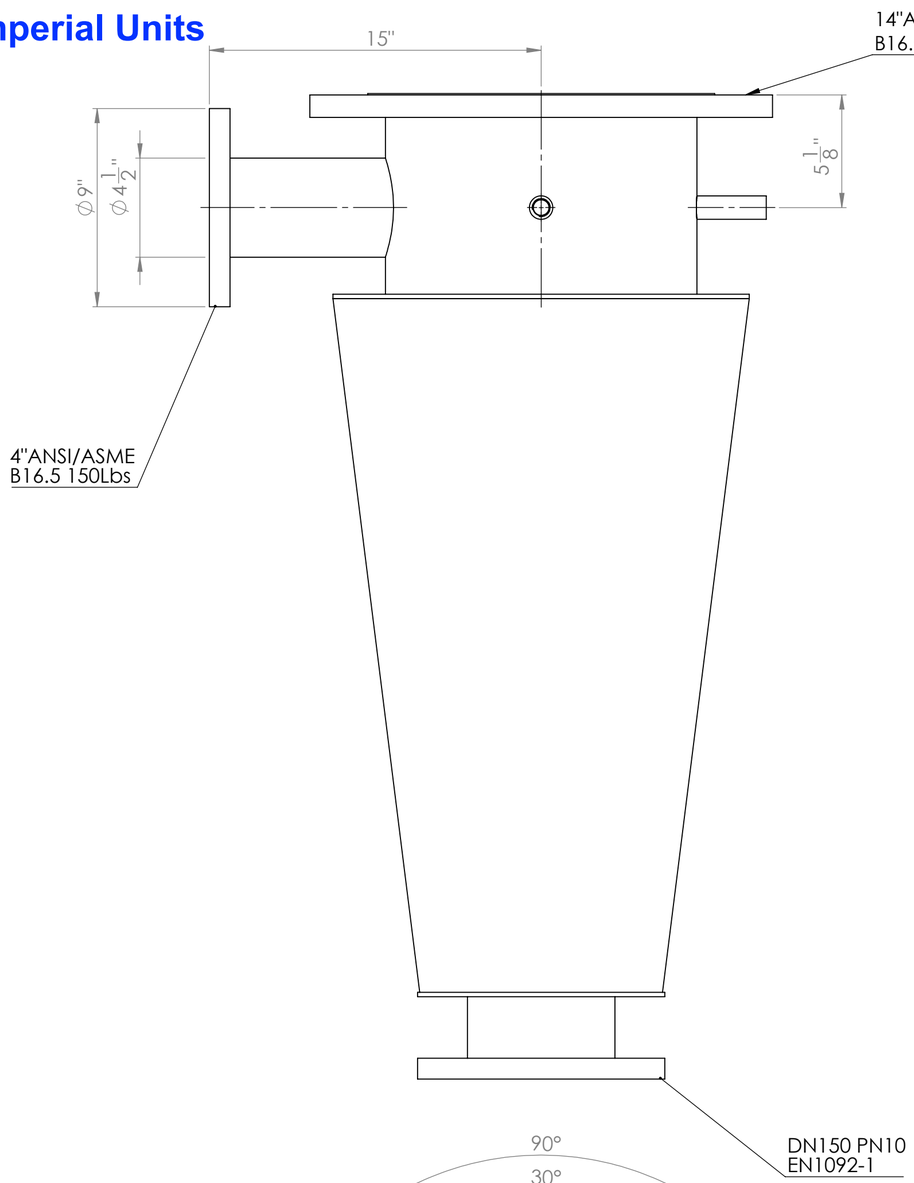


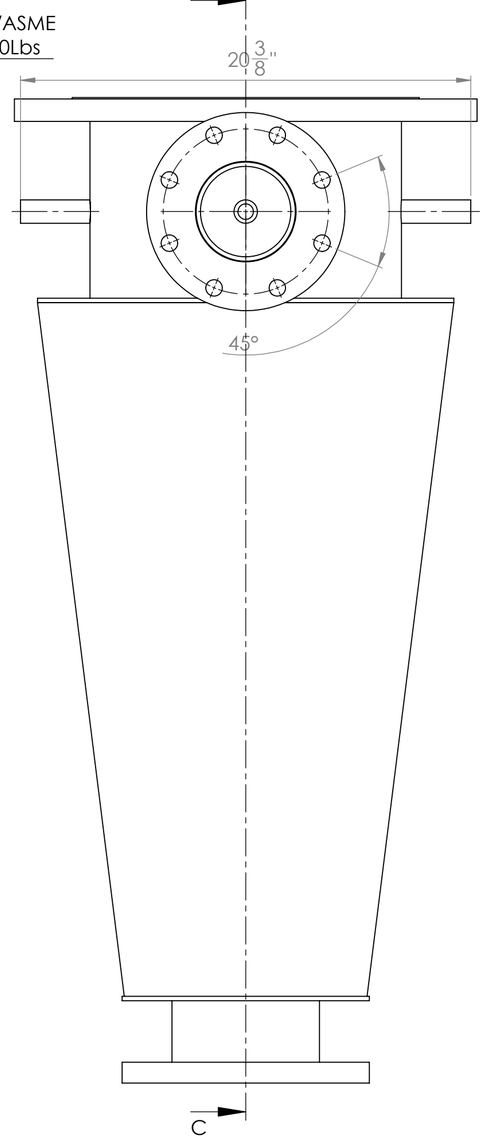
00a	PRELIMINARY	24/10/2022	S. Schiaffino	
Rev.	Description	Date	Revisioned by	Approved by

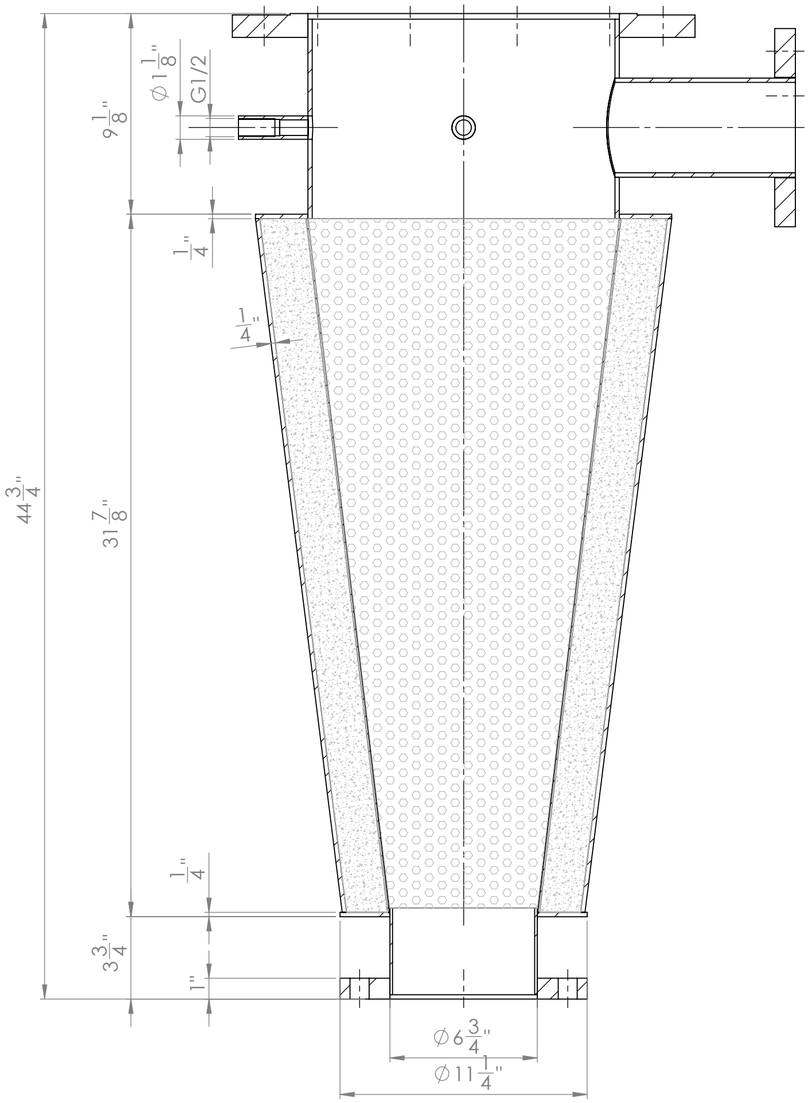
Revisioni

Dimensioni indicate in mm Dimension in millimeters	Tratt. Superf. Superf. Treatment		Materiale Material	1.0044 (S275JR)	Massa [Kg] Mass [Kg] 102.94
	Tratt. Termico Termic Treatment		Note Disegno Drawing Note	Tauton USA	
Data Approv. Approved Date	Approvato da Approved by		Categoria Category	PIPING	
Data Date 24/10/2022	Disegnato da Draw by	S. Schiaffino	Commessa Job		
NextTurbo TECHNOLOGIES	Scala del foglio Sheet Scale	1:5	Stato / Status:	WAITING FOR APPROVAL	Descrizione / Description: CONO SILENZIATO DN 150 / ANSI 16"/BOV 4" UP
	Formato Format	A2			
	Foglio Sheet	1/2			Codice / Code: N330.CS150/16"H1136 Rev.: 00a
			Tolleranze Tollerance	UNI-EN 22768 m-K	

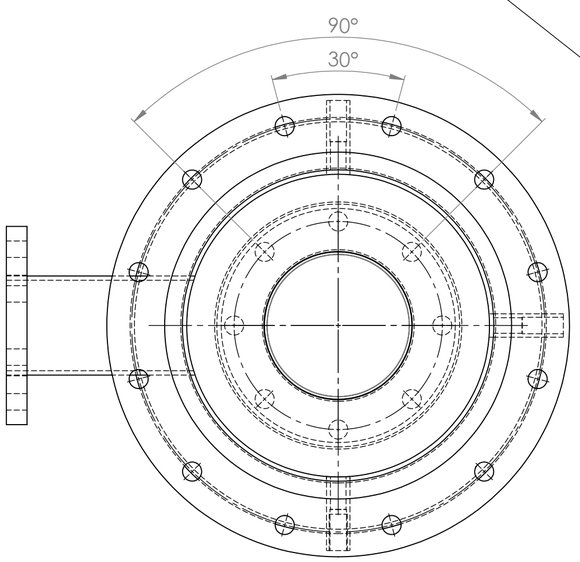
Imperial Units







SEZIONE C-C

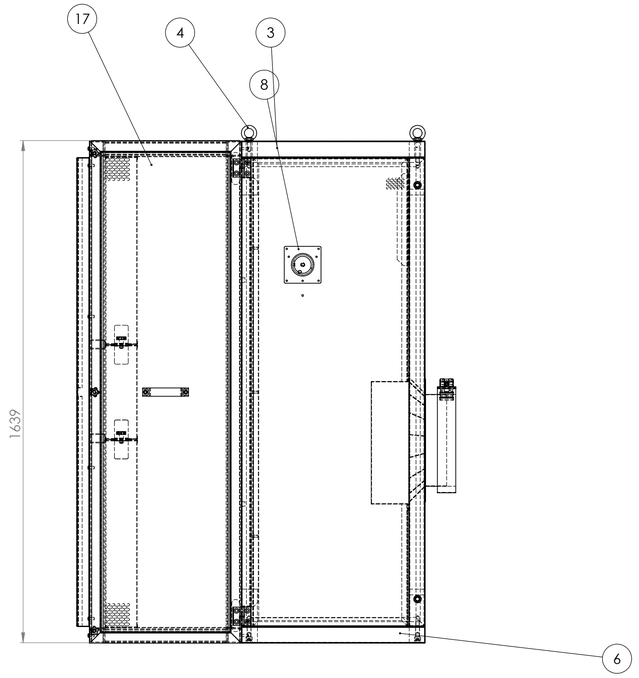


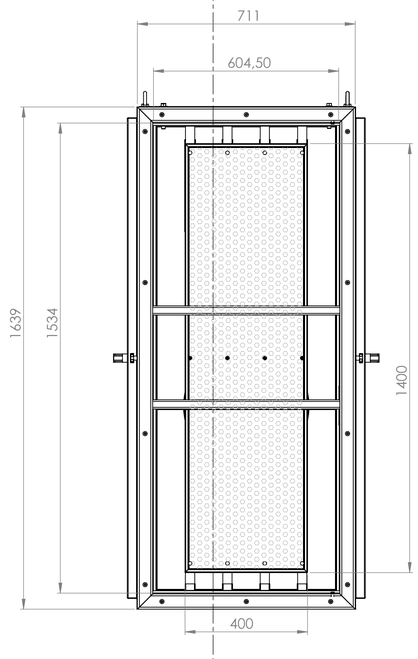
Dimensioni indicate in pollici Dimension in iches	Tratt. Superf. Superf. Treatment		Materiale Material	1.0044 (S275JR)	Massa [Kg] Mass [Kg] 102.94
	Tratt. Termico Termic Treatment		Note Disegno Drawing Note	Tauton USA	
Data Approv. Approved Date	Approvato da Approved by		Categoria Category	PIPING	
Data Date 24/10/2022	Disegnato da Draw by	S. Schiaffino	Commessa Job		
NextTurbo TECHNOLOGIES	Scala del foglio Sheet Scale	1:5	Stato / Status:	WAITING FOR APPROVAL	Descrizione / Description: CONO SILENZIATO DN 150 / ANSI 16"/BOV 4" UP
	Formato Format	A2			
	Foglio Sheet	2/2			Codice / Code: N330.CS150/16"H1136 Rev.: 00a
			Tolleranze Tollerance	UNI-EN 22768 m-K	

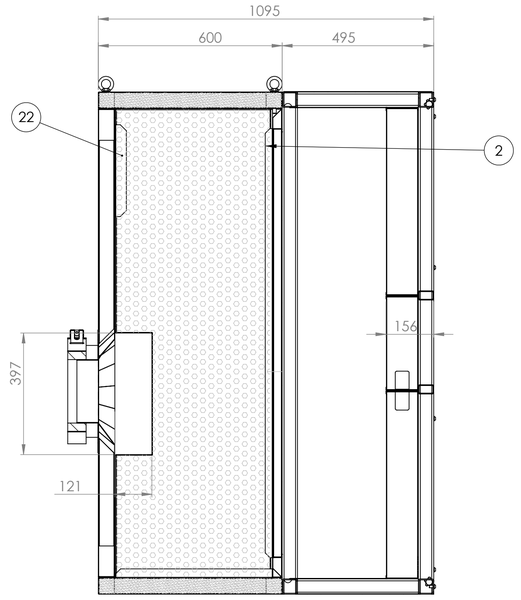
Refer to protection notice ISO 16016. / Fare riferimento all'avviso di protezione ISO 16016 .

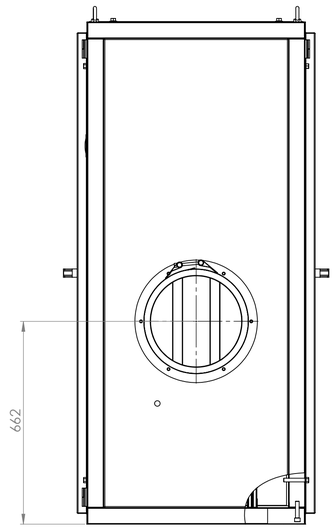
METRIC UNITS

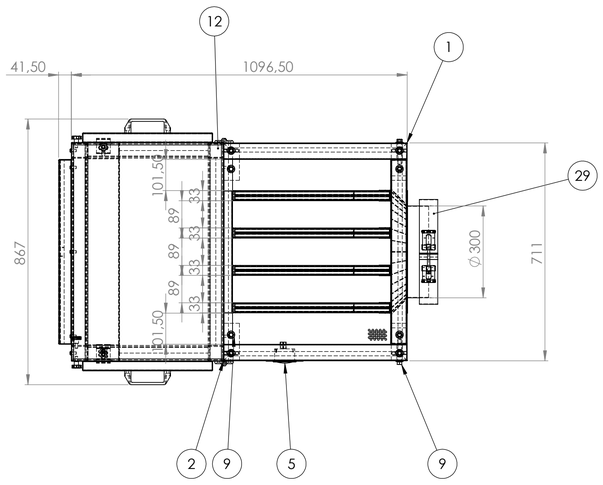
INLET FILTER-SILENCER











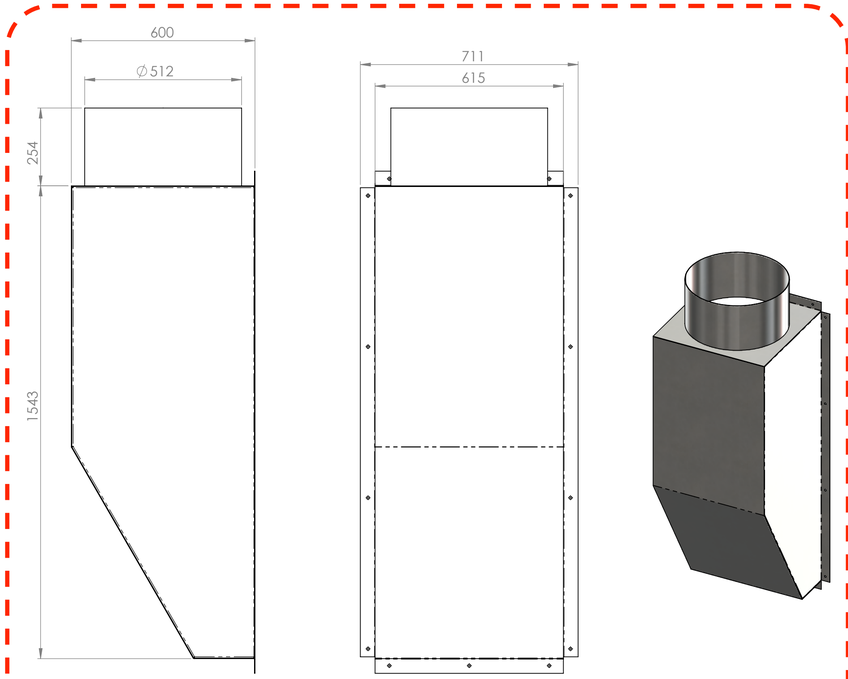
A

A

SEZIONE A-A

INLET PLENUM

NOT IN NEXT TURBO'S SCOPE



Connection louvre (NOT included in the scope of supply)

Rev.	Description	Date	Revisioned by	Approved by
00b	r0	24/10/2022	S. Schiaffino	

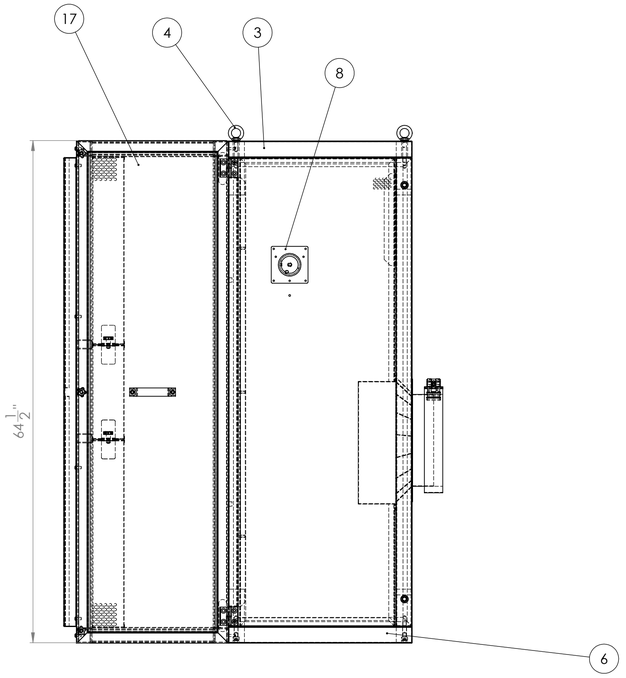
Revisioni

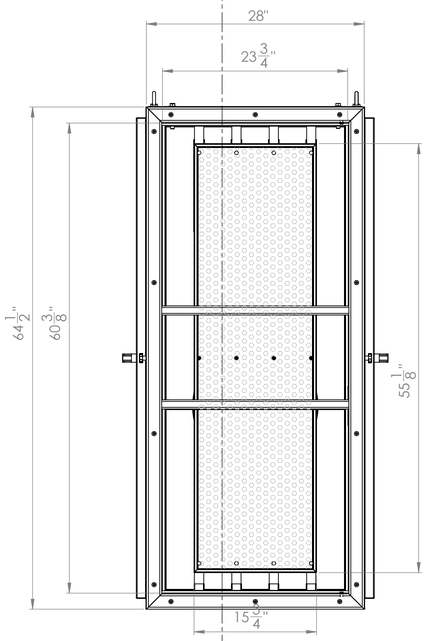
Dimensioni indicate in mm Dimension in millimeters	Tratt. Superf. Superf. Treatment	Materiale Material	Massa [Kg] Mass [Kg]
	Tratt. Termico Termic Treatment	Note Disegno Drawing Note	
Data Approv. Approved Date	Approvato da Approved by	Categoria Category	FILTRO-SILENZIATORE
Data Date 24/10/2022	Disegnato da Draw by S. Schiaffino	Commessa Job	
	Scala del foglio Sheet Scale 1:10	Stato / Status WAITING FOR APPROVAL	Descrizione / Description: SILENZIATORE 60X160 ESTRAZIONE LATERALE
	Formato Format A1		
	Foglio Sheet 1/2	Codice / Code: 044.IFS.60X160	Rev.: 00b
	Tolleranze Tolleranza UNI-EN 22768 m-K		

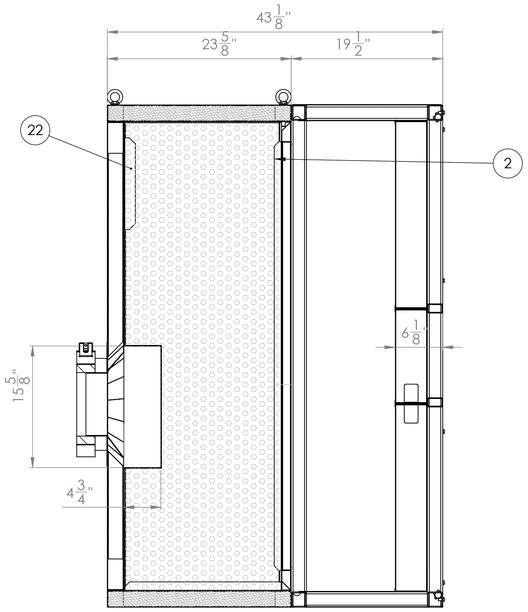
NexTurbo TECHNOLOGIES

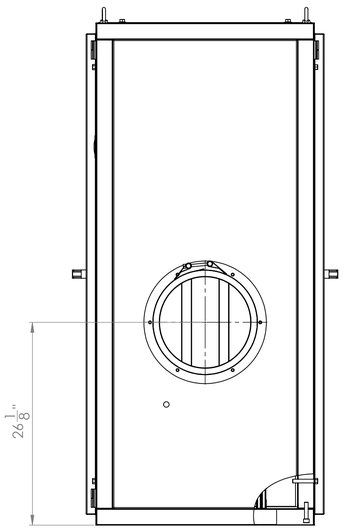
IMPERIAL UNITS

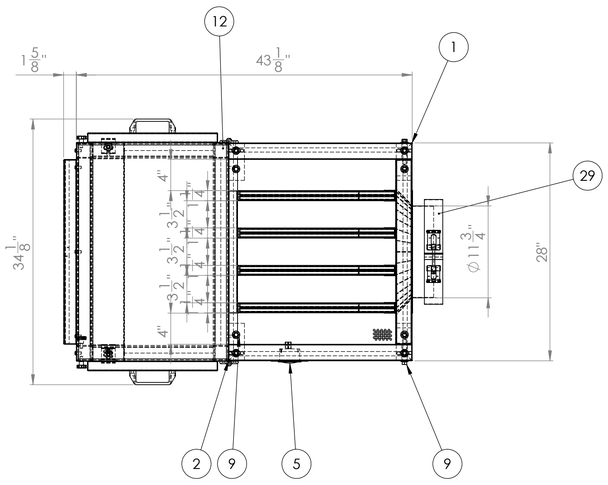
INLET FILTER-SILENCER







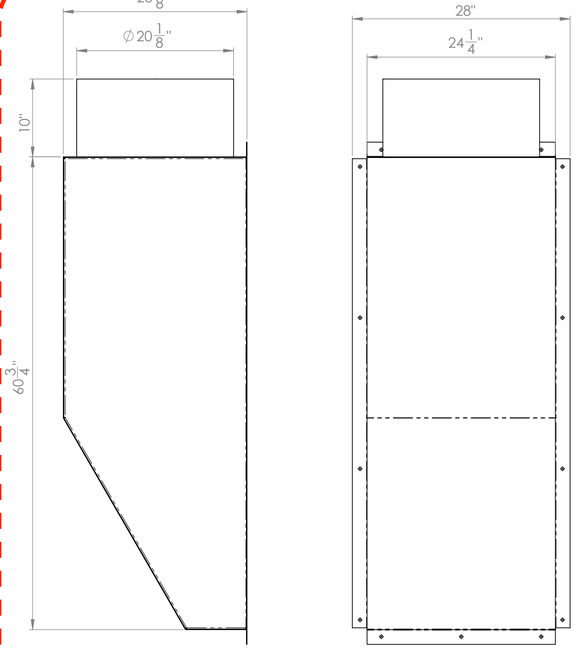


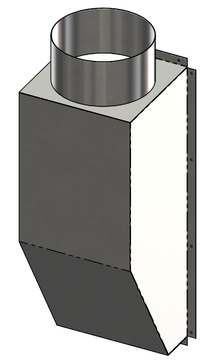


SEZIONE B-B

INLET PLENUM

NOT IN NEXT TURBO'S SCOPE





Connection louvre (NOT NTT scope)

Dimensioni indicate in mm Dimension in millimeters	Tratt. Superf. Superf. Treatment		Materiale Material	Massa [Kg] Mass [Kg]
	Tratt. Termico Termic Treatment		Note Disegno Drawing Note	
Data Approv. Approved Date	Approvato da Approved by		Categoria Category	FILTRO-SILENZIATORE
Data Date 24/10/2022	Disegnato da Drawn by	S. Schiaffino	Commessa Job	
NexTurbo TECNOLOGIES	Scala del foglio Sheet Scale	1:10	Stato / Status: WAITING FOR APPROVAL	Descrizione / Description: SILENZIATORE 60X160 ESTRAZIONE LATERALE
	Formato Format	A1		
	Foglio Sheet	2/2		Codice / Code: 044.IFS.60X160 — Rev.: 00b
	Tolleranze Tolerances	UNI-EN 22768 m-K		

Refer to protection notice ISO 16016. / Fare riferimento all'avviso di protezione ISO 16016.

Technical Data

Original Instructions

IEC Contactor Specifications

100-C23EJ400
100-FSD250
100-SB11

Bulletin Numbers 100/104-K, 100/104-C, 100/104S-C, 100/104-E, 100S-E, 100Q-C

Product Selection—100-C/104-C Contactors

- Compact sizes from 4...55 kW/5...75 Hp (9...97 A)
- Common accessories for all contactor sizes
- Front and side mounting of auxiliary contacts
- Electronic and pneumatic timing modules
- Space-saving coil-mounted control modules
- Reversible coil terminations (line or load side)
- All devices can be attached to 35 mm DIN mounting Rail
- Environmentally friendly materials


100-C Contactor


104-C Reversing Contactor

The Bulletin 100-C/104-C IEC contactor family, along with a wide range of common accessories and Bulletin 193 solid-state overload relays, provides the most compact and flexible starter component system available.

3-Pole AC- and DC-operated Contactors

Rated Operational Current I_e [A]		Ratings for switching AC motors - AC-2, AC-3, AC-4										Auxiliary Contacts		Cat. No.(1)
		3-phase kW (50 Hz)				Hp (60 Hz)								
40 °C (104 °F)		230V	400/415V	500V	690V	1-Phase		3-Phase						
AC-3	AC-1					115V	230V	200V	230V	460V	575V	N.O.	N.C.	
9	32	3	4	4	4	1/2	1-1/12	2	2	5	7-1/12	1	0	100-C09⊗10
												0	1	100-C09⊗01
12	32	4	5.5	5.5	5.5	1/2	2	3	3	7-1/2	10	1	0	100-C12⊗10
												0	1	100-C12⊗01
16	32	5.5	7.5	7.5	7.5	1	3	5	5	10	15	1	0	100-C16⊗10
												0	1	100-C16⊗01
23	32	7.5	11	13	10	2	3	5	7-1/2	15	15	1	0	100-C23⊗10
												0	1	100-C23⊗01
30	65	10	15	15	15	2	5	7-1/2	10	20	25	0	0	100-C30⊗00
												1	0	100-C30⊗10
												0	1	100-C30⊗01
37	65	11	18.5/20	20	18.5	3	5	10	10	25	30	0	0	100-C37⊗00
												1	0	100-C37⊗10
												0	1	100-C37⊗01
43	85	13	22	25	22	3	7-1/2	10	15	30	30	0	0	100-C43⊗00
												1	0	100-C43⊗10
												0	1	100-C43⊗01
55	85	15	30	30	30	5	10	15	20	40	40	0	0	100-C55⊗00
												1	0	100-C55⊗10
												0	1	100-C55⊗01
60	100	18.5	32	37	32	5	10	15	20	40	50	0	0	100-C60⊗00
												1	0	100-C60⊗10
												0	1	100-C60⊗01
72	100	22	40	45	40	5	15	20	25	50	60	0	0	100-C72⊗00
												1	0	100-C72⊗10
												0	1	100-C72⊗01
85	100	25	45	55	45	7-1/2	15	25	30	60	60	0	0	100-C85⊗00
												1	0	100-C85⊗10
												0	1	100-C85⊗01
97	130	30	55	55	55	10	20	30	30	75	75	0	0	100-C97⊗00
												1	0	100-C97⊗10
												0	1	100-C97⊗01

(1) For screwless terminals on 100-C09...C16, add an "R" after the letter "C" in the catalog number. Example: Cat. No. 100-C09⊗10 becomes 100-CR09⊗10. The AC-1 rating for the 100-CR is limited to 25 A.

⊗ Coil voltage code and terminal position—see page 19

4-Pole AC- and DC-Operated Contactors

Rated Operational Current I_e [A]		Ratings for switching AC motors - AC-2, AC-3										Contact Configuration, Main Poles		Cat. No.[1]
		3-phase kW (50 Hz)[2]				Hp (60 Hz)								
40 °C (104 °F)		230V	400/415V	500V	690V	1-Phase		3-Phase[2]						
AC-3	AC-1					115V	230V	200V	230V	460V	575V	N.O.	N.C.	
9	32	3	4	4	4	1/2	1-1/2	2	2	5	7-1/2	4	0	100-C09⊗400
												3	1	100-C09⊗300
												2	2	100-C09⊗200
12	32	4	5.5	5.5	5.5	1/2	2	3	3	7-1/2	10	4	0	100-C12⊗400
												3	1	100-C12⊗300
												2	2	100-C12⊗200
16	32	5.5	7.5	7.5	7.5	1	3	5	5	10	10	4	0	100-C16⊗400
												3	1	100-C16⊗300
												2	2	100-C16⊗200
23	32	7.5	11	13	10	2	3	5	7-1/2	15	15	4	0	100-C23⊗400
												3	1	100-C23⊗300
												2	2	100-C23⊗200
37	75	11	18.5/20	20	18.5	3	5	10	10	25	30	4	0	100-C40⊗400
												2	2	100-C40⊗200
85	130	25	45	55	45	7-1/2	15	25	30	60	50	4	0	100-C90⊗400
												2	2	100-C90⊗200

(1) For screwless terminals on 100-C09...C16, add an "R" after the letter "C" in the catalog number. Example: Cat. No. 100-C09⊗10 becomes 100-CR09⊗10. The AC-1 rating for the 100-CR is limited to 25 A.
(2) Three-phase ratings apply only to contactors with at least three N.O. power poles.
⊗ Coil voltage code and terminal position— see page 19.

Reversing AC- and DC-Operated Contactors

Rated Operational Current I_e [A]		Ratings for switching AC motors - AC-2, AC-3, AC-4										Auxiliary Contacts per Contactor		Cat. No.
		3-phase kW (50 Hz)				Hp (60 Hz)								
40 °C (104 °F)		230V	400/415V	500V	690V	1-Phase		3-Phase						
AC-3	AC-1					115V	230V	200V	230V	460V	575V	N.O.	N.C. [1]	
9	32	3	4	4	4	1/2	1-1/2	2	2	5	7-1/2	1	1	104-C09⊗22
12	32	4	5.5	5.5	5.5	1	2	3	3	7-1/2	10	1	1	104-C12⊗22
16	32	5.5	7.5	7.5	7.5	1	3	5	5	10	15	1	1	104-C16⊗22
23	32	7.5	11	13	10	2	3	5	7-1/2	15	20	1	1	104-C23⊗22
30	65	10	15	15	15	2	5	7-1/2	10	20	25	0	1	104-C30⊗02
												1	1	104-C30⊗22
37	65	11	18.5/20	20	18.5	3	5	10	10	25	30	0	1	104-C37⊗02
												1	1	104-C37⊗22
43	85	13	22	25	22	3	7.5	10	15	30	30	0	1	104-C43⊗02
												1	1	104-C43⊗22
55	85	15	30	30	30	5	10	15	20	40	40	0	1	104-C55⊗02
												1	1	104-C55⊗22
60	100	18.5	32	37	32	5	10	15	20	40	50	0	1	104-C60⊗02
												1	1	104-C60⊗22
72	100	22	40	45	40	5	15	20	25	50	60	0	1	104-C72⊗02
												1	1	104-C72⊗22
85	100	25	45	55	45	7-1/2	15	25	30	60	60	0	1	104-C85⊗02
												1	1	104-C85⊗22
97	130	30	55	55	55	10	15	30	30	75	75	0	1	104-C97⊗02
												1	1	104-C97⊗22

(1) The N.C. auxiliary contact is supplied as part of the mechanical/electrical interlock.
⊗ Coil voltage code and terminal position— see page 19.

Coil Voltage Codes

The Cat. No. as listed is incomplete. Select a coil voltage code from the table below to complete the Cat. No. Example: 120V, 60 Hz: Cat. No. 100-C09⊗10 becomes Cat. No.100-C09D10.

AC Voltages [V]	12	24	32	36	42	48	100	100…110	110	120	127	200	200…220	208	208…240
50 Hz	R	K	V	W	X	Y	KP	–	D	P	S	KG	L	–	–
60 Hz	Q	J	–	V	–	X	–	KP	–	D	–	–	KG	H	L
50/60 Hz	–	KJ	–	–	–	KY	KP	–	KD	–	–	KG	KL(1)	–	–

(1) Not available on 100/104-C90 or -C97 contactors.

AC Voltages [V]	220…230	230	230…240	240	277	347	380	380…400	400	400…415	440	480	500	550	600
50 Hz	F	–	VA	T	–	–	–	N	–	G	B	–	M	C	–
60 Hz	–	–	–	A	T	I	E	–	–	–	N	B	–	–	C
50/60 Hz	KL(1)	KF	–	KA	–	–	–	–	KN	–	KB	–	–	–	–

(1) Not available on 100/104-C90 or -C97 contactors.

DC Voltages [V]		9	12	24	24	36	36…48	48	48…72	60	64
100-C09…C55	Electronic with Integrated Diode	–	EQ	EJ	QJ(1)	–	EW	–	EY	–	–
100-C60…C97	with Integrated Diode	DR	DQ	DJ	–	DW	–	DY	–	DZ	DB

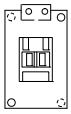
(1) "QJ" coil has faster dropout time (16…21 ms).

DC Voltages [V]		72	80	110	110…125	115	125	220	220…250	230	250
100-C09…C55	Electronic with Integrated Diode	–	–	–	ED	–	–	–	EA	–	–
100-C60…C97	with Integrated Diode	DG	DE	DD	–	DP	DS	DA	–	DF	DT

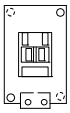
Coil Terminal Position

All contactors are delivered with the coil terminals located on the line side.

For load side coil terminations, insert a "U" prior to the coil voltage code. Ordering example: Cat. No. 100-C09UD10.



Cat. No.100-C09⊗10 Line Side

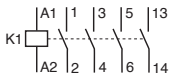
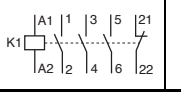
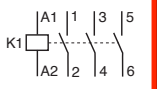
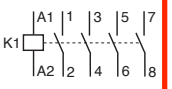
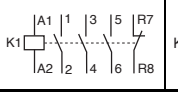
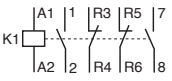


Cat. No.100-C09U⊗10 Load Side

Assignment of Contacts

Table valid for: AC / DC = 0.85...1.1 x U_s, T_{amb} = -25 °C...+60 °C (-13...140 °F), normal position (horizontal rail mounting)

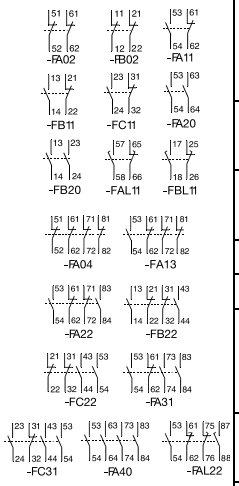
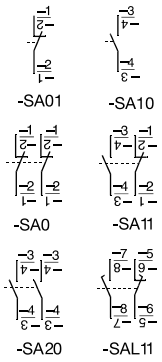
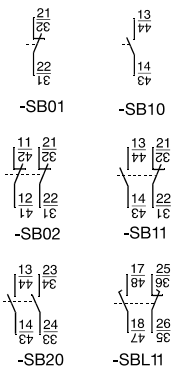
Device Combinations in Accordance with IEC 60947-1 / -4-1

Auxiliary Contact Blocks		100-C Contactors (AC and DC Control)						
	Circuit Diagram	Control	100-C09_⊗10 100-C12_⊗10 100-C16_⊗10 100-C23_⊗10	100-C09_⊗01 100-C12_⊗01 100-C16_⊗01 100-C23_⊗01	100-C30_⊗00 100-C37_⊗00 100-C43_⊗00 100-C55_⊗00 100-C60_⊗00 100-C72_⊗00 100-C85_⊗00 100-C97_⊗00	100-C09_⊗400 100-C12_⊗400 100-C16_⊗400 100-C23_⊗400 100-C40_⊗400 100-C90_⊗400	100-C09_⊗300 100-C12_⊗300 100-C16_⊗300 100-C23_⊗300	100-C09_⊗200 100-C12_⊗200 100-C16_⊗200 100-C23_⊗200 100-C40_⊗200 100-C90_⊗200
								
Side Mounting (1)								
100-SB01		AC/DC	10 + 01 = 11	01 + 01 = 02 (2)	00 + 01 = 01	00 + 01 = 01	00 + 01 = 01	00 + 01 = 01
100-SB10		AC/DC	10 + 10 = 20 (2)	01 + 10 = 11	00 + 10 = 10	00 + 10 = 10	00 + 10 = 10	00 + 10 = 10
100-SB02		AC/DC	10 + 02 = 12 (2)	—	00 + 02 = 02	00 + 02 = 02	00 + 02 = 02	00 + 02 = 02
100-SB11		AC/DC	10 + 11 = 21 (2)	01 + 11 = 12 (2)	00 + 11 = 11	00 + 11 = 11	00 + 11 = 11	00 + 11 = 11
100-SB20		AC/DC	10 + 20 = 30 (2)	01 + 20 = 21 (2)	00 + 20 = 20	00 + 20 = 20	00 + 20 = 20	00 + 20 = 20
100-SBL11 (3)		AC/DC	10 + L11 = L21 (2)	01 + L11 = L12 (2)	00 + L11 = L11	00 + L11 = L11	00 + L11 = L11	00 + L11 = L11

(1) Up to 8 auxiliary contacts possible: contactor + front mounted (AC max. 4 N.C. / DC max. 4 N.C.), side mounted (AC max. 2 N.O. / DC max. 2 N.O. and max. 2 N.C.).
(2) Double numbering: because of double numbering only left-side mounting is recommended.
(3) Early make and/or late break.

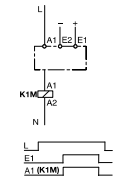
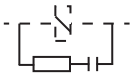
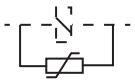
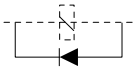
Accessories

Auxiliary Contact Blocks

	Description[1]	Connection Diagrams	N.O.	N.C.	For Use With	Cat. No. Standard Auxiliary Contact[2]	Cat. No. Bifurcated Auxiliary Contact
 	Auxiliary Contact Blocks for Front Mounting • 2- and 4-pole • Quick and easy mounting without tools • Electronic-compatible contacts down to 17V, 5mA • Mechanically linked performance between N.O. and N.C. poles and to the main contactor poles (except for L types) • Models with equal function with several terminal numbering choices • 1L = Late break N.C. / early make N.O. • Bifurcated version for switching down to 5V, 3 mA also available	 -FA02 -FB02 -FA11 -FB11 -FC11 -FA20 -FB20 -FAL11 -FBL11 -FA04 -FA13 -FA22 -FB22 -FC22 -FA31 -FC31 -FA40 -FAL22	0	2	100-C all	100-FA02	100-FAB02
					C30⊗00...C97⊗00	100-FB02	100-FBB02
			1	1	100-C all	100-FA11	100-FAB11
					C30⊗00...C97⊗00	100-FB11	100-FBB11
					C09⊗10...C23⊗10	100-FC11	100-FCB11
			2	0	100-C all	100-FA20	100-FAB20
					C30⊗00...C97⊗00	100-FB20	100-FBB20
			1L	1L	100-C all	100-FAL11	–
					C30⊗00...C97⊗00	100-FBL11	–
			0	4	100-C all	100-FA04	100-FAB04
			1	3	100-C all	100-FA13	100-FAB13
			2	2	100-C all	100-FA22	100-FAB22
					C30⊗00...C97⊗00	100-FB22	100-FBB22
					C09⊗10...C23⊗10	100-FC22	100-FCB22
			3	1	100-C all	100-FA31	100-FAB31
					C09⊗10...C23⊗10	100-FC31	100-FCB31
			4	0	100-C all	100-FA40	100-FAB40
			1 + 1L	1+1L	100-C all	100-FAL22	–
	Auxiliary Contact Blocks for Side Mounting without Sequence Terminal Designations • 1- and 2-pole • Two-way numbering for right or left mounting on the contactor • Quick and easy mounting without tools • Electronic-compatible contacts down to 17V, 10 mA • Mirror contact performance to the main contactor poles • 1L = Late break N.C. / early make N.O.	 -SA01 -SA10 -SA0 -SA11 -SA20 -SAL11	0	1	100-C all	100-SA01	–
			1	0	100-C all	100-SA10	–
			0	2	100-C all	100-SA02	–
			1	1	100-C all	100-SA11	–
			2	0	100-C all	100-SA20	–
			1L	1L	100-C all	100-SAL11	–
	Auxiliary Contact Blocks for Side Mounting with Sequence Terminal Designations • 1- and 2-pole • Two-way numbering for right or left mounting on the contactor • Quick and easy mounting without tools • Electronic-compatible contacts down to 17V, 10 mA • Mirror contact performance to the main contactor poles • 1L = Late break N.C. / early make N.O.	 -SB01 -SB10 -SB02 -SB11 -SB20 -SBL11	0	1	100-C	100-SB01	–
			1	0	100-C(3)	100-SB10	–
			0	2	100-C(3)	100-SB02	–
			1	1	100-C(3)	100-SB11	–
			2	0	100-C(3)	100-SB20	–
			1L	1L	100-C(3)	100-SBL11	–

(1) Max. number of auxiliary contacts that may be mounted:
AC and 24V DC electronic coil contactors—max. 4 N.O contacts on the front of the contactor, 2 N.O. contacts on the side, 4 N.C. front or side, 6 total. DC Coil contactors—max. 4 N.O. contacts on the front of the contactor or max. 2 N.O. contacts on the side, 4 N.C. front or side, 4 total.
(2) For screwless terminals (front mount only), insert "CR" after the "100-" in the catalog number. Example: Cat. No. 100-FA02 becomes Cat. No. 100-CRFA02.
(3) Double numbering—Left-side mounting only is recommended for Cat. No. 100-C09...100-C23 due to double numbering.

Additional Control Modules

	Description		Voltage Range	Connection Diagrams	For Use With	Cat. No.
	DC Interface (Electronic) • Interface between the DC control signal (PLC) and the AC operating mechanism of the contactor. • Requires no additional surge suppression on the relay coils.		Input: 12V DC Output: 110...240V AC		100-C with AC coils 110...240V AC	100-JE12
			Input: 18...30V DC Output: 110...240V AC			100-JE
			Input: 48V DC Output: 110...240V AC			100-JE48
	Surge Suppressors • For limitation of coil switching transients. • Plug-in, coil mounted. • Suitable for 100-C contactor sizes, 9...97 A. • RC, varistor, and diode versions.	RC Module AC operating mechanism	24...48V AC, 50/60 Hz		100-C with Coils	100-FSC48(1)
			110...280V AC, 50/60 Hz			100-FSC280(1)
			380...480V AC, 50/60 Hz			100-FSC480(1)
		Varistor Module AC/DC operating mechanism	12...55V AC, 12...77V DC		100-C with AC coils or 100-C09...-C43 with DC coils	100-FSV55(1)
			56...136V AC/78...180V DC			100-FSV136(1)
			137...277V AC/ 181...350V DC			100-FSV277(1)
			278...575V AC			100-FSV575(1)
		Diode Module DC operating mechanism	1...30 s 10...180 s		100-C09...-C43 with DC coils	100-FSD250(1)

(1) For screwless terminals, insert "CR" after the "100-" in the catalog number. Example: Cat No. 100-FSC48 becomes Cat. No.-CRFSC48.

Assembly Components (For 100-C09...C97 contactors)

	Description	For Use With	Pkg. Qty.	Cat. No.
	Dovetail Connectors • For use in contactor and starter assemblies • Single Connector – 0 mm spacing	100-C	10	100-S0
	Dovetail Connectors • For use in contactor and starter assemblies • Single Connector – 9 mm spacing		10	100-S9
	Protective Covers • Provides protection against unintended manual operation • For contactors and front-mounted auxiliary contacts, pneumatic timers, and latches	100-C all	1	100-SCCA
		100-FA, -FB, -FC, -FP, -FL	10	100-SCFA
	Reversing Power Wiring Kits • For reversing connection with a solid-state or thermal overload relay	100-C09...C23	1	105-PW23
		100-C30...C37	1	105-PW37
		100-C43...C55	1	105-PW55
		100-C60...C97	1	105-PW85
	DIN (#3) symmetrical hat rail • 35 x 7.5 x 1 m	140M-D 140M-F 100-C all	10	199-DR1

Technical Data

Allen-Bradley

194R-N30-1753
194R-PY
194R-N1

Fused and Non-Fused Disconnect Switches

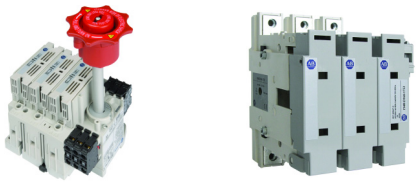
Bulletin 194R

Summary of Changes

This publication contains new and updated information as indicated in the following table.

Topic	Pages
Updated product descriptions	13
Updated quantity that is required and package quantity for terminal shields	16
Updated enclosure dimensions	48-49

Overview

	 Bulletin 194R-C, J, H, B, D, F, L, N, NU	 Bulletin 194R-NE
Product Type	Fused and non-fused rotary disconnect switches	Non-fused IEC rotary disconnect switches
Current Range	20…1200 A	125…1250 A
Main Applications	• UL 98 ratings "suitable as service entrance disconnecting means" • UL 508, CSA ratings "suitable as at-motor disconnect" • UL and IEC applications	• Disconnecting means • IEC applications
Functionality	• 3- or 4-pole fusible or non-fusible disconnect for standard OFF-ON or emergency stop in a main panel disconnect application • 4th pole available as modular accessory • Test mode switch position	• 3- or 4-pole non-fusible disconnect for standard OFF-ON or emergency stop in a main panel disconnect application • 4th pole available as modular accessory
Mounting Styles	20…63 A: DIN Rail/Panel mounting; 100…1250 A: Panel mounting	Panel mounting
Handles	• Available in rotary styles, UL Type 1/3R/4/4X/12, IP66, standard, or test mode versions • Handle colors in black and red/yellow and padlockable versions • 30 A/60 A legend markers (optional) — uses Cat. No. 1492-MS6X12 markers	• Available in rotary styles, UL Type 1/3R/4/4X/12, IP66, or standard versions • Handle colors in black and red/yellow and padlockable versions
Open Switch or Enclosed	• Open switch • Enclosed: UL/CSA rated enclosure for 20…63 A devices	• Open switch
UL/CSA Electrical Ratings:		
Rated Voltage U_e	690V AC	690V AC
Rated Current I_e	20…1200 A	125…1250 A
Rated Power P_e [FLA]	Varies w/ 1- or 3-phase switch, voltage	Varies w/ 1- or 3-phase switch, voltage
Short-Circuit Ratings	200 kA	200 kA
Mechanical Life [ops]	Up to 10 000	Up to 10 000
IEC Rated Current I_e		
Ambient Operational Temperature	-20…+60 °C (-4…+140 °F)	-20…+60 °C (-4…+140 °F)
Ambient Enclosed Temperature	-20…+60 °C (-4…+140 °F)	-20…+60 °C (-4…+140 °F)
Ambient Storage Temperature	-40…+65 °C (-40…+149 °F)	-40…+65 °C (-40…+149 °F)
Protection class per IEC 529	• Disconnects with terminal shroud or terminal screen: IP20 • 194R-J100-1753, front mounting: IP20 • Fuse carriers: IP30	• Front-mounted disconnects with terminal shroud or terminal screen: IP20
Optional Accessories	• IP66 handles • Multi-length shafts • Auxiliary contacts • Terminal covers • NFPA 79 internal handle with shaft	• IP66 handles • Multi-length shafts • Auxiliary contacts • Terminal covers

Standards Compliance and Certifications—Bulletin 194R-C, J, H, B, D, F, L, N, NU

Standards Compliance
UL 98
UL 508
CSA C22.2, No. 14
IEC/EN 60947-3 Low Voltage Switchgear and Controlgear part 3
BS EN60947-3
VDE 0660
NEMA KS-1

Certifications
CE Marked
CSA Certified (File No. LR1234)
UL Listed (File No. E 14841, Guide NLRV; File No. E 47426, Guide WHTY)

Standards Compliance and Certifications—Bulletin 194R-NE

Standards Compliance		Certifications
IEC/EN 60947-3 Low Voltage Switchgear and Controlgear part 3		CE Marked

Product Overview

The Bulletin 194R line of fused and non-fused rotary disconnect switches provides the flexibility to meet worldwide applications. The disconnect switches are UL Listed and CSA Certified and are designed to meet IEC 60947-3, VDE, DIN, BS, and applicable NEMA requirements.

Features

- 20 A...1250 A Sizes
- Fused switch versions:
  - BS88 -DIN
  - CSA HRCII-C - CSA HRCI-MISC - HRC-L
  - UL Class J- UL Class CC - UL Class L
  - NFC
- IP66 (Type 3R, 3, 12, 4, 4X) operating handle ingress ratings
- Handle with or without test mode
- Padlockable handle for up to three padlocks
- 6 auxiliary contacts can be added
- Suitable as service entrance disconnecting means (UL 98)
- Suitable as at-motor disconnecting means (UL 508)

Catalog Number Explanation

Fourth pole (20...63 A), additional auxiliary contacts, and handle options available in accessory section.

Cat. No. 194R-J30-1753

Cat. No. 194R-NE160-1753

194R	–	J	30	–	1753	S
		a	b		c	d

a	
Fuse Type	
Code	**Description**
C	UL Class CC, CSA Type HRCI-MISC
J	UL Class J, CSA Type HRCI-J
H	CSA Type HRCII-C
B	BS88(3)
D	DIN(3)
F	NFC(3)
L	UL Class L, CSA Type HRC-L
N	Non-fused (20…63 A)(1)
NE	Non-fused, IEC (100…1250 A)(1)(2)
NU	Non-fused, UL (100…1200 A)(1)

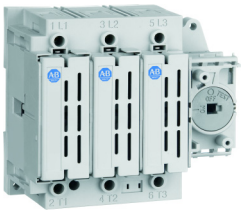
b	
Load Size(3)	
Code	**Description**
20	20 A (BS88)
25	25 A (NFC)
30	30 A (CC, J, HRCI-J)
	30 A (non-fused)
	30 A (HRCII-C)
32	32 A (BS88, NFC)
	32 A (DIN)
60	60 A (J, HRCI-J, HRCII-C)
	60 A (non-fused)
63	63 A (BS88, DIN, NFC)
100	100 A (BS88, DIN, NFC, J, HRCI-J)
125	125 A (BS88, DIN, NFC, Non-fused)
160	160 A (BS88, DIN, NFC, Non-fused)
200	200 A (BS88, DIN, NFC, J, HRCI-J, non-fused)
250	250 A (BS88, DIN, NFC, J, HRCI-J, non-fused)
400	400 A (BS88, DIN, NFC, J, HRCI-J, non-fused)
600	600 A (BS88, DIN, NFC, J, HRCI-J, non-fused)
630	630 A (BS88, DIN, NFC, non-fused)
800	800 A (BS88, DIN, NFC, L, HRCI-L, non- fused)
1200	1200 A (Non-fused)
1250	1250 A (BS88, DIN, non-fused)

c	
No. of Poles	
Code	**Description**
1753	3-poleswitch
1754	4-pole switch (non-fused:100…1250 A)

d	
Fuse Indication	
Code	**Description**
blank	No fuse status indication
S	Fuse status indication (20…63 A)

(1) Non-fused disconnect switches must use separately installed fuses for upstream short-circuit protection
(2) Does not carry UL Certification.
(3) Fuse classes BS88, DIN, and NFC are not suitable for use in North American applications

UL/CSA Non-fused Disconnect Switches



Cat. No. 194R-N30-1753

Cat. No. 194R-J100-1753

Note: Your order must include 1) Cat. No. of disconnect switch, 2) shaft, 3) handle, and 4) any accessories.

Fuse Description	Rated Current [A](1)	No. of Poles	Maximum Hp Ratings							Dim. Ref.	Cat. No.
			1-Phase (60 Hz)		3-Phase (60 Hz)			DC			
			120V	240V	240V	480V	600V	125V	250V		
Non-fused disconnect switches must use separately installed fuses for upstream short circuit protection.	30	3	2	3	7.5	15	20	3	5	A2	194R-N30-1753
	60	3	3	10	15	30	40	5	10	B2	194R-N60-1753
	100	3	7-1/2	15	30	75	100	10	15	F1	194R-NU100-1753
		4	7-1/2	15	30	75	100	10	15	F1	194R-NU100-1754
	200	3	—	50	75	150	200	15	15	F1	194R-NU200-1753
		4	—	50	75	150	200	15	15	F1	194R-NU200-1754
	400	3	—	—	125	250	350	20	50	F2	194R-NU400-1753
		4	—	—	125	250	350	20	50	F2	194R-NU400-1754
	600	3	—	—	200	400	350	20	50	F3	194R-NU600-1753
		4	—	—	200	400	350	20	50	F3	194R-NU600-1754
	800	3	—	—	200	500	500	—	—	F4	194R-NU800-1753
		4	—	—	200	500	500	—	—	F4	194R-NU800-1754
	1200	3	—	—	200	500	500	—	—	F4	194R-NU1200-1753
		4	—	—	200	500	500	—	—	F4	194R-NU1200-1754

(1) 30 A UL-rated device has I_{the} of 40 A per IEC. 60 A UL-rated device has I_{the} of 80 A per IEC.

Operating Handles (Accepts 3 Padlocks)

	Description	For Use With	Color	Degree of Protection	Cat. No.
	Padlockable handle, standard	• Bul. 194R disconnect switches up to 60 A	Black	Type 3R, 3, 12, 4, 4X	194R-PB
			Red/Yellow	Type 3R, 3, 12, 4, 4X	194R-PY
	Padlockable handle, test mode	• Bul. 194R disconnect switches up to 60 A	Black	Type 3R, 3, 12, 4, 4X	194R-PBT
			Red/Yellow	Type 3R, 3, 12, 4, 4X	194R-PYT
	Operating Handle Standard orientation with defeater	• IEC Non-fused disconnect switches: 125…630 A • IEC Fused disconnect switches: 100…400 A • UL Disconnect switches: 100…400 A	Black	IP66 (Type 1, 3R, 12, 4, 4X)	194R-HM4
			Red/Yellow	IP66 (Type 1, 3R, 12, 4, 4X)	194R-HM4E
		• IEC Non-fused disconnect switches: 800…1250 A • IEC Fused disconnect switches: 630…1250 A • UL Non-fused disconnect switches: 600…1200 A • UL Fused disconnect switches: 600…800 A	Black with light gray cover	IP65 (Type 1, 3R, 12, 4, 4X)	194R-HM4-L
			Red/Yellow	IP65 (Type 1, 3R, 12, 4, 4X)	194R-HM4E-L
	Operating Handle Standard orientation without defeater	• IEC Non-fused disconnect switches: 800…1250 A • IEC Fused disconnect switches: 630…1250 A • UL Non-fused disconnect switches: 600…1200 A • UL Fused disconnect switches: 600…800 A	Black with light gray cover	IP65 (Type 1, 3R, 12, 4, 4X)	194R-HM4-N2-L
			Red/Yellow	IP65 (Type 1, 3R, 12, 4, 4X)	194R-HM4E-N2-L

OSHA Lockout/Tag Out Compliance (LOTO)

OSHA CFR36 Section 1910 mandates that disconnect switches be able to be locked out while in the OFF position during servicing. All Bulletin 194R handles comply with this important safety requirement. See NFPA Article 430 for disconnect requirements of motor applications.

Operating Shafts

	Description	For Use With	Operating Shaft Length	Cat. No.
	Extension shaft, Standard length	140U-P*, 194R-P*, and 194R- P*T handles	12 in. (30.48 cm)	194R-S1
			21 in. (53.34 cm)	194R-S2
	Extension shaft, Standard length	Bul. 194R-HM handles for • IEC Non-fused disconnect switches: 125...630 A • IEC Fused disconnect switches: 100...400 A • UL Disconnect switches: 100...400 A	12.6 in. (320 mm)	194R-R7
	Extension Shaft, Extended length		22.8 in. (580 mm)	194R-R8
	Extension shaft, Standard length	Bul. 194R-HM handles for • IEC Non-fused disconnect switches: 800...1250 A • UL Non-fused disconnect switches: 600...1200A	12.6 in. (320 mm)	194R-R9
	Extension Shaft, Extended length		22.0 in. (560 mm)	194R-R10
	Extension shaft, Standard length	Bul. 194R-HM handles for • IEC Fused disconnect switches: 630...1250 A • UL Fused disconnect switches: 600...800 A	12.6 in. (320 mm)	194R-R11
	Extension Shaft, Extended length		22.0 in. (560 mm)	194R-R12

NFPA 79 Internal Operating Handle with Shaft

	Description	For Use With	Operating Shaft Length	Cat. No.
	NFPA 79 internal operating handle with shaft • Permits operation of the disconnect switch when the panel door is open, in compliance with NFPA 79	140U-P*, 194R-P*, and 194R-P*T handles	12 in. (30.48 cm)	194R-N1
			21 in. (53.34 cm)	194R-N2
		100…400 A UL fused disconnect switches	12.6 in. (320 mm)	194R-HM4-NFPA1
			22 in. (560 mm)	194R-HM4-NFPA3
		600…800 A UL fused disconnect switches	12.6 in. (320 mm)	194R-HM4-NFPA2
			22 in. (560 mm)	194R-HM4-NFPA4

Terminal Shields

	Description	For Use With	No. of Poles	Mounting Position	Disconnect Switch Dim. Ref.	Qty Required per Disconnect Switch	Pkg. Qty	Cat. No.
	30 A IP20 Terminal Shroud (three terminals)	—	—	—	A1, A2	2	2	194R-30-C3
	60 A IP20 Terminal Shroud (three terminals)	—	—	—	B1, B2	2	2	194R-60-C3
	30 A IP20 Terminal Shroud (one terminal)	—	—	—	A1, A2	2	2	194R-30-C1
	60 A IP20 Terminal Shroud (one terminal)	—	—	—	B1, B2	2	2	194R-60-C1
	Terminal Shroud	IEC Non-fused switches, 125…160 A	3	Line or load side	F1	2	3	194R-LNC7
			4			2	4	194R-LNC8
		IEC Non-fused switches, 250 A	3		F2	2	3	194R-LNC9
			4			2	4	194R-LNC10
		IEC Non-fused switches, 400…630 A	3		F3	2	3	194R-LNC11
			4			2	4	194R-LNC12
	IEC Terminal Shield	IEC Non-fused switches, 800 A	3	Line or load side	F4	2	1	194R-LNC13
			4			2	1	194R-LNC14
		IEC Non-fused switches, 1250 A	3		F5	2	1	194R-LNC15
			4			2	1	194R-LNC16

Non-Fused Disconnect Switches for CSA and UL Class Applications

Non-fused disconnect switches must be used with separately installed fuses.

Table 5 - Electrical Ratings, 30 A and 60 A Devices

Cat. No.		194R-N30-1753		194R-N60-1753	
Maximum Voltage, AC	[V]	600		600	
Maximum Voltage, DC	[V]	250		250	
Ampere Rating	[A]	30		60	
Maximum Short-circuit Prospective Fault Current	[kA]	200		200	
Maximum Hp, 3-Phase AC					
200V, 60 Hz	[Hp]	7.5	3	15	7.5
240V, 60 Hz	[Hp]	7.5	3	15	7.5
480V, 60 Hz	[Hp]	15	5	30	15
600V, 60 Hz	[Hp]	20	7.5	50	15
Maximum Hp, 1-Phase AC					
120V, 60 Hz	[Hp]	2	0.5	3	1.5
240V, 60 Hz	[Hp]	3	1.5	10	3
Maximum Hp, DC					
125V DC	[Hp]	3	2	5	5
250V DC	[Hp]	5	5	10	10
Power Lost	[W]	2		6	

Table 6 - Electrical Ratings, 100 . . . 1200 A Devices

Cat. No.		194R-NU100	194R-NU200	194R-NU400	194R-NU600	194R-NU800	194R-NU1200
Rated Current	[A]	100	200	400	600	800	1200
Standards Compliance		UL 98, IEC					
Ratings per UL/CSA							
Maximum Voltage, AC	[V]	600					
Maximum Voltage, DC	[V]	250					
Maximum Short-circuit Fault Current	[kA]	200	200	200	200	100	100
Fuse Type		J	J	J	J	L	L
Max. Fuse Rating	[A]	100	200	400	600	800	1200
Max. Hp Rating, 3-phase							
240V	[Hp]	30	75	125	200	200	200
480V	[Hp]	75	150	250	400	500	500
600V	[Hp]	100	200	350	350	500	500
Max. Hp Rating, DC							
125V, 2 poles in series	[Hp]	10	15	20	20	—	—
240V, 3 poles in series	[Hp]	15	15	50	50	—	

Table 7 - Mechanical Data, 30 . . .200 A Devices

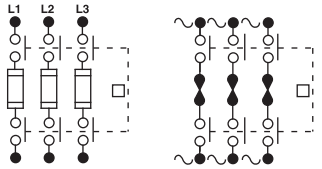
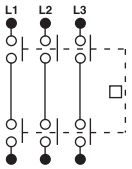
Cat. No.		194R-N30	194R-N60	194R-NU100	194R-NU200
Degree of Protection (per IEC 60947-3), Switch Only		IP20	IP20	—	—
Degree of Protection (per IEC 60947-3), Switch with Terminal Shield and Fuse Carriers		IP20	IP20	IP20	IP20
Mechanical Endurance	[Operations]	10 000	10 000	10 000	10 000
Operating Torque (Maximum)	[N•m]	3.5	3.5	10	10
	[Lb•in]	35	35	88.5	88.5
Terminal Capacity, Power Terminals	[mm^2]	2.5…10	2.5…25	300 MCM	300 MCM
	[AWG]	#14...#8	#14...#4	#6	#6
Terminal Capacity, Auxiliary Contact Terminals	[mm^2]	2.5…10	2.5…25	—	—
	[AWG]	#14...#8	#14...#4		
Maximum Number of Auxiliary Circuits		6	6	2	2
Approximate Weight	[kg]	0.81	1.14	1.67/2.1	1.67/2.1
	[lbs]	1.78	2.52	3.7/4.3	3.7/4.3
Minimum Enclosure Size	Height [mm (in.)]	248 (9-3/4)	248 (9-3/4)	610 (24)	610 (24)
	Width [mm (in.)]	171 (6-3/4)	197 (7-3/4)	406 (16)	406 (16)
	Depth [mm (in.)]	111 (4-3/8)	111 (4-3/8)	152 (6)	152 (6)
Switch Dimension Reference (See dimension drawings.)		A2	B2	F1	F1

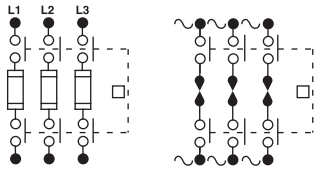
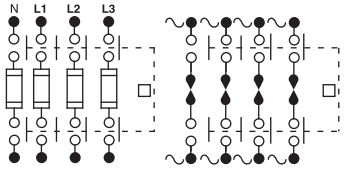
Table 8 - Mechanical Data, 400 . . .1200 A Devices

Cat. No.		194R-NU400	194R-NU600	194R-NU800	194R-NU1200
Degree of Protection (per IEC 60947-3), Switch Only		IP20	IP20	—	—
Degree of Protection (per IEC 60947-3), Switch with Terminal Shield and Fuse Carriers		IP20	IP20	IP20	IP20
Mechanical Endurance	[Operations]	6 000	6 000	3 500	3 500
Operating Torque (Maximum)	[N•m]	14.5	37	50	50
	[Lb•in]	128.3	327.5	442	442
Terminal Capacity, Power Terminals	[mm^2]	600 MCM	2 x 600 MCM	4 x 600 MCM	4 x 600 MCM
	[AWG]	#2	2 x #2	4 x #2	4 x #2
Maximum Number of Auxiliary Circuits		2	2	2	2
Approximate Weight	[kg]	3/3.8	8.2/10.3	11.6/14.5	11.6/14.5
	[lbs]	6.6/8.4	18.1/22.7	25.6/32	25.6/32
Switch Dimension Reference (See dimension drawings.)		F2	F3	F4	F4

Wiring Schematic

Figure 1 - Wiring Schematic

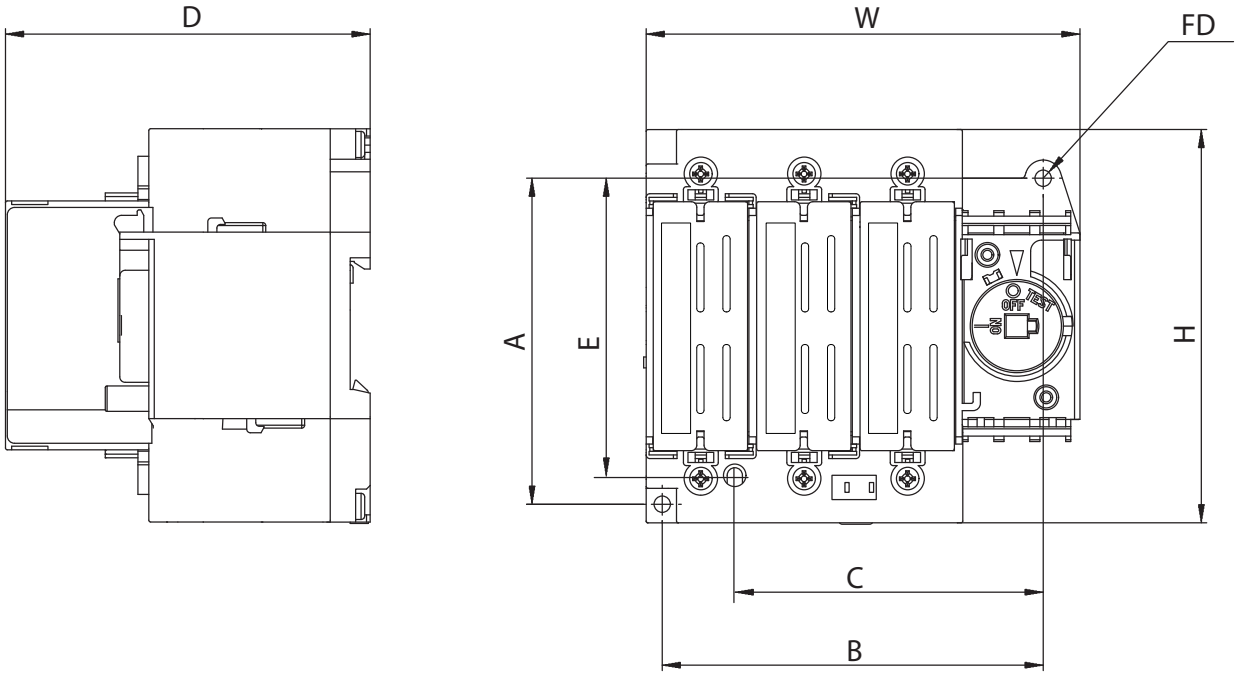
UL LISTED, CSA CERTIFIED	DIMENSION REFERENCE	CIRCUIT
Cat. No.		
194R-C30-1753 194R-J30-1753 194R-J60-1753 194R-H30-1753 194R-H60-1753	A1 A1 B1 B1 B1	
194R-N30-1753 194R-N60-1753	A2 B2	

IEC SWITCHES	DIMENSION REFERENCE	CIRCUIT
Cat. No.		
194R-B20-1753 194R-B32-1753 194R-B63-1753 194R-D32-1753 194R-D63-1753 194R-F25-1753 194R-F32-1753 194R-F63-1753	A1 A1 B1 B1 B1 A1 A1 B1	
194R-⁎-1754	See Column W4 for the width of the 4-pole switch	

Approximate Dimensions

Dimensions are in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

Figure 2 - Disconnect Switch Dimension References A1, A2, B1, and B2 (30 A and 60 A)

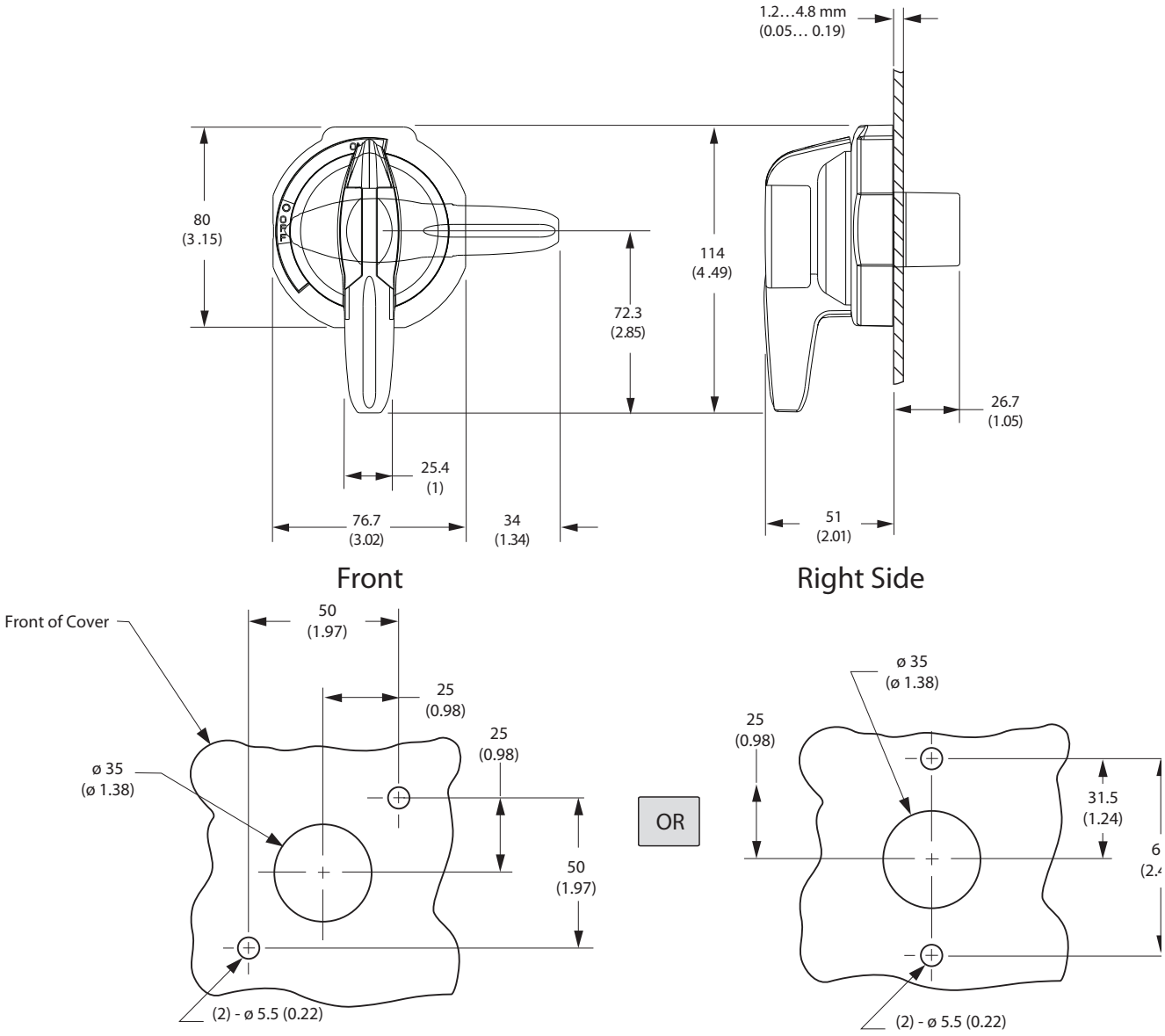


Disconnect Switch Dimension Reference	Approximate Dimensions [mm (in.)]								
	H	W (3-pole)	W (4-pole)	D	A	B	C[(1)]	E[(1)]	FD
A1	108 (4-1/4)	120 (4-3/4)	149 (5-7/8)	101 (4)	90 (3-9/16)	105 (4-1/8)	85 (3-11/32)	82 (3-15/64)	2-M4, 2-#8
A2	108 (4-1/4)	120 (4-3/4)	149 (5-7/8)	80 (3-1/8)	90 (3-9/16)	105 (4-1/8)	85 (3-11/32)	82 (3-15/64)	2-M4, 2-#8
B1	113 (4-29/64)	142 (5-19/32)	179 (7-3/64)	114 (4-31/64)	100 (3-15/16)	120 (4-23/32)	—	—	4-M4, 4-#8
B2	113 (4-29/64)	142 (5-19/32)	179 (7-3/64)	93 (3-43/64)	100 (3-15/16)	120 (4-23/32)	—	—	4-M4, 4-#8

(1) Mounting holes for backward compatibility with Bulletin 194R legacy switches.

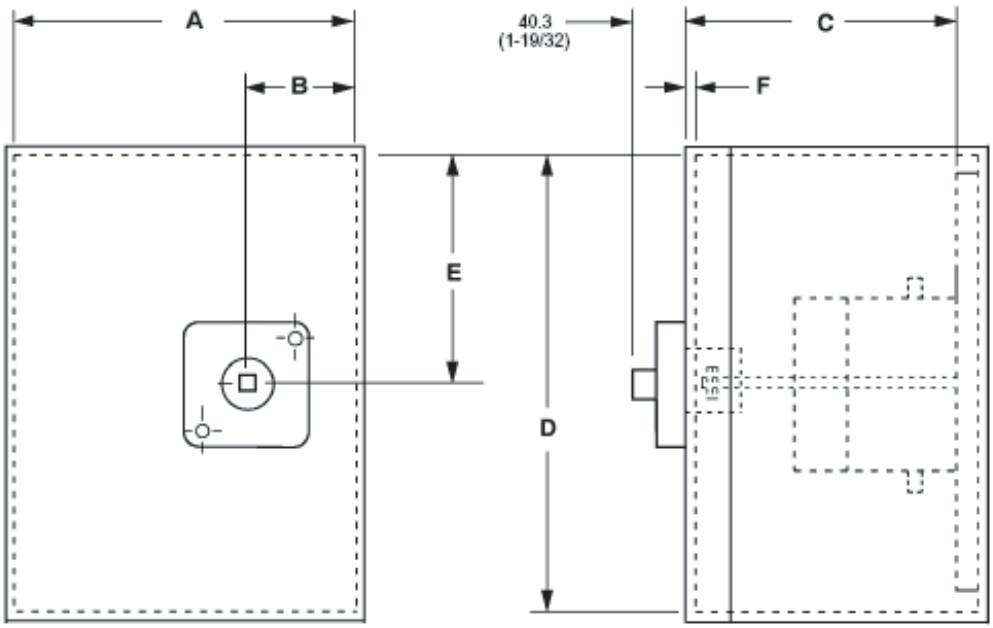
Operating Handles

Figure 18 - Cat. Nos. 194R-P…/140U-P…



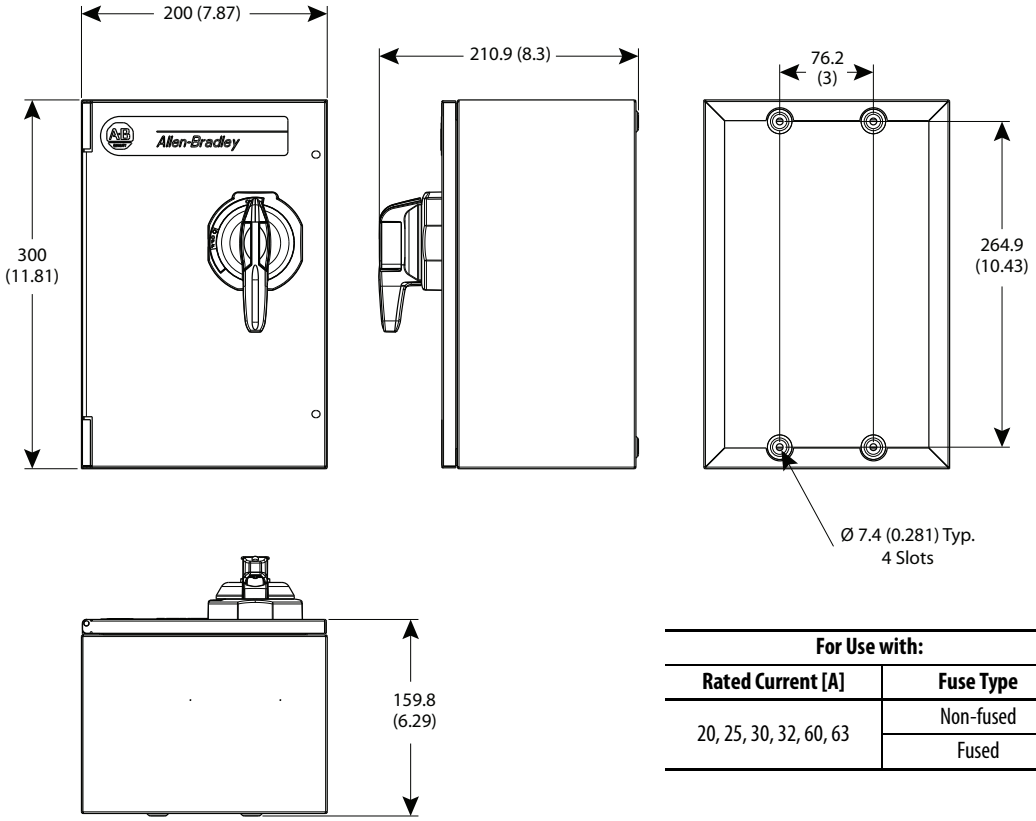
Enclosures

Figure 22 - Disconnect Switch Dimension References: A1, A2, B1, B2 (30 A and 60 A) Enclosure and Operating Handle



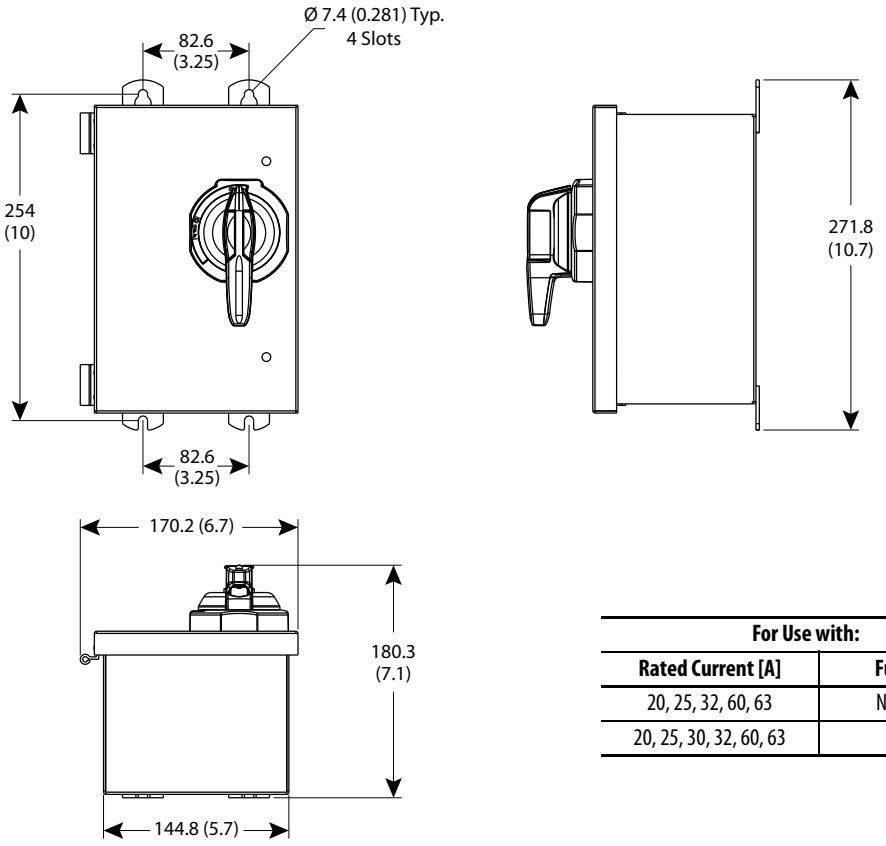
Cat. No.	Dimension Reference	A	B	C		D	E	F	
		Maximum	Minimum	Minimum	Maximum	Minimum	Minimum	Minimum	Maximum
194R-B20-1753	A1	171 (6-3/4)	45 (1-49/64)	147.6 (5-13/16)	454 (17-7/8)	248 (9-3/4)	89 (3-1/2)	1.4 (1/16)	4/78 (3/16)
194R-B32-1753									
194R-C30-1753									
194R-F32-1753									
194R-J30-1753									
194R-N30-1753	A2	171 (6-3/4)	45 (1-49/64)	111 (4-3/8)	454 (17-7/8)	248 (9-3/4)	89 (3-1/2)	1.4 (1/16)	4/78 (3/16)
194R-B63-1753	B1	197 (7-3/4)	45 (1-49/64)	147.6 (5-13/16)	454 (17-7/8)	248 (9-3/4)	105 (4-9/64)	1.4 (1/16)	4/78 (3/16)
194R-D32-1753									
194R-D63-1753									
194R-F63-1753									
194R-H30-1753									
194R-H60-1753									
194R-J60-1753									
194R-N60-1753	B2	197 (7-3/4)	45 (1-49/64)	111 (4-3/8)	454 (17-7/8)	248 (9-3/4)	105 (4-9/64)	1.4 (1/16)	4/78 (3/16)

Figure 23 - IP66 (Type 3/4/12) Watertight, Dusttight Sheet Metal Enclosure



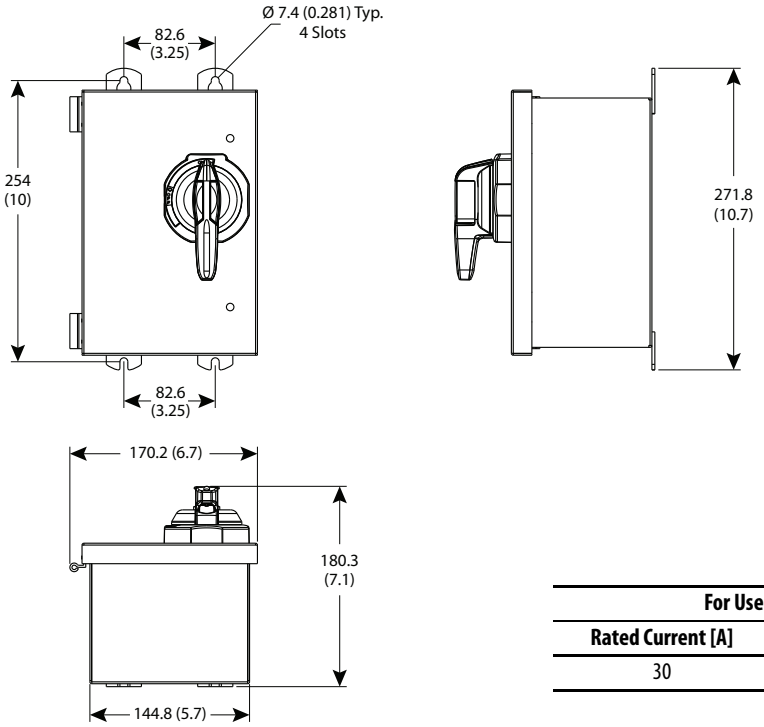
For Use with:	
Rated Current [A]	**Fuse Type**
20, 25, 30, 32, 60, 63	Non-fused
	Fused

Figure 24 - Type 4/4X Watertight, Corrosion-resistant Stainless Steel Enclosure



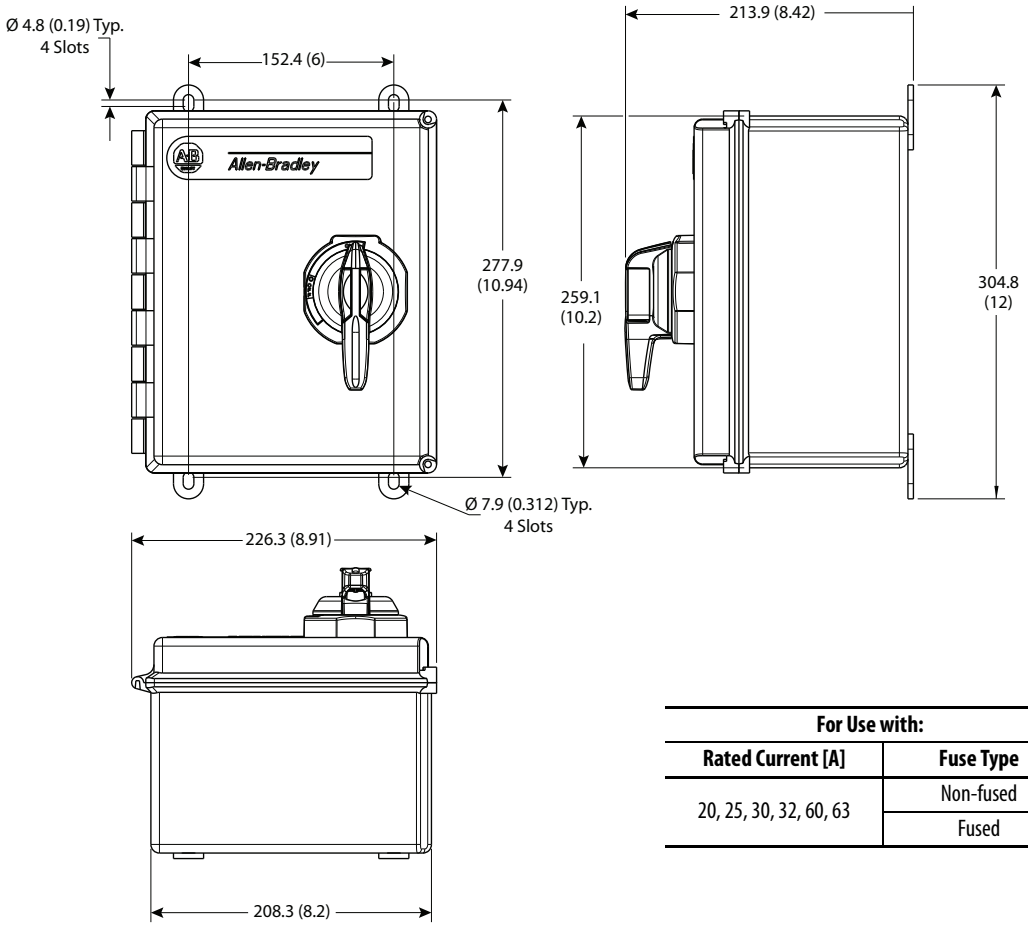
For Use with:	
Rated Current [A]	**Fuse Type**
20, 25, 32, 60, 63	Non-fused
20, 25, 30, 32, 60, 63	Fused

Figure 25 - Type 4/4X Watertight, Corrosion-resistant Stainless Steel Enclosure



For Use with:	
Rated Current [A]	**Fuse Type**
30	Non-fused

Figure 26 - IP66 (Type 3/4/4X/12) Corrosion-resistant, Non-metallic Enclosure



For Use with:	
Rated Current [A]	**Fuse Type**
20, 25, 30, 32, 60, 63	Non-fused
	Fused

Technical Data 700-HB33Z24-3-4
700-HB-33A1-3-4
700-HN153
700-HN158

Original Instructions

Allen-Bradley
by ROCKWELL AUTOMATION

Relay and Timer Specifications

Bulletin 700

Contact Data Tables

	Relay Type	Contact Arrangement	Contact Style	Contact Material	NEMA Pilot Duty	AC and DC Switching Capability
Timing Relays	700-FE	1 N.O.	single	AgCdO	D300	10V; AC DC (24V Max.)
	700-FS	1, 2 form C	single	AgCdO	B300	10V; AC DC (24V Max.)
General Purpose Relays	700-HA	2, 3 form C	single	AgNi	B300	10V; AC DC (24V Max)
	700-HAX	2, 3 form C	bifurcated	Au/AgNi	B300	6V; AC DC (24V Max)
	700-HB	2, 3 form C	single	AgNi	B300	10V; AC DC (24VMax.)
	700-HC14	4 form C	single	Ag/Au	C300 Q300	10V; AC DC (30V Max.)
	700-HC22	2 form C	single	AgNi	B300 Q300	10V; AC DC
	700-HC24	4 form C	single	AgNi	C300 Q300	10V; AC DC (30V Max.)
	700-HD	2, 3 form C	single	AgCdO	B300	10V; AC DC (24V Max)
	700-HF	2, 3, 4 form C	single	AgCdO	B300	10V; AC DC (30V Max)
	700-HG	1 form X, 1 form C, 2 form A, 2 form C	single	AgNi	A600	10V; AC DC (28V Max)
	700-HHF45	1 form X	single	AgNi	A600	10V; AC DC (28V Max)
	700-HHF62	2 form C	single	AgNi	B600	10V; AC DC (28V Max)
	700-HHF73	3 form C	single	AgNi	B300	10V; AC DC (28V Max)
	700-HJ	1, 2 form C	single	AgCdO	—	10V; AC DC (24V Max.)
	700-HK36	1 form C	single	AgNi	B300	10V; AC DC (30V Max)
	700-	1 form C	single	Au/AgNi	B300	10V; AC DC (30V Max)
	700-HK32	2 form C	single	AgNi	B300	5V; AC DC (30V Max)
	700-	2 form C	single	Au/AgNi	B300	5V; AC DC (30V Max)

Contact Data Tables

General Purpose Relays (continued)

Relay Type	Contact Arrangement	Contact Style	Contact Material	NEMA Pilot Duty	AC and DC Switching Capability
					1 mA / 10 mA / 50 mA / 100 mA / 1 A / 3 A / 5 A / 10 A / 20 A / 25 A / 30 A / 35 A
700-HLS	Solid-State 1 N.O.	—	—	—	3V — AC/DC
700-HLT	1 Form C	single	AgSnO	B300 R300	12V — 6 A AC/DC
700-HLT__X	1 Form C	single	AgSnO	B300 R300	8V — 6 A AC/DC
700-HP	2 Form C	single	AgNi	B300 Q300	5V (300 mW) — 8 A AC/DC
700-HPX	2 Form C	single	AgNi + Gold	B300 Q300	5V (50 mW) — 8 A AC/DC
700-HS	2 Form C	single	AgCdO	B300	10V — AC DC (30V Max)
700-HT	2 form C	single	AgNi	B300	10V — AC DC (30V Max)

NEMA Ratings and Test Values

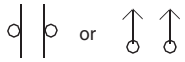
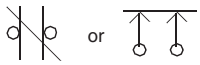
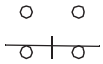
NEMA Ratings and Test Values for AC Control Circuit Contacts at 50 or 60 Hz

Maximum Current [A]											
NEMA Contact Rating Designation	Thermal Continuous Test Current [A]	120V		240V		480V		600V		VA	
		Make	Break	Make	Break	Make	Break	Make	Break	Make	Break
A150	10	60	6.00	—	—	—	—	—	—	7200	720
A300	10	60	6.00	30	3.00	—	—	—	—	7200	720
A600	10	60	6.00	30	3.00	15	1.50	12	1.20	7200	720
B150	5	30	3.00	—	—	—	—	—	—	3600	360
B300	5	30	3.00	15	1.50	—	—	—	—	3600	360
B600	5	30	3.00	15	1.50	7.5	0.75	6	0.60	3600	360
C150	2.5	15	1.50	—	—	—	—	—	—	1800	180
C300	2.5	15	1.50	7.5	0.75	—	—	—	—	1800	180
C600	2.5	15	1.50	7.5	0.75	3.75	0.375	3	0.30	1800	180
D150	1.0	3.60	0.60	—	—	—	—	—	—	432	72
D300	1.0	3.60	0.60	1.8	0.30	—	—	—	—	432	72
D600	0.5	1.80	0.30	—	—	—	—	—	—	216	36
2X A300	20	120	12	60	6.00	—	—	—	—	14400	1440
2X A600	20	120	12	60	6.00	30	3.00	24	2.40	14400	1440

NEMA Ratings and Test Values for DC Control Circuit Contacts

Maximum Current [A]						
NEMA Contact Rating Designation	**Thermal Continuous Test Current [A]**	**5…28V**	**125V**	**250V**	**301…600V**	**Make or Break at 300V or less [VA]**
N150	10	10	2.2	—	—	275
N300	10	10	2.2	1.1	—	275
N600	10	10	2.2	1.1	0.40	275
P150	5.0	5.0	1.1	—	—	138
P300	5.0	5.0	1.1	0.55	—	138
P600	5.0	5.0	1.1	0.55	0.20	138
Q300	2.5	2.5	0.55	0.27	0.11	69
Q600	2.5	2.5	0.55	0.27	0.11	69
2X P600	10	10	2.2	1.1	0.40	275

NEMA Definitions for Contact Arrangements

Contact Arrangement	Description	Diagram
Form A	A Form A contact arrangement is one that has single-pole, single-throw, normally open contacts. The function of this arrangement is to close a circuit when actuated.	
Form B	A Form B contact arrangement is one that has single-pole, single-throw, normally closed contacts. The function of this arrangement is to open a circuit when actuated.	
Form C	A Form C contact arrangement is one that has single-pole, double-throw contacts with three terminals - one for normally open, one for normally closed, and one common. The function of this arrangement is to transfer a circuit when actuated.	
Form X	A Form X contact arrangement is one that has single-pole, single-throw, normally open double-make contacts. The function of this arrangement is to close a circuit when actuated.	
Form Y	A Form Y contact arrangement is one that has single-pole single-throw normally closed double-break contacts. The function of this arrangement is to open a circuit when actuated.	
Form Z	A Form Z contact arrangement is one that has single-pole, double-throw, contacts with four terminals — two for normally open and two for normally closed. The function of this arrangement is to open one circuit and close the other.	

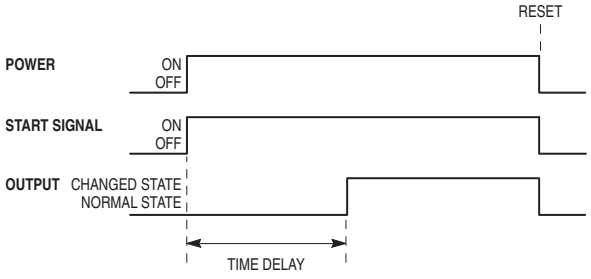
Timing Relay Selection Criteria

Single Function Timers: Timers that have only 1 timing mode (for example, ON-Delay or OFF-Delay).

Multi-Function Timers: Timers that have 4...8 timing modes that are selected by turning the mode selection switch.

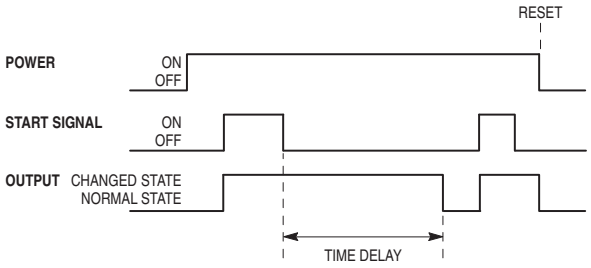
ON-Delay or (Delay on Operate)

When power is applied continuously (or when power and a start signal are applied), the timing cycle begins. The output contacts change state after the time delay is completed. The contacts will return to their normal state when a reset signal is applied or power is removed.



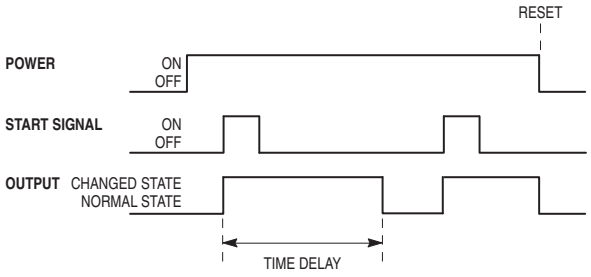
OFF-Delay or (Delay on Release)

Power is applied continuously. When a start signal is applied, the output contacts change state immediately. When the start signal is removed, the timing cycle begins. The output contacts will return to their normal state once the time delay is completed. Reset will occur when a reset signal is applied or power is removed.



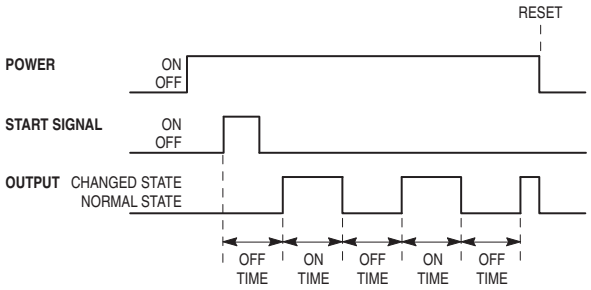
One Shot or (Repeat Cycle)

Power is applied continuously. When a start signal is applied, the output contacts change state immediately and the timing cycle begins. The output contacts will return to their normal state once the time delay is completed. Reset will occur when a reset signal is applied or power is removed.



Repeat Cycle or (Flicker)

Power is applied continuously. When a start signal is applied, the timing cycle begins. When the time delay is completed, the output contacts change state and the next timing cycle begins. This cycle will repeat until a reset signal is applied or power is removed.



Flexibility

Mounting — Timing relays are available in several different models. They can be plugged into the same socket as the relay, or use a separate plug-in socket mounting.

Contacts — The contacts are of various types and ratings. See the appropriate specification pages for more details.

Functionality — Timing relays with multi-range and multi-function capability are available. Allowing you to stock one relay to cover a wide variety of applications.

External Trigger Switch — OFF-Delay, One-Shot, and other timer functions require an external trigger switch (from a relay or push button) to control the timing function. The external trigger switch will cause the timing function to start. In OFF-Delay, the trigger switch closes to energize the output and when the trigger switch opens the OFF-Delay starts to time out. At the end of the time delay, the output is de-energized and the output contacts return to their shelf state

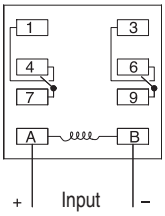
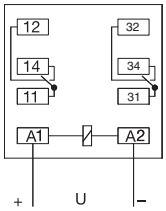
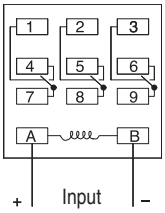
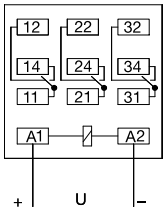
General Purpose Relays

Product Overview

				
Bulletin No.	**700-HA**	**700-HB**	**700-HD**	**700-HF**
Type	**General-purpose Relay**	**General-purpose Relay**	**General-purpose Relay**	**General-purpose Relay**
Features	• Pin-style terminals • Standard ON/OFF flag indicator • Electrical schematic on face • Clear cover for visual inspection • Optional push-to-test and manual override • Optional LED	• Blade-style quick connect terminals • Standard ON/OFF flag indicator • Electrical schematic on face • Clear cover for visual inspection • Optional push-to-test and manual override • Optional LED	• Flange-mounted • Blade-style quick connect terminals • Clear cover for visual inspection	• Square-base • Plug-in quick connect solder terminals • Optional push-to-test • Optional LED
Contact Ratings				
Contact Form	DPDT, 3PDT	DPDT, 3PDT	DPDT, 3PDT	DPDT, 4 PDT
Contact Type	Single	Single	Single	Single
Contact Material	AgNi, AgNi + Gold	AgCdO	AgCdO	AgCdO
Operating Current, Under Resistant Load, Max	700-HA: 10 A 700-HAX: 6 A	15 A	15 A	10 A
Permissible Load, min	700-HA: 10V, 5 mA 700-HAX: 6V 1 mA	10V, 10 mA	10V, 10 mA	5V, 100 mA
Coil Ratings				
Coil Voltage	AC: 6, 12, 24, 48, 110, 120, 230, 240, 277V DC: 6, 12, 24, 36, 48, 60, 80, 110, 125, 140, 220V	AC: 6, 12, 24, 120, 240V DC: 6, 12, 24, 48, 110V	AC: 6, 12, 24, 120, 208, 240V DC: 6, 12, 24, 48, 110V	AC: 6, 12, 24, 120, 240V DC: 6, 12, 24, 48, 110V
Permissible Coil Voltage Variation	80…110% of nom voltage at 50 Hz 80…110% of nom voltage at 60 Hz 80…110% of nom voltage at DC			85…110% of nom voltage at 50 Hz 85…110% of nom voltage at 60 Hz 80…110% of nom voltage at DC
Electrical Ratings				
Dielectric Withstand Voltage	Pole-to-pole: 2000V Contact-to-coil: 2000V Contact-to-frame: 2000V	Pole-to-pole: 2500V Contact-to-coil: 4000V Contact-to-frame: 2500V	Pole-to-pole: 2500V Contact-to-coil: 4000V Contact-to-frame: 2500V	Pole-to-pole: 1500V Contact-to-coil: 1500V Contact-to-frame: 1500V
Electrical Service Life (Cycles)	100,000 min	100,000 min	100,000 min	200,000 min 500,000 min (DPDT)
Reference				
Certifications	CE, cULus, cURus, CSA, Lloyds	CE, cULus, cURus, CSA, Lloyds	CE, UR, CSA, Lloyds	CE, UR, CSA
Socket Catalog Numbers	700-HN100, 700-HN101, 700-HN125, 700-HN126, 700-HN204, 700-HN205	700-HN153, 700-HN154	—	700-HN262, 700-HN264
Page	12	22	28	32

700-HB Square Base Relay

- 15 A contact rating
- DPDT, 3PDT
- Blade-style quick connect /solder terminals (Faston 187 - 4.8 x 0.5 mm)
- Standard ON/OFF flag indicator
- Options: LED, push-to-rest, and manual override

Photo	Description	Contact Rating	Wiring Diagrams		Coil Voltage	Cat. No.(1)
			U.S./Canada	International		
	DPDT 2-Pole 2 Form C Single AgCdO Contact	15 A B300			6V AC	700-HB32A06
					12V AC	700-HB32A12
					24V AC	700-HB32A24
					120V AC	700-HB32A1
					240V AC	700-HB32A2
					6V DC	700-HB32Z06
					12V DC	700-HB32Z12
					24V DC	700-HB32Z24
					48V DC	700-HB32Z48
	Sockets		700-HN154	700-HN153	110V DC	700-HB32Z1
	3PDT 3-Pole 3 Form C Single AgCdO Contact	15 A B300			6V AC	700-HB33A06
					12V AC	700-HB33A12
					24V AC	700-HB33A24
					120V AC	700-HB33A1
					240V AC	700-HB33A2
					6V DC	700-HB33Z06
					12V DC	700-HB33Z12
					24V DC	700-HB33Z24
					48V DC	700-HB33Z48
	Sockets		700-HN154	700-HN153	110V DC	700-HB33Z1

(1) LED Option: Add suffix (-4) to the selected 700-HB Relay Cat. No., except for the 240V AC Units, add (-4L).
Push-to-test, Manual Override, and LED Option: Add suffix (-3-4) to the selected 700-HB Relay Cat. No., except for the 240V AC units, add (-3-4L)
Push-to-test and Manual Override option: Add suffix (-3) to the selected 700-HB relay.

Accessories - 700-HB Relays

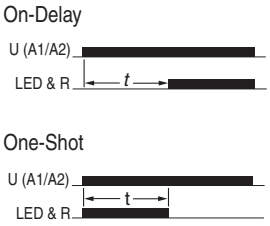
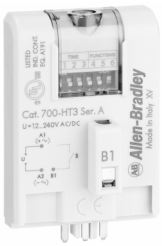
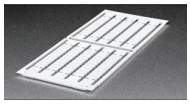
Photo	Description			Pkg. Qty.	Cat. No.
	**Diode Surge Suppressor** Voltage Range: 6…220V DC used with 700-HN204 and 700-HN205 socket			10	700-ADR
	Diode with LED Surge Suppressor Voltage Range: 6…24V DC used with 700-HN204 and 700-HN205 socket			10	700-ADL1R
	Diode with LED Surge Suppressor Voltage Range: 28…60V DC used with 700-HN204 and 700-HN205 socket			10	700-ADL2R
	Diode with LED Surge Suppressor Voltage Range: 110…220V DC used with 700-HN204 and 700-HN205 socket			10	700-ADL3R
	Varistor with LED Surge Suppressor Voltage Range: 6…24V AC used with 700-HN204 and 700-HN205 socket			10	700-AV1R
	Varistor with LED Surge Suppressor Voltage Range: 110…240V AC used with 700-HN204 and 700-HN205 socket			10	700-AV3R
	RC Surge Suppressor Voltage Range: 6…24V AC/DC used with 700-HN204 and 700-HN205 socket			10	700-AR1
	RC Surge Suppressor Voltage Range: 110…240V AC/DC used with 700-HN204 and 700-HN205 socket			10	700-AR2
	**Timing Module** On-Delay or One-Shot selectable voltage range: 12…24V AC/DC used with sockets that accept plug-in accessory modules.			1	700-AT3
	Timing Module On-Delay or One-Shot selectable voltage range: 110…125V AC used with sockets that accept plug-in accessory modules.			1	700-AT3A1
	Timing Module On-Delay or One-Shot selectable voltage range: 230…240V AC used with sockets that accept plug-in accessory modules.			1	700-AT3A2
	1. 1 s	0.05 s…1 s		1	700-HT3
	2. 10 s	0.5 s…10 s			
	3. 100 s	5 s…100 s			
	4. 10 min	0.5 min…10 min			
	5. 100 min	5 min…100 min			
	6. 10 hours	0.5 h…10 h			
	7. 100 hours	5 h…100 h			
	8. LED Indicator				

Photo	Description	Pkg. Qty.	Cat. No.
	**Screw Terminal Socket — Panel or DIN Rail Mounting. Guarded Terminal Construction** 11-blade socket for use with 700-HB relays. This socket has coil and contact separation as well as the ability to use optional plug-in modules (700-A___ accessories, LED, surge suppression, timing modules).	10	700-HN153
	**Screw Terminal Base Socket — Panel or DIN Rail Mounting. Open Style Construction** 11-blade for use with 700-HB relays.	10	700-HN154
	**DIN (#3) symmetrical hat rail** 35 x 7.5 x 1 m	10	199-DR1
	**Retainer Clip** **For Cat. Nos. 700-HN154 Sockets with 700-HB Relays** Secures relay in socket. Order must be for 10 clips or multiples of 10.	10	700-HN156
	Retainer Clip **For Cat. Nos. 700-HN153 Sockets with 700-HB Relays** Secures relay in socket. Order must be for 10 clips or multiples of 10.	10	700-HN158
	**Relay Identification Snap-in Markers** Snap-in markers fit on top of product covers. The following are blank cards. Squares slip into molded slot on top of product covers.	100	1492-MS5X12 1492-MS6X9 1492-MS6X12 1492-MS8X9 1492-MS8X12 1492-MP-Blank
	**Pre-Printed Identification Tags —** contains 10 sheets of pre-printed and blank tags. Each sheet contains 13 sets of the markings CR…9CR, TR…9TR, M…9M, F, R, 1S, and 117 blank tags. Tags are peel-off with sticky backing for easy placement on relays.	10	700-N40
	Blank Identification Tags — contains 10 sheets of blank identification tags for customer specialized printing. Each sheet contains 546 blank tags. Tags are peel-off with sticky backing for easy placement on relays.	10	700-N41

Socket and Retainer Clip Reference

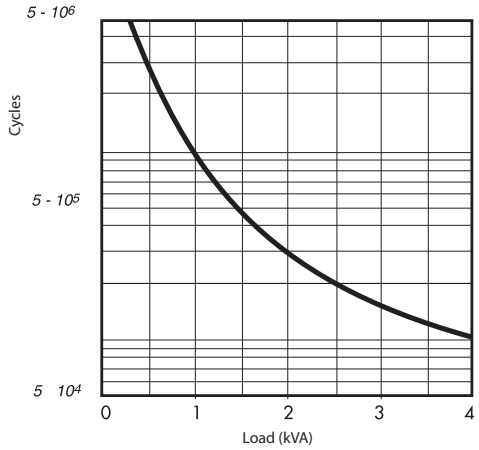
Relay Type	Socket Cat. No.	Retainer Clip Cat. No.
700-HB	700-HN153 700-HN154	700-HN158 700-HN156

Specifications - 700-HB Relays

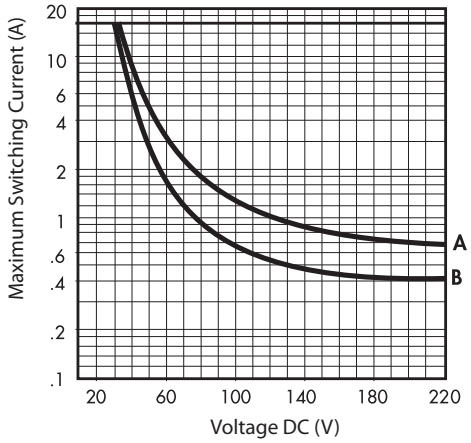
Attribute		700-HB				
Electrical Ratings						
Pilot Duty Rating [1]		NEMA B300				
Rated Thermal Current (I_{th})		15 A – 120V, 240V				
Rated Insulation Voltage (U_i)		250V IEC-300V UL/CSA				
Contacts	Inductive	**Make**		**Break**		**Hp**
		►][◄		◄][►		
		2 -Pole	3 -Pole	2 -Pole	3 -Pole	
	120V AC	60 A	30 A	6 A	3 A	3/4
	240V AC	30 A	15 A	3 A	1.5 A	2
	General-purpose	15 A, 240V AC				
	Resistive	15 A, 30V DC				
Min. Low Energy Permissible Load		1000 mW (10V, 10 mA)				
Permissible Coil Voltage Variation		80…110% of Nominal Voltage at 50 Hz				
		80…110% of Nominal Voltage at 60 Hz				
		80…110% of Nominal Voltage at DC				
Coil Consumption ±10%	AC Coils	**50 Hz**		**60 Hz**		
	Inrush	3.3VA		2.85VA		
	Sealed	2.2VA		1.9VA		
	DC Coils	1.3 W				
Max. Allowable Leakage		25% of VA				
		10% of W				
Max. Contact Resistance		50 MΩ				
Design Specification/Test Requirements						
Dielectric Withstand Voltage						
Pole-to-Pole		2500V				
Contact to Coil		4000V				
Mechanical						
Degree of Protection (Open Type) IEC 529		IP 40				
Mechanical lifecycles (AC/DC)		> 10 x 10^6/30 x 10^6				
Switching Frequency Operations		3600/HR				
Coil Voltages		See Overview/Product Selection				
Operating Time (ms)	Pickup	20 ms				
	Dropout	4 ms				
Maximum Operating Rate		4 Ops/s				
Vibration	Endurance	5 G				
	Operational	1.5 G				
Shock	Endurance	50 G				
	Operational	15 G				
Environmental						
Temperature	Operating	AC/DC		–40…+70 °C (–40…+158 °F)		
	Storage	AC/DC		–40…+100 °C (–40…+212 °F)		
Altitude		2000 m (6560 ft)				
Construction						
Insulating Material		Molded High Dielectric Material				
Enclosure		Transparent Dust Cover				
Contact Material		AgCdO				
Terminal Markings on Socket		In accordance with EN50 0005				
Sockets		700-HN153, -HN154				
Certifications		cURus Recognized (File No. E3125, Guide NLDX2/NLDX8), cULus Listed when used with 700-HN sockets noted				
Standards		UL508, CSA C22.2 No. 14, EN 61810-1				

(1) See NEMA Ratings and Test Values on page 5.

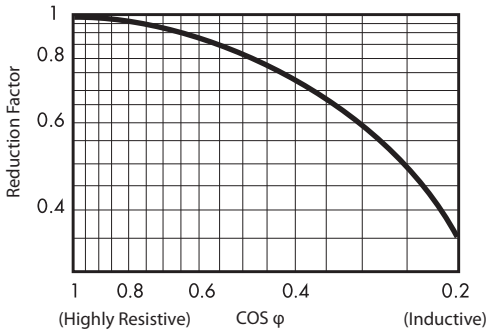
Technical Data - 700-HB Relays



Contact life versus AC1 load at 600 cycles/h.



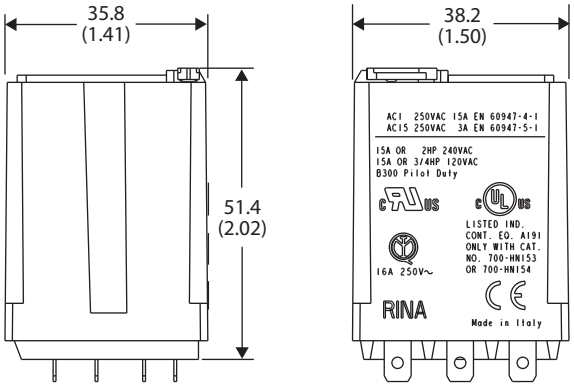
Breaking capacity for DC1 load at 600 cycles/h.
Load applied to one contact.
A = for N.O. types
B= other types



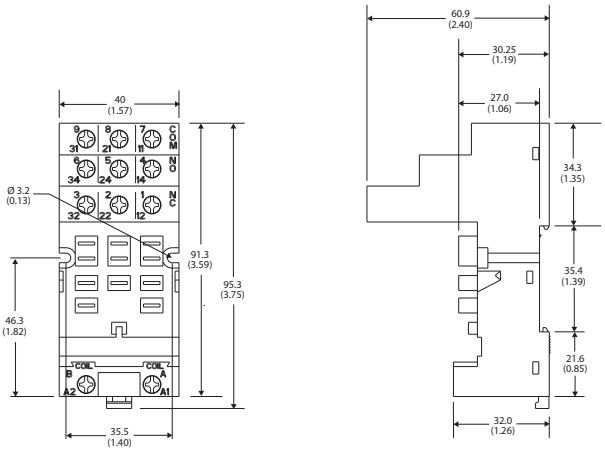
Load Reduction factor versus cos φ

Dimensions - 700-HB Relays

Approximate Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.

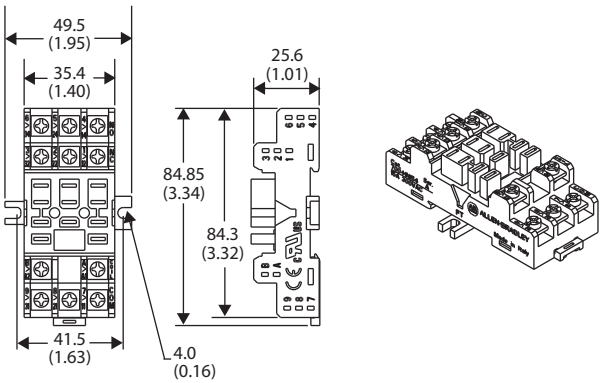


700-HB Relay



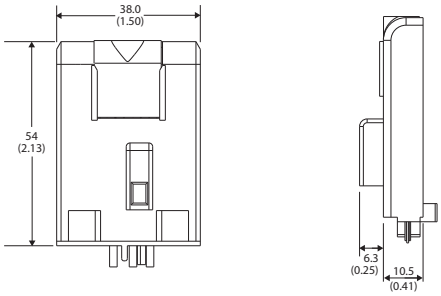
Cat. No. 700-HN153

Wire Size: 2 x 2.5 mm^2
Single Wire – Up to #12 AWG
Double Wire – 2 x 2.5 mm^2 (14 AWG… 20 AWG), Qty. 2 wires
(Either Solid or Stranded)
Strip Length: 9 mm (3/8 in.) – Torque: 0.8 N•m (7 lb•in)



Cat. No. 700-HN154

Wire Size: 2 x 2.5 mm^2
Single Wire – Up to #12 AWG
Double Wire – 2 x 2.5 mm^2 (14 AWG… 20 AWG), Qty. 2 wires
(Either Solid or Stranded)
Strip Length: 9 mm (3/8 in.) – Torque: 0.8 N•m (7 lb•in)



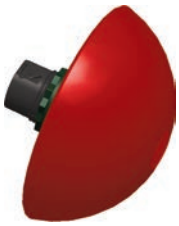
Cat. No. 700-HT3

Wire Size: 2 x 1.5 mm^2 (#2 – 16 AWG…#1–20 AWG)
(Either Solid or Stranded)
Strip Length: 9 mm (3/8 in.) – Torque: 0.8 N•m (7 lb•in)

2-Position Push-Pull Operators, Non-Illuminated — Twist-to-Release (Trigger Action), Push-Pull (Trigger Action)★♠

40 mm Trigger Action
Twist-to-Release Mushroom
Cat. No. 800FP-MT44

40 mm Trigger Action
Push-Pull Mushroom
Cat. No. 800FP-MP44



90 mm Half-Dome
Cat. No. 800FP-MP94

800F P – MT4 4 ____
a b c d

a

Operator Construction	
Code	Description
P	Round plastic operator (IP66, Type 4/4X/13)
M	Round metal operator (IP66, Type 4/13)

b

Operator Type	
Push, Twist-to-Release♦	
Code	Type
MT3	30 mm color cap
MT4	40 mm color cap
MT6	60 mm color cap
Push-Pull∇	
Code	Type
MP4	40 mm color cap
Half-Dome Push-Pull∇	
Code	Type
MP9	90 mm color cap‡

c

Color Cap	
Code	Color
2	Black
3	Green
4	Red
5	Yellow
6	Blue

d§♣Δ

Engraving	
Code	Description
Blank	No engraving on cap
LE	EMO laser engraved
E	EMO printed

★ All emergency stop operators are EN ISO 13850 compliant with standard NC, NCLB, or self-monitoring contact blocks.
♠ E-Stop operators, latch, and contact block combinations have been third-party tested for B10d values. B10d values can be found in publication SAFETY-SR001_-EN-E.
♦ Only available with red color cap.
§ For EMO guards, consult your local Rockwell Automation sales office or Allen-Bradley distributor.
♣ Only available on 40 mm color cap.
Δ Only available on red, 40 mm push, twist-to-release operator type (MT44).
‡ Half-dome operators only available with black, red, and yellow color caps.
∇ Limit of four contact blocks max. for these devices.

Specifications

Front-of-Panel (Operators)★

Description		Plastic (Bulletin 800FP)	Metal (Bulletin 800FM)
Mechanical Ratings			
Vibration (assembled to panel)		Tested at 10…2000 Hz, 1.52 mm displacement (peak-to-peak) max./10 G max. for 3 hr duration, no damage	
Shock		Tested at 1/2 cycle sine wave for 11 ms; no damage at 100 G	
Degree of protection‡		IP65/66 (Type 3/3R/4/4X/12/13)	IP65/66 (Type 3/3R/4/12/13)
Mechanical durability per EN 60947-5-1 (Annex C)	10 000 000 Cycles	Momentary push buttons, momentary mushroom	
	1 000 000 Cycles	Multi-function, selector switch, key selector switch, selector jog, SensEject™ key selector switch	
	500 000 Cycles	Non-illuminated push-pull E-stop§	
	300 000 Cycles	Twist-to-release E-stop, illuminated push-pull E-stop§, alternate action push buttons	
	100 000 Cycles	Potentiometer, toggle switch	
Operating forces (typical with one contact block)		Flush/extended = 5 N, E-stop = 36 N Mushroom = 9 N	
Operating torque (typical application with one contact block)		Selector switch = 0.25 N•m (2.2 lb•in)	
Mounting torque	Plastic	1.7 N•m (15 lb•in)	
	Metal	4.4 N•m (40 lb•in)	
Environmental			
Temperature range (operating)		-25…+70 °C (-13…+158 °F)♣	
Temperature range (short term storage)		-40…+85 °C (-40…+185 °F)	
Humidity		50…95% RH from 25…60 °C (77…140 °F)	

★ **Performance Data** — Performance data given in this publication is provided only as a guide for the user in determining suitability and do not constitute a performance warranty of any kind. Such data may represent the results of accelerated testing at elevated stress levels, and the user is responsible for correlating the data to actual application requirements. ALL WARRANTIES AS TO ACTUAL PERFORMANCE, WHETHER EXPRESS OR IMPLIED, ARE EXPRESSLY DISCLAIMED.

‡ Momentary mushroom operators are IP65. Plastic keyed operators are IP66, Type 4/13; not Type 4X.

§ Limit of four contact blocks max. for these devices.

♣ Operating temperatures below 0 °C (32 °F) are based on the absence of freezing moisture and liquids, UL Recognized to 55 °C (131 °F) - Incandescent module max. 40 °C (104 °F).

Standards Compliance and Certifications

Certifications	UR/UL, CSA, CCC, CE
Standards Compliance — CE Marked	NEMA ICS-5; UL 508, EN ISO 13850, EN 60947-1, EN 60947-5-1, EN 60947-5-5
Terminal Identification	EN/IEC 60947-1
Shipping Approvals	ABS
RoHS	✓

Back-of-Panel Components★

Electrical Ratings				
Standard contact block ratings		**Screw Termination**	**Spring Clamp Termination**	
		A600, Q600 600V AC	A300, Q300 300V AC	
		AC 15, DC 13 to IEC/EN 60947-5-1 and UL 508, 17V, 5 mA min.		
Low voltage contact block ratings‡		5V, 1 mA DC min. C300, R150, AC 15, DC 13 to EN 60947-5-1 and UL 508		
	Nominal Voltage	**Range**	**Current Draw**	**Frequency**
LED Module Ratings	24…120V AC/DC 24V AC 24V DC 120V AC 240V AC	20…132V AC/DC 10…29V AC 10…30V DC 102…132V AC 204…264V AC	15 mA (AC), 12 mA (DC) 31 mA 24 mA 6 mA 6 mA	50/60 Hz, DC 50/60 Hz DC 50/60 Hz 50/60 Hz
Thermal current		10 A max. enclosed (40 °C ambient) to UL508, EN 60947-5-1		
Insulation voltage (U_i)		Screw terminal = 690V, spring-clamp = 300V		
Wire capacity (screw terminal)§		#18…12 AWG (0.75…2.5 mm^2) Max. (2) #14 AWG or (1) #12 AWG		
Wire capacity (spring-clamp terminal)		#18…14 AWG (0.75…1.5 mm^2) One per spring clamp, two spring clamps per terminal		
Recommended tightening torque on screw terminals		0.7…0.9 N•m (6…8 lb•in)		
Dielectric strength (minimum)		2500V for one minute		
External short circuit protection	Standard blocks	10 A type gL/gG cartridge fuse to EN 60269-2-1 or gN (Class J to UL 248-8 or Class C to UL 248-4)		
	Low voltage contact blocks	6 A type gL/gG cartridge fuse to EN 60269-2-1 or gN (Class J to UL 248-8 or Class C to UL 248-4)		
Electrical shock protection		Finger-safe conforming to IP2X		
Mechanical Ratings				
Vibration (assembled to panel)		Tested at 10…2000 Hz, 1.52 mm displacement (peak-to-peak) max./10 G max. 6 hr		
Shock		Tested at 1/2 cycle sine wave for 11 ms and no damage at 100 G max.		
Contact durability per EN 60947-5-1 (Annex C)		10 000 000 cycles		
Contact operation	N.O.	Slow double make and break		
	N.C. & S.M.C.B.	Slow double make and break — positive opening ⊖		
	N.O.E.M.	Double break / double make, early make		
	N.C.L.B.	Double break / double make, late break — positive opening ⊖		
	N.C.E.B.	Double break / double make, early break — positive opening ⊖		
Push button travel to change electrical state		N.C. and N.O.E.M.	1.5 mm (0.060 in.)	
		N.O. and N.C.L.B.	2.5 mm (0.1 in.)	
Operating forces (typical)	Single circuit contact block	3.4 N		
	Dual circuit contact block	5…6.5 N		
Illumination				
LED Dominant Wavelength	Green Red White	525 nm 629 nm —		
LED Luminous Intensity	Green Red White	780 mcd 780 mcd 360 mcd		
Incandescent maximum wattage		2.6 W		
Materials				
Springs		Stainless steel and zinc coated music wire		
Electrical contacts	Standard	Silver-nickel		
	Low voltage	Gold-plated over silver		
Terminals	Screw	Brass		
	Spring-clamp	Silver-plated brass		

★ Performance Data — see note on page 3.
‡ Low voltage contacts are recommended for applications below 17V, 5 mA.
§ Wires less than #18 AWG (0.75 mm^2) may not hold in terminal securely.

Back-of-Panel Components, Continued

Other

	Description	Pkg. Quantity	Cat. No.
 *Cat. No. 800F-ALM*	**Metal Mounting Latch** These are zinc-plated, metal die cast mounting latches. **Note:** Sold only in multiples of 10. Order (quantity of) 10 to receive one package of 10 pieces.	10	**800F-ALM**
	Note: Sold only in multiples of 100. Order (quantity of) 100 to receive one package of 100 pieces.	100	**800F-ALM-BP**
 *Cat. No. 800F-ALP*	**Plastic Mounting Latch** **Note:** Sold only in multiples of 10. Order (quantity of) 10 to receive one package of 10 pieces.	10	**800F-ALP**
	Note: Sold only in multiples of 100. Order (quantity of) 100 to receive one package of 100 pieces.	100	**800F-ALP-BP**

	Description	Contact Type	Pkg. Quantity	Cat. No.
 *Cat. No. 800F-X10*	**Contact Block** **Note:** Sold only in multiples of 10. Order (quantity of) 10 to receive one package of 10 pieces. Latch not included.	N.O.	10	**800F-X10**
		N.C.		**800F-X01**
		N.O. low voltage — QuadCONNECT™		**800F-X10V**
		N.C. low voltage — QuadCONNECT™		**800F-X01V**
		N.O.L.M.		♣ **800F-X10N**
		N.O.E.M.		**800F-X10E**
		N.O.E.E.M.		➢ 800F-X10M
		N.C.L.B.		**800F-X01L**
		N.C.E.B.		✶ **800F-X01B**
		Self-Monitoring		❄ **800F-X01S**
		Dual circuit of 2 N.O.		❄ **800F-X20D**
		Dual circuit of 2 N.C.		❄ **800F-X02D**
		Dual circuit of 1 N.O.-1 N.C.		❄ **800F-X11D**
		N.O. with stab terminals		800F-X10T
		N.C. with stab terminals		800F-X01T
		N.O. spring-clamp		**800F-Q10**
		N.C. spring-clamp		**800F-Q01**
		N.O. spring-clamp low-voltage — QuadConnect™		**800F-Q10V**
		N.C. spring-clamp low-voltage — QuadConnect™		**800F-Q01V**
		N.O.E.M. spring-clamp		**800F-Q10E**
		N.C.L.B. spring clamp		**800F-Q01L**
		N.C.E.B. spring-clamp		✶ **800F-Q01B**
		Ring lug N.O.		‡§ **800F-R10**
		Ring lug N.C.		‡§ **800F-R01**
	Note: Sold only in multiples of 100. Order (quantity of) 100 to receive one package of 100 pieces. Latch not included.	N.O.	100	**800F-X10-BP**
		N.C.		**800F-X01-BP**

♣ For use with **Cat. No. 800FP-CB_** and **Cat. No. 800FP-CC_** operators.
➢ For use with **Cat. No. 800FP-CC_** operators.
✶ Only for use with 4-position selector switch, 4-position toggle switch, or 3-position push-pull operator.
❄ Cannot stack.
‡ Cannot be used in a composite catalog number.
§ Replacement screws are available (Cat. No. 800F-ARS1)

2-Position Push-Pull and Push-Pull/Twist Release Devices, Non-Illuminated

Note: A jumbo or large legend plate is recommended, if space allows.

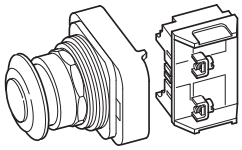
2-Position Push-Pull
Cat. No. 800T-FX6D4

2-Position Metal Push-Pull
Cat. No. 800TC-FXLE6D4S

2-Position Push-Pull / Twist
Cat. No. 800T-FXT6D4

2-Position Push-Pull / Twist
Cat. No. 800H-FRXT6D4

800 T – FX 1 A1
a b c d e



a

Protection Rating	
Code	Description
T	Metal, Type 4/13
H	Plastic, Type 4/4X/13

b

Finger-Safe Guards	
Code	Description
Blank	No guards
C	Guards on terminals

c

Head Type §		
800T Type 4/13 Code	Description	800H Type 4/4X/13 Code
FX	Mushroom head (push-pull)	—
FXC	90 mm anodized aluminum head (push-pull)	—
FXJ	Jumbo mushroom head (push-pull)	—
FXJE	Jumbo mushroom head (push-pull) with "E-Stop"	—
FXL	63 mm anodized aluminum head (push-pull)	—
FXLE	63 mm anodized aluminum head (push-pull) with "E-Stop"	—
FXT	Push-pull/twist-to-release	FRXT
FXJT	Jumbo head push-pull with twist-to-release	FRXJT

d

Color Cap	
Code	Color
Blank	No cap ♣
1	Green
2	Black
3	Orange
4	Grey
5	White
6	Red
7	Blue
9	Yellow

e

Contact Block(s)			
Code	Operator Position Out	Operator Position In	Description
Blank	—	—	No contacts on operator
Standard			
D1	O	X	1 N.O.
D2	X	O	1 N.C.
D4	X	O	1 N.C.L.B.★
A	O X	X O	1 N.O. - 1 N.C.
A1	O X	X O	1 N.O. - 1 N.C.L.B.★
A5	X X	O O	2 N.C.L.B. ∇★

A4 2 N.C.

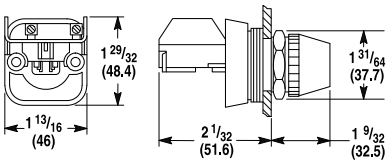
e (cont'd)

Contact Block(s)			
Code	Operator Position Out	Operator Position In	Description
Blank	—	—	No contacts
Pen*TUFF* (Low Voltage)			
D1V	O	X	1 N.O.
D2V	X	O	1 N.C.
D4V	X	O	1 N.C.L.B.
AV	O X	X O	1 N.O. - 1 N.C.
Class 1, Div. 2			
Logic Reed			
D1R	O	X	1 N.O.
D2R	X	O	1 N.C.
AR	O X	X O	1 N.O. - 1 N.C.
Sealed Switch			
D1P	O	X	1 N.O.
D2P	X	O	1 N.C.
AP	O X	X O	1 N.O. 1 N.C.
Stackable Sealed Switch			
D1Y	O	X	1 N.O.
D2Y	X	O	1 N.C.
AY	O X	X O	1 N.O. - 1 N.C.

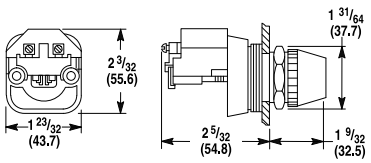
Note: X = Closed/O = Open
★ Normally closed late break contact. When button is pushed from the OUT to IN position, the mechanical detent action of the operator occurs before electrical contacts change state. When the button is pulled from the IN in the OUT position, the electrical contacts change state before the mechanical detent occurs.
§ Devices with N.C.L.B. contacts meet EN ISO 13850 and IEC 60947-5-5 standards for emergency stop applications.
♣ Not valid with head Type J or JT.
∇ Two 800T-XD4 contact blocks supplied.

Dimensions in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

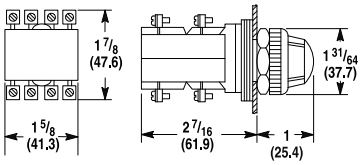
Pilot Light and Illuminated Devices (Bul. 800T Only)



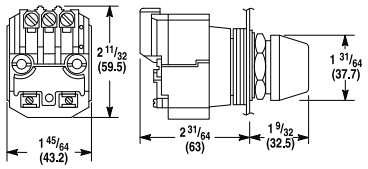
Full Voltage, Neon and Dual Input Pilot Light
Shipping Wt. 5 oz (0.14 kg)



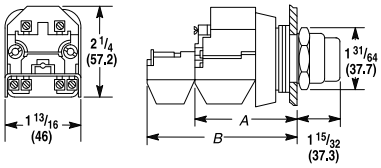
Transformer Type Pilot Light
Shipping Wt. 8 oz (0.22 kg)



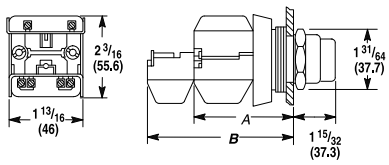
Cluster Pilot Light
Shipping Wt. 12 oz (0.34 kg)



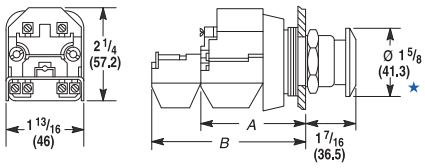
Dual Input Transformer Type Pilot Light



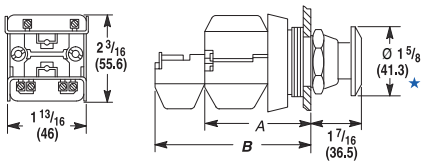
Transformer Type (Push-to-Test Pilot Light and Illuminated Push Button)



Full Voltage, Neon and Dual Input Type (Push-to-Test Pilot Light and Illuminated Push Button)



Push-Pull and Twist or Pull Release Units (Transformer Type Illuminated)



Push-Pull and Twist or Pull Release Units (Full Voltage, Neon and Dual Input Illuminated and All Non-Illuminated)

★ Jumbo mushroom versions are 2-1/4 in. (57.2 mm) diameter.

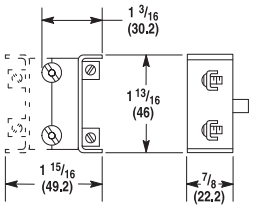
Push-to-Test Pilot Lights Illuminated Push Buttons and Illuminated Push-Pull Buttons								Non-Illuminated Push-Pull Buttons				
Cat. No. Suffix‡	Description	Transformer Type			Full Voltage or Neon Type			Cat. No. Suffix	Description	Transformer Type		
		Dim.		Ship. Wt.	Dim.		Ship. Wt.			Dim.		Ship. Wt.
D4	Transformer or Terminal Module and One Shallow Contact Block	A	2-5/32 (54.8)§	9 oz. (0.25 kg)	A	2-1/32 (51.6)	7 oz. (0.25 kg)	D4	One Shallow Contact Block	A	2-1/32 (51.6)	5 oz. (0.14 kg)
A1 and A7	Transformer or Terminal Module and One Shallow Block and One Mini Contact Block	B	2-7/8 (73)	10 oz. (0.28 kg)	B	2-7/8 (73)	8 oz. (0.22 kg)	A4 A5 A7	Two Shallow Contact Blocks	A	2-1/32 (51.6)	6 oz. (0.17 kg)
AP D1P D2P	Transformer or Terminal Module and One Sealed Switch Contact Block	A	3-1/32 (77)	10 oz. (0.28 kg)	A	2-29/32 (73.8)	8 oz. (0.22 kg)	B6	Two Shallow Blocks and Two Mini Contact Blocks	B	2-7/8 (73)	8 oz. (0.22 kg)

‡ Applies to illuminated push-pull push buttons only.

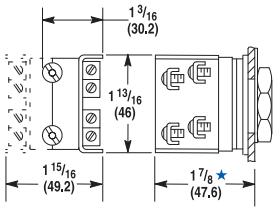
§ Dual input type pilot light dimension is 2-13/32 in. (61.1 mm).

Dimensions in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

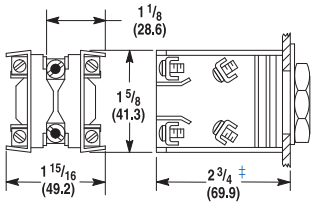
Blocks (Bul. 800T Only)



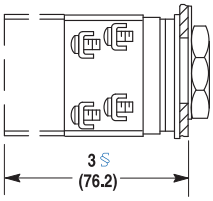
Mini Contact Block
7/8 (22.2) Deep



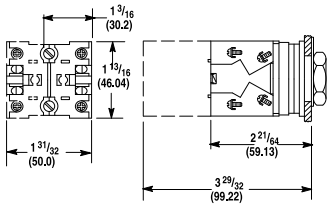
Shallow, PenTUFF,
and Logic Reed Contact Blocks
1-1/8 (28.6) Deep



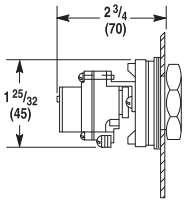
Sealed Switch Block
2 (50.8) Deep



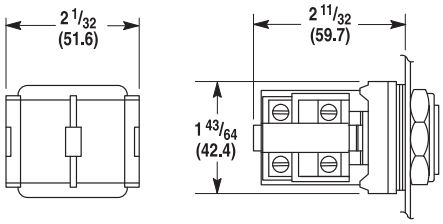
Tandem Mounting
(2 shallow contact
blocks stacked)



Stackable Sealed Switch Block
1.58 (40.1) Deep



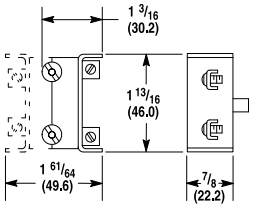
Time Delay Contact Block
(For Push Buttons Only)



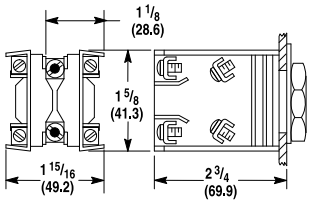
Snap Action Contact Block (For Push Button Only)

★ Dimension shown is for push buttons. Selector switch dimension is 2-1/32 in. (51.6 mm).
‡ Dimension shown is for push buttons. Selector switch dimension is 2-27/32 in. (72.2 mm).
§ Dimension shown is for push buttons. Selector switch dimension is 3-5/32 in. (80.2 mm).

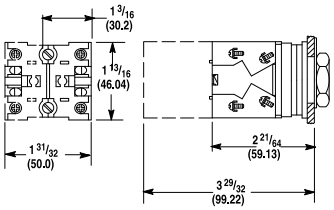
Blocks (Bul. 800H Only)



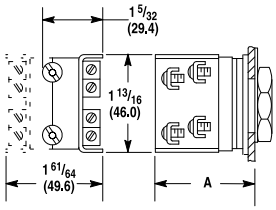
Mini Contact Block



Sealed Switch Block
2 (50.8) Deep



Stackable Sealed Switch Block
1.58 (40.1) Deep



Shallow, PenTUFF and Logic
Reed Contact Blocks

Dim.	Momentary Push Button	Maintained Push Button	Selector Switch
A	2 (50.8)	2 (50.8)	1-29/32 (48.4)

Operator Extension Behind Panel — When mounted with thrust washer, trim washer, or notched legend plate and correct number of rubber washers.

Specifications★

Electrical Ratings		
Contact ratings		Refer to the contact ratings tables on page 10-4.
Dielectric strength		2200V for one minute, 1300V for one minute (Logic Reed)
Electrical design life cycles		1,000,000 at max. rated load, 200,000 at max. rated load (Logic Reed)
Mechanical Ratings		
Vibration		10…2000 Hz, 1.52 mm displacement (peak-to-peak) max./ 10 G max. (except Logic Reed)
Shock		1/2 cycle sine wave for 11 ms ≥ 25 G (contact fragility) and no damage at 100 G
Degree of protection		Type 1/4/12/13 (800T); Type 1/4/4X/12/13 (800H); EN/IEC 60529 IP66/65
Mechanical design life cycles		
Push buttons	(Momentary, non-illuminated, flush and extended head)	10,000,000 min.
	(Momentary, illuminated)	250,000 min.
	(Push-pull/twist-to-release)	250,000 min. ‡
Selector switches	(Non-illuminated)	1,000,000 min.
	(Illuminated, key-operated)	200,000 min.
Potentiometers		25,000 min.
All other devices		200,000 min.
Contact operation		Shallow, mini, and low-voltage contact blocks: Slow, double make and break Logic Reed and sealed switch contact blocks: Single break magnetic
Wire gauge/Terminal screw torque		#18…14 AWG (#18…10 Max Duty) / 6…8 lb•in
Typical operating forces		
Operators without contact blocks		Flush, extended button, standard mushroom, jumbo plastic mushroom: 2 lbs max. Jumbo and extended aluminum mushroom head: 3.95 lbs max. Maintained selector switch: 3.6 in•lb max.
Spring return selector switches		3.6 in•lb to stop, 0.2 in•lb to return
Illuminated push buttons and push-to-test pilot lights		5 lb max.
2-position push-pull		8.0 lb max. push or pull
3-position push-pull		8 lb max. push to in position or pull to center position (15 lb max. pull to out position)
Twist-to-release or push-pull		9 lbs max. push or pull 30 in•oz max. twist, 6 in•oz minimum return
Potentiometer		Rotational torque 3…12 in•oz; stopping torque 12 in•lb (minimum)
Contact blocks	Standard	1 lb
	Logic Reed	1 lb max.
	Sealed switch	3 lb max. at 0.205 in. plunger travel
	Stackable sealed switch	1 lb max.
	MaxDuty	1.4 lb max.
	PenTUFF	1.4 lb max.
	Self Monitoring	1.6 lb
Environment		
Temperature range	Operating	-40…+131 °F (-40…+55 °C)
	Storage	-40…+185 °F (-40…+85 °C)
Note: Operating temperatures below freezing are based on the absence of moisture and liquids. Consult your local Rockwell Automation sales office or Allen-Bradley distributor for use in lower temperature applications.		
Humidity		50…95% RH from 77…140 °F (25…60 °C) per Procedure IV of MIL-STD-810C, Method 507.1 cycling test

★ **Performance Data** — Performance data given in this publication is provided only as a guide for the user in determining suitability and do not constitute a performance warranty of any kind. Such data may represent the results of accelerated testing at elevated stress levels, and the user is responsible for correlating the data to actual application requirements. ALL WARRANTIES AS TO ACTUAL PERFORMANCE, WHETHER EXPRESS OR IMPLIED, ARE EXPRESSLY DISCLAIMED.

‡ Illuminated Trigger Action E-stops are rated for 150,000 min. mechanical operations when using Cat. No. 800TC-XD4S Self-Monitoring Contact Blocks (SMCBs).

Standard Contact Ratings

Minimum: 24V, 24 mA

Maximum thermal continuous current I^{th} 10 A AC/2.5 A DC. Bulletin 800T units with 800T-XA contacts have ratings as follows:

Max. Opertnl. Volts U_e	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts U_e	Make	Break
AC 600	AC-15	A600	120…600 72…120 24…72	7200VA 60 A 60 A	720VA 720VA 10 A
DC 600	DC-13	Q600	28…600 24…28★	69VA 2.5 A	

★ For applications below 24V/24 mA, Pen*TUFF* or Logic Reed contacts are recommended.

Sealed Switch Contact Ratings

Minimum: 5V, 1 mA

Maximum continuous current I_{th} 5 A. Bulletin 800T units have control circuit ratings with sealed switch contact blocks as follows:

Max. Opertnl. Volts U_e	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts U_e	Make	Break
AC 600	AC-15	B600	120…600 0…120	3600VA 30 A	360VA 3 A
DC 300	DC-13	P300	24…300 0…24	138VA 5.0 A	

Stackable Sealed Switch Contact Ratings

Minimum: 5V, 10 mA (digital); 24V, 1 mA (analog)

Maximum continuous current I_{th} 2.5 A. Bulletin 800T units have control circuit ratings with sealed switch contact blocks as follows:

Max. Opertnl. Volts U_e	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts U_e	Make	Break
AC 300	AC-15	C300	120…300 0…120	1800VA 15 A	180VA 1.5 A
DC 150	DC-13	Q150	24…150 0…24	69VA 2.5 A	

Logic Reed Contact Ratings

Minimum — DC: 5V, 1 mA
Maximum — DC: 30V, 0.06 A, AC: 150V, 0.15 A
Should only be used with resistive loads.

Materials Used in 800H Type 4X Operators

Thermoplastic Polyester (Fiberglass Reinforced)

- Bushings
- Mounting Rings
- Sockets

Thermoplastic Polyester

- Non-illuminated button caps

Transparent Amorphous Nylon

- Pilot light lens cap
- Illuminated button caps

Glass Filled Crystalline Nylon

- Thrust washer

Mineral Filled Nylon

- Trim washer

Nitrile (Synthetic Rubber)

- Gaskets and internal seals

Pen*TUFF*™ (Low Voltage) Contact Ratings

Minimum DC: 5V, 1 mA
Maximum thermal continuous current I_{th} 2.5 A AC/1.0 A DC. Bulletin 800T units with 800T-XAV contacts have ratings as follows:

Max. Opertnl. Volts U_e	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts U_e	Make	Break
AC 300	AC-15	C300	120…300 0…120	1800VA 15 A	180VA 1.5 A
DC 150	DC-13	R150	24…150 0…24	28VA 1.0 A	

Snap Action Contact Ratings

Max. Opertnl. Volts U_e	Contact Rating Designation	Rated Operational Currents		
		Volts U_e	Make	Break
AC 300	A300	120…300 24…72	7200VA 60 A	720VA 10 A
DC 250	—	230…250 115…125	0.2 A 0.4 A	

MaxDuty Contact Rating

Maximum thermal continuous current I_{th} 24 A.
Pilot Duty — 120V AC, 12 A; 24V DC, 10 A
Motor Ratings — 120V AC, 1.5 Hp; 240V AC, 3 Hp; 24V DC, 10 A FLA/60 A LRA

Time Delay Contacts

Max. Opertnl. Volts U_e	Contact Rating Designation	Rated Operational Currents		
		Volts U_e	Make	Break
AC 120	B150	120	3600VA	360VA

Note: This device is not rated for DC applications.

Adjustment range: 0.5…15 s ± 25% I_{th} = 5 A

Standards Compliance

UL 508

CCC

Certifications

UL Listed
(File No. E14840, E10314
Guide No. NKCR, NOIV, NISD)

CSA Certified
(File No. LR1234, LR11924)

CSA C22.2, No. 14

CE Marked (EN/IEC 60947-5-1,
EN/IEC 60947-5-5,
EN ISO 13850)

Blank and Custom Legend Plates — Aluminum, Type 4/13 (800T), Continued

Specialty Legend Plates

Cat. No. 800T-X618

Cat. No. 800T-X647Y

Cat. No. 800T-X646

Type	Start/Stop Legend Plates	Emergency Stop Legend Plates		
	Grey	Yellow	Yellow (Large Size)	Yellow IEC Ring
	Cat. No.	Cat. No.	Cat. No.	Cat. No.
Push-to-Stop Pull-to-Start or Push-to-Stop Twist or Pull Release	**800T-X618**	**800T-X618Y**	**800T-X647Y**	—
Blank	—	—	**800T-X645Y**	**800T-X646**
Custom	—	—	800T-X645YE	—
Emergency Stop	—	—	—	**800T-X646EM**

Potentiometer Legend Plates

Cat. No. 800T-X609

Cat. No. 800T-X608

Type	Cat. No.
Potentiometer with graduated markings	∗ **800T-X609**
SPEED	**800T-X608**

∗ For graduated markings with a custom text, order Cat. No. 800T-X609E and specify up to two lines of text, 14 characters per line.

18 mm Legend Plates

Type A Legend Plate
Cat. No. 800T-N515

Description	Cat. No.
Blank	
Type A	**800T-N515**
Type B	**800T-N516**
With Custom Marking❄	
Type A with Text	800T-N515E
Type B with Text	800T-N516E

❄ Text must be supplied.

Custom Text Guidelines

Legend Type	Number of Lines	Maximum Number of Characters per Line
A	1	9
B	2	13

Bulletin 855E — 50 mm Control Tower Stack Lights

855E-24TL5
855E-B24SA3
855E-BVM

Light Modules

Flashing Incandescent

855E	–	10	FN	4
		a	b	c

a	
Voltage	
Code	Description
00	0…250V AC/DC (no lamp module) (1)
12	12V AC/DC
24	24V AC/DC
10	120V AC
20	240V AC

b	
Light Module Type	
Code	Description
XN	Steady no lamp (1)
DN	Steady incandescent
FN	Flashing incandescent
TL	Steady socket-mount LED
GL	Flashing socket-mount LED
BL	Strobe

c	
Lens Color	
Code	Description
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

(1) Can only be selected with module type XN, voltage code 00. Accepts socket mount incandescent lamp types only.

Sound Modules

Sound modules have continuous and pulsing tones. Maximum sound output is 103 dB at 1 m (3.3 ft). A reduced volume setting is available by changing the position of the volume DIP switch, which produces a sound output of 88 dB(A) at 1 (3.3 ft). Maximum sound output is 80 dB(A) at 1 m (3.3 ft).

Black Two-tone Sound Module

855E	–	B	10	TA3
		a	b	c

a	
Housing Color	
Code	Description
B	Black
G	Gray

b	
Voltage	
Code	Description
12	12V AC/DC
24	24V AC/DC
10	120V AC
20	240V AC

c	
Module Type	
Code	Description
SA3	Single circuit/single tone piezo style steady/pulsing DIP switch selectable
TA	Two circuit/two-tone piezo style steady/pulsing DIP switch selectable

Standard Stack Light Bases

Surface-mount Base with Cap

Vertical-mount Base with Cap


Pole-mount Bases


Quick-release Base

855E – B VM C

a b c

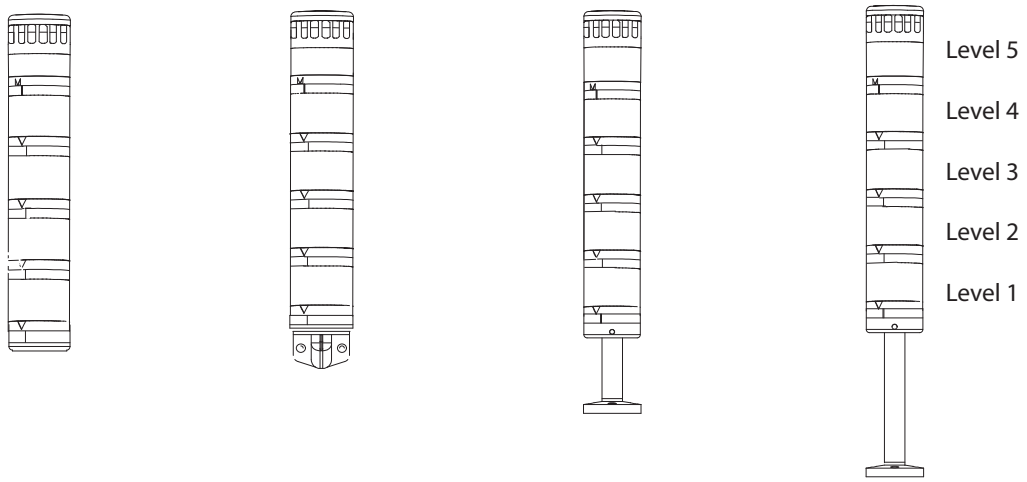
a	
Housing Color	
Code	**Description**
B	Black
G	Gray

b	
Base Type	
Code	**Description**
CB	Surface mount with 1/2 in. NPT threading
RB	Surface mount with M20 metric threading
SB	Surface mount with PG16 threading
TM	25 mm tube mount
VM	Vertical mount
PM10	10 cm aluminum pole-mount base
PM25	25 cm aluminum pole-mount base
PM40	40 cm aluminum pole-mount base
PM60	60 cm aluminum pole-mount base
PM80	80 cm aluminum pole-mount base
MM10	10 cm quick-release base
MM25	25 cm quick-release base
MM40	40 cm quick-release base

c	
Cap Option (1)	
Code	**Description**
Blank	No cap
C	Cap included

(1) Quick-release bases always include a cap.

Pre-configured Tower Lights, 1…5 Modules



Surface Mount | Vertical Mount | 10 cm Pole Mount | 25 cm Pole Mount

855	EC	–	B	10	Y	3	L	5	B	3	F	7	Y	6
	a		b	c	d	e	d	e	d	e	d	e	d	e
					(Level 1, d+e)		(Level 2, d+e)		(Level 3, d+e)		(Level 4, d+e)		(Level 5, d+e)	

a	
Base Type	
Code	**Description**
EC	Surface mount - 1/2 in. NPT threading
ES	Surface mount - PG16
EV	Vertical mount
EM	25 mm tube mount
EP	10 cm pole mount
EE	25 cm pole mount

b	
Base & Cap Color	
Code	**Description**
B	Black
G	Gray

c	
Voltage	
Code	**Description**
12	12V AC/DC
24	24V AC/DC
10	120V AC
20	240V AC

d	
Module Type	
Code	**Description**
D	Steady incandescent
F	Flashing incandescent
Y	Steady LED
L	Flashing LED
B	Strobe
P	Single-circuit piezo sound module
Q	Two-circuit piezo sound module(1)

e	
Lens Color/Sound	
Code	**Description**
1	Sound module (2)
3	Green
4	Red
5	Amber
6	Blue
7	Clear
8	Yellow

(1) If the two-circuit sound module (option Q in Table d) is selected, the maximum number of light modules that are allowed is three.
(2) Sound module option can only be selected with Module Type option P or Q in Table d. They must be located in the top position of the stack.

Specifications (Bulletin 855E)

Table 62 - Mechanical

Standard Bases		Based on the weight and style of mounting; tower lights are subject to damage from shock and vibration. Listed below are reference guidelines for maximum acceptable conditions.	
		Shock [G]	Vibration [G]
Surface Mount Base or 10 cm Aluminum Pole Base	1 module stack	150	5
	3 module stack	45	1.5
	5 module stack	35	0.75
Vertical Base or 25 cm Aluminum Pole Base	1 module stack	95	3.5
	3 module stack	30	1.25
	5 module stack	20	0.5
Recommended Wire Sizes		0.5…1.5 mm^2 (22…16 AWG)	
Recommended Terminal Torque		0.87 N•m (7 lb•in)	

Table 63 - Environmental

Attribute		Value
Ingress Ratings	Light Modules with Cap	IP66/UL Type 4/4X/13
	Sound Modules	IP66/UL Type 4/4X/13
	Surface, Vertical, Tube Mount Bases	IP66/UL Type 4/4X/13
	Pole Mount Bases	IP66/UL Type 4/4X/13
	Flange-style Base with M12 Micro Connector(1)	IP66/UL Type 4/4X/13
Temperature Ranges	Operating	-25…+50 °C (-13…+122 °F)
	Storage	-40…+85 °C (-40…+185 °F)

(1) UL Type 1 when used with Cat. No. 855T-AVM mounting bracket.

Table 64 - Materials

Part	Material
Bases, Caps, Lens Covers, Sound Module Housings, Lenses	Polycarbonate
Lamp Socket	Polycarbonate
Rubber Seals and Gaskets	Nitrile rubber
Pole (for aluminum pole assembly)	Aluminum
Pole Base Footing (for aluminum pole base)	Polycarbonate
Insulation Sleeve (for pole insulation)	Polyolefin
Mounting Screw Washers	Polypropylene

Table 65 - Light Output

Device		Light Output			
		12V AC/DC	24V AC/DC	120V AC	240V AC
Steady Incandescent		0.5 MSCP 6.3 Lumens	2.5 MSCP 31.4 Lumens	3.0 MSCP 37.7 Lumens	0.49 MSCP 6.2 Lumens
Flashing Incandescent					
Strobe		1 J per lamp			
Steady, Flashing Socket Mount LED	Red	900…2240 mcd			
	Green	900…1800 mcd			
	Amber	1400…3550 mcd			
	Blue	224…560 mcd			
	White and Yellow	900…1800 mcd			

Table 66 - Operating Voltage

Device	Operating Voltage			
	12V AC/DC	24V AC/DC	120V AC	240V AC
Light modules and sound modules	12V AC/DC (±10%)	24V AC/DC (±10%)	110V AC, 50 Hz (±10%) 120V AC, 60 Hz (±10%)	230V AC, 50 (±10%) 240V AC, 60 (±10%)

Table 67 - Lamp Life Ratings (Design Life) Average Life Under Static, No Vibration, Conditions

Device	Lamp Life Rating			
	12V AC/DC	24V AC/DC	120V AC	240V AC
Incandescent Modules[1] [2]	8000 hr	7000 hr	3000 hr	1600 hr
LED Modules	100,000 hr			
Strobe Modules	15,000 hr			
Sound modules	20,000 hr			

(1) First failures at about 35% of average life. Severe vibration can reduce life to 44% of average life.
(2) Flashing applications can reduce life to 50% of average life.

Table 68 - Current Consumption

Device		Current Consumption [mA]		
		24V AC/DC	120V AC	240V AC
Light only modules	Steady LED	22 (red, amber, and yellow) 33 (green, blue, and white)	30 (red, amber, and yellow) 29 (green, blue, and white)	
	Flashing LED	28 (red, amber, and yellow) 36 (green, blue, and white)	30 (red, amber, and yellow) 29 (green, blue, and white)	
	Strobe LED	35 (red, amber, and yellow) 65 (green, blue, and white)	10	
Sound modules	Single-tone	65	31	32

Table 69 - Flashing and Tone Frequency

Attribute	Value
Flashing Frequency (Light Only Modules)	
Flashing Incandescent Modules	12V module approximately 1.5 Hz 24V, 120V, and 240V modules approximately 2 Hz Time ON/Time OFF = 1:1
Flashing LED Modules	Approximately 1.5 Hz; Time On/Time OFF = 1:1
LED Strobe Modules	Approximately 2 Hz (flash duration 1/50,000 second)
Flashing and Tone Frequency (Light Modules/with Sound Set at Continuous Tone)	
Tone Frequency	Tone frequency is preset at 2800 Hz
Flashing and Tone Pulsing Frequencies (Light Modules/with Sound Set at Pulsing Tone)	
Tone Frequency	Tone frequency is preset at 2800 Hz

Table 70 - Decibel Rating (Sound Modules) [1]

Device	Decibel Rating
Single-tone Sound Module (SA3)	Maximum volume ranges from 88 dB(A) or 103 dB(A) (volume adjustable by DIP switch)
Two-tone Sound Module (TA3)	

(1) All dB(A) ratings are determined at a distance of 1 m (3.3 ft) from the sound module.

Table 71 - Leakage Current Impact

All light and sound modules can absorb up to 3 mA of leakage current from solid-state outputs without module activation.

Standards Compliance

- UL 508
- CSA C22.2 No. 14
- EN/IEC 60947-1
- EN/IEC 60947-5-1

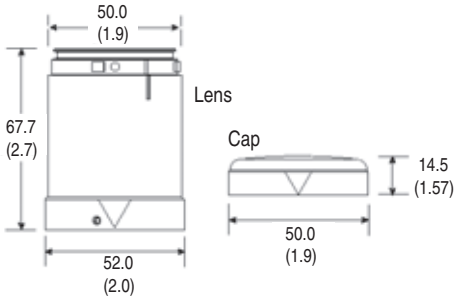
Certifications

- cULus Listed (File No. E14840, Guides NKCR, NKCR7)
- CE Marked

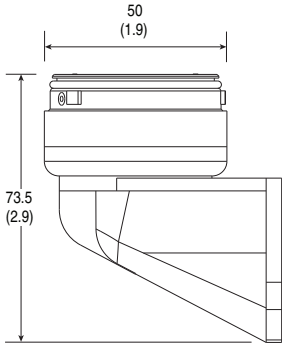
Approximate Dimensions (Bulletin 855E)

Dimensions in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

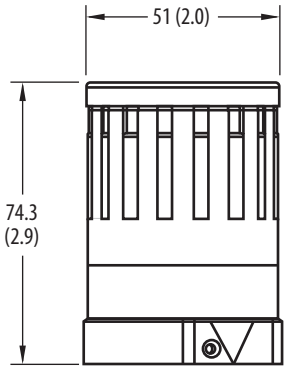
Light Modules



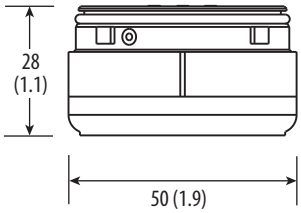
Vertical Mount Base



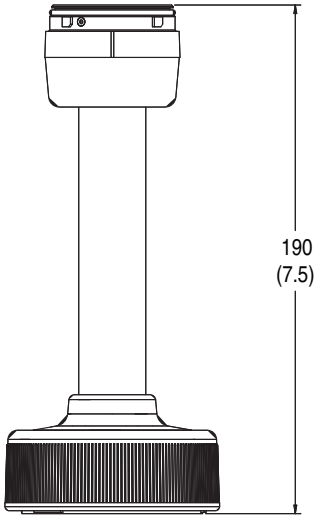
Sound Module



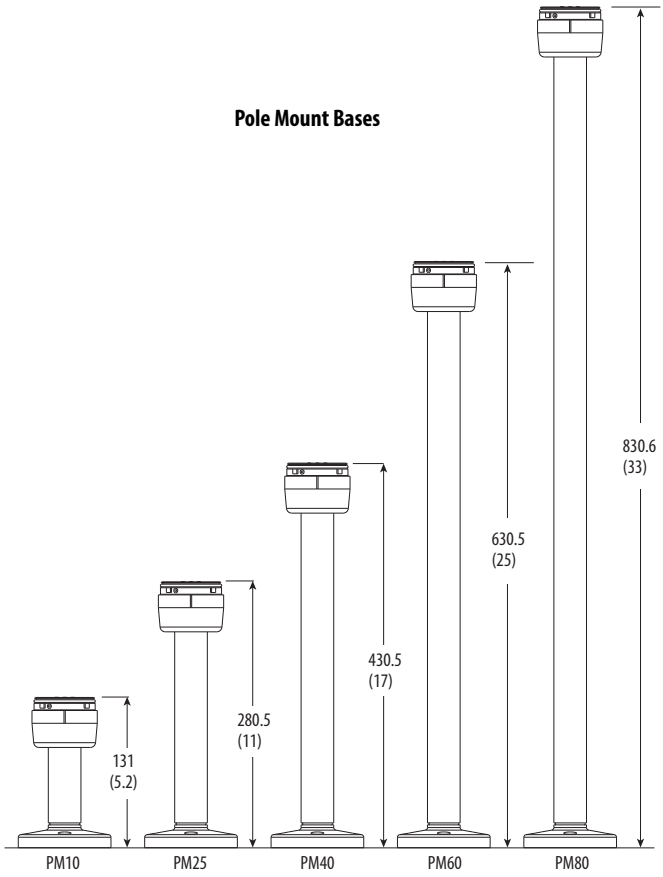
Surface Mount Base



Quick Release Base



Pole Mount Bases



Bulletin 1492 DIN Rail Receptacle

Advantages

- Quick to snap on 35 mm DIN rail and easy to wire
- Available with ground fault current interrupt (GFCI) or standard duplex outlets
- Feature of visual indication of power included with GFCI receptacle

1492-REC15G
GFCI Receptacle

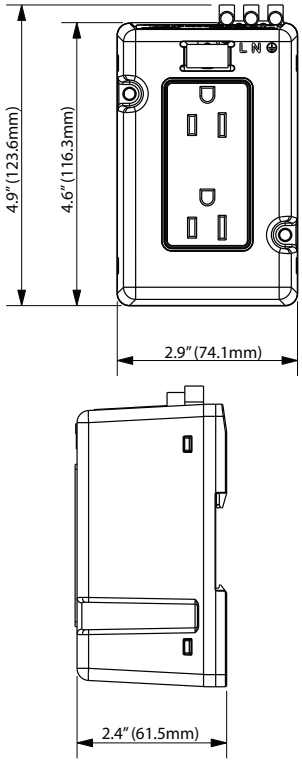
1492-REC15
Standard Duplex Receptacle

Overview

The Bulletin 1492 DIN rail receptacle is an enclosed 15 Amp power outlet. It is a convenient power source for portable computers or test devices for in-the-panel troubleshooting.

Technical Specifications for the DIN Rail Receptacle		
	1492-REC15	1492-REC15G
Mechanical Ratings		
	15 Amp Duplex	15 Amp GFCI
Operating Temperatures	-13°F to 140°F (-25°C to 60°C)	
Storage Temperatures, Short Term	-31°F to 176°F (-35°C to 80°C)	
Terminal Wire Sizes	#20 - #10 AWG solid or stranded	
Terminal Torque	7 lb.-in. (.79 Nm)	
Electrical Ratings		
Device Ratings	15 Amp, 125V	15 Amp, 125V
Operating Frequency	50 - 60 Hz	
Dielectric Voltage	Withstands 2000V per UL498	Withstands 1500V per UL498
Current Interrupting	N/A	10 kA
Trip Level	N/A	5±1 mA
Material Listing		
Enclosure Cover, Flammability	PBT/polycarbonate blend, UL94 rating V0 @ .63mm	
Enclosure Base, Flammability	Polyamide 6/6 30% GF, UL94 rating V0 @ .63mm	
Spring	Stainless Steel	
Standards and Certifications		
	UL 508A (file # E54866)	
	cULus	
	UL498	UL 498, UL 943
	NEMA WD-6	
	NEMA 5-15R	

Dimensions



	Cat. No.	Pkg. Qty.
Marking Systems Marker Card:	1492-MS10x17 (40/card)	5

LISTEN. THINK. SOLVE.®

Allen-Bradley • Rockwell Software

Rockwell Automation

Publication 1492-PP023A-EN-E – February 2009

Technical Data

Original Instructions

Allen-Bradley by ROCKWELL AUTOMATION

5069-IB16
5069-OB16
5069-IF8
5069-IY4
5069-RTB18-SPRING
5069-RTB64-SPRING

Compact 5000 I/O Modules and EtherNet/IP Adapters

Catalog Numbers

Digital I/O Modules	5069-IA16, 5069-IB16, 5069-IB16F, 5069-IB16K, 5069-IB6F-3W, 5069-OA16, 5069-OB8, 5069-OB16, 5069-OB16F, 5069-OB16K, 5069-OW4I, 5069-OW16, 5069-OX4I
Analog I/O Modules	5069-IF8, 5069-IY4, 5069-IY4K, 5069-OF4, 5069-OF4K, 5069-OF8
High-speed Counter Module	5069-HSC2xOB4
Safety I/O Modules	5069-IB8S, 5069-IB8SK, 5069-OBV8S, 5069-OBV8SK
Serial Module	5069-SERIAL
Field Potential Distributor	5069-FPD
Address Reserve Module	5069-ARM
EtherNet/IP Adapters	5069-AENTR, 5069-AENTRK, 5069-AEN2TR

The Compact 5000™ I/O architecture provides a wide range of input and output modules to span many applications, from high-speed digital to process control. The architecture uses Producer/Consumer technology that allows input information and output status to be shared among multiple Logix 5000™ controllers.

Compact 5000 I/O modules are used as local I/O modules in CompactLogix™ 5380 and Compact GuardLogix® 5380 controller systems or as remote I/O modules with CompactLogix 5380, Compact GuardLogix 5380 controllers, and some other Logix 5000 controllers. The modules are configured with the Studio 5000 Logix Designer® application.

The I/O modules require a removable terminal block (RTB) to connect field-side wiring. RTBs are not included with the I/O modules. You must order RTBs separately.

Summary of Changes

The publication was revised for the following changes:

- The 5069-IF8 module specifications were updated to indicate the following.

Common mode voltage (channel to channel)	±10V (Current mode and 3-wire RTD mode) ±2V (Voltage mode)

See page 54.

- The 5069-IY4 and 5069-IY4K module specifications were updated to indicate the following:

Common mode voltage (channel to channel)	±10V (Current mode and 3-wire RTD mode) ±2V (Voltage mode)

See page 66.

Power Compact 5000 I/O Modules

There are different types of power that are used with Compact 5000 I/O modules.

Power Type	Description	Related Specifications	
		Name	Description
Module (MOD) Power	System-side power that is used to operate a local or remote system. Power passes across a MOD Power bus. Modules draw current from the bus and pass the remaining current to the next module.	MOD Power	Level of MOD Power current that the module draws from the MOD Power bus
		MOD Power Passthrough, max	Maximum level of MOD Power current that the module can pass to the next module.
Sensor/ Actuator (SA) Power	Field-side power that some modules uses to power field-side devices. Power passes across an SA Power bus. Some modules draw current from the bus and pass the remaining current to the next module. Other modules do not draw current from the bus but do pass the current to the next module. You use 5069-FPD field potential distributors to establish new SA Power buses in a system. **IMPORTANT**: Remember the following: • If the system includes DC type modules and AC type modules, you must use a field potential distributor to install them on separate SA Power buses. • You cannot install AC type modules directly next to a Compact GuardLogix 5380 controller. You must first install a field potential distributor.	SA Power	Level of SA Power current that the module draws from the SA Power bus
		SA Power Passthrough, max	Maximum level of SA Power current that the module can pass to the next module.
Local Actuator (LA) Power	Field-side power that some Compact 5000 I/O modules use instead of SA power. Modules that use LA power **do not use SA power**. They only pass SA power to the next to the next I/O module in the system. You must install modules that use LA Power on an SA Power bus with the same module type. For example, you must install a 5069-OB8 module on an SA Power bus that includes DC type modules.	LA Power	Maximum level of LA Power current that you can apply to the module, by channel, group, or module.

For more information on MOD power, SA power, and LA power, see the user manuals listed in Additional Resources on page 137.

Digital I/O Modules

I/O Type	Cat. No.	Description	Pages
AC digital input	5069-IA16	79...264V AC 16-point, input module	4
DC digital input	5069-IB16	10...32V DC 16-point, sinking input module	9
	5069-IB16K	10...32V DC 16-point, conformal coated sinking input module	
	5069-IB16F	10...32V DC 16-point, sinking fast input module	
	5069-IB6F-3W	10...32V DC 6-point, 3-wire, sinking fast input module	14
AC digital output	5069-OA16	85...264V AC 16-point, output module	19
DC digital output	5069-OB8	10...32V DC 8-point, sourcing high-current output module	24
	069-OB16	10...32V DC 8-point, sourcing high-current output module	29
	5069-OB16K	10...32V DC 16-point, conformal coated sourcing output module	
	5069-OB16F	10...32V DC 16-point, sourcing fast output module	
Relay output	5069-OW4I	5...264V AC /125V DC 4-point, isolated normally open relay output module	35
	5069-OW16	5...264V AC/125V DC 16-point, normally open relay output module	40
	5069-OX4I	5...264V AC /125V DC 4-point, isolated normally open/normally closed relay output module	45

5069-IB16, 5069-IB16K, and 5069-IB16F Digital 16-point Sinking Input Modules

The following figure shows a wiring diagram for the 5069-IB16, 5069-IB16K, and 5069-IB16F modules.

5069-IB16, 5069-IB16K, and 5069-IB16F Wiring Diagram

Channel Connections

The example shows devices that are connected to channels 0, 3, and 6. You are not restricted to using only those channels. You can connect devices to any channel or combination of channels as needed.

SA Power

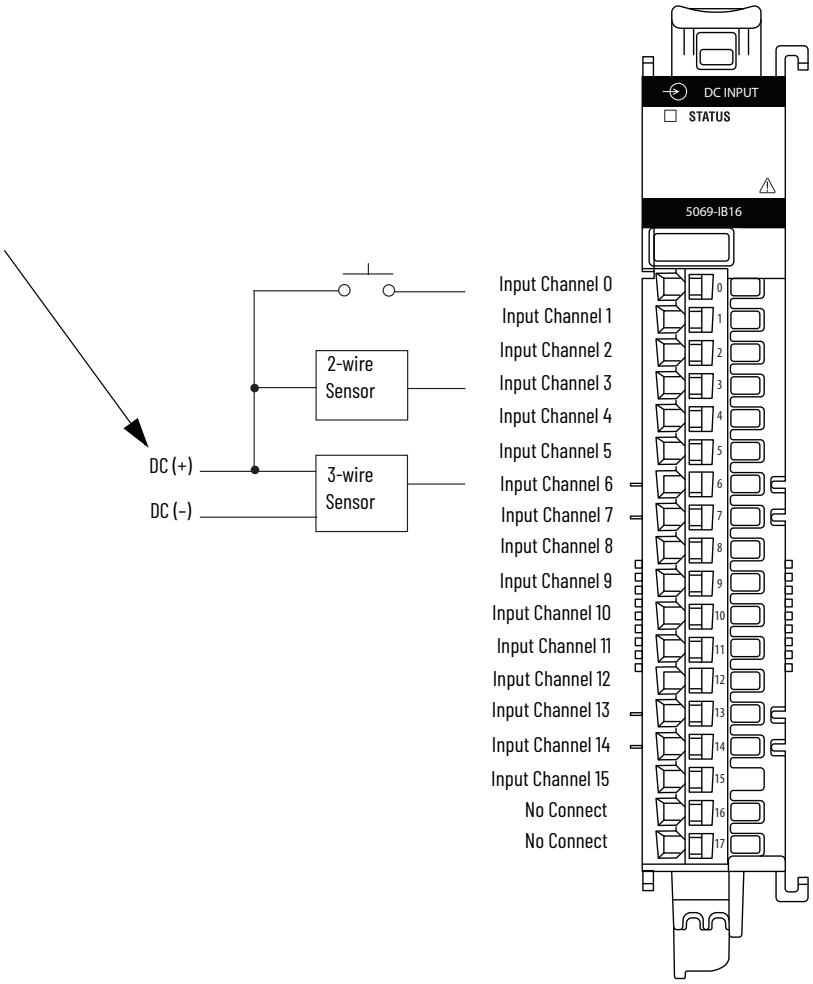
Connections to an external power supply that provides SA power via the SA Power RTB on one of the following:

- CompactLogix 5380 controller
- Compact GuardLogix 5380 controller
- CompactLogix 5480 controller
- 5069-AENTR or 5069-AEN2TR EtherNet/IP Adapter
- 5069-FPD field potential distributor

IMPORTANT: Remember the following:

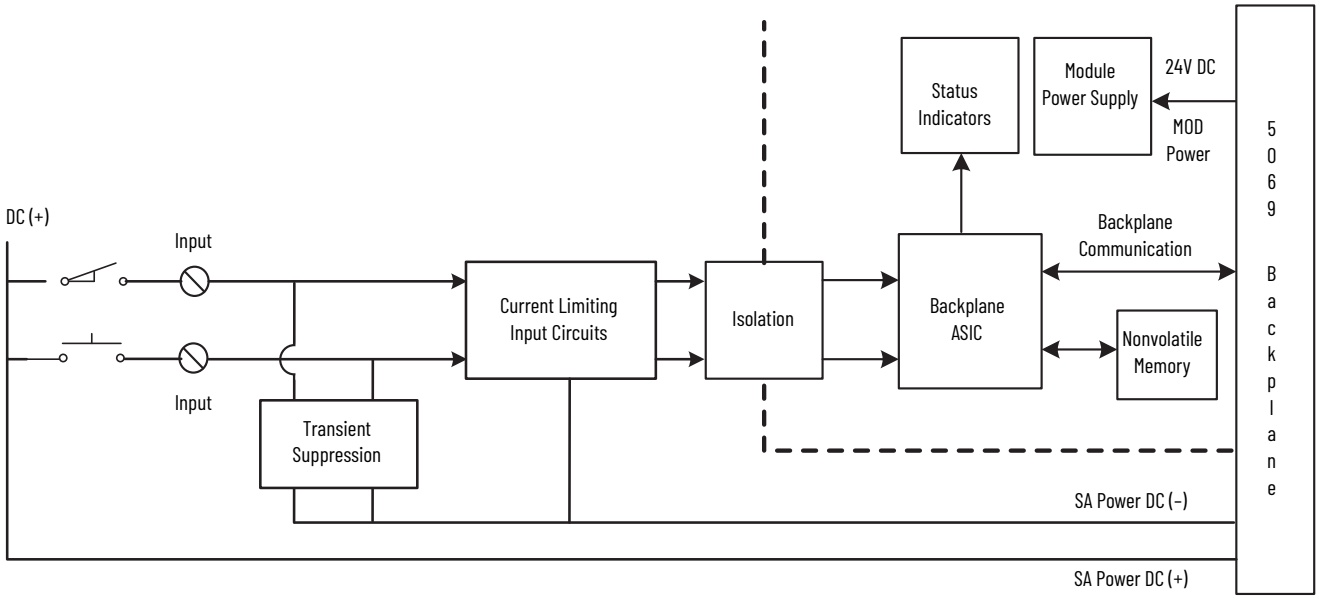
- The 5069-IB16, 5069-IB16K, and 5069-IB16F modules use DC SA power. You must connect DC power to the component, that is, controller, adapter, or field potential distributor, that provides SA Power to the modules.
- The 5069-IB16, 5069-IB16K, and 5069-IB16F module inputs use a shared common. The inputs have a return through internal module circuitry to the SA (–) terminal on the SA Power RTB.
- If you install modules in a system that use AC SA power and DC SA power, you must install them on separate SA power buses.
- You use a 5069-FPD field potential distributor to establish a new SA Power bus in a system. SA Power buses are isolated from each other. To keep the modules on separate SA Power buses, complete these steps.
  1. Install the modules that use one type of SA power, for example DC, to the right of the adapter or controller, that is, the first SA Power bus.
  2. Install the 5069-FPD field potential distributor to establish a second SA Power bus.
  3. Install the modules that use the other type of SA power, for example AC, on the second SA Power bus.

IMPORTANT: The 5069-IB16K and 5069-IB16K modules are wired the same as the wiring diagram that is shown for the 5069-IB16 module.



The following figure shows a functional block diagram for the 5069-IB16, 5069-IB16K, and 5069-IB16F modules.

5069-IB16, 5069-IB16K, and 5069-IB16F Functional Block Diagram



Technical Specifications - 5069-IB16, 5069-IB16K, and 5069-IB16F

Attribute	5069-IB16, 5069-IB16K	5069-IB16F
On-state voltage, min	10V DC	
On-state voltage, nom	24V DC	
On-state voltage, max	32V DC	
On-state current, min	4 mA @ 10V	
On-state current, nom	6 mA @ 24V DC	
On-state current, max	7.4 mA @ 32V DC	
Off-state voltage, max	5V DC	
Off-state current, max	1.5 mA	
Input impedance, min	1.33 kΩ	
Input impedance, nom	4.1 kΩ	
Input impedance, max	7.0 kΩ	
Inrush current, max	< 250 mA peak (decaying to, 37% in 22 ms, without activation)	
Input delay time (screw to backplane)		
Off to On	≤ 100 µs, ±10 µs @ 25 °C (77 °F)	≤ 10 µs, ±1 µs @ 25 °C (77 °F)
On to Off	≤ 100 µs, ±10 µs @ 25 °C (77 °F)	≤ 10 µs, ±1 µs @ 25 °C (77 °F)
Input drift over temperature span	±100 ns/°C (55.6 ns/°F) from 0...60 °C (32...140 °F)	< 10 ns/°C (5.56 ns/°F) from 0...60 °C (32...140 °F)
Input On to Off minimum pulse width	60 µs	6 µs
Input Off to On minimum pulse width	60 µs	6 µs

Technical Specifications - 5069-IB16, 5069-IB16K, and 5069-IB16F

Attribute	5069-IB16, 5069-IB16K	5069-IB16F
Input filter time		
Off to On	Hardware delay: 50 µs + filter time User-selectable filter time: 0…50 ms	Hardware delay: 2 µs + filter time User-selectable filter time: 0…50 ms
On to Off	Hardware delay: 50 µs + filter time User-selectable filter time: 0…50 ms	Hardware delay: 3 µs + filter time User-selectable filter time: 0…50 ms
Reverse polarity protection	Yes	
Overvoltage protection, max	36V (fuse protected)	
Pulse and period measurements	Not supported	±2 µs
Counter frequency	0 - f_{max} = 500 Hz (inv period 2 ms)	0 - f_{max} = 30 kHz (inv period 33.3 µs)
Frequency counter	0 - f_{max} = 500 Hz (inv period 2 ms)	0 - f_{max} = 30 kHz (inv period 33.3 µs)
Timestamp of inputs	Not supported	±10 µs accuracy 1 ns resolution
Overrides	Not supported	
Pulse latching	Not supported	Supported
Events	Not supported	Four events supported (triggered by any input or simple counters)
Pattern matching	Not supported	Supported
Extended counters	Not supported	

General Specifications - 5069-IB16, 5069-IB16K, and 5069-IB16F

Attribute	5069-IB16, 5069-IB16K	5069-IB16F
Inputs	16 Channels (1 group of 16), sinking	
Voltage category	12/24V DC Sink	
Voltage and current ratings		
Input ratings	4…7.4 mA per channel @ 10…32V DC	
MOD Power	75 mA @ 18…32V DC	
MOD Power Passthrough, max[1]	9.55 A @ 18…32V DC	
SA Power	200 mA @ 10…32V DC	
SA Power Passthrough, max[2]	9.95 A @ 10…32V DC	
Power dissipation, max	3.9 W	
Thermal dissipation, max	13.3 BTU/hr	
Isolation voltage	250V (continuous), Basic Insulation Type No isolation between SA Power and input ports No isolation between individual input ports	
Module keying	Electronic keying via programming software	
Indicators	1 green/red module status indicator 16 yellow/red I/O status indicators	
Slot width	1	
Dimensions (HxWxD), approx	144.57 x 22 x 105.42 mm (5.69 x 0.87 x 4.15 in.)	
DIN rail	Compatible zinc-plated chromate-passivated steel DIN rail. You can use the EN50022 - 35 x 7.5 mm (1.38 x 0.30 in.) DIN rail.	

General Specifications - 5069-IB16, 5069-IB16K, and 5069-IB16F

Attribute	5069-IB16, 5069-IB16K	5069-IB16F
RTB	One of these RTB types. • 5069-RTB18-SPRING RTB • 5069-RTB18-SCREW RTB **IMPORTANT**: You must order RTBs separately. RTBs do not ship with Compact 5000 I/O modules. We recommend that you order only the RTB type that your system requires.	
RTB torque (5069-RTB18-SCREW RTB only)	0.4 N·m (3.5 lb·in)	
RTB keying	None	
Wire category(3)	2 - input ports 2 - power ports 1 wire per terminal for each signal port	
Wire size		
5069-RTB18-SPRING connections	0.5…1.5 mm^2 (22…16 AWG) solid or stranded shielded copper wire rated at 105 °C (221 °F), or greater, 2.9 mm (0.11 in.) max diameter including insulation, single wire connection only.	
5069-RTB18-SCREW connections	0.5…1.5 mm^2 (22…16 AWG) solid or stranded shielded copper wire rated at 105 °C (221 °F), or greater, 3.5 mm (0.14 in.) max diameter including insulation, single wire connection only.	
Insulation stripping length	5069-RTB18-SPRING connections: 10 mm (0.39 in.) 5069-RTB18-SCREW connections: 12 mm (0.47 in.)	
Weight, approx	175 g (0.39 lb)	
Enclosure type	None (open-style)	
North American temp code	T4	
ATEX/IECEx temp code	T4	
IECEx temp code	T4	

(1) Level of MOD Power current that passes through the module depends on the system configuration, such as, module slot location and the other module types that are used in the system. For more information, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, 5069-UM001, CompactLogix 5480 Controllers User Manual, 5069-UM002, and Compact 5000 EtherNet/IP Adapters User Manual, 5069-UM004.

(2) Level of SA Power current that passes through the module depends on the system configuration, such as, module slot location and the other module types that are used in the system. For more information, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, 5069-UM001, CompactLogix 5480 Controllers User Manual, 5069-UM002, and Compact 5000 EtherNet/IP Adapters User Manual, 5069-UM004.

(3) Use this Conductor Category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 5069-IB16, 5069-IB16K, and 5069-IB16F

Attribute	5069-IB16, 5069-IB16K, 5069-IB16F
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air, max	60 °C (140 °F)
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…+85 °C (-40…+185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	5 g @ 10…500 Hz

Environmental Specifications - 5069-IB16, 5069-IB16K, and 5069-IB16F

Attribute	5069-IB16, 5069-IB16K, 5069-IB16F
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	IEC 61000-6-4
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% pulse 100% AM at 900 MHz 10V/m with 200 Hz 50% pulse 100% AM at 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV @ 5 kHz on power ports ±3 kV @ 5 kHz on input ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on power ports ±1 kV line-line (DM) and ±2 kV line-earth (CM) on input ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Voltage variation IEC 61000-4-29	10 ms interruption on MOD Power port

Certifications - 5069-IB16, 5069-IB16K, and 5069-IB16F

Certification[1]	5069-IB16, 5069-IB16K, 5069-IB16F
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
CE	European Union 2014/30/EU EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2014/35/EU LVD, compliant with: • EN 61010-2-201; Control Equipment Safety Requirements European Union 2011/65/EU RoHS, compliant with: • EN 50581; Technical documentation
RCM	Australian Radiocommunications Act, compliant with: EN 61000-6-4; Industrial Emissions
Ex	European Union 2014/34/EU ATEX Directive, compliant with: • EN 60079-0; General Requirements • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • II 3 G Ex nA IIC T4 Gc • DEMKO 15 ATEX 1484X
IECEx	IECEx System, compliant with: • IEC 60079-0; General Requirements • IEC 60079-15; Potentially Explosive Atmospheres, Protection "n" • II 3 G Ex nA IIC T4 Gc • IECEx UL 15.0055X
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3
EAC	Russian Customs Union TR CU 020/2011 EMC Technical Regulation Russian Customs Union TR CU 004/2011 LV Technical Regulation

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

5069-OB16, 5069-OB16K, and 5069-OB16F Digital 16-point Sourcing Output Modules

The following figure shows a wiring diagram for the 5069-OB16, 5069-OB16K, and 5069-OB16F modules.

5069-OB16, 5069-OB16K, and 5069-OB16F Wiring Diagram

Channel Connections

The diagram shows devices that are connected to channels 0, 2, 4, and 6. You are not restricted to using only those channels.

You can connect devices to any channel or combination of channels as needed.

LA Power

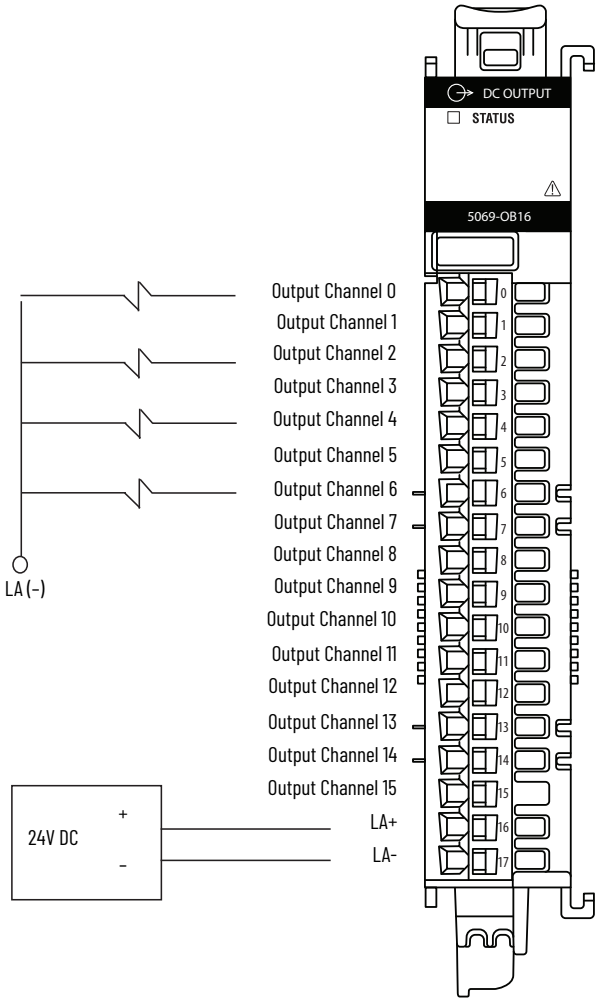
The Local Actuator (LA+ and LA –) connections are used to supply field-side power to the module.

- The 5069-OB16, 5069-OB16K, and 5069-OB16F modules **do not draw current from the SA Power bus**.

Still, the modules are DC type modules, and you must install them on a DC SA Power bus.

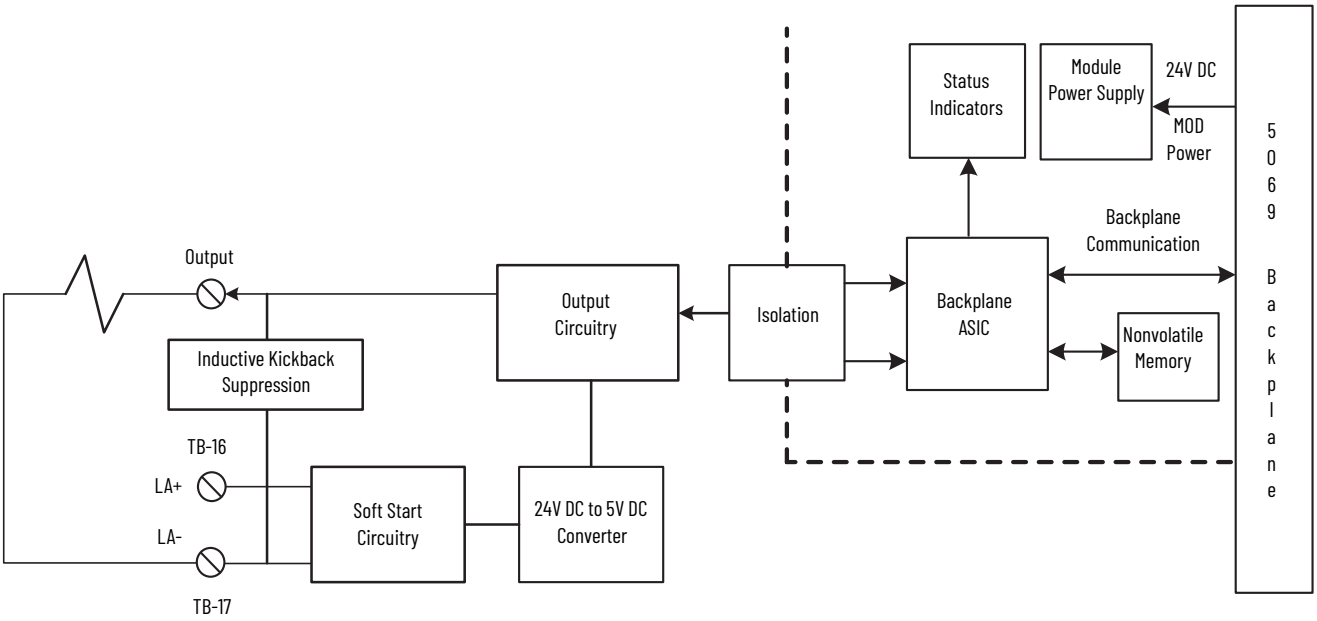
- If you install modules in a system that use AC SA power and DC SA power, you must install them on separate SA Power buses.
- You use a 5069-FPD field potential distributor to establish a new SA Power bus in a system. SA Power buses are isolated from each other. To keep the modules on separate SA Power buses, complete these steps.
  1. Install the modules that use one type of SA power, for example DC, to the right of the adapter or controller, that is, the first SA Power bus.
  2. Install the 5069-FPD field potential distributor to establish a second SA Power bus.
  3. Install the modules that use the other type of SA power, for example AC, on the second SA Power bus.

IMPORTANT: The 5069-OB16K and 5069-OB16K modules are wired the same as the wiring diagram that is shown for the 5069-OB16 module.



The following figure shows a functional block diagram for the 5069-OB16, 5069-OB16K, and 5069-OB16F modules.

5069-OB16, 5069-OB16K, and 5069-OB16F Functional Block Diagram



Technical Specifications - 5069-OB16, 5069-OB16K, and 5069-OB16F

Attribute	5069-OB16, 5069-OB16K	5069-OB16F
On-state voltage, min[1]	10V DC	
On-state voltage, nom[1]	24V DC	
On-state voltage, max[1]	32V DC	
On-state voltage drop, max[1]	< 0.2V DC	
On-state current per channel, min[1]	1 mA	
Off-state voltage, max[1]	5V DC with 1 mA min load	
Off-state leakage current per point, max[2]	< 0.5 mA per point	
Output current rating	0.5 A resistive per channel @ 10...32V DC 8 A resistive per module @ 10...32V DC, max	
Surge current per point	1 A max for 10 ms per point, repeatable every 2 s	
Output delay time (backplane to screw)		
Off to On	≤ 100 µs, ±10 µs @ 25 °C (77 °F) @ 0.5 A	10 µs, ±1 µs @ 25 °C (77 °F) @ 0.5 A
On to Off	≤100 µs, ±10 µs @ 25 °C (77 °F) @ 0.5 A	10 µs, ±1 µs @ 25 °C (77 °F) @ 0.5 A
Pulse width, min	200 µs @ 0.5 A @ 25 °C (77 °F)	20 µs @ 0.5 A @ 25 °C (77 °F)
Output drift over temperature span	±100 ns/°C (55.6 ns/°F) from 0...60 °C (32...140 °F) @ 0.5 A	±10 ns/°C (5.56 ns/°F) from 0...60 °C (32...140 °F) @ 0.5 A
Field power loss detection	Yes	

Technical Specifications - 5069-OB16, 5069-OB16K, and 5069-OB16F

Attribute	5069-OB16, 5069-OB16K	5069-OB16F
No load detection diagnostics	Yes (per channel diagnostics)	
Output short circuit/overload/overtemp detection	Yes (per channel diagnostics)	
Output short circuit/overload protection	Yes	
Reverse voltage protection	Yes	
Overvoltage protection, max	36V (fuse protected)	
Pilot duty rating	0.5 A pilot duty rating per channel @ 10...32V DC	
Output control in fault state per point	• Hold Last State • On • Off (default)	
Output states in program mode per point	• Hold Last State • On • Off (default)	
Output states in fault mode per point	• Hold Last State • On • Off (default)	
Duration of fault mode per point	• 1 s • 2 s • 5 s • 10 s • Forever (default)	
Scheduled outputs	Not supported	±10 µs accuracy 1 ns resolution

(1) Local Actuator (LA) Field Power related attributes.

(2) Recommended Loading Resistor - To limit the effects of leakage current through solid-state outputs, you can connect a loading resistor in parallel with your load. For 24V DC operation, use a 5.6 KΩ, 0.5 W resistor for transistor operation.

General Specifications - 5069-OB16, 5069-OB16K, and 5069-OB16F

Attribute	5069-OB16, 5069-OB16K	5069-OB16F
Outputs	16 Channels (1 group of 16), sourcing	
Voltage category	12/24V DC source	
Voltage and current ratings		
MOD Power	75 mA @ 18...32V DC	
MOD Power Passthrough, max(1)	9.55 A @ 18...32V DC	
LA Power	0.5 A per channel @ 10...32V DC 8 A per module @ 10...32V DC	
SA Power Passthrough, max(2) The module does not draw SA Power current.	9.95 A @ 10...32V DC	
Do not exceed 10 A MOD or SA Power (Passthrough) current draw		
Power dissipation, max	3.25 W (16 channels @ 0.5 A)	
Thermal dissipation, max	11.09 BTU/hr	

General Specifications - 5069-OB16, 5069-OB16K, and 5069-OB16F

Attribute	5069-OB16, 5069-OB16K	5069-OB16F
Isolation voltage	250V (continuous), Basic Insulation Type No isolation between LA power and output ports No isolation between individual output ports	
Module keying	Electronic, module keying, software configurable	
Indicators	1 green/red module status indicator 16 yellow/red I/O status indicators	
Slot width	1	
Dimensions (HxWxD), approx	144.57 x 22 x 105.42 mm (5.69 x 0.87 x 4.15 in.)	
DIN rail	Compatible zinc-plated chromate-passivated steel DIN rail. You can use the EN50022 - 35 x 7.5 mm (1.38 x 0.30 in.) DIN rail.	
RTB	One of these RTB types. • 5069-RTB18-SPRING RTB • 5069-RTB18-SCREW RTB **IMPORTANT**: You must order RTBs separately. RTBs do not ship with Compact 5000 I/O modules. We recommend that you order only the RTB type that your system requires.	
RTB torque (5069-RTB18-SCREW RTB only)	0.4 N•m (3.5 lb•in)	
RTB keying	None	
Wire category[3]	2 - output ports 2 - power ports 1 wire per terminal for each signal port	
Wire size		
5069-RTB18-SPRING removable terminal block	0.5…1.5 mm^2 (22…16 AWG) solid or stranded copper wire rated at 105 °C (221 °F), or greater, 2.9 mm (0.11 in.) max diameter including insulation	
5069-RTB18-SCREW removable terminal block	0.5…1.5 mm^2 (22…16 AWG) solid or stranded copper wire rated at 105 °C (221 °F), or greater, 3.5 mm (0.14 in.) max diameter including insulation	
Insulation stripping length		
5069-RTB18-SPRING connections	10 mm (0.39 in.)	
5069-RTB18-SCREW connections	12 mm (0.47 in.)	
Weight, approx	175 g (0.39 lb)	
Enclosure type	None (open - style)	
North American temp code	T4	
ATEX temp code	T4	
IECEx temp code	T4	

(1) Level of MOD Power current that passes through the module depends on the system configuration, such as, module slot location and the other module types that are used in the system. For more information, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, 5069-UM001, CompactLogix 5480 Controllers User Manual, 5069-UM002, and Compact 5000 EtherNet/IP Adapters User Manual, 5069-UM004.

(2) Level of SA Power current that passes through the module depends on the system configuration, such as, module slot location and the other module types that are used in the system. For more information, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, 5069-UM001, CompactLogix 5480 Controllers User Manual, 5069-UM002, and Compact 5000 EtherNet/IP Adapters User Manual, 5069-UM004.

(3) Use this Conductor Category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 5069-OB16, 5069-OB16K, and 5069-OB16F

Attribute	5069-OB16, 5069-OB16K, 5069-OB16F
Temperature, operating IEC 60068-2-1 (Test Ab, Operating Cold), IEC 60068-2-2 (TestBb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Operating Thermal Shock)	0...60 °C (32...140 °F)
Temperature, surrounding air, max.	60 °C (140 °F)
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40...+85 °C (-40...+185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5...95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	5 g @ 10...500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	IEC 61000-6-4
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% pulse 100% AM at 900 MHz 10V/m with 200 Hz 50% pulse 100% AM at 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV @ 5 kHz on power ports ±3 kV @ 5 kHz on output ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on power ports ±1 kV line-line (DM) and ±2 kV line-earth (CM) on output ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Voltage variation IEC 61000-4-29	10 ms interruption on MOD power port

Certifications - 5069-OB16, 5069-OB16K, and 5069-OB16F

Certification[1]	5069-OB16, 5069-OB16K, 5069-OB16F
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
CE	European Union 2014/30/EU EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2014/35/EU, compliant with: • EN 61010-2-201; Control Equipment Safety Requirements European Union 2011/65/EU RoHS, compliant with: • EN 50581; Technical documentation
RCM	Australian Radiocommunications Act, compliant with: EN 61000-6-4; Industrial Emissions
Ex	European Union 2014/34/EU ATEX Directive, compliant with: • EN 60079-0; General Requirements • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • II 3 G Ex nA IIC T4 Gc • DEMKO 15 ATEX 1484X
IECEx	IECEx System, compliant with: • IEC 60079-0; General Requirements • IEC 60079-15; Potentially Explosive Atmospheres, Protection "n" • II 3 G Ex nA IIC T4 Gc • IECEx UL 15.0055X
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3
EAC	Russian Customs Union TR CU 020/2011 EMC Technical Regulation Russian Customs Union TR CU 004/2011 LV Technical Regulation

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Analog I/O Modules

I/O Type	Cat. No.	Description	Page
Analog input	5069-IF8	8-channel current/voltage input module	50
	5069-IY4	4-channel current/voltage/RTD/Thermocouple input module	58
	5069-IY4K	4-channel conformal coated current/voltage/RTD/Thermocouple input module	
Analog output	5069-OF4	4-channel current/voltage output module	73
	5069-OF4K	4-channel conformal coated current/voltage output module	
	5069-OF8	8-channel current/voltage output module	

5069-IF8 Analog 8-channel Current/Voltage Input Module

The following table lists the devices that are supported with the 5069-IF8 module.

Device	Mode(s)[1]	Supported	Wiring Diagram Example
2-wire analog device 4-wire analog device[2]	Current	Yes	page 51
	Voltage		page 52
	Combination of current and voltage	Yes	page 53
1-wire analog device 3-wire analog device	N/A - These devices are not supported regardless of the channel mode configuration.	No	—
2-wire Thermocouple device			
2-wire RTD device 3-wire RTD device			

(1) Make sure that the channel configuration in your Logix Designer application project matches the input device type that is connected to the channel. You choose the input type in the Channels category on the Module Properties dialog box. For example, if a current input device is connected to channel 0 on the module, the module configuration for channel must be Input Type = Current.

(2) These devices are 2-wire current and voltage devices with 2-wire sensor power connections.

The following figure shows a wiring diagram for the 5069-IF8 module with channels configured for current mode.

5069-IF8 Wiring Diagram - Current Mode

Channel Connections

The diagram shows devices that are connected to channels 0, 2, 5, and 7. You are not restricted to using only this channel.
You can connect devices to any channel or combination of channels as needed.

IMPORTANT

- Place additional loop devices, for example, strip chart recorders, at either **A** location in the current loop.
- Use separate external power supplies to provide SA power to the system and to power external devices that are connected to the module.
- This module has only two shield terminals. Compact 5000 I/O module RTBs only support one wire per terminal.

If you connect more than two devices to the module, you can ground two devices at the shield terminals.
You must ground the remaining devices somewhere else, such as, to the DIN rail via a terminal strip. In this case, use the same power supply to power the additional devices. If separate power supplies are used to power the additional devices, ground the power supplies at the same ground location.

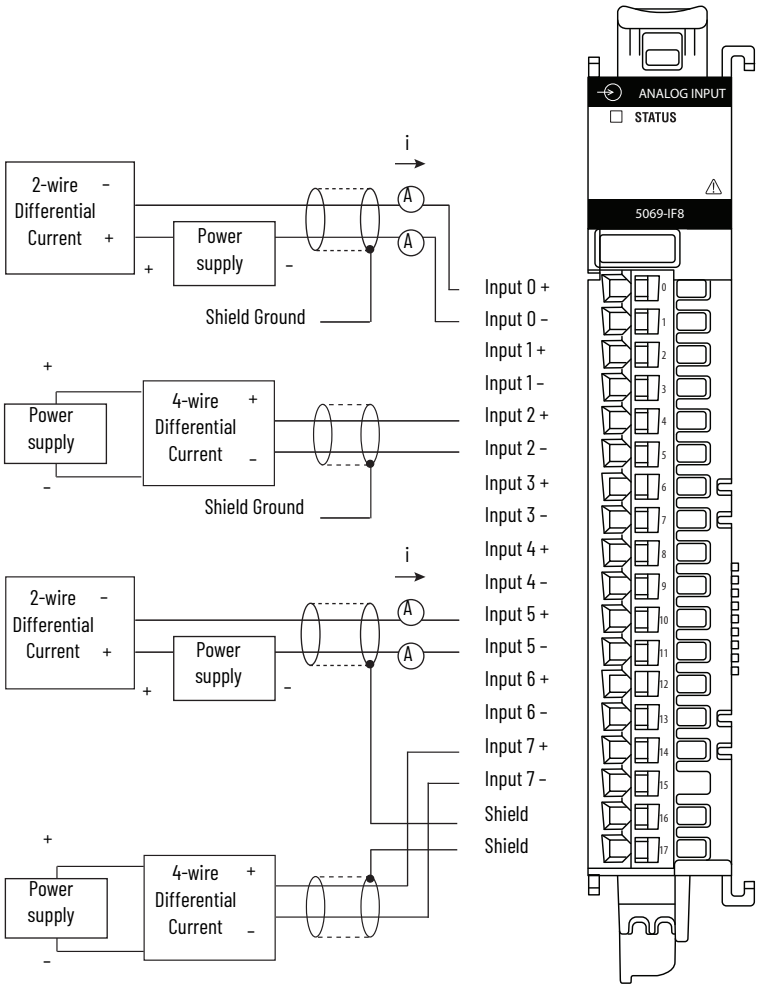
SA Power

Connections to an external power supply that provides SA power are made via the SA Power RTB on one of the following:

- CompactLogix 5380 controller
- Compact GuardLogix 5380 controller
- CompactLogix 5480 controller
- 5069-AENTR or 5069-AEN2TR EtherNet/IP Adapter
- 5069-FPD field potential distributor

IMPORTANT: Remember the following:

- The 5069-IF8 module uses DC SA power. You must connect DC power to the component, that is, controller, adapter, or field potential distributor, that provides SA Power to the modules.
- If you install modules in a system that use AC SA power and DC SA power, you must install them on separate SA power buses.
- You use a 5069-FPD field potential distributor to establish a new SA Power bus in a system. SA Power buses are isolated from each other. To keep the modules on separate SA Power buses, complete these steps.
  1. Install the modules that use one type of SA power, for example DC, to the right of the adapter or controller, that is, the first SA Power bus.
  2. Install the 5069-FPD field potential distributor to establish a second SA Power bus.
  3. Install the modules that use the other type of SA power, for example AC, on the second SA Power bus.



The following figure shows a wiring diagram for the 5069-IF8 module with channels configured for voltage mode.

5069-IF8 Wiring Diagram - Voltage Mode

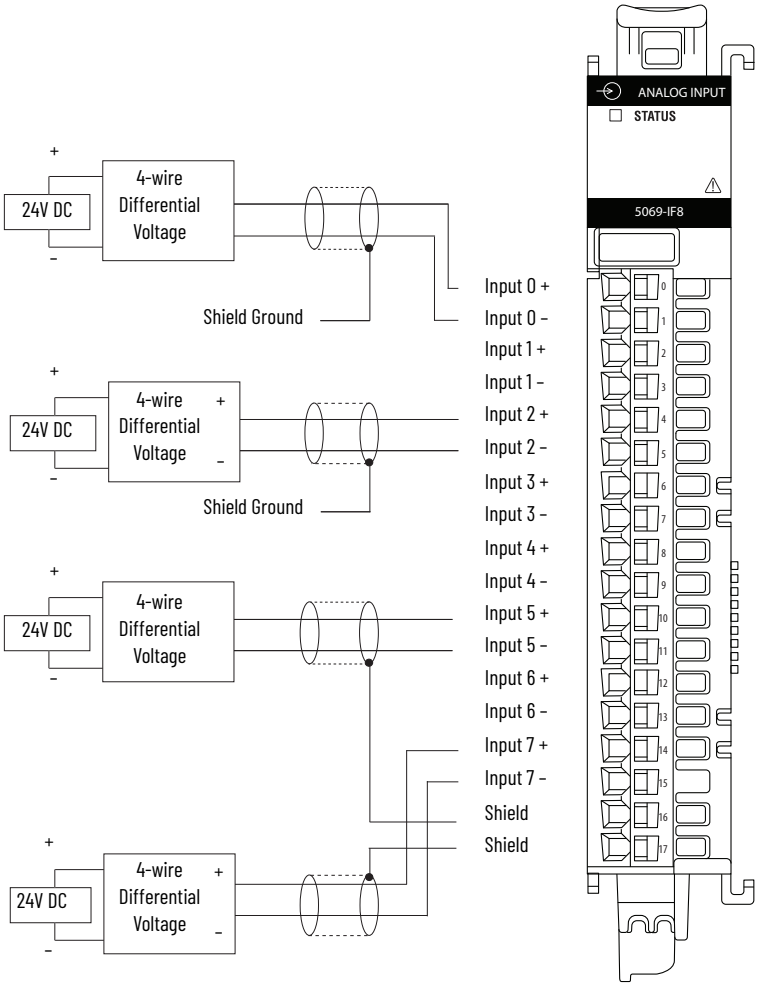
Channel Connections

The diagram shows devices that are connected to channels 0, 2, 5, and 7. You are not restricted to using only this channel.
You can connect devices to any channel or combination of channels as needed.

IMPORTANT

- Use separate external power supplies to provide SA power to the system and to power external devices that are connected to the module.
- This module has only two shield terminals. Compact 5000 I/O module RTBs only support one wire per terminal.

If you connect more than two devices to the module, you can ground two devices at the shield terminals.
You must ground the remaining devices somewhere else, such as, to the DIN rail via a terminal strip. In this case, use the same power supply to power the additional devices. If separate power supplies are used to power the additional devices, ground the power supplies at the same ground location.



The following figure shows a wiring diagram for the 5069-IF8 module with different device types connected to different channels. The device type and mode configuration for each channel must match.

5069-IF8 Wiring Diagram – Combination of Device Types Connected to the Module

Channel Connections

The diagram shows devices that are connected to channels 0, 2, 5, and 7. You are not restricted to using only this channel.
You can connect devices to any channel or combination of channels as needed.

IMPORTANT

- Place additional loop devices, for example, strip chart recorders, at either **A** location in the current loop.
- Use separate external power supplies to provide SA power to the system and to power external devices that are connected to the module.
- This module has only two shield terminals. Compact 5000 I/O module RTBs only support one wire per terminal.

If you connect more than two devices to the module, you can ground two devices at the shield terminals.
You must ground the remaining devices somewhere else, such as, to the DIN rail via a terminal strip. In this case, use the same power supply to power the additional devices. If separate power supplies are used to power the additional devices, ground the power supplies at the same ground location.

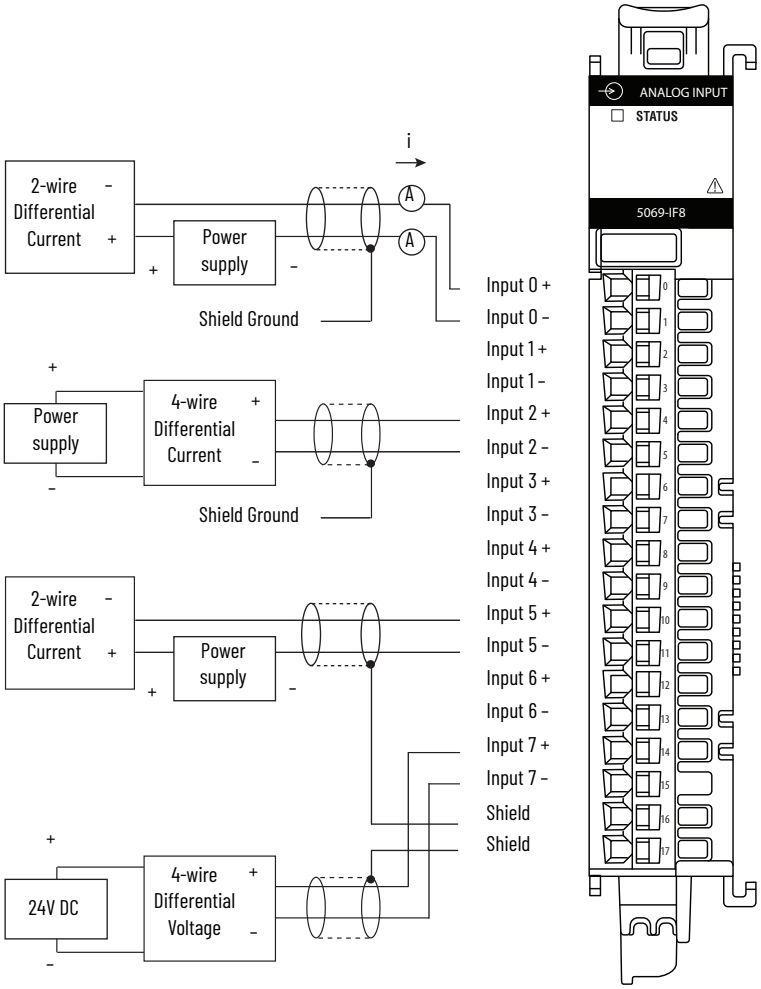
SA Power

Connections to an external power supply that provides SA power are made via the SA Power RTB on one of the following:

- CompactLogix 5380 controller
- Compact GuardLogix 5380 controller
- CompactLogix 5480 controller
- 5069-AENTR or 5069-AEN2TR EtherNet/IP Adapter
- 5069-FPD field potential distributor

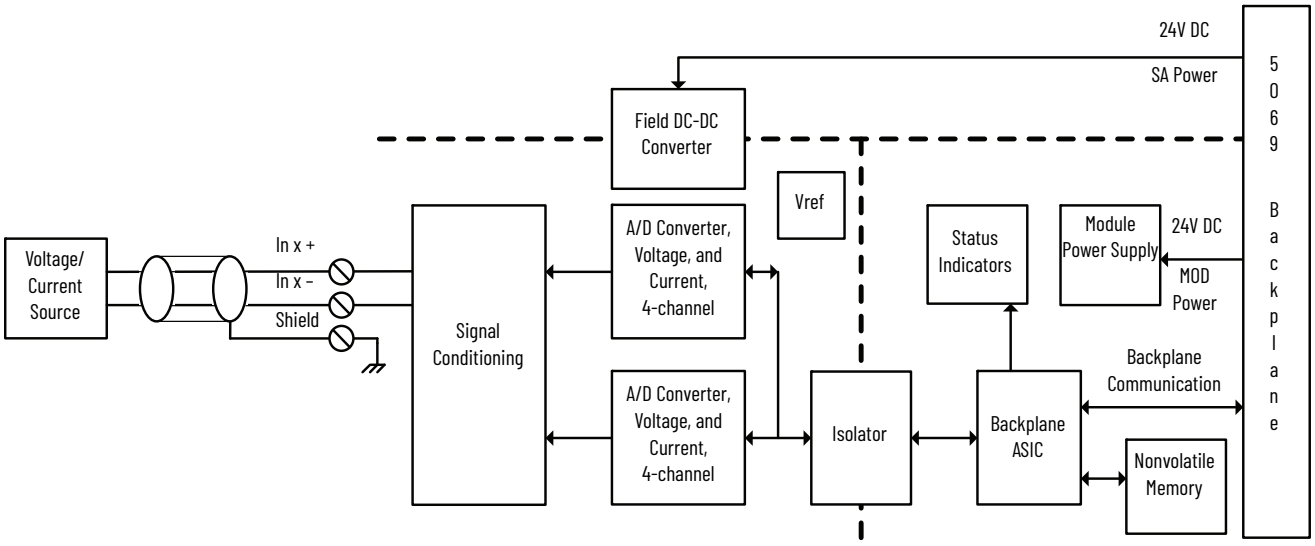
IMPORTANT: Remember the following:

- The 5069-IF8 module uses DC SA power. You must connect DC power to the component, that is, controller, adapter, or field potential distributor, that provides SA Power to the modules.
- If you install modules in a system that use AC SA power and DC SA power, you must install them on separate SA power buses.
- You use a 5069-FPD field potential distributor to establish a new SA Power bus in a system. SA Power buses are isolated from each other. To keep the modules on separate SA Power buses, complete these steps.
  1. Install the modules that use one type of SA power, for example DC, to the right of the adapter or controller, that is, the first SA Power bus.
  2. Install the 5069-FPD field potential distributor to establish a second SA Power bus.
  3. Install the modules that use the other type of SA power, for example AC, on the second SA Power bus.



The following figure shows a functional block diagram for the 5069-IF8 module.

5069-IF8 Functional Block Diagram



Technical Specifications - 5069-IF8

Attribute	5069-IF8
Inputs	8 differential
Input range, voltage	±10V 0…10V 0…5V
Input range, current	0…20 mA 4…20 mA
Input impedance	Voltage: >1 MΩ Current: 90 Ω typical, 70…110 Ω range
Common mode voltage (channel to channel)	±10V (Current mode) ±2V (Voltage mode)
Module conversion method	Sigma-Delta, Two 24-bit multiplexed ADC
Resolution, voltage[1] (16 bits at 10 Hz notch filter)	±10.5V: <320 µV/count (15 bits plus sign bipolar) 0…10.5V: <160 µV/count (16 bits unipolar) 0…5.25V: <80 µ/V count (16 bits unipolar)
Resolution, current[1] (16 bits at 10 Hz notch filter)	0…21 mA: <0.32 µA/count (16 bits) 3.6…21 mA: <0.27 µA/count (16 bits)
Calibrated accuracy at 25 °C	Voltage 0.10% full scale Current 0.10% full scale
Accuracy drift with temperature	Voltage 0.20% full scale Current 0.30% full scale
Input Total Unadjusted Error (TUE)[2] (Over full temperature range)	Voltage 0.30% full scale Current 0.40% full scale
Scan Time Per channel Per group (channel group 0…3 or channel group 4…7)	 625 µs 2.5 ms
Notch filter at minimum RPI (0.2 ms, 1 channel enabled)	62.5 kHz

Technical Specifications - 5069-IF8

Attribute	5069-IF8
Minimum notch filter frequency at RPI of 2.5 ms	10 kHz
Step response time to 63% of value (Notch filter 10 kHz)	7.5 ms
Input notch filter (Hz) selections	5, 10 (50/60 Default), 15, 20, 50, 60, 100, 200, 500, 1000, 2500, 5000, 10000, 15625, 25000, 31250, 62500
Input anti-aliasing filter cutoff frequency, nom	500 Hz
Input digital filter	First order lag, 0 ms (Default)...32,767 ms (32.767 s)
HART handheld compliance	Add an external 250 Ω resistor into the current loop for HART transmitter compliance.
Overvoltage protection, max	Voltage and Current modes: ± 30V DC
Overcurrent protection, max	Current mode: ±30 mA
Data value during overload condition	Full scale, overrange flag, Data uncertain / data bad
Open circuit detection time	Voltage: + full scale, < 2 s Current: 4...20 mA range, <2 s
Onboard data alarming	Yes
Scaling to engineering units	Yes
Real-time channel sampling	Yes
Data format	IEEE 32-bit floating point

(1) Notch filter dependent.

(2) Includes offset, gain, non-linearity, and repeatability error terms.

General Specifications - 5069-IF8

Attribute	5069-IF8
Voltage and current ratings	
MOD Power	75 mA @ 18...32V DC
MOD Power Passthrough, max(1)	9.55 A @ 18...32V DC
SA Power	100 mA @ 18...32V DC
SA Power Passthrough, max(2)	9.95 A @ 18...32V DC
Do not exceed 10 A MOD or SA Power (Passthrough) current draw.	
Power dissipation, max	Voltage mode: 2.1 W Current mode: 2.4 W
Thermal dissipation, max	Voltage mode: 7.2 BTU/hr Current mode: 8.2 BTU/hr
Isolation voltage	250V (continuous), Basic Insulation Type 50V Functional Isolation between SA power and input ports No isolation between individual Input ports
Calibration methods	Factory calibrated User-performed (optional)
Module keying	Electronic keying via programming software
Indicators	1 green/red module status indicator 8 yellow/red I/O status indicator
Slot width	1
Common mode noise rejection ratio	130 dB @ 50/60 Hz
Normal mode noise rejection ratio	65 dB @ 50/60 Hz, notch filter dependent
Dimensions (HxWxD), approx	144.57 x 22 x 105.42 mm (5.69 x 0.87 x 4.15 in.)

General Specifications - 5069-IF8

Attribute	5069-IF8
DIN rail	Compatible zinc-plated chromate-passivated steel DIN rail. You can use the EN50022 - 35 x 7.5 mm (1.38 x 0.30 in.) DIN rail.
RTB	One of these RTB types. • 5069-RTB18-SPRING RTB • 5069-RTB18-SCREW RTB **IMPORTANT**: You must order RTBs separately. RTBs do not ship with Compact 5000 I/O modules. We recommend that you order only the RTB type that your system requires.
RTB torque (5069-RTB18-SCREW RTB only)	0.4 N•m (3.5 lb•in)
RTB keying	None
Wire category(3)	2 - shielded input ports 2 - power ports 1 wire per terminal for each signal port
Wire size	
5069-RTB18-SPRING removable terminal block	0.5…1.5 mm^2 (22…16 AWG) solid or stranded copper wire rated at 105 °C (221 °F), or greater, 2.9 mm (0.11 in.) max diameter including insulation
5069-RTB18-SCREW removable terminal block	0.5…1.5 mm^2 (22…16 AWG) solid or stranded copper wire rated at 105 °C (221 °F), or greater, 3.5 mm (0.14 in.) max diameter including insulation
Insulation stripping length	
5069-RTB18-SPRING connections	10 mm (0.39 in.)
5069-RTB18-SCREW connections	12 mm (0.47 in.)
Weight, approx	175 g (0.39 lb)
Enclosure type	None (open-style)
North American temperature code	T4
ATEX temp code	T4
IECEx temp code	T4

(1) Level of MOD Power current that passes through the module depends on the system configuration, such as, module slot location and the other module types that are used in the system. For more information, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, 5069-UM001, CompactLogix 5480 Controllers User Manual, 5069-UM002, and Compact 5000 EtherNet/IP Adapters User Manual, 5069-UM004.

(2) Level of SA Power current that passes through the module depends on the system configuration, such as, module slot location and the other module types that are used in the system. For more information, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, 5069-UM001, CompactLogix 5480 Controllers User Manual, 5069-UM002, and Compact 5000 EtherNet/IP Adapters User Manual, 5069-UM004.

(3) Use this Conductor Category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 5069-IF8

Attribute	5069-IF8
Temperature, operating IEC 60068-2-1 (Test Ab, Operating Cold), IEC 60068-2-2 (TestBb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air, max	60 °C (140 °F)
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…+85 °C (-40…+185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	5 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g

Environmental Specifications - 5069-IF8

Attribute	5069-IF8
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	IEC 61000-6-4
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 880% AM from 80...2000 MHz 10V/m with 200 Hz 50% pulse 100% AM at 900 MHz 10V/m with 200 Hz 50% pulse 100% AM at 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV @ 5 kHz on power ports ±3 kV @ 5 kHz on shielded input ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on power ports ±2 kV line-earth (CM) on shielded input ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Voltage variation IEC 61000-4-29	10 ms interruption on MOD Power port

Certifications - 5069-IF8

Certification(1)	5069-IF8
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
CE	European Union 2014/30/EU EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2014/35/EU LVD, compliant with: • EN 61010-2-201; Control Equipment Safety Requirements European Union 2011/65/EU RoHS, compliant with: • EN 50581; Technical documentation
RCM	Australian Radiocommunications Act, compliant with: EN 61000-6-4; Industrial Emissions
Ex	European Union 2014/34/EU ATEX Directive, compliant with: • EN 60079-0; General Requirements • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • II 3 G Ex nA IIC T4 Gc • DEMKO 15 ATEX 1484X
IECEx	IECEx System, compliant with: • IEC 60079-0; General Requirements • IEC 60079-15; Potentially Explosive Atmospheres, Protection "n" • II 3 G Ex nA IIC T4 Gc • IECEx UL 15.0055X
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3
EAC	Russian Customs Union TR CU 020/2011 EMC Technical Regulation Russian Customs Union TR CU 004/2011 LV Technical Regulation

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

5069-IY4 and 5069-IY4K Analog Input Modules

The following table lists the analog devices that are supported with the 5069-IY4 and 5069-IY4K modules.

Device	Mode(s)[1]	Supported	Wiring Diagram Example
2-wire analog device 4-wire analog device[2]	Current	Yes	page 59
	Voltage		page 60
	Any combination of current, voltage, RTD, Thermocouple[3]	Yes	page 64 and page 65
2-wire RTD device 3-wire RTD device	RTD	Yes	page 61 and page 62
	Any combination of current, voltage, RTD, Thermocouple[3]	Yes	page 64 and page 65
2-wire Thermocouple device	Thermocouple[4]	Yes	page 63
	Any combination of current, voltage, RTD, Thermocouple[3]	Yes	page 64 and page 65
1-wire analog device 3-wire analog device	N/A - These devices are not supported regardless of the channel mode configuration.	No	–

(1) Make sure that the channel configuration in your Logix Designer application project matches the input device type that is connected to the channel. You choose the input type in the Channels category on the Module Properties dialog box. For example, if a current input device is connected to channel 0 on the module, the module configuration for channel must be Input Type = Current.

(2) These devices are 2-wire current and voltage devices with 2-wire sensor power connections.

(3) You must use the 5069-RTB14CJC RTB if at least one thermocouple is connected to the module. If there are no thermocouples connected to the module, we recommend that you use the 5069-RTB18 RTB.

(4) You must use the 5069-RTB14CJC RTB.

The following figure shows a wiring diagram for a 5069-IY4 module with channels configured for current mode.

5069-IY4 and 5069-IY4K Wiring Diagram - Current Mode

Channel Connections

The diagram shows devices that are connected to channels 0, 1, 2, and 3. You are not restricted to using only this channel.
You can connect devices to any channel or combination of channels as needed.

IMPORTANT

- Place additional loop devices, for example, strip chart recorders, at either **A** location in the current loop.
- Use separate external power supplies to provide SA power to the system and to power external devices that are connected to the module.
- This module has only two shield terminals. Compact 5000 I/O module RTBs only support one wire per terminal.

If you connect more than two devices to the module, you can ground two devices at the shield terminals.
You must ground the remaining devices somewhere else, such as, to the DIN rail via a terminal strip. In this case, use the same power supply to power the additional devices. If separate power supplies are used to power the additional devices, ground the power supplies at the same ground location.

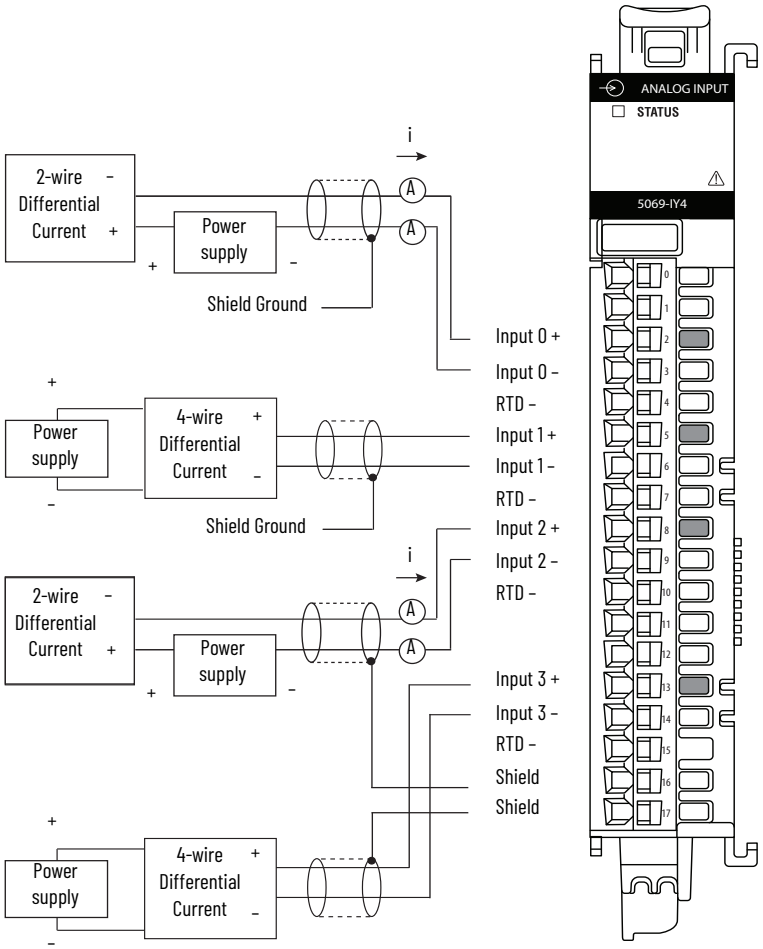
SA Power

Connections to an external power supply that provides SA power are made via the SA Power RTB on one of the following:

- CompactLogix 5380 controller
- Compact GuardLogix 5380 controller
- CompactLogix 5480 controller
- 5069-AENTR or 5069-AEN2TR EtherNet/IP Adapter
- 5069-FPD field potential distributor

IMPORTANT: Remember the following:

- The 5069-IF8 module uses DC SA power. You must connect DC power to the component, that is, controller, adapter, or field potential distributor, that provides SA Power to the modules.
- If you install modules in a system that use AC SA power and DC SA power, you must install them on separate SA power buses.
- You use a 5069-FPD field potential distributor to establish a new SA Power bus in a system. SA Power buses are isolated from each other. To keep the modules on separate SA Power buses, complete these steps.
  1. Install the modules that use one type of SA power, for example DC, to the right of the adapter or controller, that is, the first SA Power bus.
  2. Install the 5069-FPD field potential distributor to establish a second SA Power bus.
  3. Install the modules that use the other type of SA power, for example AC, on the second SA Power bus.



The following figure shows a wiring diagram for a 5069-IY4 module with channels configured for voltage mode.

5069-IY4 and 5069-IY4K Wiring Diagram - Voltage Mode

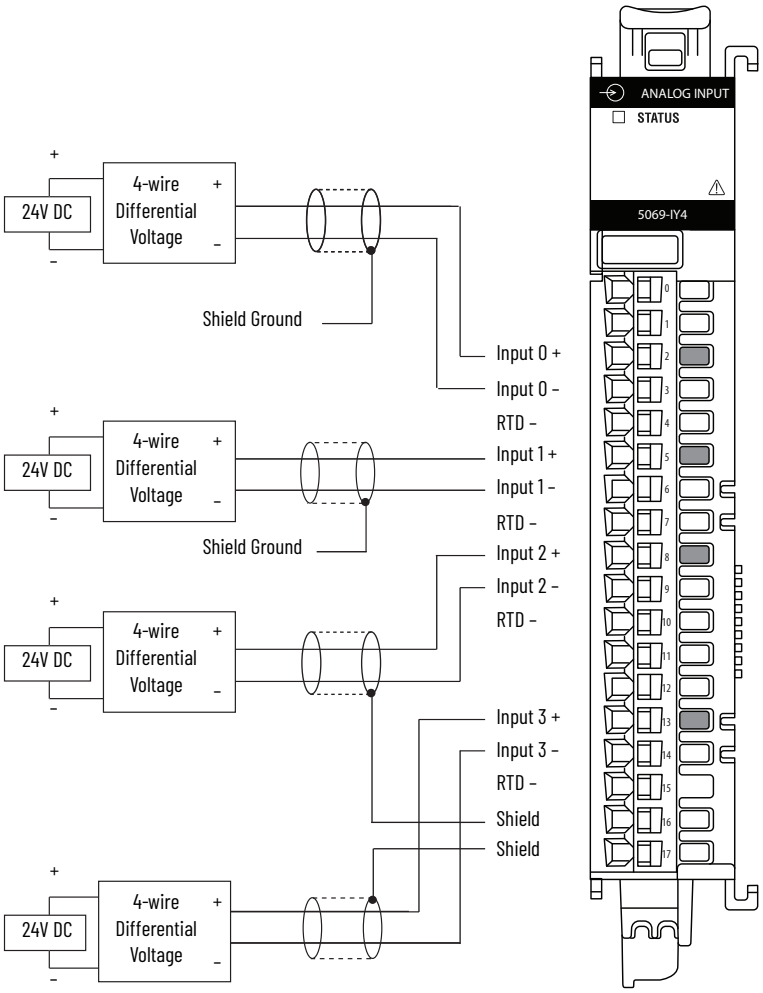
Channel Connections

The diagram shows devices that are connected to channels 0, 1, 2, and 3. You are not restricted to using only this channel.
You can connect devices to any channel or combination of channels as needed.

IMPORTANT

- Use separate external power supplies to provide SA power to the system and to power external devices that are connected to the module.
- This module has only two shield terminals. Compact 5000 I/O module RTBs only support one wire per terminal.

If you connect more than two devices to the module, you can ground two devices at the shield terminals.
You must ground the remaining devices somewhere else, such as, to the DIN rail via a terminal strip. In this case, use the same power supply to power the additional devices. If separate power supplies are used to power the additional devices, ground the power supplies at the same ground location.



The following figure shows a wiring diagram for a 5069-IY4 module with channels configured for RTD mode.

5069-IY4 and 5069-IY4K Wiring Diagram - 3-wire RTD

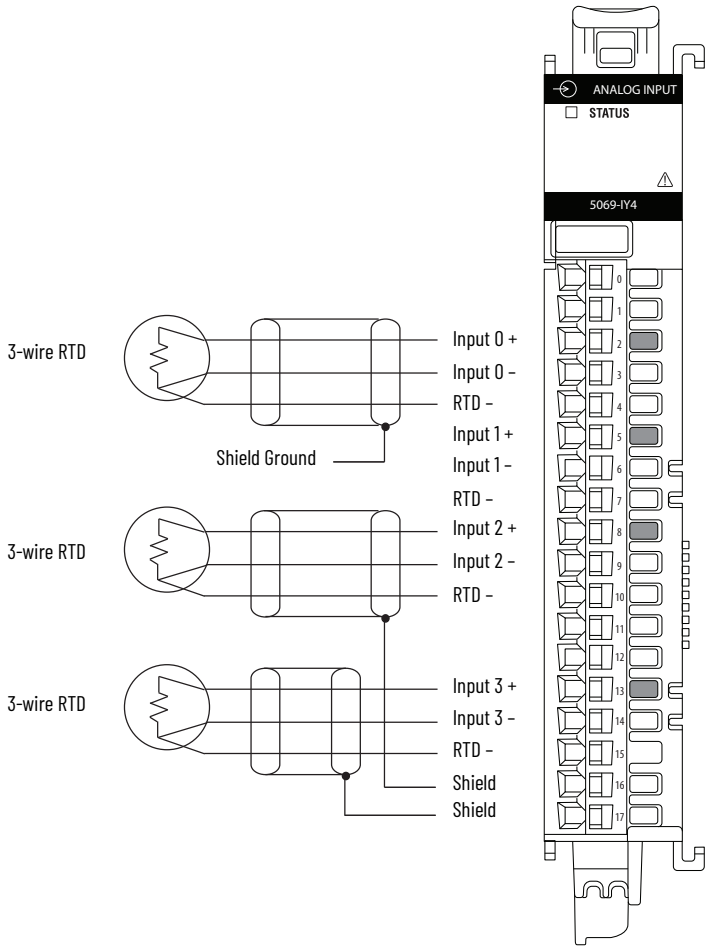
Channel Connections

The diagram shows devices that are connected to channels 0, 2, and 3. You are not restricted to using only this channel.

You can connect devices to any channel or combination of channels as needed.

IMPORTANT - This module has only two shield terminals. Compact 5000 I/O module RTBs only support one wire per terminal.

If you connect more than two devices to the module, you can ground two devices at the shield terminals. You must ground the remaining devices somewhere else, such as, to the DIN rail via a terminal strip.



The following figure shows a wiring diagram for a 5069-IY4 module with channels configured for RTD mode.

5069-IY4 and 5069-IY4K Wiring Diagram - 2-wire RTD

Channel Connections

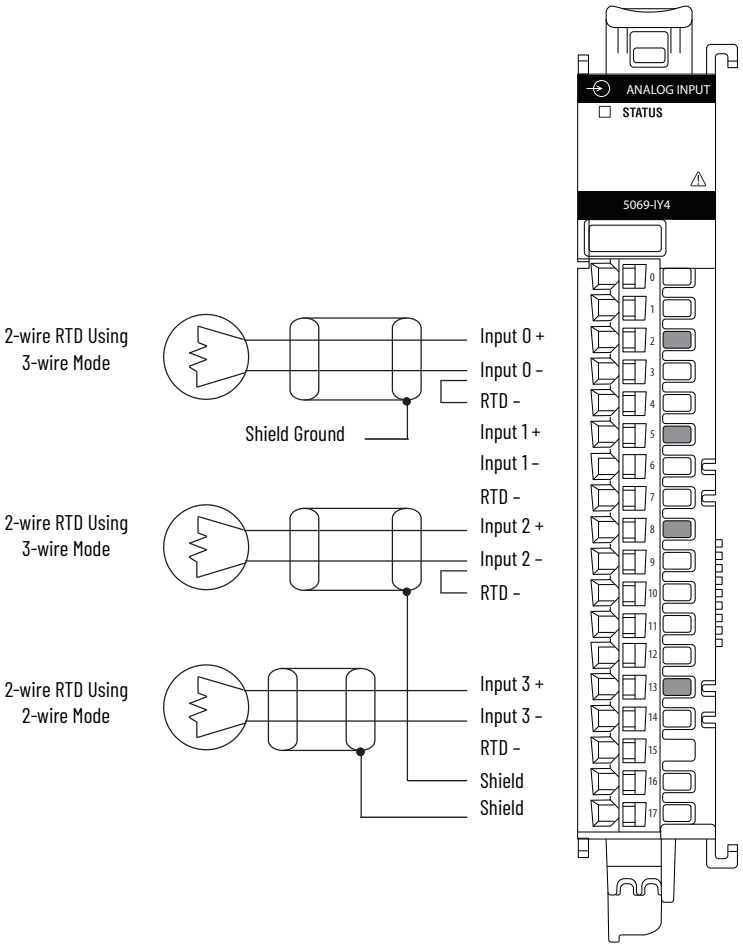
The diagram shows a device that is connected to channels 0, 2, and 3. You are not restricted to using only these channels.

You can connect devices to any channel or combination of channels as needed.

IMPORTANT

- When you use a 2-wire RTD in 3-wire mode, as shown on the RTDs that are connected to channel 3, you must jumper terminals Input *x*- and RTD *x* together.
- This module has only two shield terminals. Compact 5000 I/O module RTBs only support one wire per terminal.

If you connect more than two devices to the module, you can ground two devices at the shield terminals. You must ground the remaining devices somewhere else, such as, to the DIN rail via a terminal strip.



The following figure shows a wiring diagram for a 5069-IY4 module with channels configured for thermocouple mode.

5069-IY4 and 5069-IY4K Wiring Diagram - Thermocouple Input

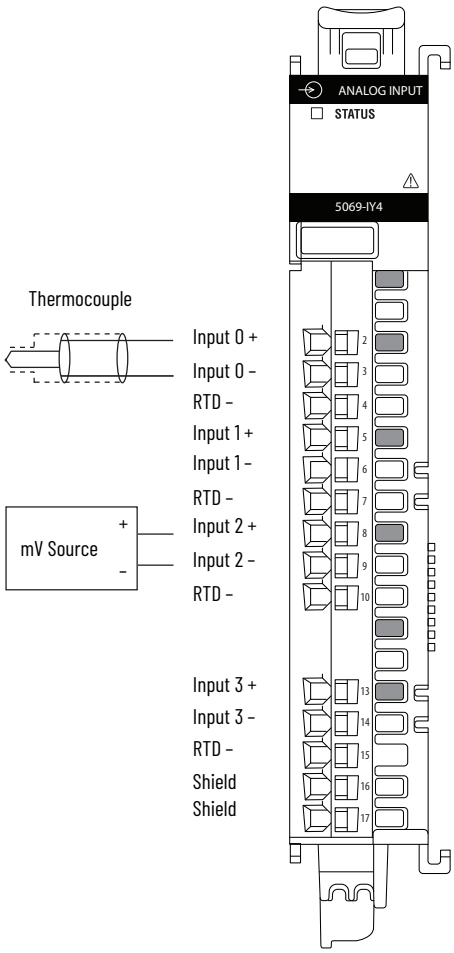
Channel Connections

The diagram shows a device that is connected to channel 0 and channel 2. You are not restricted to using only these channels.

You can connect devices to any channel or combination of channels as needed.

IMPORTANT - When you use the 5069-IY4 and 5069-IY4K analog input modules in Thermocouple mode, you must use one of these CJC type RTBs:

- 5069-RTB14CJC-SPRING (shown)
- 5069-RTB14CJC-SCREW



The following figure shows a wiring diagram for the 5069-IY4 module with different device types connected to different channels.

5069-IY4 and 5069-IY4K Wiring Diagram - Current, Voltage and RTD Device Types Connected to the Module

Channel Connections

The diagram shows an analog current device connected to channel 0, an analog voltage device connected to channel 1, and an RTD connected to channel 2. You are not restricted to using those devices with those channels.
You can connect devices to any channel or combination of channels as needed.

IMPORTANT:

- In this example, the module can use a 5069-RTB18 RTB because no thermocouple devices are connected to the module.
- When an analog current device is connected to the module, place additional loop devices, for example, strip chart recorders, at either **A** location in the current loop.
- Use separate external power supplies to provide SA power to the system and to power external devices that are connected to the module.
- This module has only two shield terminals. Compact 5000 I/O module RTBs only support one wire per terminal.

If you connect more than two devices to the module, you can ground two devices at the shield terminals.
You must ground the remaining devices somewhere else, such as, to the DIN rail via a terminal strip. In this case, use the same power supply to power the additional devices. If separate power supplies are used to power the additional devices, ground the power supplies at the same ground location.

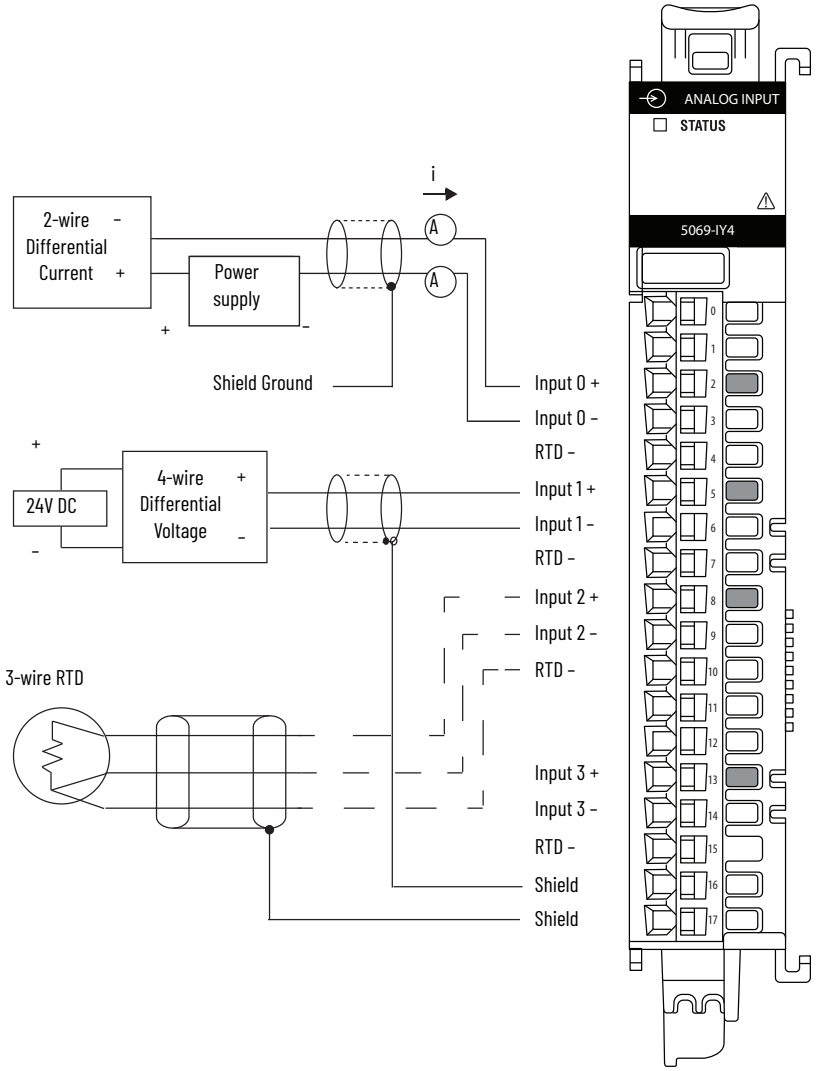
SA Power

Connections to an external power supply that provides SA power are made via the SA Power RTB on one of the following:

- CompactLogix 5380 controller
- CompactLogix 5480 controller
- Compact GuardLogix 5380 controller
- 5069-AENTR or 5069-AEN2TR EtherNet/IP Adapter
- 5069-FPD field potential distributor

IMPORTANT: Remember the following:

- The 5069-IY4 and 5069-IY4K modules use DC SA power. You must connect DC power to the component, that is, controller, adapter, or field potential distributor, that provides SA Power to the modules.
- If you install modules in a system that use AC SA power and DC SA power, you must install them on separate SA power buses.
- You use a 5069-FPD field potential distributor to establish a new SA Power bus in a system. SA Power buses are isolated from each other. To keep the modules on separate SA Power buses, complete these steps.
  1. Install the modules that use one type of SA power, for example DC, to the right of the adapter or controller, that is, the first SA Power bus.
  2. Install the 5069-FPD field potential distributor to establish a second SA Power bus.
  3. Install the modules that use the other type of SA power, for example AC, on the second SA Power bus.



The following figure shows a wiring diagram for 5069-a IY4 module with channels configured for current, voltage, RTD, and thermocouple modes.

5069-IY4 and 5069-IY4K Wiring Diagram - Current, Voltage, RTD, and Thermocouple Modes

Channel Connections

The diagram shows specific devices connected to channels 0, 1, 2, and 3, respectively. You are not restricted to using those devices with those channels.

You can connect devices to any channel or combination of channels as needed.

IMPORTANT:

- When an analog current device is connected to the module, place additional loop devices, for example, strip chart recorders, at either **A** location in the current loop.
- Use separate external power supplies to provide SA power to the system and to power external devices that are connected to the module.
- This module has only two shield terminals. Compact 5000 I/O module RTBs only support one wire per terminal.

If you connect more than two devices to the module, you can ground two devices at the shield terminals.

You must ground the remaining devices somewhere else, such as, to the DIN rail via a terminal strip. In this case, use the same power supply to power the additional devices. If separate power supplies are used to power the additional devices, ground the power supplies at the same ground location.

SA Power

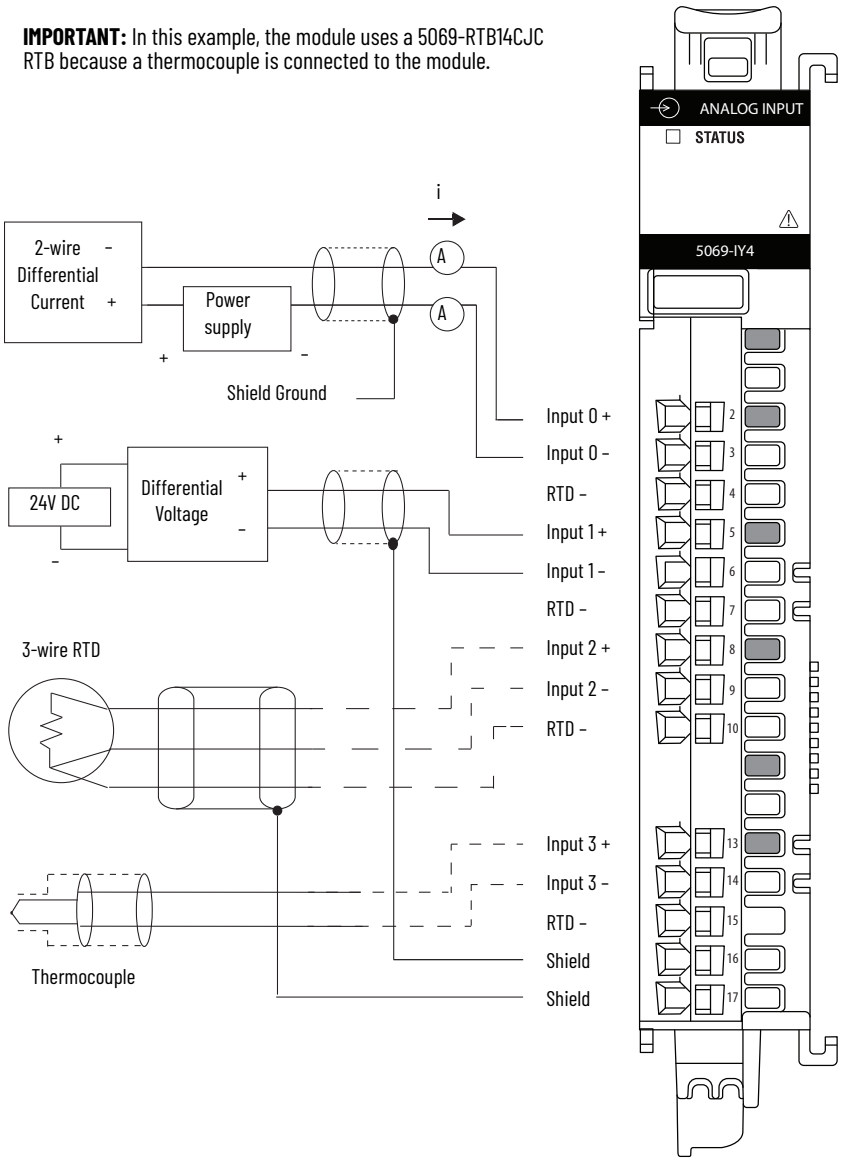
Connections to an external power supply that provides SA power are made via the SA Power RTB on one of the following:

- CompactLogix 5380 controller
- CompactLogix 5480 controller
- Compact GuardLogix 5380 controller
- 5069-AENTR or 5069-AEN2TR EtherNet/IP Adapter
- 5069-FPD field potential distributor

IMPORTANT: Remember the following:

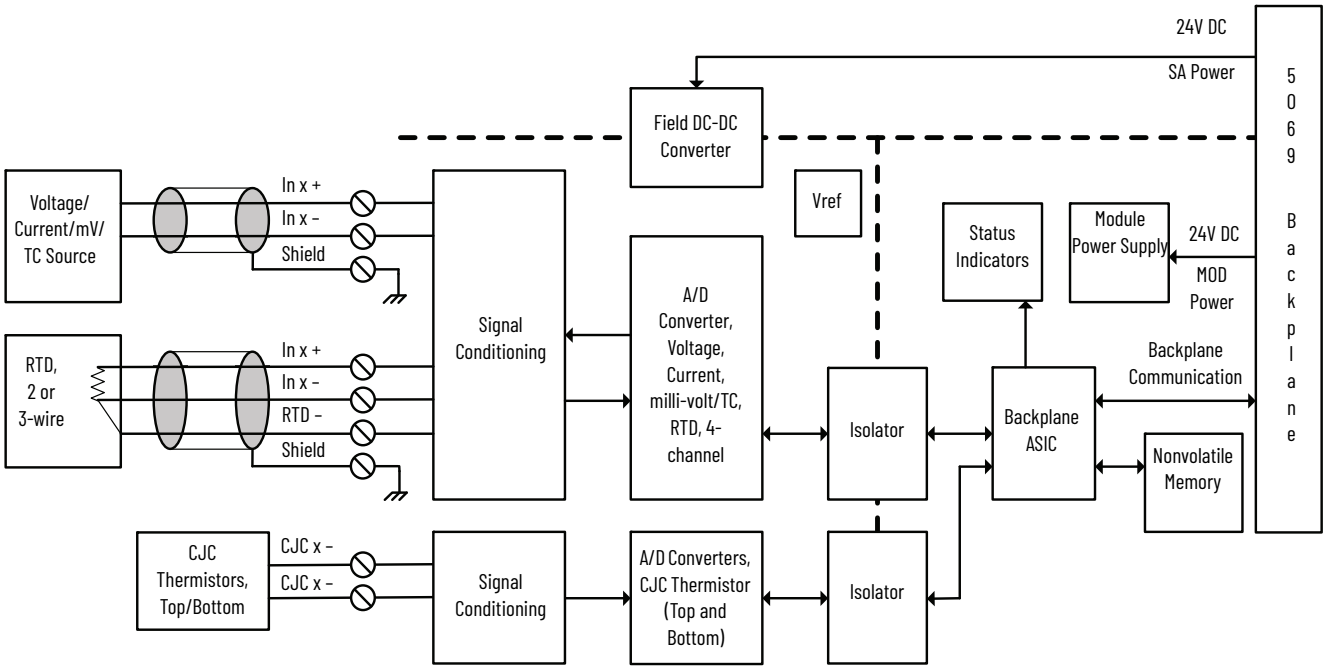
- The 5069-IY4 and 5069-IY4K modules use DC SA power. You must connect DC power to the component, that is, controller, adapter, or field potential distributor, that provides SA Power to the modules.
- If you install modules in a system that use AC SA power and DC SA power, you must install them on separate SA power buses.
- You use a 5069-FPD field potential distributor to establish a new SA Power bus in a system. SA Power buses are isolated from each other. To keep the modules on separate SA Power buses, complete these steps.
  1. Install the modules that use one type of SA power, for example DC, to the right of the adapter or controller, that is, the first SA Power bus.
  2. Install the 5069-FPD field potential distributor to establish a second SA Power bus.
  3. Install the modules that use the other type of SA power, for example AC, on the second SA Power bus.

IMPORTANT: In this example, the module uses a 5069-RTB14CJC RTB because a thermocouple is connected to the module.



The following figure shows a functional block diagram for the 5069-IY4 and 5069-IY4K modules.

5069-IY4 and 5069-IY4K Functional Block Diagram



Technical Specifications - 5069-IY4 and 5069-IY4K

Attribute	5069-IY4, 5069-IY4K
Inputs	4 differential
Input range, voltage	±10V 0…10V 0…5V
Input range, current	0…20 mA 4…20 mA
Input range, resistive	1…500 Ω 2…1000 Ω 4…2000 Ω 8…4000 Ω
Input type, RTD	100, 200, 500, 1000 Ω platinum, alpha=385 100, 200, 500, 1000 Ω platinum, alpha=3916 120 Ω nickel, alpha=672 100, 120, 200, 500 Ω nickel, alpha=618 10 Ω copper 427
Input range, thermocouple / millivolt	± 100 mV
Input type, thermocouple	B, C, D, E, J, K, L (TXK/XK), N, R, S, T
Input impedance	Voltage: >1 MΩ Current: 90 Ω typical, 70…110 Ω range RTD: >1 MΩ Thermocouple/millivolt: >1 MΩ
Common mode voltage (channel to channel)	±10V (Current mode and 3-wire RTD mode) ±2V (Voltage mode)

Technical Specifications - 5069-IY4 and 5069-IY4K

Attribute	5069-IY4, 5069-IY4K
Module conversion method	Sigma-Delta, One 24-bit multiplexed ADC
Resolution, voltage[1] (16 bits at 10 Hz notch filter)	±10.5V: <320 µV/count (15 bits plus sign bipolar) 0…10.5V: <160 µV/count (16 bits unipolar) 0…5.25V: <80 µ/V count (16 bits unipolar)
Resolution, current[1] (16 bits at 10 Hz notch filter)	0…21 mA: <0.32 µA/count (16 bits) 3.6…21 mA: <0.27 µA/count (16 bits)
Resolution, RTD[1] (16 bits at 10 Hz notch filter) 3 Wire mode	< 7.9 mΩ/cnt in 1…500 Ω mode < 15.8 mΩ/cnt in 2…1000 Ω mode < 31.7 mΩ/cnt in 4…2000 Ω mode < 63.4 mΩ/cnt in 8…4000 Ω mode
Resolution, thermocouple / millivolt[1] (16 bits at 10 Hz notch filter)	< 3.1 µV/cnt in ±100 mV mode
RTD excitation current	600 µA, 3 wire mode 100 µA, 2 wire mode
Wire impedance (3-wire RTD mode only)	25 Ω maximum for specified accuracy
RTD sensor types/temperature range: (Each sensor type in a cell supports all temperature ranges in the corresponding column to the right.)	
100, 200, 500, 1000 Ohm PT 385	-200…+870 °C -328…+1598 °F 73…1143 °K 132…2058 °R
100, 200, 500, 1000 Ohm PT 3916	-200…+630 °C -328…+1166 °F 73…903 °K 132…1626 °R
10 Ohm CU 247	-200…+260 °C -328…+500 °F 73…533 °K 132…960 °R
120 Ohm NI 672	-80…+320 °C -112…+608 °F 193…593 °K 348…1068 °R
100, 120, 200, 500 Ohm NI 618	-60…+250 °C -76…+482 °F 213…523 °K 384…942 °R

Technical Specifications - 5069-IY4 and 5069-IY4K

Attribute	5069-IY4, 5069-IY4K
Thermocouple type/temperature range	
Thermocouple Type B	21...1820 °C 68...3308 °F 293...2093 °K 528...3768 °R
Thermocouple Type C	0...2320 °C 32...4208 °F 273...2593 °K 492...4668 °R
Thermocouple Type D	0...2320 °C 32...4208 °F 273...2593 °K 492...4668 °R
Thermocouple Type E	-270...+1000 °C -454...+1832 °F 3...1273 °K 6...2292 °R
Thermocouple Type J	-210...+1200 °C -346...+2192 °F 63...1473 °K 114...2652 °R
Thermocouple Type K	-270...+1372 °C -454...+2502 °F 3...1645 °K 6...2961 °R
Thermocouple Type N	-270...+1300 °C -454...+2372 °F 3...1573 °K 6...2832 °R
Thermocouple Type R	-50...+1768 °C -58...+3215 °F 223...2041 °K 402...3674 °R
Thermocouple Type S	-50...+1768 °C -58...+3215 °F 223...2041 °K 402...3674 °R
Thermocouple Type T	-270...+400 °C -454...+752 °F 3...673 °K 6...1212 °R
Thermocouple Type TXK/XK (L)	-200...+800 °C -328...+1472 °F 73...1073 °K 132...1932 °R
Thermocouple linearization	ITS-90

Technical Specifications - 5069-IY4 and 5069-IY4K

Attribute	5069-IY4, 5069-IY4K
CJC inputs (for thermocouple mode use only)	Two CJC sensors 2 thermistors embedded in 5069-RTB14CJC-(SCREW or SPRING) RTB -or- 2 thermistors wired to 5069-RTB18-(SCREW or SPRING) RTB Thermistor type: Measurement Specialties, Inc. 10K3A1A
Local CJC sensor accuracy	± 0.3 °C
Remote CJC sensor accuracy (Based on specified thermistor)	± 0.3 °C
Calibrated accuracy at 25 °C	Voltage 0.100% full scale Current 0.100% full scale RTD 0.100% full scale Thermocouple/millivolt 0.100% full scale
Accuracy drift with temperature	Voltage 0.200% full scale Current 0.300% full scale RTD 0.200% full scale Thermocouple/millivolt 0.200% full scale
Input Total Unadjusted Error (TUE)(2) (Over full temperature range)	Voltage 0.300% Full Scale Current 0.400% Full Scale RTD 0.300% Full Scale Thermocouple/millivolt 0.300% Full Scale
Scan time • Per channel • Per group (channel group 0...3)	 625 µs 2.5 ms
Notch filter at minimum RPI (0.2 ms, 1 channel enabled)	62.5 kHz
Minimum notch filter frequency at RPI of 2.5 ms	10 kHz
Step response time to 63% of value (Notch filter 10 kHz)	7.5 ms
Input notch filter (Hz) selections	5, 10 (50/60 default), 15, 20, 50, 60, 100, 200, 500, 1000, 2500, 5000, 10000, 15625, 25000, 31250, 62500
Input anti-aliasing filter cutoff frequency, typical	500 Hz
Input digital filter	First Order Lag, 0 ms (Default)...32,767 ms (32.767 s)
HART handheld compliance:	Add an external 250 Ω resistor into the current loop for HART transmitter compliance.
Overvoltage protection, max	Voltage, current, RTD, and thermocouple/mV modes: ± 30V DC
Overcurrent protection, max	Current mode: ± 30 mA
Data value during overload condition	Full scale, overrange flag, Data uncertain / data bad
Open circuit detection time, nom	Voltage: + full scale, < 2 s Current: 4...20 mA range, < 2 s RTD: < 2 s Thermocouple / millivolt: + full scale, < 10 s
Onboard data alarming	Yes
Scaling to engineering units	Yes
Real-time channel sampling	Yes
Data format	IEEE 32-bit floating point

(1) Notch filter dependent.

(2) Includes offset, gain, non-linearity, and repeatability error terms.

General Specifications - 5069-IY4 and 5069-IY4K

Attribute	5069-IY4, 5069-IY4K
Voltage and current ratings	
MOD Power	75 mA @ 18...32V DC
MOD Power Passthrough, max[1]	9.55 A @ 18...32V DC
SA Power	100 mA @ 18...32V DC
SA Power Passthrough, max[2]	9.95 A @ 18...32V DC
Do n ot exceed 10 A MOD or SA Power (Passthrough) current draw	
Power dissipation, max	Voltage mode: 1.8 W Current mode: 2.1 W RTD mode: 2.1 W Thermocouple / millivolt mode: 1.8 W
Thermal dissipation, max	Voltage mode: 6.1 BTU/hr Current mode: 7.2 BTU/hr RTD mode: 7.2 BTU/hr Thermocouple/millivolt: 6.1 BTU/hr
Isolation voltage	250V (continuous), Basic Insulation Type 50V Functional Isolation between SA Power and input ports No isolation between individual input ports
Calibration methods	Factory calibrated User-performed (optional)
Module keying	Electronic keying via programming software
Indicators	1 green/red module status indicator 4 yellow/red I/O status indicators 2 yellow/red CJC status indicators
Slot width	1
Common mode noise rejection ratio	130 dB @ 50/60 Hz
Normal mode noise rejection ratio	65 dB @ 50/60 Hz, notch filter dependent
Dimensions (HxWxD), approx	144.57 x 22 x 105.42 mm (5.69 x 0.87 x 4.15 in.)
DIN rail	Compatible zinc-plated chromate-passivated steel DIN rail. You can use the EN50022 - 35 x 7.5 mm (1.38 x 0.30 in.) DIN rail.
RTB	One of these RTB types. • 5069-RTB18-SCREW • 5069-RTB18-SPRING • 5069-RTB14CJC-SCREW (Thermocouple mode) • 5069-RTB14CJC-SPRING (Thermocouple mode) **IMPORTANT**: You must order RTBs separately. RTBs do not ship with Compact 5000 I/O modules. We recommend that you order only the RTB type that your system requires.

General Specifications - 5069-IY4 and 5069-IY4K

Attribute	5069-IY4, 5069-IY4K
RTB torque (5069-RTB18-SCREW, 5069-RTB14CJC-SCREW)	0.4 N•m (3.5 lb•in)
RTB keying	None
Wire category(3)	2 - shielded input ports 2 - power ports 1 wire per terminal for each signal port
Wire size	
5069-RTB18-SPRING and 5069-RTB14CJC-SPRING connections	0.5…1.5 mm^2 (22…16 AWG) solid or stranded shielded copper wire rated at 105 °C (221 °F), or greater, 2.9 mm (0.11 in.) max diameter including insulation, single wire connection only.
5069-RTB18-SCREW and 5069-RTB14CJC-SCREW connections	0.5…1.5 mm^2 (22…16 AWG) solid or stranded shielded copper wire rated at 105 °C (221 °F), or greater, 3.5 mm (0.14 in.) max diameter including insulation, single wire connection only.
Insulation stripping length	
5069-RTB18-SPRING connections	10 mm (0.39 in.)
5069-RTB18-SCREW connections	12 mm (0.47 in.)
Enclosure type	None (open-style)
Weight, approx	175 g (0.39 lb)
North American temperature code	T4
ATEX temp code	T4
IECEx temp code	T4

(1) Level of MOD Power current that passes through the module depends on the system configuration, such as, module slot location and the other module types that are used in the system. For more information, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, 5069-UM001, CompactLogix 5480 Controllers User Manual, 5069-UM002, and Compact 5000 EtherNet/IP Adapters User Manual, 5069-UM004.

(2) Level of SA Power current that passes through the module depends on the system configuration, such as, module slot location and the other module types that are used in the system. For more information, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, 5069-UM001, CompactLogix 5480 Controllers User Manual, 5069-UM002, and Compact 5000 EtherNet/IP Adapters User Manual, 5069-UM004.

(3) Use this Conductor Category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 5069-IY4 and 5069-IY4K

Attribute	5069-IY4, 5069-IY4K
Temperature, operating IEC 60068-2-1 (Test Ab, Operating Cold), IEC 60068-2-2 (TestBb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air, max	60 °C (140 °F)
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…+85 °C (-40…+185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	5 g @ 10…500 Hz

Environmental Specifications - 5069-IY4 and 5069-IY4K

Attribute	5069-IY4, 5069-IY4K
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	IEC 61000-6-4
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% pulse 100% AM at 900 MHz 10V/m with 200 Hz 50% pulse 100% AM at 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV @ 5 kHz on power ports ±3 kV @ 5 kHz on shielded input ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on power ports ±2 kV line-earth (CM) on shielded input ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Voltage variation IEC 61000-4-29	10 ms interruption on MOD Power port

Certifications - 5069-IY4 and 5069-IY4K

Certification[1]	5069-IY4, 5069-IY4K
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
CE	European Union 2014/30/EU EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2014/35/EU LVD, compliant with: • EN 61010-2-201; Control Equipment Safety Requirements European Union 2011/65/EU RoHS, compliant with: • EN 50581; Technical documentation
RCM	Australian Radiocommunications Act, compliant with: EN 61000-6-4; Industrial Emissions
Ex	European Union 2014/34/EU ATEX Directive, compliant with: • EN 60079-0; General Requirements • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • II 3 G Ex nA IIC T4 Gc • DEMKO 15 ATEX 1484X
IECEx	IECEx System, compliant with: • IEC 60079-0; General Requirements • IEC 60079-15; Potentially Explosive Atmospheres, Protection "n" • II 3 G Ex nA IIC T4 Gc • IECEx UL 15.0055X
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3
EAC	Russian Customs Union TR CU 020/2011 EMC Technical Regulation Russian Customs Union TR CU 004/2011 LV Technical Regulation

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Technical Data

Original Instructions

5069-L310ER
5069-ECR

Allen-Bradley
by ROCKWELL AUTOMATION

CompactLogix 5380, Compact GuardLogix 5380, and CompactLogix 5480 Controllers Specifications

Bulletin 5069

Rockwell Automation

Summary of Changes

This publication contains the following new or updated information. This list includes substantive updates only and is not intended to reflect all changes.

Topic	Page
Added CompactLogix™ 5380 Process controllers (5069-L320ERP, 5069-L340ERP).	Throughout
Added I/O Capacity and Message Rate Capacity specifications for controllers.	3, 7, 16

Catalog Numbers

This publication is applicable to these controllers:

CompactLogix 5380 Controller Catalog Numbers	5069-L306ER, 5069-L306ERM, 5069-L310ER, 5069-L310ERM, 5069-L310ER-NSE, 5069-L320ER, 5069-L320ERM, 5069-L320ERMK, 5069-L330ER, 5069-L330ERM, 5069-L330ERMK, 5069-L340ER, 5069-L340ERM, 5069-L350ERM, 5069-L350ERMK, 5069-L380ERM, 5069-L3100ERM
CompactLogix 5380 Process Controller Catalog Numbers	5069-L320ERP, 5069-L340ERP
Compact GuardLogix 5380 SIL 2 Controller Catalog Numbers	5069-L306ERS2, 5069-L306ERMS2, 5069-L310ERS2, 5069-L310ERMS2,5069-L320ERS2, 5069-L320ERS2K, 5069-L320ERMS2, 5069-L320ERMS2K, 5069-L330ERS2, 5069-L330ERS2K, 5069-L330ERMS2, 5069-L330ERMS2K, 5069-L340ERS2, 5069-L340ERMS2, 5069-L350ERS2, 5069-L350ERS2K, 5069-L350ERMS2, 5069-L350ERMS2K, 5069-L380ERS2, 5069-L380ERMS2, 5069-L3100ERS2, 5069-L3100ERMS2
Compact GuardLogix 5380 SIL 3 Controller Catalog Numbers	5069-L306ERMS3, 5069-L310ERMS3, 5069-L320ERMS3, 5069-L320ERMS3K, 5069-L330ERMS3, 5069-L330ERMS3K, 5069-L340ERMS3, 5069-L350ERMS3, 5069-L350ERMS3K, 5069-L380ERMS3, 5069-L3100ERMS3
CompactLogix 5480 Controller Catalog Number	5069-L430ERMW, 5069-L450ERMW, 5069-4100ERMW, 5069-L4200ERMW

CompactLogix 5380 Controllers

CompactLogix™ 5380 controllers are part of the Logix 5000™ family of controllers. The controllers provide a scalable controller solution to address a wide variety of applications. The applications range from standalone systems to more complex systems with devices that are connected to the controller via an EtherNet/IP™ network.

The controllers are mounted on a DIN rail. They can monitor and control local and remote I/O modules, and other devices connected to an EtherNet/IP network. The CompactLogix 5380 controllers support this functionality:

- Use of Compact 5000™ I/O module as local I/O and remote I/O modules.
- Use Compact 5000 I/O modules, and other I/O modules, as remote I/O modules.
- Support for Integrated Motion over an EtherNet/IP network (not all controllers).
- Use of Dual-IP mode or Linear/DLR mode.
- Use of two Ethernet ports that let the controller connect to EtherNet/IP device-level and enterprise-level networks.
- Use of 1784-SD1, 1784-SD2, 1784-SDHC8, 1784-SDHC32, 9509-CMSDCD4 Secure Digital (SD) card for nonvolatile memory.
- USB programming port for temporary connection.
- CompactLogix 5380 Process controllers (5069-L320ERP, 5069-L340ERP) support PlantPAx® 5.0, and are conformal coated to add a layer of protection when exposed to harsh, corrosive environments. For more information, see the PlantPAx DCS Configuration and Implementation User Manual, publication PROCES-UM100.

Features - CompactLogix 5380 Controllers

Feature	5069-L306ER, 5069-L306ERM	5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM	5069-L320ER, 5069-L320ERM, 5069-L320ERMK, 5069-L320ERP	5069-L330ER, 5069-L330ERM, 5069-L330ERMK	5069-L340ER, 5069-L340ERM, 5069-L340ERP	5069-L350ERM, 5069-L350ERMK	5069-L380ERM	5069-L3100ERM
Controller tasks Continuous Periodic Event	32 tasks 1000 programs/task All event triggers							
Built-in communication ports	1 - USB port 2 - Ethernet ports **IMPORTANT**: Consider the following: When the controller operates in Dual-IP mode, each Ethernet port requires a unique IP address. When the controller operates in Linear/DLR mode, the controller uses only one IP address.							
USB port communication	USB 2.0, Type B Full speed (12 Mbps) Programming, configuration, firmware update, and online edits only							
Ethernet performance	10 Mbps, 100 Mbps, 1 Gbps Full-duplex only							
I/O Capacity (Class 0/1) (1)	128,000 packets/second							
Message Rate Capacity HMI/MSG (Class 3) (1)	2000 messages/second							
EtherNet/IP modes supported	Dual-IP mode (Available with the Studio 5000 Logix Designer® application, version 29.00.00 or later) Linear/DLR mode							
EtherNet/IP network topologies supported	DLR Star Linear							
EtherNet/IP nodes supported, max (2)	16	24	40	60	90	120	150	180
Socket interfaces supported, max	32							
Integrated motion (3)	5069-L306ERM	5069-L310ERM	5069-L320ERM, 5069-L320ERMK, 5069-L320ERP	5069-L330ERM, 5069-L330ERMK	5069-L340ERM, 5069-L340ERP	5069-L350ERM, 5069-L350ERMK	5069-L380ERM	5069-L3100ERM

Features - CompactLogix 5380 Controllers (Continued)

Feature	5069-L306ER, 5069-L306ERM	5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM	5069-L320ER, 5069-L320ERM, 5069-L320ERMK, 5069-L320ERP	5069-L330ER, 5069-L330ERM, 5069-L330ERMK	5069-L340ER, 5069-L340ERM, 5069-L340ERP	5069-L350ERM, 5069-L350ERMK	5069-L380ERM	5069-L3100ERM
Number of axes supported, max(4)	256							
Number of CIP™ Drive axes (Position loop-configured) supported, max(5)	5069-L306ERM: 2	5069-L310ERM: 4	5069-L320ERM, 5069-L320ERMK, 5069-L320ERP: 8	5069-L330ERM, 5069-L330ERMK: 16	5069-L340ERM, 5069-L340ERP: 20	24	28	32
Programming languages	Ladder Diagram (LD) Structured Text (ST) Function Block Diagram (FBD) Sequential Function Chart (SFC)							

(1) I/O numbers are maximums; they assume no HMI/MSG. HMI/MSG numbers are maximums, they assume no I/O. Maximums assume the processor is target, not originator. Packet rates vary depending on packet size. For more details, see Troubleshoot EtherNet/IP Application Technique, publication ENET-AT003, and the EDS file for a specific catalog number.

(2) The maximum number of nodes that are listed represents when the controller is used with the Logix Designer application, version 31 or later. Some controllers can be used with earlier Logix Designer application versions. The maximum number of nodes that a controller supports can be fewer in Logix Designer application, versions 30 or earlier.

(3) Only CompactLogix 5380 controllers that have an M or P in their catalog number support Integrated Motion on EtherNet/IP networks.

(4) Any combination of CIP Drive, Virtual, Consumed, Regenerative AC/DC Converter and Non-Regenerative AC/DC Converter axis types.

(5) The maximum number of CIP Drive axes (configured for Position Loop) that can be included in the total integrated motion axes count for a controller.

Technical Specifications - CompactLogix 5380 Controllers

Attribute	5069-L306ER, 5069-L306ERM	5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM	5069-L320ER, 5069-L320ERM, 5069-L320ERMK, 5069-L320ERP	5069-L330ER, 5069-L330ERM, 5069-L330ERMK	5069-L340ER, 5069-L340ERM, 5069-L340ERP	5069-L350ERM, 5069-L350ERMK	5069-L380ERM	5069-L3100ERM
User memory	0.6 MB	1 MB	2 MB	3 MB	4 MB	5 MB	8 MB	10 MB
Optional nonvolatile memory	• 1784-SD1 (1 GB) • 1784-SD2 (2 GB), ships with controller • 1784-SDHC8 (8 GB) • 1784-SDHC32 (32 GB) • 9509-CMSDCD4 (4 GB) CodeMeter CmCard card							
Local I/O modules, max	8	8	16	31(1)	31	31	31	31
MOD Power voltage range	18...32V DC							
MOD Power current, max	450 mA							
MOD Power inrush	850 mA for 125 ms							
MOD Power passthrough(2)	9.55 A @ 18...32V DC							
MOD Power current rating, max	10 A Do not exceed 10 A current draw at the MOD Power RTB.							
SA Power voltage ranges(3)	0...32V DC 0...240V AC, 47...63 Hz ATEX/IECEX, 125V AC max							
SA Power current, max(3)	10 mA (DC power) 25 mA (AC power)							
SA Power passthrough(3), (4)	9.95 A @ 0...32V DC 9.975 A @ 0...240V AC, 47...63 Hz ATEX/IECEX, 125V AC max							
SA Power current rating, max (3)	10 A (AC or DC power) Do not exceed 10 A current draw at the SA Power RTB.							
Power dissipation, max	8.5 W							
Thermal dissipation, max	29 BTU/hr							
Isolation voltage	300V (continuous), Basic Insulation Type, SA, and MOD Power to Backplane 300V (continuous), Basic Insulation Type, SA to MOD Power 300V (continuous), Basic Insulation Type, Ethernet to Backplane 300V (continuous), Double Insulation Type, Ethernet to MOD Power 300V (continuous), Double Insulation Type, Ethernet to SA Power 50V (continuous), Functional Insulation Type, Ethernet to USB 300V (continuous), Basic Insulation Type, USB to Backplane 300V (continuous), Double Insulation Type, USB to MOD Power 300V (continuous), Double Insulation Type, USB to SA Power No isolation between Ethernet ports Type tested at 1500V AC for 60 s							
Weight, approx	0.768 kg (1.693 lb)							

Technical Specifications - CompactLogix 5380 Controllers (Continued)

Attribute	5069-L306ER, 5069-L306ERM	5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM	5069-L320ER, 5069-L320ERM, 5069-L320ERMK, 5069-L320ERP	5069-L330ER, 5069-L330ERM, 5069-L330ERMK	5069-L340ER, 5069-L340ERM, 5069-L340ERP	5069-L350ERM, 5069-L350ERMK	5069-L380ERM	5069-L3100ERM
Dimensions (HxWxD), approx	143.97 x 98.10 x 136.81 mm (5.67 x 3.86 x 5.39 in.)							
Location	DIN rail mount (horizontal mount only)							
DIN rail	Compatible zinc-plated, chromate steel DIN rail. EN50022 - 35 x 7.5 mm (1.38 x 0.30 in.)							
Removable terminal block	RTBs are available in separately ordered 5069 RTB kits. The MOD power connection uses a 4-point RTB, and the SA power connection uses a 6-point RTB. The following kits are available: • Kit catalog number 5069-RTB64-SCREW contains RTB catalog numbers 5069-RTB6-SCREW and 5069-RTB4-SCREW. • Kit catalog number 5069-RTB64-SPRING contains RTB catalog numbers 5069-RTB6-SPRING and 5069-RTB4-SPRING.							
Terminal block torque	5069-RTB4-SCREW & 5069-RTB6-SCREW: 0.4 N•m (3.5 lb•in) 5069-RTB4-SPRING & 5069-RTB6-SPRING: Torque does not apply							
Wire size	5069-RTB4-SCREW, 5069-RTB6-SCREW connections: 0.5…1.5 mm^2 (22…16 AWG) solid or stranded copper wire that is rated at 105 °C (221 °F), or greater, 3.5 mm (0.14 in.) max diameter including insulation, single wire connection only 5069-RTB4-SPRING, 5069-RTB6-SPRING connections: 0.5…1.5 mm^2 (22…16 AWG) solid or stranded copper wire that is rated at 105 °C (221 °F), or greater, 2.9 mm (0.11 in.) max diameter including insulation, single wire connection only Ethernet connections: Ethernet Cabling and Installation according to IEC 61918 and IEC 61784-5-2							
Insulation stripping length	5069-RTB4-SCREW, 5069-RTB6-SCREW connections: 12 mm (0.47 in.) 5069-RTB4-SPRING, 5069-RTB6-SPRING connections: 10 mm (0.39 in.)							
Wire category(5)	3 - on USB port 1 - on power ports 2 - on Ethernet ports							
Enclosure	None (open-style)							
North American temperature code	T4							
ATEX temperature code	T4							
IECEx temperature code	T4							

(1) When you use these controllers with the Studio 5000 Logix Designer application, version 29.00.00, the application limits the number of local I/O modules in the project to 16. For more information, see the Rockwell Automation Knowledgebase article #942580, '5380 CompactLogix controllers limited to 16 local 5069 modules in version 29 of Studio 5000® environment.The document is available at http://www.rockwellautomation.com/knowledgebase.
With the Logix Designer application, version 30.00.00 or later, the controllers support as many as 31 local I/O modules.

(2) Maximum level of MOD Power current that the controller can pass through to the next module in the system. The specific level of current passed through varies based on system configuration.

(3) SA power specifications are based on the number and type of Compact 5000 I/O modules that are used in the system. If the set of I/O modules that are used in the system require AC and DC voltage, you must install a 5069-FPD field potential distributor to separate the module types.

(4) Maximum level of SA Power current that the controller can pass through to the next module in the system. The specific level of current passed through varies based on system configuration.

(5) Use this Conductor Category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - CompactLogix 5380 Controllers

Attribute	5069-L306ER, 5069-L306ERM, 5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM, 5069-L320ER, 5069-L320ERM, 5069-L320ERMK, 5069-L320ERP, 5069-L330ER, 5069-L330ERM, 5069-L330ERMK, 5069-L340ER, 5069-L340ERM, 5069-L340ERP, 5069-L350ERM, 5069-L350ERMK, 5069-L380ERM, 5069-L3100ERM
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0 °C < Ta < +60 °C (+32 °F <Ta < +140 °F)
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…+85 °C (-40…+185 °F)
Temperature, surrounding air, max	60 °C (140 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	5 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	IEC 61000-6-4

Environmental Specifications - CompactLogix 5380 Controllers (Continued)

Attribute	5069-L306ER, 5069-L306ERM, 5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM, 5069-L320ER, 5069-L320ERM, 5069-L320ERMK, 5069-L320ERP, 5069-L330ER, 5069-L330ERM, 5069-L330ERMK, 5069-L340ER, 5069-L340ERM, 5069-L340ERP, 5069-L350ERM, 5069-L350ERMK, 5069-L380ERM, 5069-L3100ERM
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	± 4 kV at 5 kHz on power ports ± 2 kV at 5 kHz on Ethernet ports
Surge transient immunity IEC 61000-4-5	± 1 kV line-line (DM) and ± 2 kV line-earth (CM) on power ports ± 2 kV line-earth (CM) on Ethernet ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Voltage variation IEC 61000-4-29	10 ms interruption on MOD Power port

Certifications - CompactLogix 5380 Controllers

Certification[1]	5069-L306ER, 5069-L306ERM, 5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM, 5069-L320ER, 5069-L320ERM, 5069-L320ERMK, 5069-L320ERP, 5069-L330ER, 5069-L330ERM, 5069-L330ERMK, 5069-L340ER, 5069-L340ERM, 5069-L340ERP, 5069-L350ERM, 5069-L350ERMK, 5069-L380ERM, 5069-L3100ERM
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
CE	European Union 2014/30/EU EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2014/35/EU LVD, compliant with: • EN 61010-2-201; Control Equipment Safety Requirements European Union 2011/65/EU RoHS, compliant with: • EN 50581; Technical documentation
RCM	Australian Radiocommunications Act, compliant with: • EN 61000-6-4; Industrial Emissions
Ex	European Union 2014/34/EU ATEX Directive, compliant with: • EN 60079-0; General Requirements • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • II 3 G Ex nA IIC T4 Gc • DEMKO 15 ATEX 1455X when used at or below 125V AC
IECEx	IECEx System, compliant with: • IEC 600079-0: General Requirements • IEC 60079-15; Potentially Explosive Atmospheres, Protection "n" • II 3 G Ex nA IIC T4 Gc • IECEx UL 15.0007X when used at or below 125V AC
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: • Article 58-2 of Radio Waves Act, Clause 3 **IMPORTANT**: This certification does not apply to the following catalog numbers: 5069-L320ERMK, 5069-L330ERMK, 5069-L350ERMK
EAC	Russian Customs Union TR CU 020/2011 EMC Technical Regulation
EtherNet/IP	ODVA conformance tested to EtherNet/IP specifications

(1) See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Controller Minimum Spacing Requirements

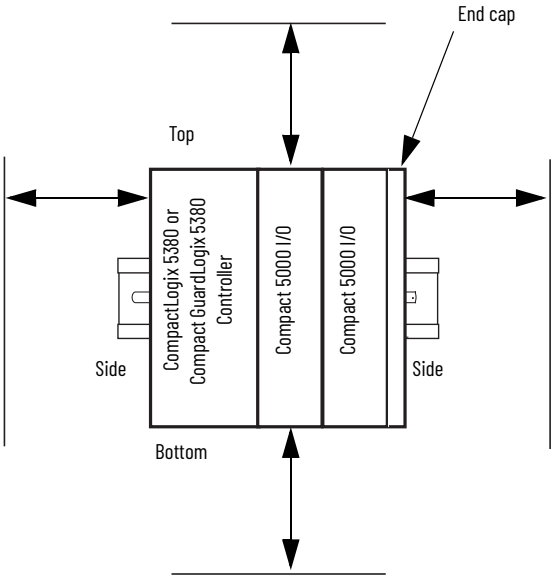
The minimum distance between the CompactLogix 5380 system or Compact GuardLogix 5380 system and enclosure walls, wireways, and adjacent equipment varies based on the current operating temperature.

The minimum distances on all sides of the system are as follows:

- **CompactLogix 5380 Standard and Process Controllers**
  - 50.80 mm (2.00 in.) at 55 °C (131 °F)
  - 101.60 mm (4.00 in) at 60 °C (140 °F)
- **Compact GuardLogix 5380 SIL 2 Controller**

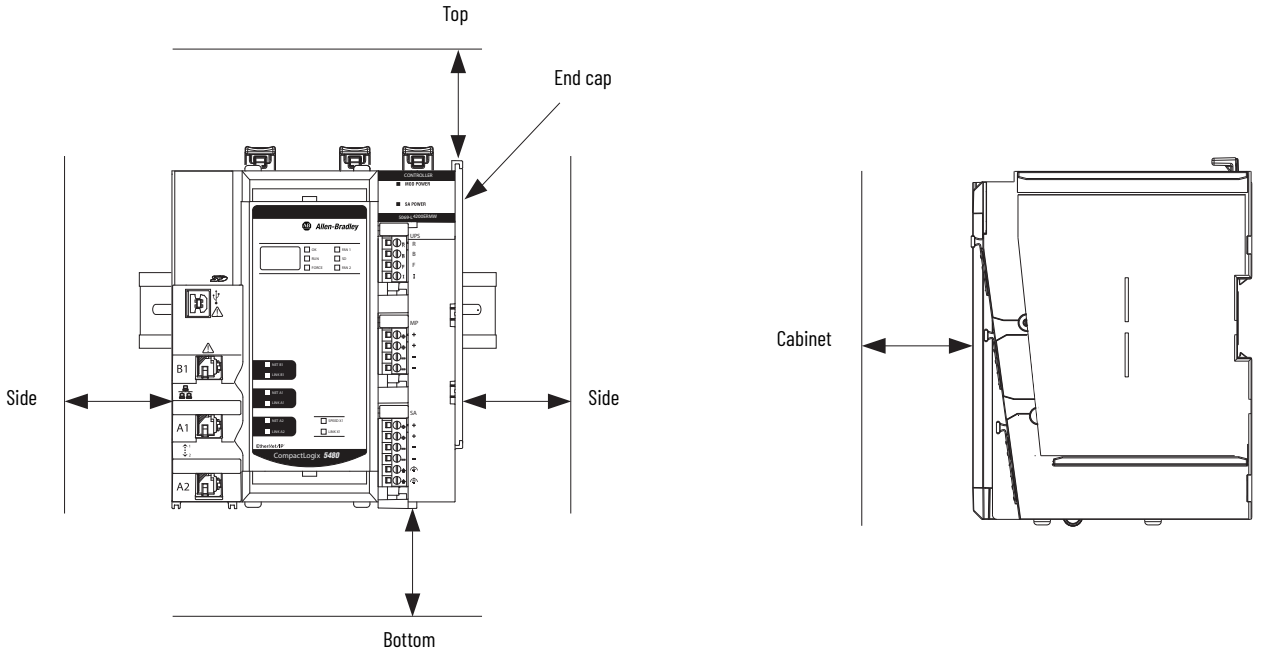
  Series A catalog numbers:
  - 50.8 mm (2.00 in.) at 50 °C (122 °F)
  - 101.6 mm (4.00 in.) at 55 °C (131 °F)
  - 152.4 mm (6.00 in) at 60 °C (140 °F)

  Series B catalog numbers:
  - 50.8 mm (2.00 in.) at 55 °C (131 °F)
  - 101.6 mm (4.00 in.) at 60 °C (140 °F)
- **Compact GuardLogix 5380 SIL 3 Controller**
  - 50.8 mm (2.00 in.) at 55 °C (131 °F)
  - 101.6 mm (4.00 in.) at 60 °C (140 °F)



The minimum distance on of a system that includes only a CompactLogix 5480 controller is as follows:

- 25.00 mm (0.98 in.) between the sides and the cabinet
- 25.00 mm (0.98 in.) between the front of the controller and the cabinet
- 50.00 mm (1.96 in.) between the top and bottom and the cabinet
  We recommend that you install the controller near the bottom of the enclosure, where ambient temperature is lower.

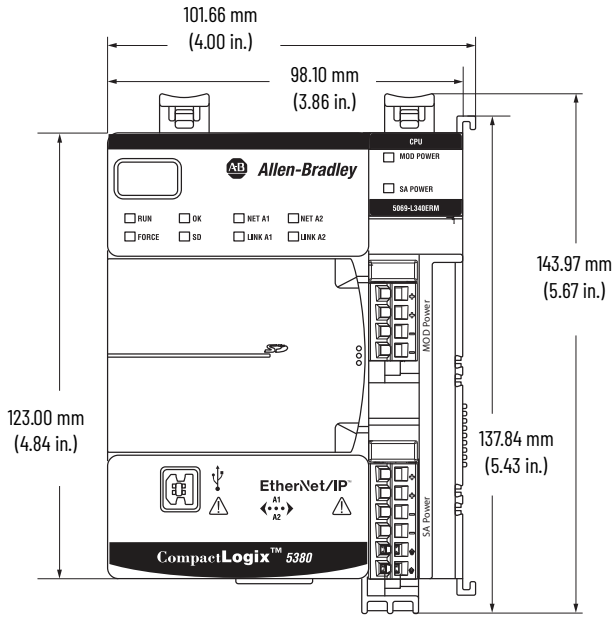


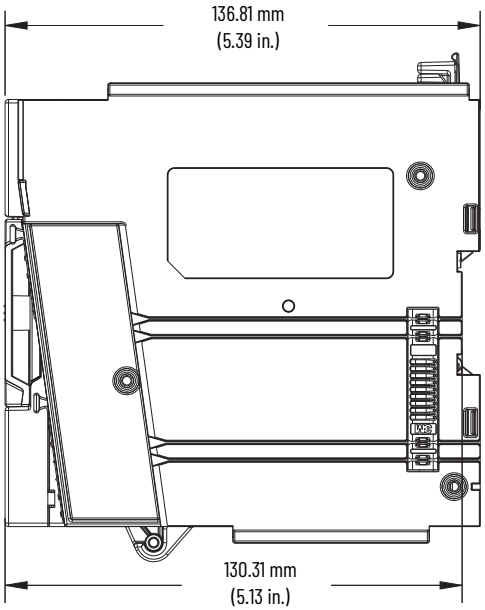
IMPORTANT If Compact 5000 I/O modules are installed next to a CompactLogix 5380, Compact GuardLogix 5380, or CompactLogix 5480 controller, you must mount the system horizontally.

You mount CompactLogix 5480 controllers in any orientation if there are no Compact 5000 I/O modules installed next to the controller.

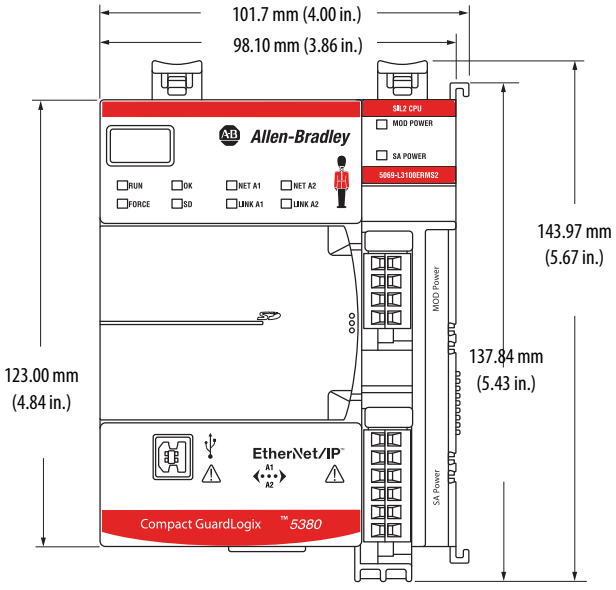
Controller Dimensions

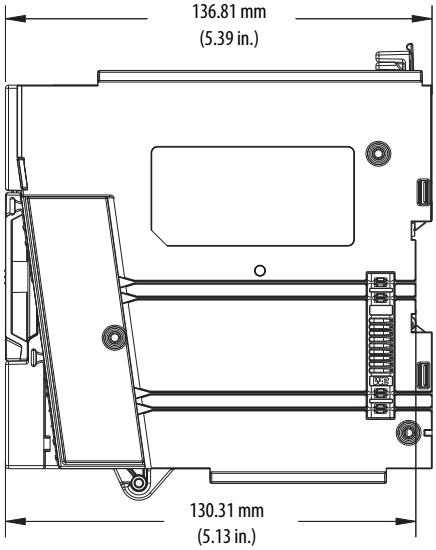
CompactLogix 5380





Compact GuardLogix 5380 SIL 2 Controller





Controller Use with Other Devices

Your controller can control and communicate with the following devices:

- Control I/O Modules
- Communicate with Display Devices
- Communicate with Other Controllers

Control I/O Modules

The CompactLogix 5380 and Compact GuardLogix 5380 controllers can monitor and control local and remote I/O modules.

Local I/O Modules

- A CompactLogix 5380 and CompactLogix 5480 system supports Compact 5000 I/O standard modules as local I/O modules.
- A Compact GuardLogix 5380 system supports Compact 5000 I/O standard and safety modules as local modules.

The number of local I/O modules that are supported in a CompactLogix 5380 system or Compact GuardLogix 5380 system varies by controller catalog number.

Cat. No.	Local Compact 5000 I/O Modules Supported, Max	
	Standard I/O Modules	Any Combination of Standard and Safety I/O Modules
5069-L306ER, 5069-L306ERM	8	—
5069-L306ERS2, 5069-L306ERMS2, 5069-L306ERMS3		8
5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM	8	—
5069-L310ERS2, 5069-L310ERMS2, 5069-L310ERMS3		8
5069-L320ER, 5069-L320ERM, 5069-L320ERMK, 5069-L320ERP	16	—
5069-L320ERS2, 5069-L320ERMS2, 5069-L320ERS2K, 5069-L320ERMS2K, 5069-L320ERMS3, 5069-L320ERMS3K		16
5069-L330ER, 5069-L330ERM(1), 5069-L330ERMK(1)	31	—
5069-L330ERS2, 5069-L330ERMS2, 5069-L330ERS2K, 5069-L330ERMS2K, 5069-L330ERMS3, 5069-L330ERMS3K		31
5069-L340ER, 5069-L340ERM, 5069-L340ERP	31	—
5069-L340ERS2, 5069-L340ERMS2, 5069-L340ERMS3		31
5069-L350ERM, 5069-L350ERMK	31	—
5069-L350ERS2, 5069-L350ERMS2, 5069-L350ERS2K, 5069-L350ERMS2K, 5069-L350ERMS3, 5069-L350ERMS3K		31
5069-L380ERM	31	—
5069-L380ERS2, 5069-L380ERMS2, 5069-L380ERMS3		31
5069-L3100ERM	31	—
5069-L3100ERS2, 5069-L3100ERMS2, 5069-L3100ERMS3		31
5069-L430ERMW, 5069-L450ERMW, 5069-4100ERMW, 5069-L4200ERMW	31	—

(1) When you use these controllers with the Logix Designer application, version 29.00.00, the application limits the number of local I/O modules in the project to 16. For more information, see the Rockwell Automation Knowledgebase article #942580, '5380 CompactLogix controllers limited to 16 local 5069 modules in version 29 of Studio 5000®.' The document is available at http://www.rockwellautomation.com/knowledgebase. With the Logix Designer application, version 30.00.00 or later, the controllers support 31 local I/O modules.

Remote I/O Modules

The controllers can connect to these remote I/O modules over an EtherNet/IP network.

IMPORTANT For maximum performance, we recommend that you use Compact 5000 I/O modules when you use remote I/O modules.

CompactLogix 5380 controllers, Compact GuardLogix 5380, and CompactLogix 5480 controllers support the remote I/O modules in this table. The I/O modules that are listed are **standard I/O modules**.

Module Type	I/O Module Family
Chassis-based I/O	1746 SLC™ I/O
	1756 ControlLogix® I/O
	1769 Compact I/O™
	Compact 5000 I/O standard modules
In-cabinet I/O	1734 POINT I/O™
	1794 FLEX™ I/O
On-Machine™ I/O	1732 ArmorBlock® I/O
	1738 ArmorPOINT® I/O

Only Compact GuardLogix 5380 controllers support the remote I/O modules in this table. The I/O modules that are listed are **safety I/O modules**.

Module Type	I/O Module Family
Chassis-based I/O	Compact 5000 I/O safety modules
	1756 ControlLogix Safety I/O
In-cabinet I/O	CompactBlock™ Guard I/O™
	POINT Guard I/O™
On-Machine™ I/O	1732 ArmorBlock® Guard I/O™

Communicate with Display Devices

The controller can communicate with these display devices over an EtherNet/IP network.

Device Type	Display
Industrial computers	Allen-Bradley® integrated-display rotating media (HDD) and solid-state (SSD) computers
	Allen-Bradley integrated-display computers with keypad
	Allen-Bradley non-display computers
Graphic terminals	PanelView™ Plus and PanelView CE terminals
	PanelView standard terminals
Message displays	InView™ message displays

Communicate with Other Controllers

The controller can communicate with these programmable controllers.

Controller Type	Controller Family
Programmable automation controller	CompactLogix 5370
	CompactLogix 5380
	CompactLogix 5480
	Compact GuardLogix 5370 (safety)
	Compact GuardLogix 5380 (safety)
	ControlLogix 5570
	ControlLogix 5580
	GuardLogix 5570 (safety)
	GuardLogix 5580 (safety)
	1756 Armor™ ContrlLogix (safety)
	1756 Armor™ GuardLogix® (safety)
	1768 Compact GuardLogix (safety)
	1768 CompactLogix
	1769 Modular CompactLogix
	1769 Packaged CompactLogix
Programmable logic controllers	1789 SoftLogix™ 5800
	PowerFlex® with DriveLogix™
	1785 PLC-5®(1)
	1747 SLC™(1)
	1761 MicroLogix™(2)
	1762 MicroLogix(2)
	1763 MicroLogix
	1764 MicroLogix(2)
	1766 MicroLogix

(1) These controllers require a built-in Ethernet port or a 1761-NET-ENI, EtherNet/IP RS-232-C interface to communicate with a CompactLogix 5380 controller over an EtherNet/IP network.

(2) These controllers require a 1761-NET-ENI, EtherNet/IP RS-232-C interface to communicate with a CompactLogix 5380 controller over an EtherNet/IP network.

Ethernet Node Limits

When you configure a CompactLogix 5380, Compact GuardLogix 5380, or CompactLogix 5480 control system, consider the number of Ethernet nodes that are used. The number of Ethernet nodes that you can include in the I/O configuration section in the Logix Designer application project is limited.

Maximum Number of Ethernet Nodes

The number of nodes that are supported in a Logix Designer application project varies by CompactLogix 5380, Compact GuardLogix 5380, and CompactLogix 5480 controller.

The maximum number of nodes that are listed represents when the controller is used with the Logix Designer application, version 31 or later. You can use CompactLogix 5380 controllers with earlier Logix Designer application versions. The maximum number of nodes that a controller supports can be fewer in Logix Designer application, versions 30 or earlier.

Cat. No.	Ethernet Nodes Supported
5069-L306ER, 5069-L306ERM, 5069-L306ERS2, 5069-L306ERMS2, 5069-L306ERMS3	16
5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM, 5069-L310ERS2, 5069-L310ERMS2, 5069-L310ERMS3	24
5069-L320ER, 5069-L320ERM, 5069-L320ERMK, 5069-L320ERP 5069-L320ERS2, 5069-L320ERMS2, 5069-L320ERS2K, 5069-L320ERMS2K, 5069-L320ERMS3, 5069-L320ERMS3K	40
5069-L330ER, 5069-L330ERM, 5069-L330ERMK, 5069-L330ERS2, 5069-L330ERMS2, 5069-L330ERS2K, 5069-L330ERMS2K, 5069-L330ERMS3, 5069-L330ERMS3K	60
5069-L340ER, 5069-L340ERM, 5069-L340ERP 5069-L340ERS2, 5069-L340ERMS2, 5069-L340ERMS3	90
5069-L350ERM, 5069-L350ERMK, 5069-L350ERS2, 5069-L350ERMS2, 5069-L350ERS2K, 5069-L350ERMS2K	120
5069-L380ERM, 5069-L380ERS2, 5069-L380ERMS2, 5069-L380ERMS3	150
5069-L3100ERM, 5069-L3100ERS2, 5069-L3100ERMS2, 5069-L3100ERMS3	180
5069-L430ERMW	60
5069-L450ERMW	120
5069-4100ERMW	180
5069-L4200ERMW	250

Any devices that you add directly to the I/O configuration section are counted toward the Ethernet node limit. The following are examples of devices that must be counted:

- Remote communication adapters
- Devices with an embedded Ethernet port, such as I/O modules, drives, and linking devices
- Remote controllers when a produce/consume connection is established between the two controllers
- HMI devices that are included in the I/O configuration tree
- Third-party devices that are directly connected to the EtherNet/IP network

Accessories

The following accessories are used with a CompactLogix 5380, Compact GuardLogix 5380, or CompactLogix 5480 controller:

- End Cap
- Memory Cards
- Removable Terminal Kits - For CompactLogix 5380 and Compact GuardLogix 5380 controllers, Removable Terminal Blocks (RTB) are available in separately ordered 5069 RTB kits. For CompactLogix 5480 controllers, the required RTB kit ships with the controllers.
- Ethernet Communication Cables

End Cap

You must install an end cap, catalog number 5069-ECR, on the right side of the last module in a CompactLogix 5380, Compact GuardLogix 5380, or CompactLogix 5480 control system. The end cap is shipped with the controller.

SHOCK HAZARD: The end cap covers the exposed interconnections on the last module in the system. If you do not install the end cap before powering the system, equipment damage or injury from electric shock can result.

Memory Cards

Memory cards, also known as Secure Digital (SD) cards, offer nonvolatile memory to store a user program and tag data on a controller. Through the Logix Designer application, you can manually trigger the controller to save to or load from nonvolatile memory or configure the controller to load from nonvolatile memory on powerup.

A 1784-SD2 card ships with the controller. If you need additional SD cards, we recommend that you use one that is available from Rockwell Automation. The following SD cards are available to use with the controllers:

- 1784-SD1 (1 GB)
- 1784-SD2 (2 GB)
- 1784-SDHC8 (8GB)
- 1784-SDHC32 (32 GB)
- 9509-CMSDCD4 (4 GB)

We recommend that you use the SD cards available from Rockwell Automation.

Technical Specifications - 1784-SD1, 1784-SD2, 1784-SDHC8, 1784-SDHC32, 9509-CMSDCD4

Attribute	1784-SD1	1784-SD2	1784-SDHC8	1784-SDHC32	9509-CMSDCD4(1)
Memory	1 GB	2 GB	8 GB	32 GB	4 GB
Supported controllers	CompactLogix 5380, Compact GuardLogix 5380, CompactLogix 5480 controllers				
Weight, approx	1.76 g (0.062 oz)				2 g (0.07 oz)

(1) This card is used when license-based source protection and execution protection features are enabled.

Technical Data

Original Instructions

PanelView 5310 Terminals Specifications

Catalog Numbers 2713P-T6CD1, 2713P-T6CD1-B, 2713P-T6CD1-K, 2713P-T7WD1, 2713P-T7WD1-B, 2713P-T7WD1-K, 2713P-T9WD1, 2713P-T9WD1-B, 2713P-T9WD1-K, 2713P-T10CD1, 2713P-T10CD1-B, 2713P-T10CD1-K, 2713P-T12WD1, 2713P-T12WD1-B, 2713P-T12WD1-K

The PanelView™ 5310 terminals are operator interface devices that monitor and control devices attached to ControlLogix® 5570 and 5580, and CompactLogix™ L1, L2, and L3 controllers over an EtherNet/IP™ network. Animated graphic and text displays provide operators with a view into the operating state of a machine or process. Operators interact with the control system by using the touch screen.

The PanelView 5310 terminals include these features and capabilities:

- Tightly integrated control and design environment allows information to be shared between the PanelView 5310 terminal and the Logix platforms.
- The Studio 5000® environment provides one point of access for the Studio 5000 View Designer® and Studio 5000 Logix Designer® applications.(1)
- Connection to one ControlLogix 5570, ControlLogix 5580, or CompactLogix L1, L2, or L3 controller with revision 27 firmware or later.
- Supports a maximum of 100 user-defined screens.
- Supports a maximum of 4,000 Logix-based alarms.(1)
- Easily configured screen navigation menu.
- Conformal coating available for all terminal sizes.

(1) PanelView 5310 firmware can support up to 4,000 Logix-based alarms in a single controller if you use Studio 5000 View Designer application version 5 and Studio 5000 Logix Designer application version 32 or higher. Of the 4,000 alarms, no more than 1,000 can be instruction-based. Earlier versions of the Studio 5000 View Designer or Studio 5000 Logix Designer applications can support up to 1,000 Logix-based alarms.

Summary of Changes

This publication contains new and updated information as indicated in this table.

Topic	Page
Updated the Corrosive Atmosphere statement in the Environmental Specifications table.	2
Removed the following catalog numbers from the Accessories section: 2711P-RY2032, 2711-RCSD, 2711P-RSACDIN, 1784-SD1, and 1784-SD2.	6…7

Environmental Specifications

This table provides environmental specifications for the PanelView 5310 terminals.

Attribute	Value
Temperature, operating	0…50 °C (32…122 °F)
Temperature, nonoperating	-25…+70 °C (-13…+158 °F)
Relative humidity	5…95% without condensation
Vibration	0.012 pk-pk, 10…57 Hz 2 g peak at 57…500 Hz
Shock, operating	15 g at 11 ms
Shock, nonoperating	30 g at 11 ms
Altitude, operating	Sea level to 2,000 m (6,562 ft)
Enclosure ratings	NEMA and UL Type 4X, 12, 13, and classified by UL as IP66 (when mounted on a flat surface of an equivalent enclosure)
Corrosive Atmosphere ASTM B845-97 Method K Accelerated Test (30 Day Exposure)	For PanelView 5310 conformal-coated PCBA level products with catalog numbers that end in K, product meets or exceeds the following requirement: Severity Level GX* ** per ANSI/ISA 71.04.2013, Airborne Contaminants—Gases **Up to 2100 angstroms of film growth per 3 days of copper and silver reactivity Severity Level CX* per IEC 60721-3-3 2019, Chemically Active Substances *Port plugs need to remain installed in unused ports, at all times during storage and operation, for the product to meet its corrosive atmosphere rating.

Certifications

This table provides certification information for the PanelView 5310 terminals.

Certification[1]	Value
c-UL-us	c-UL-us Listed to UL 61010-1, UL 61010-2-201, CAN/CSA-C22.2 No. 61010-1, and CAN/CSA-C22.2 No. 61010-2-201; see 2713P-CT002
CE (EMC)	European Union EMC Directive, compliance with: • EN 61131-2; Programmable Controllers (pertinent EMC sections); see 2713P-CT004
EAC	Russian Customs Union TP TC 020/2011 EMC Technical Regulation; see 2713P-CT001
EtherNet/IP	ODVA conformance tested to EtherNet/IP specifications; see 2713P-CT005
KC	KC registered; see 2713P-CT001
RCM	Australian Radiocommunications Act, compliance with: • EN 61000-6-4; Industrial Emissions; see 2713P-CT003
Morocco	Moroccan EMC Directive, compliance with: • NM EN 61131-2; Programmable Controllers EMC; see 2713P-CT008
RoHS	• China RoHS • European RoHS • Turkey RoHS (EEE Yönetmeliğine Uygundur. In Conformity with the EEE Regulation.) • UAE RoHS ENV-CT001

(1) When marked. See the Rockwell Automation® Product Certifications site at rok.auto/certifications for declarations of conformity, certificates, and other certification details.

Technical Specifications

This section provides technical specifications for the PanelView 5310 terminals.

Technical Specifications - PanelView 5310 Terminals

Attribute	6-in. Touch 2713P-T6CD1 2713P-T6CD1-B(1) 2713P-T6CD1-K(2)	7-in. Wide Touch 2713P-T7WD1 2713P-T7WD1-B(1) 2713P-T7WD1-K(2)	9-in. Wide Touch 2713P-T9WD1 2713P-T9WD1-B(1) 2713P-T9WD1-K(2)	10.4-in. Touch 2713P-T10CD1 2713P-T10CD1-B(1) 2713P-T10CD1-K(2)	12.1-in. Wide Touch 2713P-T12WD1 2713P-T12WD1-B(1) 2713P-T12WD1-K(2)
Operator input	Touch				
Conformal coated	Yes				
Display type	Color TFT LCD (thin-film-transistor, liquid-crystal display)				
Display size, diagonal	5.7-in. screen	7-in. widescreen	9-in. widescreen	10.4-in. screen	12.1-in. widescreen
View area, W x H	115 x 86 mm (4.5 x 3.4 in.)	152 x 91 mm (6.0 x 3.6 in.)	196 x 118 mm (7.7 x 4.6 in.)	211 x 158 mm (8.3 x 6.2 in.)	261 x 163 mm (10.3 x 6.4 in.)
Display resolution/ aspect ratio	640 x 480 VGA/4:3	800 x 480 WVGA/5:3	800 x 480 WVGA/5:3	800 x 600 SVGA/4:3	1280 x 800 WXGA/16:10
Color depth	24-bit color graphics (16.7 million colors)				
Brightness, typical	300 cd/m^2 (Nits)				
Backlight	• Light-emitting diode, non-replaceable • Life: 50,000 h min at 40 °C (104 °F) to half-brightness				
Backlight power consumption, typical	2.4 W	3 W	3.5 W	4 W	5 W
Touch screen	• Analog resistive • Actuation rating: 1 million presses • Operating force: <100 grams				
Battery (real-time clock backup)	• Accuracy: +/-2 minutes per month. • Battery life: 4 years min at 25 °C (77 °F) • Replacement: CR2032 lithium coin cell				
Memory RAM User available	 1 GB RAM 1 GB nonvolatile storage for projects				
Secure Digital (SD) card slot	One SD card slot for external storage; supports cat. no. 1784-SD*x* cards. See Secure Digital (SD) Cards on page 7.				
USB ports Host Device	 One USB high-speed 2.0 host port (type A) supports removable drives for external storage. One high-speed 2.0 device port (type B) supports connection to host computer (available in a future release).				
Ethernet port	One 10/100Base-T, Auto MDI/MDI-X Ethernet port for controller communication.				
Status indicators	STS (status, green), ERR (error, red)				
Software	Studio 5000 environment provides single portal to View Designer and Logix Designer applications.				
Electrical					
USB host port (type A)	0.5 A at 5V DC				
Input voltage	24V DC nom (18…30V DC)				
Power consumption, max	13 W		14 W	15 W	16 W
Power consumption, typical	9 W		11 W	12 W	12 W
Power dissipation	31 BTU/hr.		38 BTU/hr.	41 BTU/hr.	41 BTU/hr.
Inrush current, max	15 A				

Technical Specifications - PanelView 5310 Terminals (Continued)

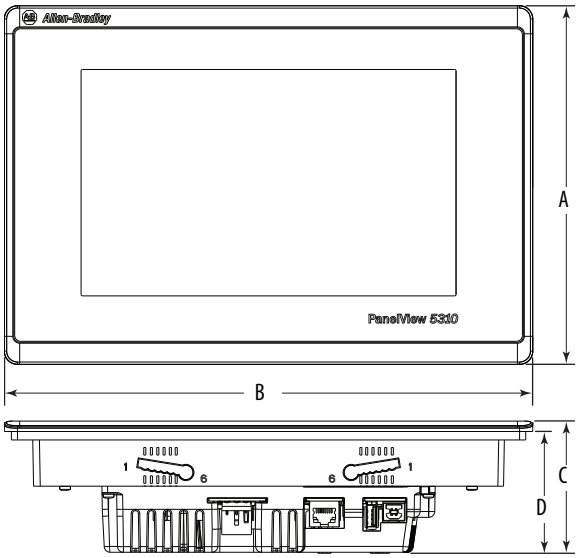
Attribute	6-in. Touch 2713P-T6CD1 2713P-T6CD1-B(1) 2713P-T6CD1-K(2)	7-in. Wide Touch 2713P-T7WD1 2713P-T7WD1-B(1) 2713P-T7WD1-K(2)	9-in. Wide Touch 2713P-T9WD1 2713P-T9WD1-B(1) 2713P-T9WD1-K(2)	10.4-in. Touch 2713P-T10CD1 2713P-T10CD1-B(1) 2713P-T10CD1-K(2)	12.1-in. Wide Touch 2713P-T12WD1 2713P-T12WD1-B(1) 2713P-T12WD1-K(2)
Power supply	Supports safety extra low voltage and protected extra low voltage 24V DC supplies(3)(4)				
Mechanical					
Weight, approx	0.79 kg (1.7 lb)	2.0 kg (4.4 lb)	2.41 kg (5.31 lb)	3.35 kg (7.39 lb)	3.65 kg (8.0 lb)
Terminal dimensions, approx	See PanelView 5310 Terminal and Cutout Dimensions on this page.				
Cutout dimensions, approx	See PanelView 5310 Terminal and Cutout Dimensions on this page.				

(1) Add -B to the end of a catalog number to order a terminal without the Allen-Bradley® logo and product identification, for example, 2713P-T7WD1-B.
(2) Add -K to the end of a catalog number to order a terminal with conformal coating, for example, 2713P-T6CD1-K.
(3) DC-powered terminals support safety extra low voltage (SELV) and protective extra-low voltage (protected extra low voltage) 24V DC power supplies, such as catalog numbers 1606-XLP95E, 1606-XLP100E, and 2711P-RSACDIN.
(4) Where PELV is defined in IEC 61131-2.

Terminal Dimensions

This section provides dimensions for the PanelView 5310 terminals. The 9-inch widescreen terminal is shown for illustrative purposes. All other terminal sizes look similar.

PanelView 5310 Terminal Dimensions - (9-in. widescreen terminal shown)



PanelView 5310 Terminal and Cutout Dimensions

Terminal Size (in.)	Input Type	Terminal Dimensions				Cutout Dimensions	
		Height (A) mm (in.)	Width (B) mm (in.)	Overall Depth (C) mm (in.)	Mounted Depth (D) mm (in.)	Height (A) mm (in.)	Width (B) mm (in.)
6	Touch	153 (6.0)	186 (7.3)	69.5 (2.74)	64 (2.5)(1)	123 (4.84)	156 (6.14)
7		178 (7.0)	237 (9.3)			148 (5.82)	207 (8.15)
9		190 (7.48)	280 (11.02)			162 (6.38)	252 (9.92)
10.4		252 (9.92)	297 (11.69)			224 (8.82)	269 (10.59)
12.1		246 (9.69)	340 (13.39)			218 (8.58)	312 (12.28)

(1) When mounted in a panel, the front of the bezel extends less than 6 mm (0.24 in.) from the panel.

Studio 5000 Environment

Use the Studio 5000 environment to create HMI applications for the PanelView 5310 terminal platform. This environment includes these major components:

- **Studio 5000 View Designer** – you can create and design a project for a specific PanelView 5310 terminal and download the project to the terminal.

  You can create an application for any PanelView 5310 terminal and reuse that same application across the entire platform.
- **Studio 5000 Logix Designer** – you can develop control logic for a CompactLogix or ControlLogix controller and download the logic to the controller.

In the Studio 5000 environment, you can create an application for any PanelView 5310 terminal and reuse that same application across the entire platform.

Accessories

This section lists accessories for the PanelView 5310 terminals.

Power Supplies and Replacement Power Terminal Blocks

Cat. No.	Description	Quantity
1606-XLB120E	DIN rail power supply, 24…28V DC output voltage, 120 W	1
1606-XLP100E	DIN rail power supply, 24…28V DC output voltage, 100 W	1
1606-XLP95E	DIN rail power supply, 24…28V DC output voltage, 95 W	1
2711-TBDC	3-pin DC power terminal block	10

Mounting Hardware

Cat. No.	Description	Quantity
2711P-RMCP[1]	Mounting levers (black)	16

(1) Catalog number 2711P-RMCP mounting levers are used with the PanelView 5310 terminals. Do not use gray mounting levers; they are not compatible with PanelView 5310 terminals.

Secure Digital (SD) Cards[1]

Cat. No.	Description
1784-SDHC8	8-GB SDHC card
1784-SDHC32	32-GB SDHC card

(1) To help reduce the chance of corruption when you use SD Cards or USB drives with the terminal, Rockwell Automation recommends that you use only the above SD card catalog numbers.

The SD™ and SDHC™ accessory cards in the above table have been designed to meet industrial robustness and environmental requirements. Rockwell Automation recommends that you use these accessory cards with the terminal to help reduce the chances of corruption. Studio 5000 View Designer software requires the following for SD cards that are inserted into the HMI device:

- 4 GB of free space
- A supported SDHC card type, preferably one listed in the Secure Digital (SD) Cards table
- An environmental rating for the PanelView 5000 environment
- A supported format of either FAT32 or ext3

USB Programming Cable

Cat. No.	Description	Length
6189V-USBCBL2	Programming cable that connects the device port of the terminal to a USB host port of a computer	1.8 m (5.9 ft)

Protective Overlays

Cat. No.[1]	Display Size	Quantity
2711P-RGT6S	6-in.	3
2711P-RGT7SP	7-in. widescreen	
2711P-RGT9SP	9-in. widescreen	
2711P-RGT10SP	10.4-in.	
2711P-RGT12SP	12.1-in. widescreen	

(1) Although these protective overlays were designed for the PanelView 5510 terminals, they can also be used for the PanelView 5310 terminals. However, when these overlays are used on a PanelView 5310 terminal, there is an increased air gap between the overlay and the terminal screen.

Additional Resources

These documents contain more information about related products from Rockwell Automation.

Resource	Description
Visualization Solutions Selection Guide, publication VIEW-SG001	Provides an overview of the visualization products (includes catalog number selections) offered by Rockwell Automation.
PanelView 5310 Terminals User Manual, publication 2713P-UM001	Provides information on how to install, operate, configure, and troubleshoot the PanelView 5310 terminals.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines on how to install a Rockwell Automation industrial system.
Product Certifications website, rok.auto/certifications	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at rok.auto/literature.

Notes:

Rockwell Automation Support

Use these resources to access support information.

Technical Support Center	Find help with how-to videos, FAQs, chat, user forums, and product notification updates.	rok.auto/support
Knowledgebase	Access Knowledgebase articles.	rok.auto/knowledgebase
Local Technical Support Phone Numbers	Locate the telephone number for your country.	rok.auto/phonesupport
Literature Library	Find installation instructions, manuals, brochures, and technical data publications.	rok.auto/literature
Product Compatibility and Download Center (PCDC)	Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes.	rok.auto/pcdc

Documentation Feedback

Your comments help us serve your documentation needs better. If you have any suggestions on how to improve our content, complete the form at rok.auto/docfeedback.

Rockwell Automation maintains current product environmental compliance information on its website at rok.auto/pec.

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ASIA PACIFIC: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Publication 2713P-TD001G-EN-P - July 2021
Supersedes Publication 2713P-TD001F-EN-P - May 2021

GMA

5 mm x 20 mm Fast-acting glass tube fuses

RoHS

Agency information

- UL Listed, Guide JDYX, File E19180, 63mA-6A
- UL Recognized, Guide JDYX2, File E19180, 7-15A
- CSA Certified, Class 1422-01, File 53787, 63mA-6A
- PSE Approval, 1A-15A

Product features

- Fast-acting, low breaking capacity
- Optional axial leads available
- 5 x 20mm physical size
- Glass tube, silver-plated (63mA-315mA) and nickel-plated (500mA-15A) brass endcap construction
- Designed to UL/CSA 248-14

Ordering

- Specify packaging, product, and option code
- Ratings above 6.3A have a 0.8 mm diameter lead
- With TR2 packaging code, lead wire length is 19.05 mm

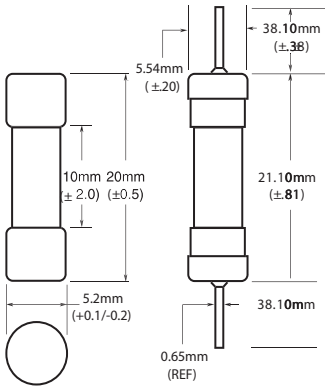
Electrical Characteristics		
Rated Current	% of Amp Rating	Opening Time
63mA - 15A	100%	None
	135%	60 minutes maximum
	200%	2 minutes maximum

Specifications

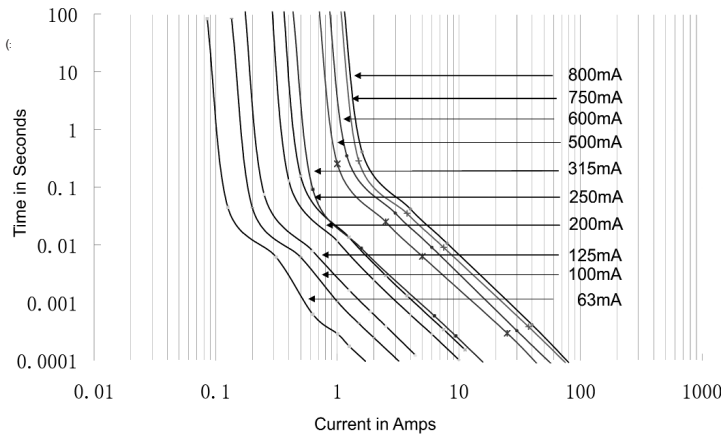
Product Code	Amp Rating	Voltage Rating Vac	Interrupting Rating (amps)*		Typical DC Cold Resistance (Ω)**	Typical Pre-Arc I^2t Vac†	Maximum Voltage Drop (mV)‡
			250Vac	125Vac			
GMA-63-R	63mA	250	35	10,000	15.750	0.00024	4700
GMA-100-R	100mA	250	35	10,000	7.840	0.0001	4300
GMA-125-R	125mA	250	35	10,000	4.895	0.0024	2600
GMA-200-R	200mA	250	35	10,000	2.500	0.001	3400
GMA-250-R	250mA	250	35	10,000	1.735	0.018	2200
GMA-300-R	300mA	250	35	10,000	0.906	0.019	470
GMA-315-R	315mA	250	35	10,000	0.839	0.019	450
GMA-500-R	500mA	250	35	10,000	0.454	0.15	230
GMA-600-R	600mA	250	35	10,000	0.256	0.32	200
GMA-750-R	750mA	250	35	10,000	0.186	0.47	200
GMA-800-R	800mA	250	35	10,000	0.170	0.70	180
GMA-1-R	1	250	35	10,000	0.163	0.48	300
GMA-1.25-R	1.25	250	100	10,000	0.122	0.84	290
GMA-1.5-R	1.5	250	100	10,000	0.090	1.6	270
GMA-1.6-R	1.6	250	100	10,000	0.080	2.0	260
GMA-2-R	2	250	100	10,000	0.066	3.1	250
GMA-2.5-R	2.5	250	100	10,000	0.046	4.9	240
GMA-3-R	3	250	100	10,000	0.039	8.8	215
GMA-3.15-R	3.15	125	-	10,000	0.036	9.7	210
GMA-3.5-R	3.5	125	-	10,000	0.030	13	210
GMA-4-R	4	125	-	10,000	0.026	19	205
GMA-5-R	5	125	-	10,000	0.021	29	200
GMA-6-R	6	125	-	10,000	0.017	45	180
GMA-7-R	7	125	-	200	0.012	150	110
GMA-8-R	8	125	-	200	0.009	280	110
GMA-10-R	10	125	-	200	0.006	280	110
GMA-15-R	15	125	-	150	0.004	950	100

* Interrupting ratings: Interrupting ratings for 63mA - 6A were measured at 70% - 80% power factor on AC. The interrupting ratings for 7A - 15A were measured at 100% power factor on AC.
** DC Cold Resistance (Measured at <10% of rated current)
† Typical Pre-Arching I^2t (I^2t was measured at listed interrupting rating and rated voltage)
‡ Maximum Voltage drop (Voltage drop was measured at 20°C ambient temperature at rated current)

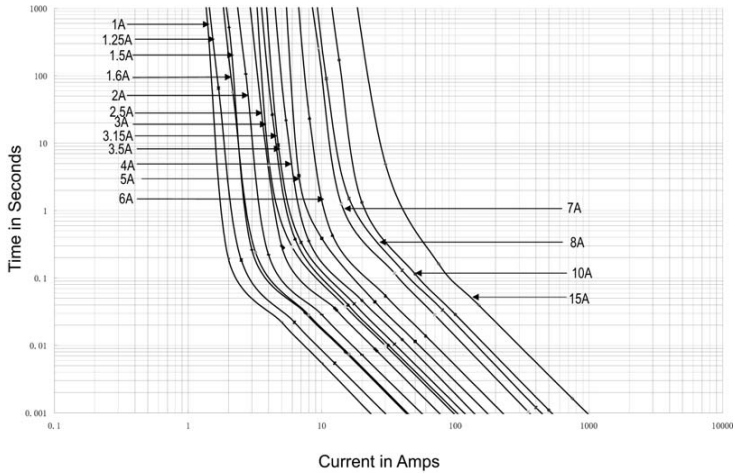
Dimensions - mm



Time-Current Curve – GMA-R 63mA-800mA



Time-Current Curve – GMA-R 1-15A



Packaging Code	
Packaging Code	Description
BK	100 fuses packed into a cardboard carton
BK1	1000 fuses packed into a poly bag
TR2	1500 fuses packed into tape on a reel (19.05mm lead wire length)

Option Code	
Option Code	Description
V	Axial leads - copper tinned wire with nickel-plated brass overcaps

Eaton
Electronics Division
1000 Eaton Boulevard
Cleveland, OH 44122
United States
www.eaton.com/electronics

Printed in USA
Publication No. 2017 BU-SB091174
May 2017

Powering Business Worldwide

Type series H 57

- 7- resp. 8-digit hour meter
- High shock resistance
- Without reset
- Small dimension
- Magnified figures
- Protection IP 52
- Data retention when breaking of power supply
- Long service life
- Optional mounting position
- UL-approvals

Applications

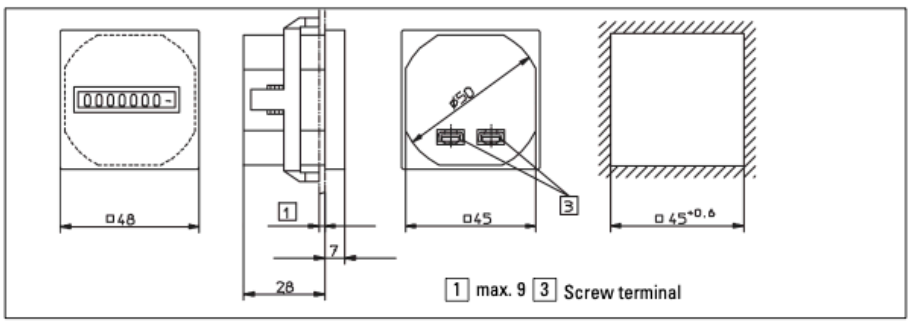
general counting, service interval for measurement systems (respiratory ventilators, oxygen machines, dialysis machines), small appliances, UV lamps, display panels in cars.

Technical data:

Electrical connection:	clamp terminal for cable diameter up to 2,5 mm², tightening torque max. 0,8 Nm
Power consumption:	10 ... 30 V DC: appr. 500 mW 100 ... 130 V DC: appr. 750 mW 20 ... 30 V AC, 50 Hz appr. 0,3 VA 42 ... 48 V AC, 50 Hz appr. 0.25 VA 100 ... 130 V AC, 50 Hz appr. 0.6 VA 187 ... 264 V AC, 50 Hz appr. 1.2 VA 360 ... 440 V AC, 50 Hz appr. 1.65 VA
Rated voltages:	20...30/42...48/100...130/187...264/360...440 V AC, 50 or 60 Hz, 10...30/100...130 V DC
On time:	100 %
Display:	7 at AC 99999.99 8 at DC 999999.99
Accuracy:	AC: Supply frequency + 30 ms DC: < 0.003 % (24 h)
Count mode:	adding
Height of figures:	4 mm
Colour of figures:	white and red on black
Ambient temperature:	–15° ... +50°C
Mounting position:	any
Protection:	up to IP 52, DIN 40 050 front side
Housing:	Plastic

Weight:	H 57: 48 g; AH 57: 84 g
Base mount socket No. 48	36 g
Slip-on bezel 55	8 g
Slip-on bezel 72	13 g
Operating indicator of the running time meter:	
AC:	Fast rotating wheel with red dashes
DC:	1/100 h display turns continuously by 1 digit in 36 s
Test voltage:	2000 V AC , 50 Hz for AC counters
Options:	Further voltages on request
Counter with wire entry from below, screw fixing from rear.	Art-No. 3.228.401.XXX.044
Colour of housing:	grey: Art-No. 3.22X.400.XXX
Flat pin	0.8 x 6.3 mm Art-No. 3.228.401.XXX
Cap wrapped (**IP 65** from front)	
IP 65 version:	Order code: 3.22X.XXX.XXX.422
Necessary sealing between counter and bezel:	
H 57:	N.511.018
H 57.55:	N.511.018 + N.511.017
H 57.72:	N.511.018 + N.511.016
(at IP 65 version delivery includes sealing)	
Approvals:	UL for USA and Canada E128604

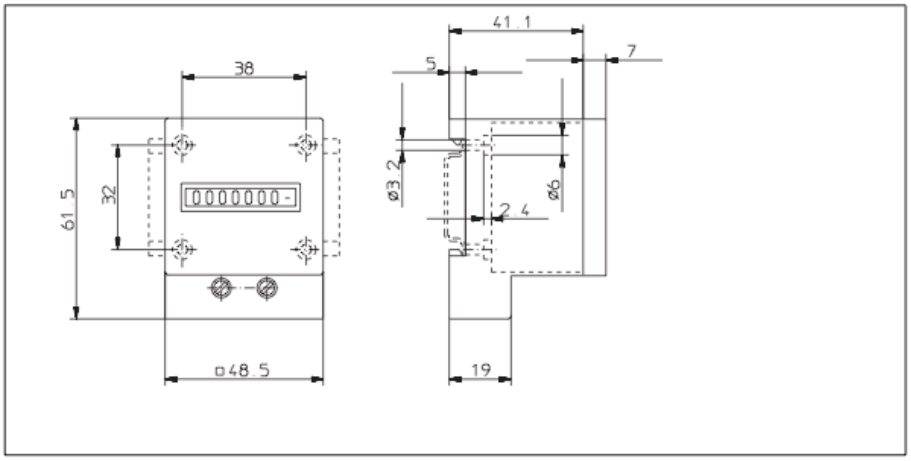
H 57



Voltage	Art-No. (AC), 50 Hz	Art-No. (AC), 60 Hz	Art-No.(V DC)
10 ... 30			3.220.401.351
20 ... 30	3.220.401.071	3.220.401.081	
36 ...80			3.220.401.353
42 ... 48	3.220.401.072	3.220.401.082	
100 ... 130	3.220.401.074	3.220.401.084	3.220.401.381
187 ...264	3.220.401.075	3.220.401.085	
360 ... 440	3.220.401.079	3.220.401.089	

Type series H 57

AH 57



Voltage	Art-No. (AC), 50 Hz	Art-No. (AC), 60 Hz	Art-No.(V DC)
10 ... 30			3.223.401.351
10 ... 50			3.223.401.371
20 ... 30	3.223.401.071	3.223.401.081	
36 ...80			3.223.401.353
42 ... 48	3.223.401.072	3.223.401.082	
100 ... 130	3.223.401.074	3.223.401.084	3.223.401.381
187 ...264	3.223.401.075	3.223.401.085	
360 ... 440	3.223.401.079	3.223.401.089	

Slip-on bezel 55 x 55
black: Art-No. T008.171
grey: Art-No. T008.170

Slip-on bezel 72 x 72
black: Art-No. T008.177
grey: Art-No. T008.176

Slip-on bezel 55 x 55
black: Art-No. G008.040
grey: Art-No. G008.041

For hour meter H57 with flat pins
Art-No. 3.228.401.XXX

Slip-on bezel Ø 72 for Panel cut-out
Ø 60 mm, colour black Art-No. N.510.226

Industrial Ethernet Switch - FL SWITCH 1008N

1085256

https://www.phoenixcontact.com/us/products/1085256

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Narrow Ethernet switch, eight RJ45 ports with 10/100 Mbps on all ports, automatic data transmission speed detection, autocrossing function, and QoS

Your advantages

- RJ45 ports support a transmission speed of 10/100 Mbps
- QoS-prioritized (Quality of Service) messages
- Local diagnostic indicators with LEDs
- PROFINET PTCP filter for reliable communication on PROFINET networks
- Enhanced traffic prioritization for automation protocols
- Energy-efficient Ethernet in accord. with IEEE 802.3az
- PROFINET Conformance Class A for real-time data exchange
- Auto negotiation and autocrossing detection simplifies installation and setup

Commercial Data

Item number	1085256
Packing unit	1 pc
Sales Key	D15
Product Key	DNN116
GTIN	4055626833590
Weight per Piece (including packing)	257 g
Weight per Piece (excluding packing)	174 g
Country of origin	TW

Technical Data

Dimensions

Width	22.5 mm
Height	140.4 mm
Depth	92.4 mm

Material specifications

Housing material	Polycarbonate fiber reinforced
	Polycarbonate fiber reinforced

Mounting

Mounting type	DIN rail mounting

Interfaces

Ethernet (RJ45)

Number of interfaces	8
Connection method	RJ45
Note on the connection method	Auto negotiation and autocrossing
Transmission speed	10/100 Mbps
Transmission physics	Ethernet in RJ45 twisted pair
Transmission length	100 m (per segment)
Signal LEDs	Data receive, link status
No. of channels	8 (RJ45 ports)

Product properties

Product type	Switch
MTTF	133.9 Years (MIL-HDBK-217F standard, temperature 25°C, operating cycle 100%)
	1254 Years (SN 29500 standard, temperature 25°C, operating cycle 21%)
	1196 Years (Telcordia standard, 25°C temperature, 21% operating cycle (5 days a week, 8 hours a day))

Switch functions

Basic functions	Unmanaged switch
	Autonegotiation
	Store and Forward switching mode
PROFINET conformance class	Conformance-Class A
MAC address table	2k
Status and diagnostic indicators	LEDs: U_S, link and activity per port
Additional functions	100 BASE-TX/100BASE-FX (IEEE 802.3u)
	Quality of Service (QoS) prioritization (IEEE 802.1p)
	Energy-efficient Ethernet (IEEE 802.3az)

	10Base-T (IEEE 802.3)

Security functions

Basic functions	Unmanaged switch
	Autonegotiation
	Store and Forward switching mode

Electrical properties

Transmission medium	Copper

Supply

Supply voltage (DC)	24 V
Supply voltage (AC)	24 V AC (50/60 Hz)
Supply voltage range	9 V DC ... 32 V DC
	18 V AC ... 30 V AC (50/60 Hz)
Power supply connection	Via COMBICON, max. conductor cross section 2.5 mm²
Residual ripple	3.6 V_{PP} (within the permitted voltage range)
Max. current consumption	173 mA (at 9 V DC)
Typical current consumption	28 mA (at 24 V DC)

Connection data

Connection method	Push-in spring connection
Conductor cross section, rigid	0.2 mm² ... 2.5 mm²
Conductor cross section, flexible	0.2 mm² ... 2.5 mm²
Conductor cross section AWG	24 ... 12
Conductor cross section, flexible, with ferrule, with plastic sleeve	0.25 mm² ... 2.5 mm²
Conductor cross section flexible, with ferrule without plastic sleeve	0.25 mm² ... 2.5 mm²
Stripping length	10 mm

Ambient conditions

Degree of protection	IP30
Ambient temperature (operation)	-10 °C ... 60 °C
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Altitude	2000 m (maximum)
Permissible humidity (operation)	5 % ... 95 % (non-condensing)
Permissible humidity (storage/transport)	5 % ... 95 % (non-condensing)
Shock (operation)	30g (EN 60068-2-27)
Vibration (operation)	in acc. with IEC 60068-2-6: 5g, 150 Hz
Air pressure (operation)	79 kPa ... 108 kPa up to 2000 m above mean sea level (Without derating)
Air pressure (storage/transport)	79 kPa ... 108 kPa up to 2000 m above mean sea level (Without derating)

EMC data

	EN 61000-6-2 EN 61000-4-2 (ESD) Criterion B

Conformance with EMC directives	EN 61000-6-2 EN 61000-4-3 (electromagnetic fields) Criterion A
	EN 61000-6-2 EN 61000-4-4 (EFT burst) Criterion A
	EN 61000-6-2 EN 61000-4-5 (surge) Criterion B
	EN 61000-6-2 EN 61000-4-6 (line noise immunity) Criterion A
	EN 61000-6-2 EN 61000-4-8 (electromagnetic fields) Criterion A
	EN 61000-6-2 Class A
Electromagnetic compatibility	Conformance with EMC Directive 2014/30/EU
Noise emission	EN 61000-6-4:2007 + A1:2011
Noise immunity	EN 61000-6-2:2005

LED signaling

Status display	LEDs: U_S, link and activity per port

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Middletown, PA 17057, United States
(+717) 944-1300
info@phoenixcon.com

Power supply unit - TRIO-PS-2G/1AC/24DC/5

2903148

https://www.phoenixcontact.com/us/products/2903148

Please be informed that the data shown in this PDF document is generated from our Online Catalog. Please find the complete data in the user documentation. Our General Terms of Use for Downloads are valid.

Primary-switched TRIO POWER power supply with push-in connection for DIN rail mounting, input: 1-phase, output: 24 V DC/5 A

Product Description

TRIO POWER power supplies with standard functionality
The TRIO POWER power supply range with push-in connection has been perfected for use in machine building. All functions and the space-saving design of the single and three-phase modules are optimally tailored to the stringent requirements. Under challenging ambient conditions, the power supply units, which feature an extremely robust electrical and mechanical design, ensure the reliable supply of all loads.

Your advantages

- Save time and costs, thanks to the Push-in connection and narrow design
- Increase system availability, thanks to dynamic boost with 150% of the nominal current for five seconds
- Maximum flexibility due to the wide temperature range from -25°C to +70°C and device startup at -40°C
- Rugged design

Commercial Data

Item number	2903148
Packing unit	1 pc
Minimum order quantity	1 pc
Sales Key	C14
Product Key	CMPO13
Catalog Page	Page 255 (C-4-2019)
GTIN	4046356960847
Weight per Piece (including packing)	440.4 g
Weight per Piece (excluding packing)	440.4 g
Customs tariff number	85044030
Country of origin	CN

Technical Data

Input data

AC operation

Network type	Star network
Nominal input voltage range	100 V AC ... 240 V AC
Input voltage range	100 V AC ... 240 V AC -15 % ... +10 %
Input voltage range AC	85 V AC ... 264 V AC
Electric strength, max.	≤ 300 V AC 15 s
Typical national grid voltage	120 V AC
	230 V AC
Voltage type of supply voltage	AC/DC
Inrush current	≤ 16 A (typical)
Inrush current integral (I^2t)	< 0.6 A^2s
Inrush current limitation	typ. 16 A (after 1 ms)
AC frequency range	50 Hz ... 60 Hz ±10 %
Mains buffering time	typ. 20 ms (120 V AC)
	typ. 100 ms (230 V AC)
Current consumption	2.2 A (100 V AC)
	1.9 A (120 V AC)
	1.1 A (230 V AC)
	1.1 A (240 V AC)
Nominal power consumption	272 VA
Protective circuit	Transient surge protection; Varistor
Power factor (cos phi)	0.5
Typical response time	< 1 s
Input fuse	6.3 A (internal (device protection))
Recommended breaker for input protection	6 A ... 16 A (Characteristics B, C, D, K)
Discharge current to PE	< 0.25 mA

DC operation

Nominal input voltage range	110 V DC ... 250 V DC
Input voltage range	99 V DC ... 275 V DC
Switch-on voltage	≥ 88 V DC
Shut-down voltage	< 60 V DC
Voltage type of supply voltage	AC/DC
Mains buffering time	> 100 ms (230 V AC)
Current consumption	1.4 A (110 V DC)
	0.6 A (250 V DC)

Output data

Efficiency	> 90 % (for 230 V AC and nominal values)
Output characteristic	U/I with dynamic load reserve

Nominal output voltage	24 V DC ±1 %
Setting range of the output voltage (U_{Set})	24 V DC ... 28 V DC (> 24 V DC, constant capacity restricted)
Nominal output current (I_N)	5 A
Dynamic Boost ($I_{Dyn.Boost}$)	7.5 A (5 s)
Derating	> 60 °C ... 70 °C (2.5%/K)
Feedback voltage resistance	≤ 35 V DC
Protection against overvoltage at the output (OVP)	≤ 30 V DC
Control deviation	< 1 % (change in load, static 10 % ... 90 %)
	< 3 % (Dynamic load change 10 % ... 90 %, 10 Hz)
	< 0.1 % (change in input voltage ±10 %)
Residual ripple	< 50 mV_{PP} (with nominal values)
Output power	120 W
	180 W
Maximum no-load power dissipation	< 1 W
Power loss nominal load max.	< 16 W
Rise time	≤ 12 ms (U_{OUT} (10 % ... 90 %))
Connection in parallel	yes, for redundancy and increased capacity
Connection in series	yes

Signal: DC OK

Maximum switching voltage	30 V AC/DC
Continuous load current	100 mA

Connection data

Input

Connection method	Push-in connection
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	4 mm²
Conductor cross section flexible min.	0.2 mm²
Conductor cross section flexible max.	2.5 mm²
Conductor cross section AWG min.	24
Conductor cross section AWG max.	12
Stripping length	10 mm

Output

Connection method	Push-in connection
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	4 mm²
Conductor cross section flexible min.	0.2 mm²
Conductor cross section flexible max.	2.5 mm²
Conductor cross section AWG min.	24
Conductor cross section AWG max.	12
Stripping length	8 mm

Signal

Connection method	Push-in connection
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	1.5 mm²
Conductor cross section flexible min.	0.2 mm²
Conductor cross section flexible max.	1.5 mm²
Conductor cross section AWG min.	24
Conductor cross section AWG max.	16
Stripping length	8 mm

LED signaling

Types of signaling	LED
	Floating signal contact

Signal output: LED status indicator

Signalization designation	DC OK
Status display	“DC OK” LED
Color	green

Electrical properties

Number of phases	1.00
Insulation voltage input/output	3 kV AC (type test)
	1.5 kV AC (routine test)

Product properties

Product type	Power supply
MTBF (IEC 61709, SN 29500)	> 3380000 h (25 °C)
	> 1970000 h (40 °C)
	> 900000 h (60 °C)

Insulation characteristics

Protection class	II (in closed control cabinet)
Degree of pollution	2

Dimensions

Width	35 mm
Height	130 mm
Depth	115 mm

Installation dimensions

Installation distance right/left	0 mm / 0 mm
Installation distance top/bottom	50 mm / 50 mm

Mounting

Mounting type	DIN rail mounting
Assembly instructions	alignable: horizontally 0 mm (≤ 40 °C) 10 mm (≤ 70 °C), vertically 50 mm

Mounting position	horizontal DIN rail NS 35, EN 60715
With protective coating	No

Material specifications

Flammability rating according to UL 94 (housing / terminal blocks)	V0
Housing material	Plastic
Type of housing	Polycarbonate
Hood version	Polycarbonate

Environmental and real-life conditions

Ambient conditions

Degree of protection	IP20
Ambient temperature (operation)	-25 °C ... 70 °C (> 60 °C Derating: 2,5 %/K)
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Ambient temperature (start-up type tested)	-40 °C
Maximum altitude	≤ 5000 m (> 2000 m, Derating: 10 %/1000 m)
Climatic class	3K3 (in acc. with EN 60721)
Max. permissible relative humidity (operation)	≤ 95 % (at 25 °C, non-condensing)
Shock	18 ms, 30g, in each space direction (according to IEC 60068-2-27)
Vibration (operation)	< 15 Hz, amplitude ±2.5 mm (according to IEC 60068-2-6)
	15 Hz ... 150 Hz, 4g, 90 min.

Standards and regulations

Rail applications	EN 50121-4
Standard – Electronic equipment for use in electrical power installations and their assembly into electrical power installations	EN 50178/VDE 0160 (PELV)
Standard – Limitation of mains harmonic currents	EN 61000-3-2
Standard - Electrical safety	IEC 62368-1 (SELV)
Standard – Safety extra-low voltage	IEC 62368-1 (SELV) und EN 60204-1 (PELV)
Standard - Safe isolation	DIN VDE 0100-410
Standard - Safety of transformers	EN 61558-2-16 (air clearances and creepage distances only)

Approval data

UL approvals	UL Listed UL 508
	UL/C-UL Recognized UL 60950-1
	UL ANSI/ISA-12.12.01 Class I, Division 2, Groups A, B, C, D (Hazardous Location)

Conformity/Approvals

SIL in accordance with IEC 61508	0

EMC data

Low Voltage Directive	Conformance with Low Voltage Directive 2014/35/EC
Electromagnetic compatibility	Conformance with EMC Directive 2014/30/EU

EMC requirements for noise emission	EN 61000-6-3
	EN 61000-6-4
EMC requirements for noise immunity	EN 61000-6-1
	EN 61000-6-2
Noise emission	EN 55011 (EN 55022)
Noise immunity	EN 61000-6-2:2005

Electrostatic discharge

Standards/regulations	EN 61000-4-2

Electrostatic discharge

Contact discharge	6 kV (Test Level 4)
Discharge in air	8 kV (Test Level 4)
Comments	Criterion A

Electromagnetic HF field

Standards/regulations	EN 61000-4-3

Electromagnetic HF field

Frequency range	80 MHz ... 1 GHz
Test field strength	10 V/m (Test Level 3)
Frequency range	1 GHz ... 2 GHz
Test field strength	10 V/m (Test Level 3)
Frequency range	2 GHz ... 3 GHz
Test field strength	10 V/m (Test Level 3)
Comments	Criterion A

Fast transients (burst)

Standards/regulations	EN 61000-4-4

Fast transients (burst)

Input	4 kV (Test Level 4 - asymmetrical)
Output	2 kV (Test Level 3 - asymmetrical)
Signal	1 kV (Test Level 2 - asymmetrical)
Comments	Criterion A

Surge voltage load (surge)

Standards/regulations	EN 61000-4-5
Input	3 kV (Test Level 3 - symmetrical)
	6 kV (Test Level 4 - asymmetrical)
Output	1 kV (Test Level 2 - symmetrical)
	2 kV (Test Level 3 - asymmetrical)
Signal	1 kV (Test Level 2 - asymmetrical)
Comments	Criterion B

Conducted interference

Standards/regulations	EN 61000-4-6

Conducted interference

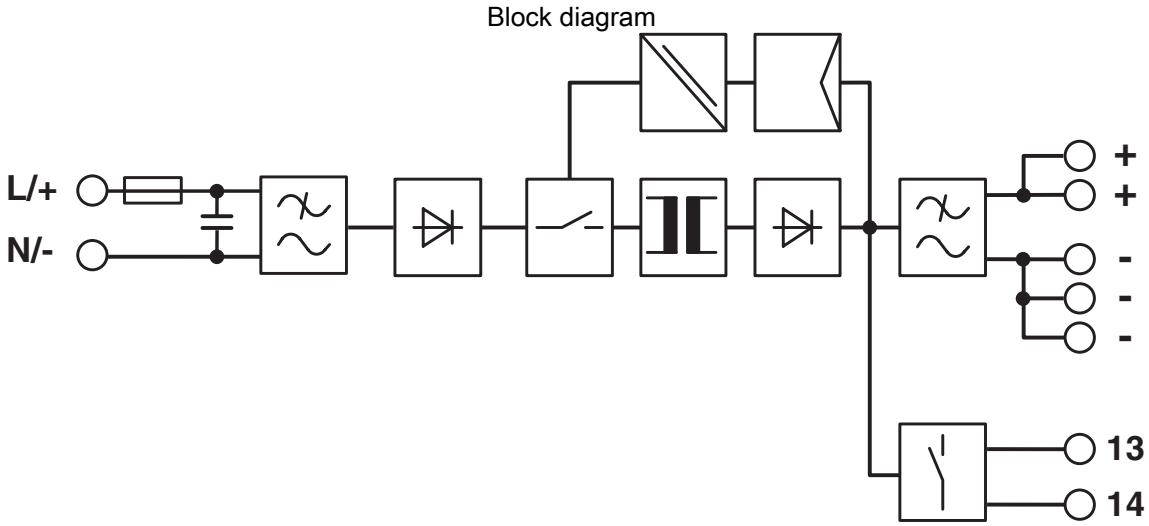
Input/Output	asymmetrical
Frequency range	0.15 MHz ... 80 MHz
Comments	Criterion A
Voltage	10 V (Test Level 3)

Emitted interference

Standards/regulations	EN 61000-6-3
Radio interference voltage in acc. with EN 55011	EN 55011 (EN 55022) Class B, area of application: Industry and residential
Emitted radio interference in acc. with EN 55011	EN 55011 (EN 55022) Class B, area of application: Industry and residential
Criterion A	Normal operating behavior within the specified limits.
Criterion B	Temporary impairment to operational behavior that is corrected by the device itself.

Drawings

Block diagram



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Uninterruptible power supply - TRIO-UPS-2G/1AC/24DC/5 - 2907160

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Uninterruptible power supply with integrated power supply unit. For lead AGM energy storage with 1.3 Ah to 12 Ah nominal capacity. Input: 1-phase, output: 24 V DC/5 A. Push-in connection technology

Product Description

Supply DC loads reliably and save space with the TRIO uninterruptible power supplies. An input grid is no longer necessary for startup. Connected industrial PCs can be shut down easily via the integrated USB interface.

Your advantages

- Space saving: Combination of UPS module and power supply in the same housing
- Long buffer times, thanks to large selection of VRLA energy storage systems
- USB interface for connection to higher-level controllers such as industrial PCs
- Startup from energy storage possible, even without mains input
- Universal range of possible applications, thanks to a comprehensive package of approvals and an extended temperature range
- Easy installation, thanks to push-in connection technology

RoHS

Key Commercial Data

Packing unit	1 pc
GTIN	4 055626 166575
GTIN	4055626166575
Weight per Piece (excluding packing)	940.000 g
Custom tariff number	85371091
Country of origin	China

Technical data

Dimensions

Width	60 mm

Uninterruptible power supply - TRIO-UPS-2G/1AC/24DC/5 - 2907160

Technical data

Dimensions

Height	130 mm
Depth	115 mm
Width with alternative assembly	115 mm
Height with alternative assembly	130 mm
Depth with alternative assembly	60 mm
Installation distance right/left	0 mm / 0 mm
Installation distance top/bottom	50 mm / 50 mm

Ambient conditions

Degree of protection	IP20
Inflammability class in acc. with UL 94 (housing / terminal blocks)	V0
Ambient temperature (operation)	-25 °C ... 70 °C (> 60 °C Derating: 2.5 %/K)
Ambient temperature (start-up type tested)	-40 °C
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Max. permissible relative humidity (operation)	≤ 95 % (At +25°C, non-condensing)
Climatic class	3K3 (in acc. with EN 60721)
Degree of pollution	2
Installation height	≤ 4000 m (> 2000 m, observe derating)

Input data

AC input voltage range	100 V AC ... 240 V AC -15 % ... +10 %
Inrush current limiting/I²t	< 0.43 A^2s
Mains buffering time	≥ 15 ms (120 V AC)
Typical response time	60 ms
Input fuse, integrated	6.3 A (slow-blow, internal)

Output data

Nominal output voltage	24 V DC
Setting range of the output voltage (U_{Set})	24 V DC ... 28 V DC (> 24 V constant capacity)
Nominal output current (I_N)	5 A
Dynamic Boost ($I_{Dyn.Boost}$)	7.5 A
Derating	> 60 °C (2.5%/K of P_{Out} nom.)
Control deviation	< 0.75 % (Static load change 10 % ... 90 %)
Maximum power dissipation in no-load condition	< 3 W (230 V AC)
Efficiency	typ. 85 % (120 V AC)
	typ. 87 % (230 V AC)
	typ. 96 % (Battery operation)
Residual ripple	< 20 mV
Connection in parallel	yes, with diode module uncoupled

Uninterruptible power supply - TRIO-UPS-2G/1AC/24DC/5 - 2907160

Technical data

Output data

Surge protection against internal surge voltages	< 30 V DC
Feedback voltage resistance	≤ 35 V DC

General

Net weight	0.75 kg
Insulation voltage input/output	3 kV AC (type test)
	1.5 kV AC (routine test)
Protection class	I
MTBF (IEC 61709, SN 29500)	> 1395470 h (230 V AC, at 25 °C)
	> 825726 h (230 V AC, at 40 °C)
	> 388314 h (230 V AC, at 60 °C)
Mounting position	horizontal DIN rail NS 35, EN 60715
Assembly instructions	alignable: horizontally 0 mm, vertically 50 mm

Connection data, input

Connection method	Push-in connection
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	4 mm²
Conductor cross section flexible min.	0.2 mm²
Conductor cross section flexible max.	2.5 mm²
Conductor cross section AWG min.	24
Conductor cross section AWG max.	12
Stripping length	10 mm

Connection data, output

Connection method	Push-in connection
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	4 mm²
Conductor cross section flexible min.	0.2 mm²
Conductor cross section flexible max.	2.5 mm²
Conductor cross section AWG min.	24
Conductor cross section AWG max.	12
Stripping length	10 mm

Connection data for signaling

Connection method	Push-in connection
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	1.5 mm²
Conductor cross section flexible min.	0.2 mm²

Uninterruptible power supply - TRIO-UPS-2G/1AC/24DC/5 - 2907160

Technical data

Connection data for signaling

Conductor cross section flexible max.	1.5 mm²
Conductor cross section AWG min.	24
Conductor cross section AWG max.	16
Stripping length	8 mm

Charging process

Charge characteristic curve	IU_0U
Charge current	typical
	0.2 A ... 1.5 A (-25°C ... 40°C)
	reduced
	1.5 A ... 0 A (40 °C ... 65 °C)
	default
	1 A (-25°C ... 40°C)

Standards

EMC requirements for noise immunity	EN 61000-6-1
	EN 61000-6-2
EMC requirements for noise emission	EN 61000-6-3
	EN 61000-6-4
Standard - safety for equipment for measurement, control, and laboratory use	IEC 61010-1
Standard – Safety extra-low voltage	IEC 61010 (SELV) / (PELV)
Standard - Safe isolation	DIN VDE 0100-410
Standard - power supply devices for low voltage with DC output	EN 61204-3
Overvoltage category EN 61010-1	II

Conformance/approvals

UL approvals	UL Listed UL 61010
	UL/C-UL Listed ANSI/ISA-12.12.01 Class I, Division 2, Groups A, B, C

EMC data

Electromagnetic compatibility	Conformance with EMC Directive 2014/30/EU
Low Voltage Directive	Conformance with Low Voltage Directive 2014/35/EC
Conducted noise emission	EN 61000-6-3 (Class B)
Noise emission	EN 61000-6-3 (Class B)
DNV GL conducted interference	Class B
Additional text	Area power distribution
DNV GL noise radiation	Class B
Additional text	Bridge and deck area
Electrostatic discharge	EN 61000-4-2

Uninterruptible power supply - TRIO-UPS-2G/1AC/24DC/5 - 2907160

Technical data

EMC data

Contact discharge	6 kV (Test Level 4)
Discharge in air	8 kV (Test Level 4)
Electromagnetic HF field	EN 61000-4-3
Frequency range	80 MHz ... 6 GHz
Test field strength	10 V/m (Test Level 3)
Comments	Criterion B
Fast transients (burst)	EN 61000-4-4
Input	4 kV (Test Level 4 - asymmetrical)
Output	2 kV (Test Level 3 - asymmetrical)
Signal	1 kV (Test Level 4 - asymmetrical)
Comments	Criterion B
Input	2 kV (Test Level 3 - symmetrical)
	4 kV (Test Level 4 - asymmetrical)
Output	1 kV (Test Level 1 - symmetrical)
	2 kV (Test Level 3 - asymmetrical)
Signal	1 kV (Test Level 2 - asymmetrical)
Comments	Criterion B
Conducted interference	EN 61000-4-6
I/O/S	asymmetrical
Frequency range	0.15 MHz ... 80 MHz
Voltage	10 V (Test Level 3)
Comments	Criterion A
Attenuated sinusoidal oscillations (ring wave)	EN 61000-4-12
Input	2 kV (symmetrical)
	4 kV (asymmetrical)
Comments	Criterion B
Criterion A	Normal operating behavior within the specified limits.
Criterion B	Temporary impairment to operational behavior that is corrected by the device itself.

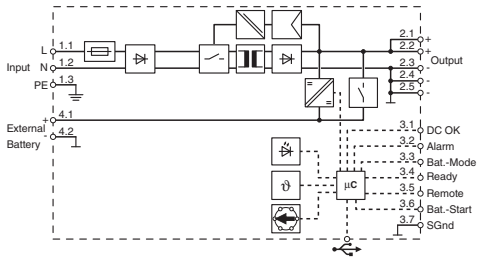
Environmental Product Compliance

REACh SVHC	Lead 7439-92-1

Drawings

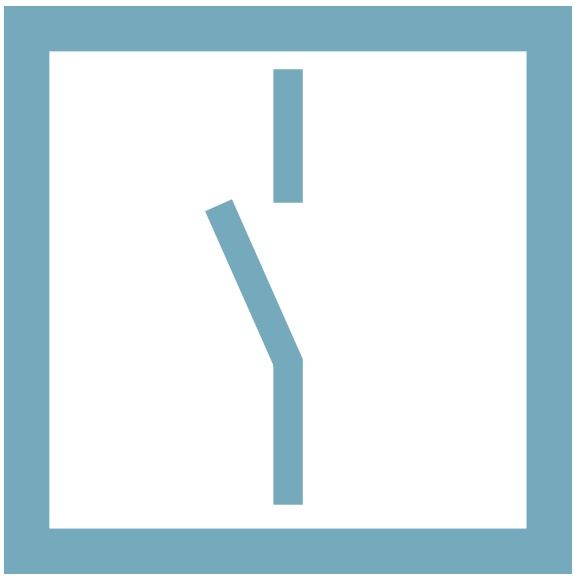
Uninterruptible power supply - TRIO-UPS-2G/1AC/24DC/5 - 2907160

Block diagram



Pictogram

Pictogram



Classifications

eCl@ss

eCl@ss 10.0.1	27040705
eCl@ss 11.0	27040705
eCl@ss 9.0	27040705

Uninterruptible power supply - TRIO-UPS-2G/1AC/24DC/5 - 2907160

Classifications

ETIM

ETIM 6.0	EC000382
ETIM 7.0	EC000382

UNSPSC

UNSPSC 18.0	39121011
UNSPSC 19.0	39121011
UNSPSC 20.0	39121011
UNSPSC 21.0	39121011

Accessories

Accessories

Battery unit

Energy storage - UPS-BAT/PB/24DC/1.2AH - 1274520

Energy storage, VRLA-AGM, 24 V DC, 1.2 Ah, automatic detection and communication with QUINT UPS-IQ

Energy storage - UPS-BAT/PB/24DC/4AH - 1274117

Energy storage, VRLA-AGM, 24 V DC, 4 Ah, automatic detection and communication with QUINT UPS-IQ

Energy storage - UPS-BAT/PB/24DC/7AH - 1274118

Energy storage, VRLA-AGM, 24 V DC, 7 Ah, automatic detection and communication with QUINT UPS-IQ

Uninterruptible power supply - TRIO-UPS-2G/1AC/24DC/5 - 2907160

Accessories

Energy storage - UPS-BAT/PB/24DC/12AH - 1274119

Energy storage, VRLA-AGM, 24 V DC, 12 Ah, automatic detection and communication with QUINT UPS-IQ

Energy storage - UPS-BAT/VRLA-WTR/24DC/13AH - 2320416

Energy storage device, lead AGM, VRLA technology, 24 V DC, 13 Ah, tool-free battery replacement, automatic detection, and communication with QUINT UPS-IQ

Data cable preassembled

Data cable - MINI-SCREW-USB-DATACABLE - 2908217

Used for communication between an industrial PC and Phoenix Contact devices with USB-Mini-B connection.

Thermomagnetic device circuit breaker - TMC 81C 01A - 2907558

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Thermomagnetic device circuit breaker, number of positions: 1, connection method: Screw, cross section: 1 mm² - 35 mm², AWG: 18 - 2, width: 17.6 mm, mounting type: DIN rail: 35 mm, Color: gray

RoHS

Key Commercial Data

Packing unit	1 pc
GTIN	4 055626 214986
GTIN	4055626214986
Weight per Piece (excluding packing)	150.000 g
Country of origin	China

Technical data

General

Mounting type	DIN rail: 35 mm
Color	gray
Number of positions	1

Electrical data

Operating voltage	120 V AC (277 V AC)
	60 V DC
Rated current I_N	1 A
Rated short-circuit switching capacity I_{cn}	10 kA (IC)

Dimensions

Height	116 mm
Width	17.6 mm

Thermomagnetic device circuit breaker - TMC 81C 01A - 2907558

Technical data

Dimensions

Depth	65.7 mm

Ambient conditions

Ambient temperature (operation)	-35 °C ... 70 °C

Connection data

Conductor cross section solid min.	1 mm²
Conductor cross section solid max.	35 mm²
Conductor cross section flexible min.	1 mm²
Conductor cross section flexible max.	35 mm²
Conductor cross section AWG min.	18
Conductor cross section AWG max.	2
Connection method	Screw
Tightening torque max	2 Nm

Standards and Regulations

Standards/specifications	UL 489 IEC 60947-2

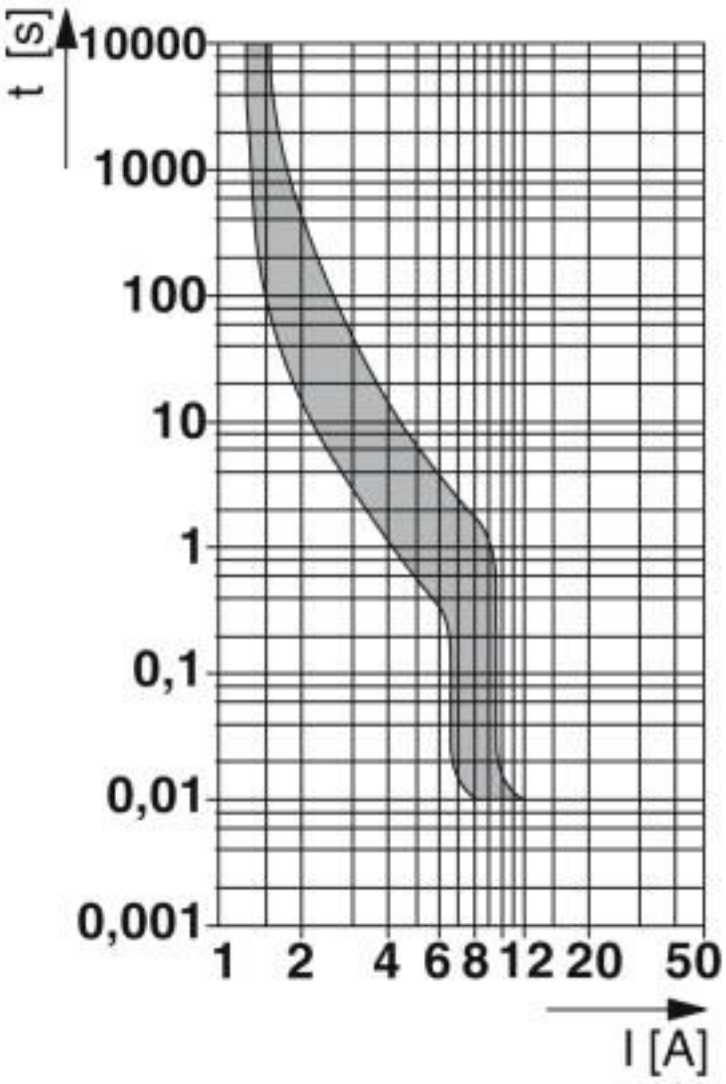
Environmental Product Compliance

REACh SVHC	Lead 7439-92-1
	Cadmium oxide 1306-19-0

Drawings

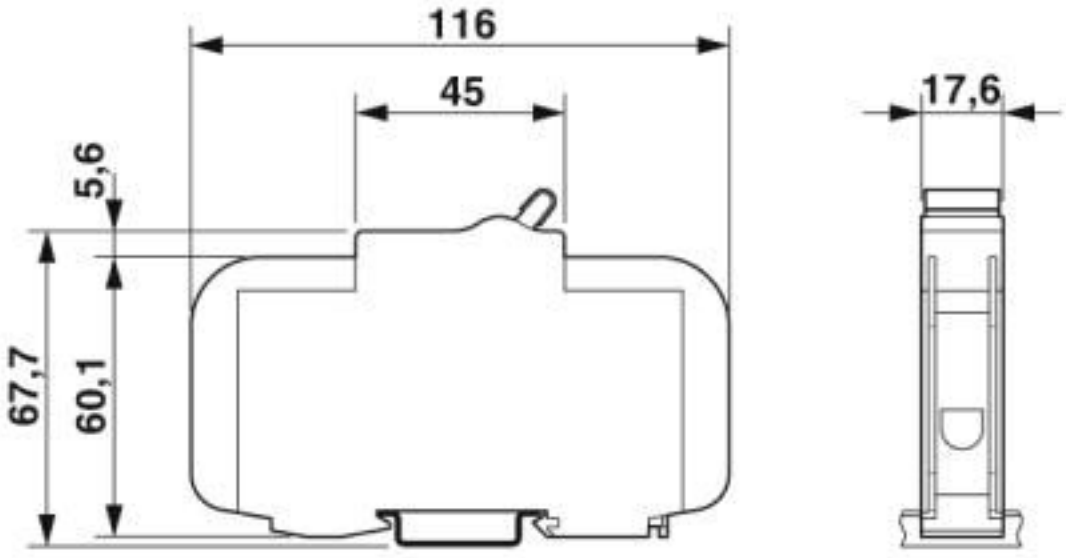
Thermomagnetic device circuit breaker - TMC 81C 01A - 2907558

Diagram



Thermomagnetic device circuit breaker - TMC 81C 01A - 2907558

Dimensional drawing



Classifications

eCl@ss

eCl@ss 10.0.1	27141116
eCl@ss 11.0	27141116
eCl@ss 4.0	27141116
eCl@ss 4.1	27141116
eCl@ss 5.0	27141116
eCl@ss 5.1	27141100
eCl@ss 6.0	27141100
eCl@ss 7.0	27141116
eCl@ss 8.0	27141116
eCl@ss 9.0	27141116

ETIM

ETIM 3.0	EC000899
ETIM 4.0	EC000899
ETIM 5.0	EC000899
ETIM 6.0	EC000899
ETIM 7.0	EC000899

UNSPSC

UNSPSC 6.01	30211812
UNSPSC 7.0901	39121411

Thermomagnetic device circuit breaker - TMC 81C 01A - 2907558

Classifications

UNSPSC

UNSPSC 11	39121411
UNSPSC 12.01	39121411
UNSPSC 13.2	39121620
UNSPSC 18.0	39121410
UNSPSC 19.0	39121410
UNSPSC 20.0	39121410
UNSPSC 21.0	39121410

Approvals

Approvals

Approvals

UL Listed / cUL Listed / cULus Listed

Ex Approvals

Approval details

UL Listed		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 320373
cUL Listed		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 320373
cULus Listed			

Thermomagnetic device circuit breaker - TMC 81C 03A - 2907560

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Thermomagnetic device circuit breaker, number of positions: 1, connection method: Screw, cross section: 1 mm² - 35 mm², AWG: 18 - 2, width: 17.6 mm, mounting type: DIN rail: 35 mm, Color: gray

RoHS

Key Commercial Data

Packing unit	1 pc
GTIN	4 055626 214962
GTIN	4055626214962
Weight per Piece (excluding packing)	150.000 g
Country of origin	China

Technical data

General

Mounting type	DIN rail: 35 mm
Color	gray
Number of positions	1

Electrical data

Operating voltage	120 V AC (277 V AC)
	60 V DC
Rated current I_N	3 A
Rated short-circuit switching capacity I_{cn}	10 kA (IC)

Dimensions

Height	116 mm
Width	17.6 mm

Thermomagnetic device circuit breaker - TMC 81C 03A - 2907560

Technical data

Dimensions

Depth	65.7 mm

Ambient conditions

Ambient temperature (operation)	-35 °C ... 70 °C

Connection data

Conductor cross section solid min.	1 mm²
Conductor cross section solid max.	35 mm²
Conductor cross section flexible min.	1 mm²
Conductor cross section flexible max.	35 mm²
Conductor cross section AWG min.	18
Conductor cross section AWG max.	2
Connection method	Screw
Tightening torque max	2 Nm

Standards and Regulations

Standards/specifications	UL 489 IEC 60947-2

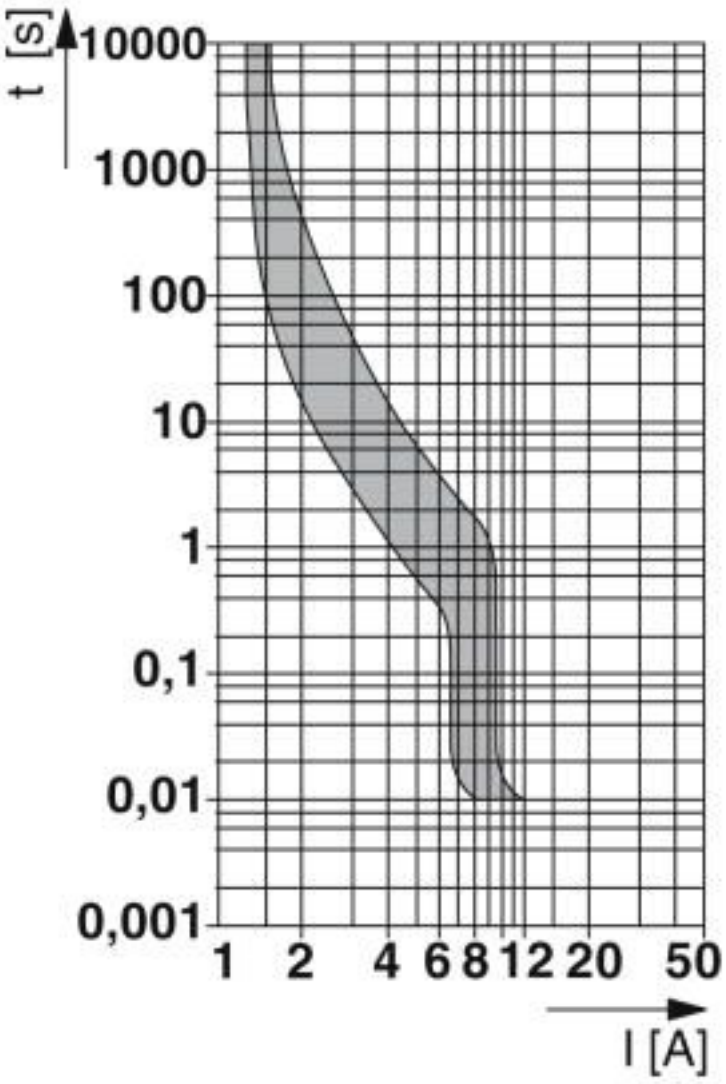
Environmental Product Compliance

REACh SVHC	Lead 7439-92-1
	Cadmium oxide 1306-19-0

Drawings

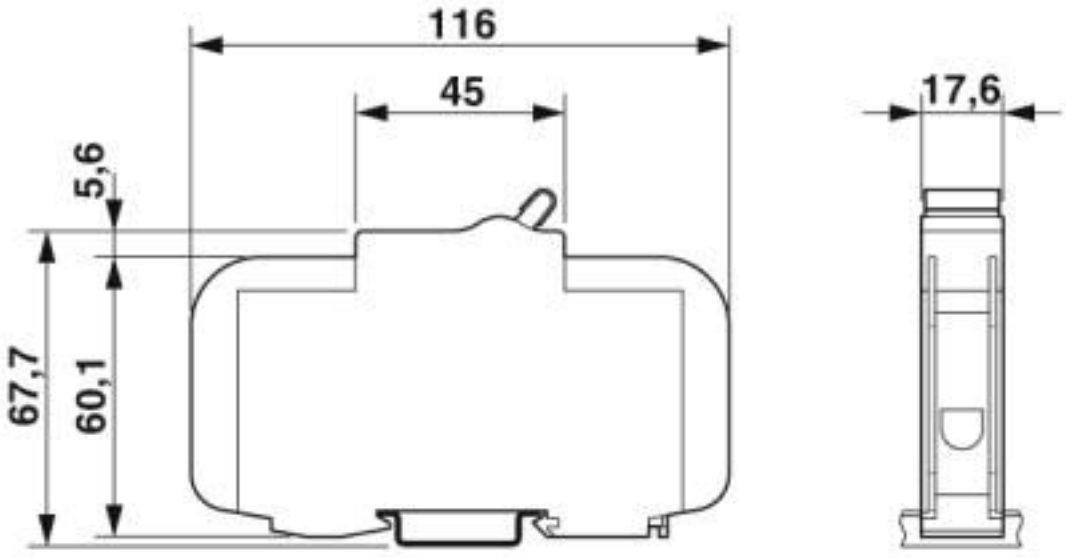
Thermomagnetic device circuit breaker - TMC 81C 03A - 2907560

Diagram



Thermomagnetic device circuit breaker - TMC 81C 03A - 2907560

Dimensional drawing



Classifications

eCl@ss

eCl@ss 10.0.1	27141116
eCl@ss 11.0	27141116
eCl@ss 4.0	27141116
eCl@ss 4.1	27141116
eCl@ss 5.0	27141116
eCl@ss 5.1	27141100
eCl@ss 6.0	27141100
eCl@ss 7.0	27141116
eCl@ss 8.0	27141116
eCl@ss 9.0	27141116

ETIM

ETIM 3.0	EC000899
ETIM 4.0	EC000899
ETIM 5.0	EC000899
ETIM 6.0	EC000899
ETIM 7.0	EC000899

UNSPSC

UNSPSC 6.01	30211812
UNSPSC 7.0901	39121411

Thermomagnetic device circuit breaker - TMC 81C 03A - 2907560

Classifications

UNSPSC

UNSPSC 11	39121411
UNSPSC 12.01	39121411
UNSPSC 13.2	39121620
UNSPSC 18.0	39121410
UNSPSC 19.0	39121410
UNSPSC 20.0	39121410
UNSPSC 21.0	39121410

Approvals

Approvals

Approvals

UL Listed / cUL Listed / cULus Listed

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cUL Listed		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 320373
cULus Listed			

Thermomagnetic device circuit breaker - TMC 81C 05A - 2907562

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Thermomagnetic device circuit breaker, number of positions: 1, connection method: Screw, cross section: 1 mm² - 35 mm², AWG: 18 - 2, width: 17.6 mm, mounting type: DIN rail: 35 mm, Color: gray

RoHS

Key Commercial Data

Packing unit	1 pc
GTIN	4 055626 214948
GTIN	4055626214948
Weight per Piece (excluding packing)	141.670 g
Country of origin	China

Technical data

General

Mounting type	DIN rail: 35 mm
Color	gray
Number of positions	1

Electrical data

Operating voltage	120 V AC (277 V AC)
	60 V DC
Rated current I_N	5 A
Rated short-circuit switching capacity I_{cn}	10 kA (IC)

Dimensions

Height	116 mm
Width	17.6 mm

Thermomagnetic device circuit breaker - TMC 81C 05A - 2907562

Technical data

Dimensions

Depth	65.7 mm

Ambient conditions

Ambient temperature (operation)	-35 °C ... 70 °C

Connection data

Conductor cross section solid min.	1 mm²
Conductor cross section solid max.	35 mm²
Conductor cross section flexible min.	1 mm²
Conductor cross section flexible max.	35 mm²
Conductor cross section AWG min.	18
Conductor cross section AWG max.	2
Connection method	Screw
Tightening torque max	2 Nm

Standards and Regulations

Standards/specifications	UL 489 IEC 60947-2

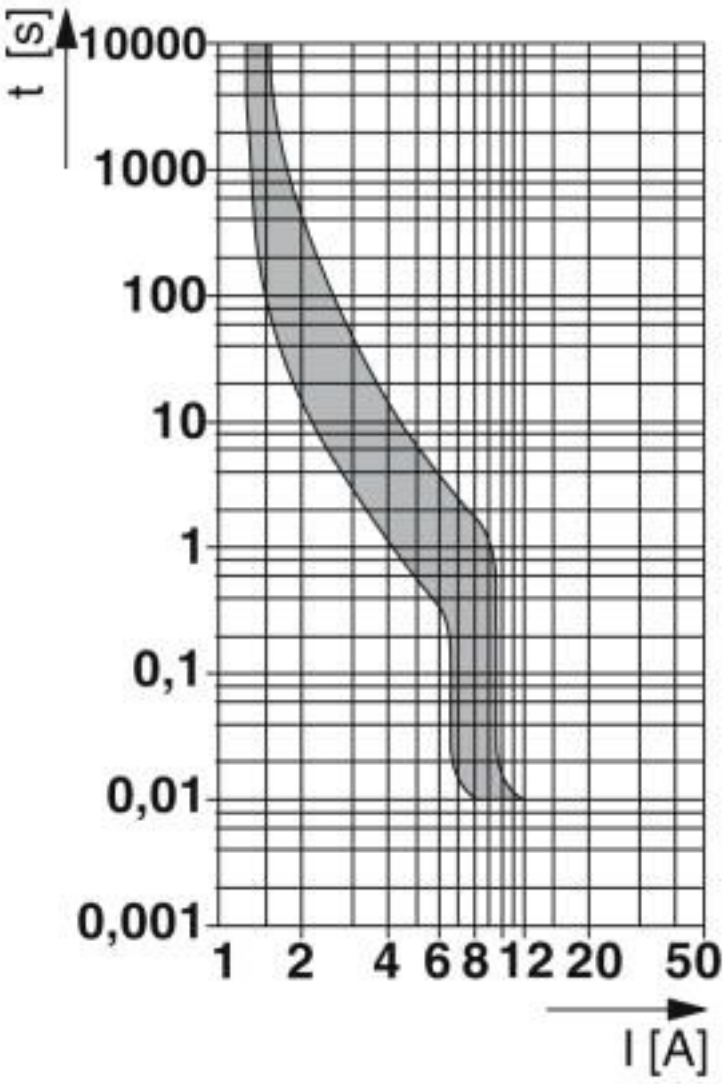
Environmental Product Compliance

REACh SVHC	Lead 7439-92-1
	Cadmium oxide 1306-19-0

Drawings

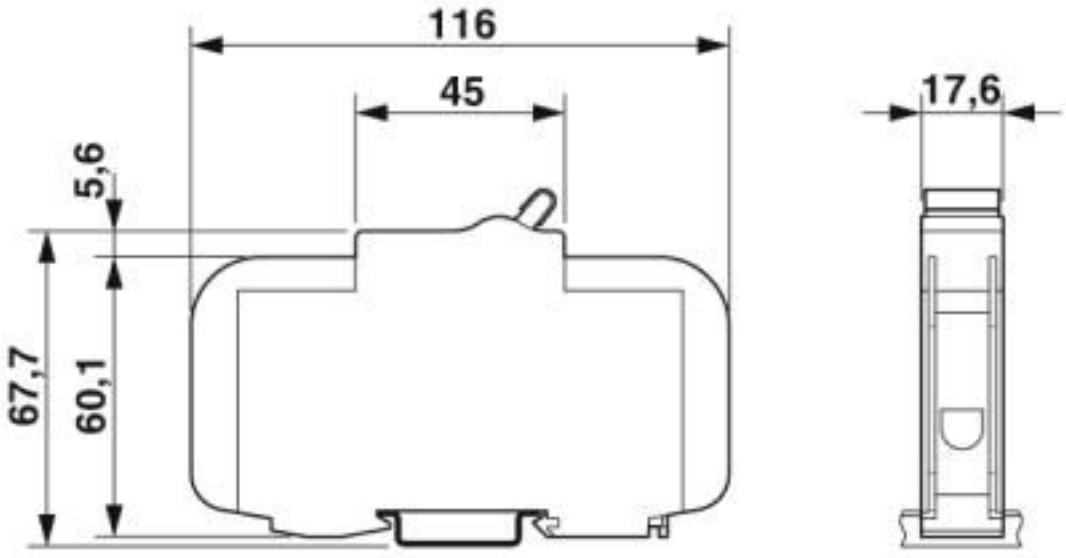
Thermomagnetic device circuit breaker - TMC 81C 05A - 2907562

Diagram



Thermomagnetic device circuit breaker - TMC 81C 05A - 2907562

Dimensional drawing



Classifications

eCl@ss

eCl@ss 10.0.1	27141116
eCl@ss 11.0	27141116
eCl@ss 4.0	27141116
eCl@ss 4.1	27141116
eCl@ss 5.0	27141116
eCl@ss 5.1	27141100
eCl@ss 6.0	27141100
eCl@ss 7.0	27141116
eCl@ss 8.0	27141116
eCl@ss 9.0	27141116

ETIM

ETIM 3.0	EC000899
ETIM 4.0	EC000899
ETIM 5.0	EC000899
ETIM 6.0	EC000899
ETIM 7.0	EC000899

UNSPSC

UNSPSC 6.01	30211812
UNSPSC 7.0901	39121411

Thermomagnetic device circuit breaker - TMC 81C 05A - 2907562

Classifications

UNSPSC

UNSPSC 11	39121411
UNSPSC 12.01	39121411
UNSPSC 13.2	39121620
UNSPSC 18.0	39121410
UNSPSC 19.0	39121410
UNSPSC 20.0	39121410
UNSPSC 21.0	39121410

Approvals

Approvals

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Approval details

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cUL Listed		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 320373
cULus Listed			

Thermomagnetic device circuit breaker - TMC 81C 06A - 2907563

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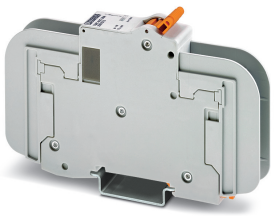


Thermomagnetic device circuit breaker, number of positions: 1, connection method: Screw, cross section: 1 mm² - 35 mm², AWG: 18 - 2, width: 17.6 mm, mounting type: DIN rail: 35 mm, Color: gray

RoHS

Key Commercial Data

Packing unit	1 pc
GTIN	4 055626 214931
GTIN	4055626214931
Weight per Piece (excluding packing)	141.670 g
Country of origin	China

Technical data

General

Mounting type	DIN rail: 35 mm
Color	gray
Number of positions	1

Electrical data

Operating voltage	120 V AC (277 V AC)
	60 V DC
Rated current I_N	6 A
Rated short-circuit switching capacity I_{cn}	10 kA (IC)

Dimensions

Height	116 mm
Width	17.6 mm

Thermomagnetic device circuit breaker - TMC 81C 06A - 2907563

Technical data

Dimensions

Depth	65.7 mm

Ambient conditions

Ambient temperature (operation)	-35 °C ... 70 °C

Connection data

Conductor cross section solid min.	1 mm²
Conductor cross section solid max.	35 mm²
Conductor cross section flexible min.	1 mm²
Conductor cross section flexible max.	35 mm²
Conductor cross section AWG min.	18
Conductor cross section AWG max.	2
Connection method	Screw
Tightening torque max	2 Nm

Standards and Regulations

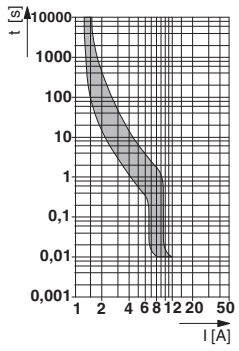
Standards/specifications	UL 489 IEC 60947-2

Environmental Product Compliance

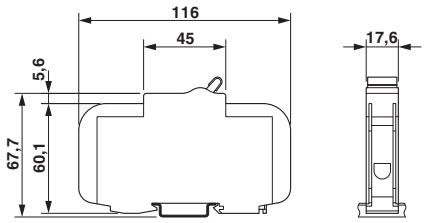
REACh SVHC	Lead 7439-92-1
	Cadmium oxide 1306-19-0

Drawings

Diagram



Dimensional drawing



Classifications

eCl@ss

eCl@ss 10.0.1	27141116

Thermomagnetic device circuit breaker - TMC 81C 06A - 2907563

Classifications

eCl@ss

eCl@ss 11.0	27141116
eCl@ss 4.0	27141116
eCl@ss 4.1	27141116
eCl@ss 5.0	27141116
eCl@ss 5.1	27141100
eCl@ss 6.0	27141100
eCl@ss 7.0	27141116
eCl@ss 9.0	27141116

ETIM

ETIM 3.0	EC000899
ETIM 4.0	EC000899
ETIM 6.0	EC000899
ETIM 7.0	EC000899

UNSPSC

UNSPSC 6.01	30211812
UNSPSC 7.0901	39121411
UNSPSC 11	39121411
UNSPSC 12.01	39121411
UNSPSC 13.2	39121620
UNSPSC 18.0	39121410
UNSPSC 19.0	39121410
UNSPSC 20.0	39121410
UNSPSC 21.0	39121410

Approvals

Approvals

Approvals

UL Listed / cUL Listed / cULus Listed

Ex Approvals

Approval details

Thermomagnetic device circuit breaker - TMC 81C 06A - 2907563

Approvals

UL Listed		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 320373

cUL Listed		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 320373

cULus Listed	

Accessories

Accessories

Bridge

Wiring bridge - TMC 8 B1 80 57 C - 2907991

Bus bar for TMC 81... circuit breakers (single phase). 17.8 mm pitch, up to 57 positions. Rated for 80 A (end feed) 1000 V AC/DC. UL 508 Listed for connection of UL 489 rated circuit breakers.

Wiring bridge - TMC 8 B1 80 37 CA - 2907992

Bus bar for TMC 81... circuit breakers (single phase) with auxilliary switch module. 27 mm pitch, up to 37 positions. Rated for 80 A (end feed) 1000 V AC/DC. UL 508 Listed for connection of UL 489 rated circuit breakers.

Device marking

Label - EML (10X4)R - 0815583

Label, Roll, white, unlabeled, can be labeled with: THERMOMARK ROLLMASTER 300/600, THERMOMARK X1.2, THERMOMARK ROLL X1, THERMOMARK ROLL 2.0, THERMOMARK ROLL, mounting type: adhesive, lettering field size: 10 x 4 mm, Number of individual labels: 10000

Thermomagnetic device circuit breaker - TMC 81C 06A - 2907563

Accessories

Terminal marking

Marking foil for zack marker strip - TML (104X3,8)R - 0801833

Marking foil for zack marker strip, Roll, white, unlabeled, can be labeled with: THERMOMARK ROLL 2.0, THERMOMARK ROLL, THERMOMARK ROLL X1, THERMOMARK ROLLMASTER 300/600, THERMOMARK X1.2, mounting type: adhesive, for terminal block width: 104 mm, lettering field size: 104 x 3.8 mm, Number of individual labels: 2500

Terminal adapter - TMC 8 B TERM PIN - 2907998

Feeder terminal adapter for TMC 8..... circuit breaker bus bars. Rated for 1000 V AC/DC, 115 A. Wire range 14…2 AWG. UL Listed for connection to UL 489 rated circuit breakers.

Wiring bridge end cover - TMC 8 B END CAP - 2907999

Protective end covers for TMC 8 bus bars

Protective covers - TMC 8 B BUS CAP - 2908000

Protective covers for TMC 8 bus bars. Cuttable, three positions, yellow.

Thermomagnetic device circuit breaker - TMC 7/8 AUX - 2908219

Thermomagnetic device circuit breaker, number of positions: 1, connection method: Screw, cross section: 1 mm² - 35 mm², AWG: 18 - 2, width: 9 mm, mounting type: Snaps on to side of circuit breaker, Color: gray

Thermomagnetic device circuit breaker - TMC 81C 06A - 2907563

Accessories

Thermomagnetic device circuit breaker - TMC 7/8 ALARM - 2908220

Thermomagnetic device circuit breaker, number of positions: 1, connection method: Screw, cross section: 1 mm² - 35 mm², AWG: 18 - 2, width: 9 mm, mounting type: Snaps on to side of circuit breaker, Color: gray

Thermomagnetic device circuit breaker - TMC 7/8 12VDC SHNT - 2908221

Thermomagnetic device circuit breaker, number of positions: 1, connection method: Screw, cross section: 1 mm² - 35 mm², AWG: 18 - 2, width: 18 mm, mounting type: Snaps on to side of circuit breaker, Color: gray

Thermomagnetic device circuit breaker - TMC 7/8 24VDC SHNT - 2908222

Thermomagnetic device circuit breaker, number of positions: 1, connection method: Screw, cross section: 1 mm² - 35 mm², AWG: 18 - 2, width: 18 mm, mounting type: Snaps on to side of circuit breaker, Color: gray

Thermomagnetic device circuit breaker - TMC 7/8 48VDC SHNT - 2908224

Thermomagnetic device circuit breaker, number of positions: 1, connection method: Screw, cross section: 1 mm² - 35 mm², AWG: 18 - 2, width: 18 mm, mounting type: Snaps on to side of circuit breaker, Color: gray

Thermomagnetic device circuit breaker - TMC 7/8 125VDC SHNT - 2908225

Thermomagnetic device circuit breaker, number of positions: 1, connection method: Screw, cross section: 1 mm² - 35 mm², AWG: 18 - 2, width: 18 mm, mounting type: Snaps on to side of circuit breaker, Color: gray

Thermomagnetic device circuit breaker - TMC 81C 06A - 2907563

Accessories

Thermomagnetic device circuit breaker - TMC 7/8 120VAC SHNT - 2908226

Thermomagnetic device circuit breaker, number of positions: 1, connection method: Screw, cross section: 1 mm² - 35 mm², AWG: 18 - 2, width: 18 mm, mounting type: Snaps on to side of circuit breaker, Color: gray

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Thermomagnetic device circuit breaker - TMC 7/8 240VAC SHNT - 2908227

Thermomagnetic device circuit breaker, number of positions: 1, connection method: Screw, cross section: 1 mm² - 35 mm², AWG: 18 - 2, width: 18 mm, mounting type: Snaps on to side of circuit breaker, Color: gray

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Thermomagnetic device circuit breaker - TMC 7/8 277VAC SHNT - 2908228

Thermomagnetic device circuit breaker, number of positions: 1, connection method: Screw, cross section: 1 mm² - 35 mm², AWG: 18 - 2, width: 18 mm, mounting type: Snaps on to side of circuit breaker, Color: gray

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Thermomagnetic device circuit breaker - TMC 81D 03A

2907628

https://www.phoenixcontact.com/us/products/2907628

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Thermomagnetic device circuit breaker, number of positions: 1, connection method: Screw, cross section: 1 mm^2 - 35 mm^2, AWG: 18 - 2, mounting type: DIN rail: 35 mm, Color: gray

Commercial Data

Item number	2907628
Packing unit	1 pc
Note	Made to Order (non-returnable)
Sales Key	C29
Product Key	CLA125
GTIN	4055626215181
Weight per Piece (including packing)	222.222 g
Weight per Piece (excluding packing)	222.222 g
Country of origin	CN

Technical Data

Product properties

Type	DIN rail module, one-piece
Product type	Thermomagnetic device circuit breakers
Number of positions	1
Mechanical service life	20000

Electrical properties

Service life electrical	6000

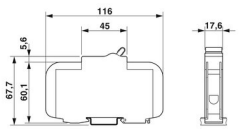
General

Operating voltage	120 V AC (277 V AC)
	60 V DC
Rated current I_N	3 A
Tripping method	TM (thermomagnetic)
Rated short-circuit switching capacity I_{cn}	10 kA (IC)
Fuse	D

Connection data

Tightening torque	... 2 Nm
Conductor cross section solid	1 mm² ... 35 mm²
Cross section AWG	18 ... 2 (converted acc. to IEC)
Conductor cross section flexible	1 mm² ... 35 mm²
Connection method	Screw
Tightening torque, min	2 Nm
Conductor cross section flexible max.	35 mm²
Conductor cross section solid max.	35 mm²

Dimensions

Dimensional drawing	
Width	17.6 mm
Height	116 mm
Depth	65.7 mm

Material specifications

Color	gray

Environmental and real-life conditions

Ambient conditions

Ambient temperature (operation)	-35 °C ... 70 °C
Humidity test	48 h, 95% RH, 40°C (IEC 60068-2-78)
Shock (operation)	30g (11 ms) (IEC 60068-2-11)
Vibration (operation)	±0.38 mm (10-57 Hz), 5g (57...500 Hz) (IEC 60068-2-6, Fc, sine)

Standards and regulations

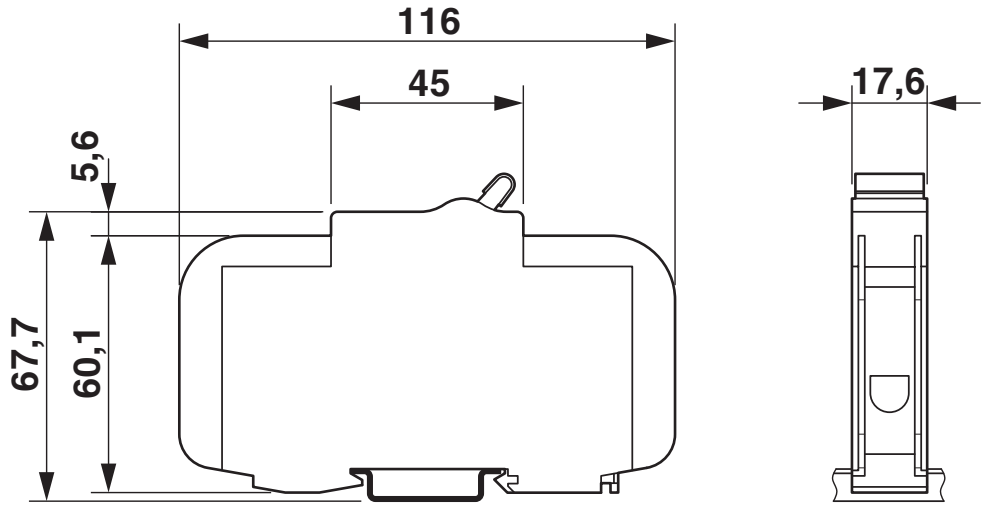
Standards/specifications	UL 489
	IEC 60947-2

Mounting

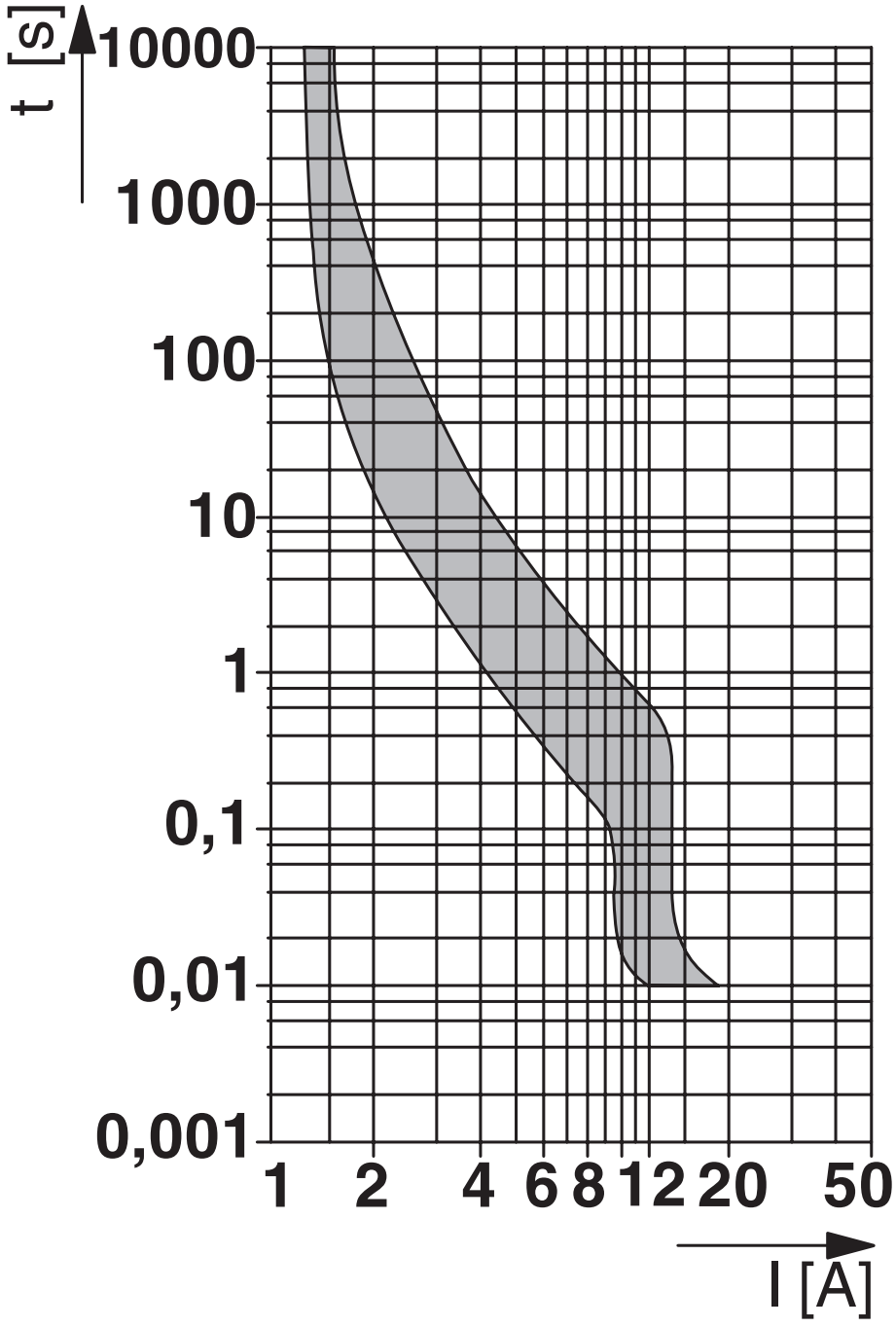
Mounting type	DIN rail: 35 mm

Drawings

Dimensional drawing



Diagram



Phoenix Contact USA
586 Fulling Mill Road
Middletown, PA 17057, United States
(+717) 944-1300
info@phoenixcon.com

Thermomagnetic device circuit breaker - TMC 81D 10A

2907634

https://www.phoenixcontact.com/us/products/2907634

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Thermomagnetic device circuit breaker, number of positions: 1, connection method: Screw, cross section: 1 mm^2 - 35 mm^2, AWG: 18 - 2, mounting type: DIN rail: 35 mm, Color: gray

Commercial Data

Item number	2907634
Packing unit	1 pc
Note	Made to Order (non-returnable)
Sales Key	C29
Product Key	CLA125
GTIN	4055626215129
Weight per Piece (including packing)	132.75 g
Weight per Piece (excluding packing)	132.75 g
Country of origin	CN

Technical Data

Product properties

Type	DIN rail module, one-piece
Product type	Thermomagnetic device circuit breakers
Number of positions	1
Mechanical service life	20000

Electrical properties

Service life electrical	6000

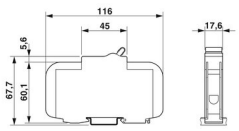
General

Operating voltage	120 V AC (277 V AC)
	60 V DC
Rated current I_N	10 A
Tripping method	TM (thermomagnetic)
Rated short-circuit switching capacity I_{cn}	10 kA (IC)
Fuse	D

Connection data

Tightening torque	... 2 Nm
Conductor cross section solid	1 mm² ... 35 mm²
Cross section AWG	18 ... 2 (converted acc. to IEC)
Conductor cross section flexible	1 mm² ... 35 mm²
Connection method	Screw
Tightening torque, min	2 Nm
Conductor cross section flexible max.	35 mm²
Conductor cross section solid max.	35 mm²

Dimensions

Dimensional drawing	
Width	17.6 mm
Height	116 mm
Depth	65.7 mm

Material specifications

Color	gray

Environmental and real-life conditions

Ambient conditions

Ambient temperature (operation)	-35 °C ... 70 °C
Humidity test	48 h, 95% RH, 40°C (IEC 60068-2-78)
Shock (operation)	30g (11 ms) (IEC 60068-2-11)
Vibration (operation)	±0.38 mm (10-57 Hz), 5g (57...500 Hz) (IEC 60068-2-6, Fc, sine)

Standards and regulations

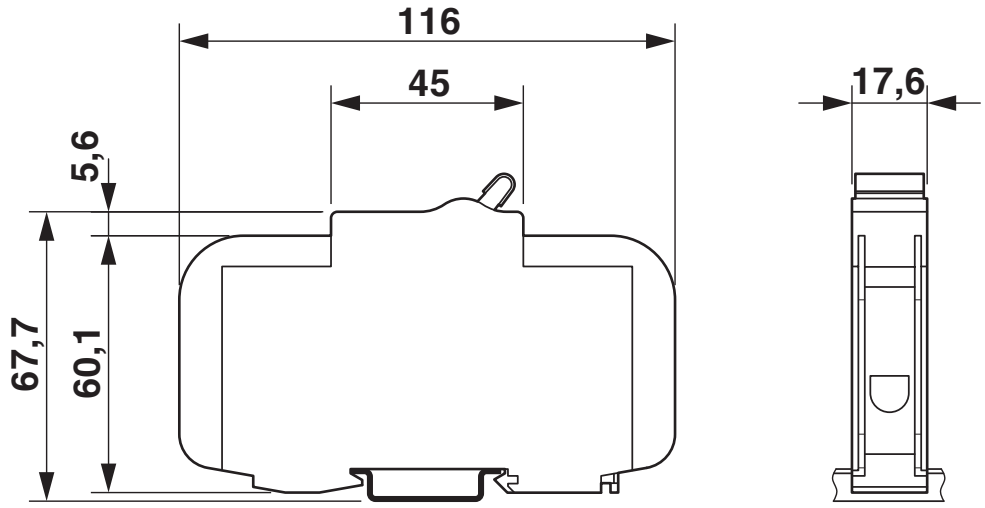
Standards/specifications	UL 489
	IEC 60947-2

Mounting

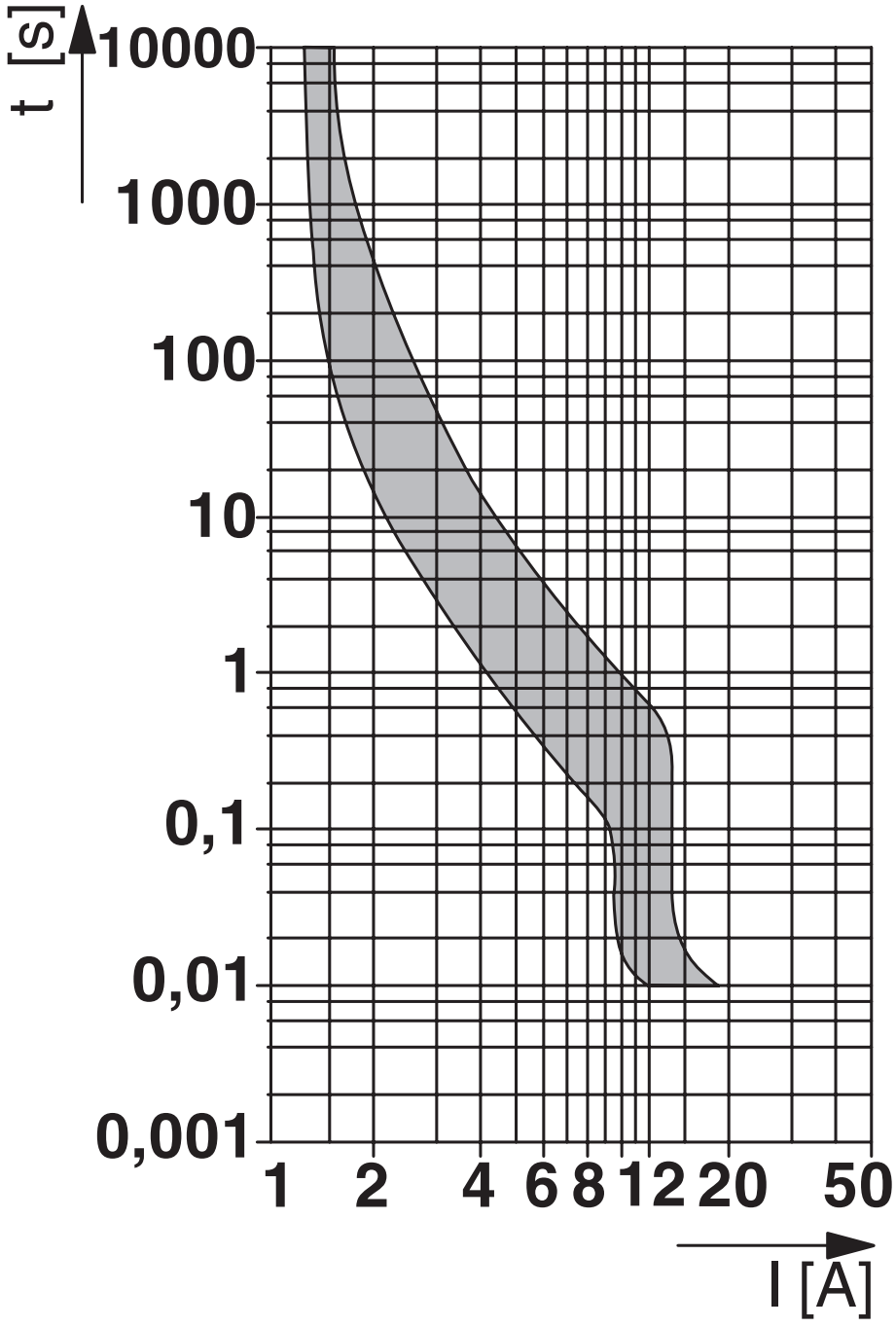
Mounting type	DIN rail: 35 mm

Drawings

Dimensional drawing



Diagram



Phoenix Contact USA
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Thermomagnetic device circuit breaker - TMC 81D 20A

2907640

https://www.phoenixcontact.com/us/products/2907640

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Thermomagnetic device circuit breaker, number of positions: 1, connection method: Screw, cross section: 1 mm^2 - 35 mm^2, AWG: 18 - 2, mounting type: DIN rail: 35 mm, Color: gray

Commercial Data

Item number	2907640
Packing unit	1 pc
Note	Made to Order (non-returnable)
Sales Key	C29
Product Key	CLA125
GTIN	4055626215075
Weight per Piece (including packing)	222.222 g
Weight per Piece (excluding packing)	222.222 g
Country of origin	CN

Technical Data

Product properties

Type	DIN rail module, one-piece
Product type	Thermomagnetic device circuit breakers
Number of positions	1
Mechanical service life	20000

Electrical properties

Service life electrical	6000

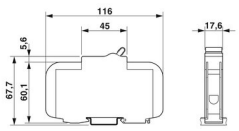
General

Operating voltage	120 V AC (277 V AC)
	60 V DC
Rated current I_N	20 A
Tripping method	TM (thermomagnetic)
Rated short-circuit switching capacity I_{cn}	10 kA (IC)
Fuse	D

Connection data

Tightening torque	... 2 Nm
Conductor cross section solid	1 mm² ... 35 mm²
Cross section AWG	18 ... 2 (converted acc. to IEC)
Conductor cross section flexible	1 mm² ... 35 mm²
Connection method	Screw
Tightening torque, min	2 Nm
Conductor cross section flexible max.	35 mm²
Conductor cross section solid max.	35 mm²

Dimensions

Dimensional drawing	
Width	17.6 mm
Height	116 mm
Depth	65.7 mm

Material specifications

Color	gray

Environmental and real-life conditions

Ambient conditions

Ambient temperature (operation)	-35 °C ... 70 °C
Humidity test	48 h, 95% RH, 40°C (IEC 60068-2-78)
Shock (operation)	30g (11 ms) (IEC 60068-2-11)
Vibration (operation)	±0.38 mm (10-57 Hz), 5g (57...500 Hz) (IEC 60068-2-6, Fc, sine)

Standards and regulations

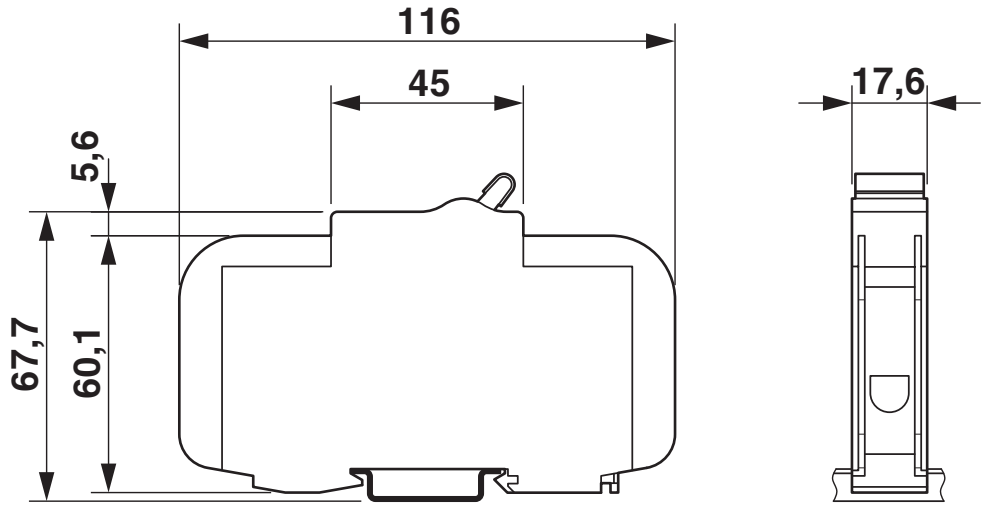
Standards/specifications	UL 489
	IEC 60947-2

Mounting

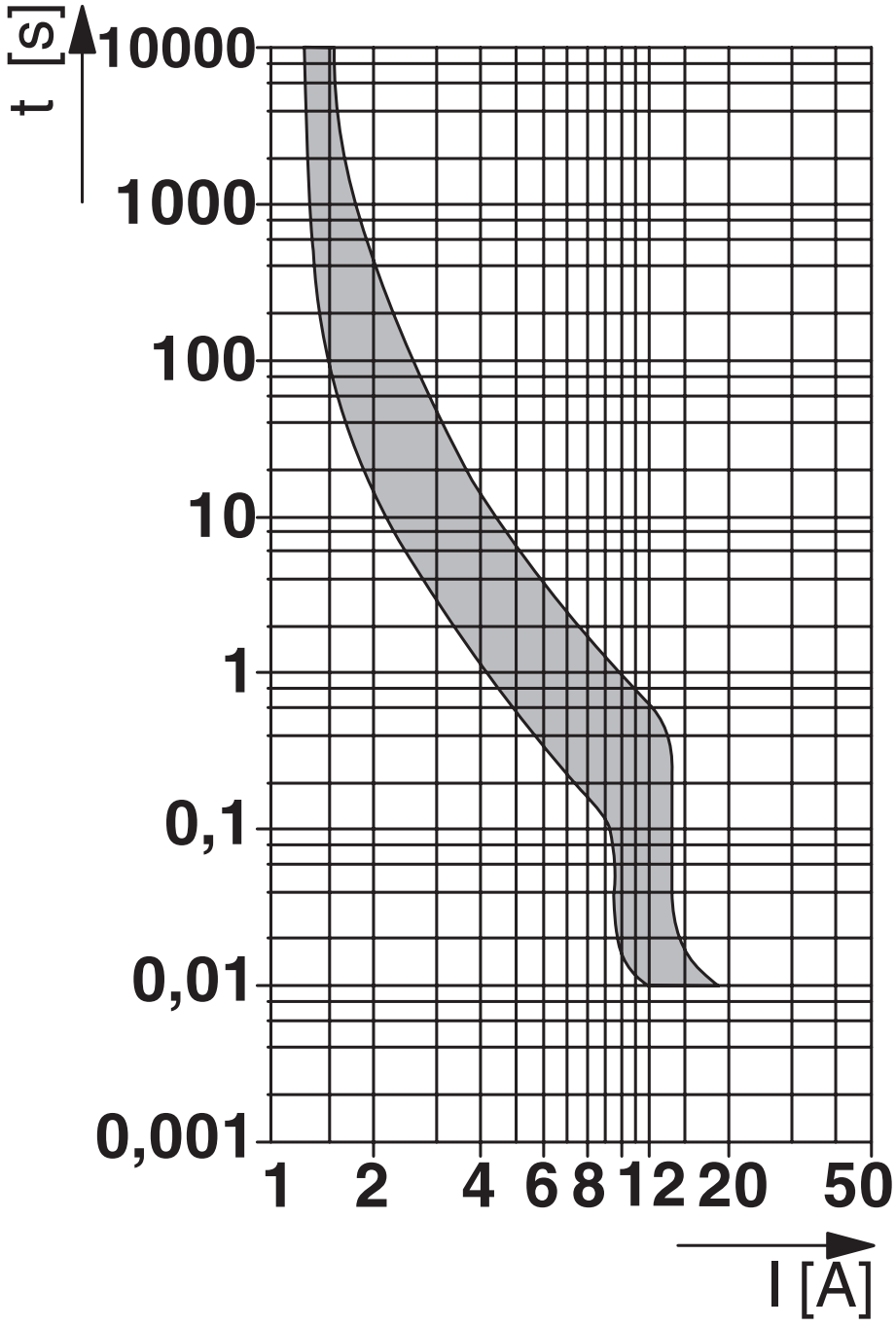
Mounting type	DIN rail: 35 mm

Drawings

Dimensional drawing



Diagram



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Thermomagnetic device circuit breaker - TMC 7/8 AUX - 2908219

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Thermomagnetic device circuit breaker, number of positions: 1, connection method: Screw, cross section: 1 mm² - 35 mm², AWG: 18 - 2, width: 9 mm, mounting type: Snaps on to side of circuit breaker, Color: gray

RoHS

Key Commercial Data

Packing unit	1 pc
GTIN	4 055626 299709
GTIN	4055626299709
Weight per Piece (excluding packing)	41.670 g
Custom tariff number	85362010
Country of origin	China

Technical data

General

Mounting type	Snaps on to side of circuit breaker
Color	gray
Number of positions	1

Electrical data

Operating voltage	120 V AC ... 277 V AC
	24 V DC ... 125 V DC
Rated current I_N	6 A (12 ... 240 V AC)
	3 A (277 V AC)
	6 A (12 ... 24 V DC)
	2 A (48 V DC)

Thermomagnetic device circuit breaker - TMC 7/8 AUX - 2908219

Technical data

Electrical data

	1 A (130 V DC)

Dimensions

Height	85.8 mm
Width	9 mm
Depth	65.7 mm

Ambient conditions

Ambient temperature (operation)	-35 °C ... 70 °C

Connection data

Conductor cross section solid min.	1 mm²
Conductor cross section solid max.	35 mm²
Conductor cross section flexible min.	1 mm²
Conductor cross section flexible max.	35 mm²
Conductor cross section AWG min.	18
Conductor cross section AWG max.	2
Connection method	Screw
Tightening torque max	1 Nm

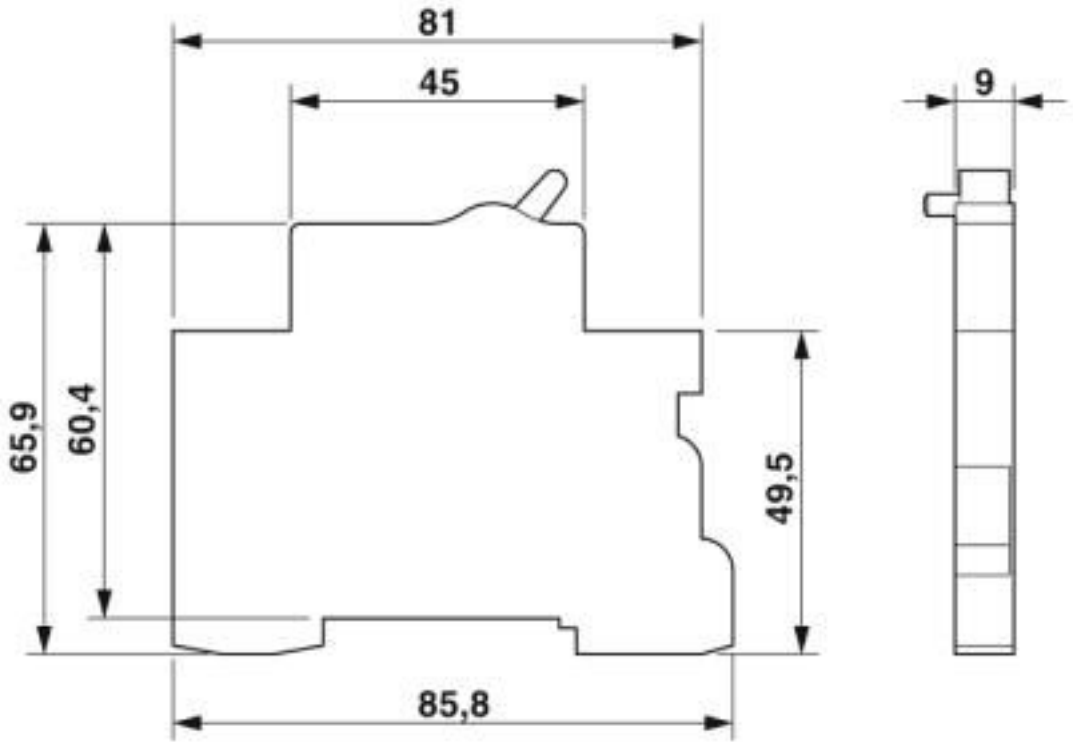
Environmental Product Compliance

REACh SVHC	Lead 7439-92-1
	Cadmium oxide 1306-19-0

Drawings

Thermomagnetic device circuit breaker - TMC 7/8 AUX - 2908219

Dimensional drawing



Classifications

eCl@ss

eCl@ss 10.0.1	27141116
eCl@ss 11.0	27141116
eCl@ss 5.1	27379201
eCl@ss 6.0	27130800
eCl@ss 7.0	27130806
eCl@ss 8.0	27141116
eCl@ss 9.0	27141116

ETIM

ETIM 5.0	EC000899
ETIM 6.0	EC000942
ETIM 7.0	EC000942

UNSPSC

UNSPSC 13.2	39121620
UNSPSC 18.0	39121410

Thermomagnetic device circuit breaker - TMC 7/8 AUX - 2908219

Classifications

UNSPSC

UNSPSC 19.0	39121410
UNSPSC 20.0	39121410
UNSPSC 21.0	39121410

Approvals

Approvals

Approvals

UL Listed / cUL Listed / cULus Listed

Ex Approvals

Approval details

UL Listed		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 478429
cUL Listed		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 478429
cULus Listed			

Electronic circuit breaker - PTCB E1 24DC/1-8A NO

2908262

https://www.phoenixcontact.com/us/products/2908262

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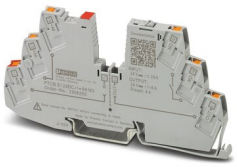


1-channel, electronic circuit breaker for protecting loads at 24 V DC against overload and short circuit. Easy potential distribution with components from the CLIPLINE complete terminal block system. With electronic interlock of the set nominal currents. For installation on DIN rails.

Your advantages

- Simple application setup due to bridging option to CLIPLINE complete terminal block system
- More space in the control cabinet: narrowest protection on just 6 mm width
- Flexible use and reduction of inventory due to adjustable amp values on each device for wide range of applications
- Individual setup for suitable protection, exactly according to your requirements

Commercial Data

Item number	2908262
Packing unit	1 pc
Minimum order quantity	1 pc
Sales Key	C32
Product Key	CLA135
Catalog Page	Page 381 (C-4-2019)
GTIN	4055626323763
Weight per Piece (including packing)	44.26 g
Weight per Piece (excluding packing)	43 g
Customs tariff number	85363010
Country of origin	US

Technical Data

Notes

General

Note	EN 50121-3-2: Railway applications - Electromagnetic compatibility - Part 3-2: Rolling stock – Apparatus
	Connection for signal line tested in accordance with EN 61000-4-4 with 1 kV; if necessary, customer must provide appropriate protective measures
	Repeated hard short circuits can reduce the melting integral of the integrated backup fuse.

Product properties

Type	DIN rail module, one-piece
Product type	Device circuit breakers
Number of positions	1
No. of channels	1

Insulation characteristics

Protection class	III
Pollution degree	2

Electrical properties

No. of channels	1

General

Operating voltage	18 V DC ... 30 V DC
Rated voltage	24 V DC
Rated current I_N	24 A DC (Total current input)
	8 A DC (Rated current output)
Rated current I_N	1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 A DC (adjustable)
Rated current (pre-adjusted)	4 A
Rated surge voltage	0.5 kV
Tripping method	E (electronic)
Feedback resistance	max. 35 V DC
Required backup fuse	Only required if I_{max} of the power supply > the short-circuit switching capacity. Integrated failsafe element.
Short-circuit switching capacity	300 A
Dielectric strength	max. 35 V DC (Load circuit)
Fuse	electronic
Efficiency	> 99 %
Closed circuit current I_0	typ. 12 mA
Power dissipation	typ. 0.3 W (No-load operation)
	< 1.6 W (Nominal operation)
Module initialization time	1 s

Waiting time after switch off of a channel	5 s (at overload / short circuit)
Measuring tolerance I	± 15 %
Temperature derating	21 A (Total current at 60°C)
	24 A (Total current at 50°C)
	7 A (Channel current at 60°C)
	8 A (Channel current at 50°C)
MTBF (IEC 61709, SN 29500)	25641025 h (at 25 °C with 21 % load)
	10989010 h (at 40°C with 34.25% load)
	1149425 h (at 55°C with 100% load)
Voltage drop	0.13 V (at 8 A)
Fail-safe element	15 A DC

Load circuit

Shutdown time	≤ 10 ms (for short circuit > 2.0 x I_N)
	1 s (1.2 ... 2.0 x I_N)
Undervoltage switch-off	≤ 17.8 V DC (active)
	≥ 18.8 V DC (inactive)
Overvoltage switch-off	≥ 30.5 V DC (active)
	≤ 29.5 V DC (inactive)
Max. capacitive load	35000 µF (Depending on the current setting and the short-circuit current available)

Indicator/remote signaling

Connection name	Remote indication circuit
Switching function	N/O contact
Operating voltage	0 V DC ... 30 V DC
Operating current	100 mA DC

Connection data

Main circuit IN+

Connection method	Push-in connection
Stripping length	8 mm
Conductor cross section flexible	0.2 mm² ... 2.5 mm²
Conductor cross section solid	0.2 mm² ... 4 mm²
Conductor cross section AWG	24 ... 12
Conductor cross section, flexible, with ferrule, with plastic sleeve	0.2 mm² ... 2.5 mm²
Conductor cross section flexible, with ferrule without plastic sleeve	0.2 mm² ... 2.5 mm²

Main circuit IN-

Connection method	Push-in connection
Stripping length	8 mm
Conductor cross section flexible	0.2 mm² ... 2.5 mm²
Conductor cross section solid	0.2 mm² ... 4 mm²
Conductor cross section AWG	24 ... 12

Conductor cross section, flexible, with ferrule, with plastic sleeve	0.2 mm² ... 2.5 mm²
Conductor cross section flexible, with ferrule without plastic sleeve	0.2 mm² ... 2.5 mm²

Main circuit OUT

Connection method	Push-in connection
Stripping length	8 mm
Conductor cross section flexible	0.2 mm² ... 2.5 mm²
Conductor cross section solid	0.2 mm² ... 4 mm²
Conductor cross section AWG	24 ... 12
Conductor cross section, flexible, with ferrule, with plastic sleeve	0.2 mm² ... 2.5 mm²
Conductor cross section flexible, with ferrule without plastic sleeve	0.2 mm² ... 2.5 mm²

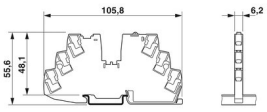
Remote indication circuit

Connection method	Push-in connection
Conductor cross section flexible	0.2 mm² ... 2.5 mm²
Conductor cross section solid	0.2 mm² ... 4 mm²
Conductor cross section AWG	24 ... 14
Conductor cross section, flexible, with ferrule, with plastic sleeve	0.2 mm² ... 2.5 mm²
Conductor cross section flexible, with ferrule without plastic sleeve	0.2 mm² ... 2.5 mm²

LED signaling

Channel LED off	off (Channel switched off)
Channel LED yellow	lit (Channel switched on, channel load > 80%)
	flashing (Programming mode active)
Channel LED green	lit (Channel switched on)
Channel LED red	lit (Channel switched off, over- or undervoltage active)
	ON temporarily (Channel switched off, 5 s cool-down phase, overload or short-circuit release)
	flashing (Channel switched off, ready to be switched back on, overload or short-circuit release)
	flashing quickly (Channel switched off, external voltage at the output, possible installation error)

Dimensions

Dimensional drawing	
Width	6.2 mm
Height	105.8 mm
Depth	55.6 mm (incl. DIN rail 7.5 mm)

Material specifications

Color	traffic grey A RAL 7042
Material	PBT (Housing)
	PBT (Pusher)
Flammability rating according to UL 94	V-0

Environmental and real-life conditions

Ambient conditions

Degree of protection	IP20
Ambient temperature (operation)	-30 °C ... 60 °C
Ambient temperature (storage/transport)	-40 °C ... 70 °C
Altitude	≤ 3000 m up to 52 °C (amsl (above mean sea level))
	≤ 4000 m up to 46 °C (amsl (above mean sea level))
Humidity test	96 h, 95 % RH, 40 °C
Shock (operation)	30g (IEC 60068-2-27, Test Ea)
Vibration (operation)	10 Hz ... 59.6 Hz (Amplitude ±0.35 mm; in accordance with IEC 60068-2-6, Test Fc)
	59.6 Hz … 150 Hz (Acceleration 5g; in accordance with IEC 60068-2-6, Test Fc)
	5 Hz … 100 Hz (Resonance search 4g; resonance frequency 4g; 90 min in accordance with DNV GL Class B)

Approval data

UL approval

Identification	UL/C-UL Listed UL 508
	UL Recognized UL 2367
	UL/C-UL Listed ANSI/UL 121201 Class I, Division 2, Groups A, B, C, D; T4 (Hazardous Location)

Shipbuilding approval

Identification	DNV GL

DNV GL data

Temperature	D
Humidity	B
Vibration	B
EMC	B
Enclosure	A

Standards and regulations

Standards/specifications	EN 61000-6-2
Standards/specifications	EN 61000-6-3
Standards/specifications	EN 60068-2-78
Standards/specifications	EN 50178
Standards/specifications	EN 60068-2-6
Standards/specifications	EN 60068-2-27

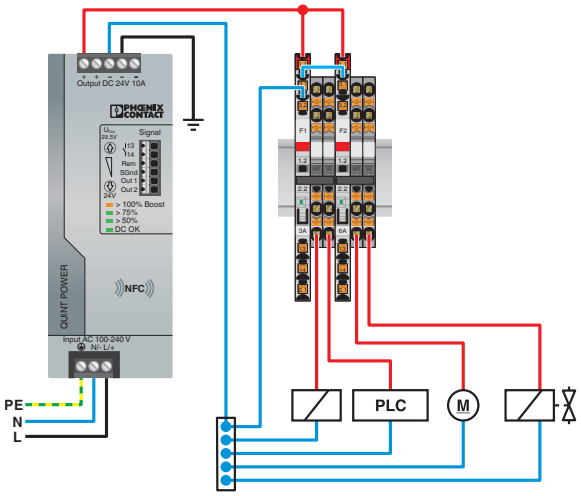
Standards/specifications	EN 60068-2-30
Standards/specifications	EN 61373
Standards/specifications	EN 45545-2

Mounting

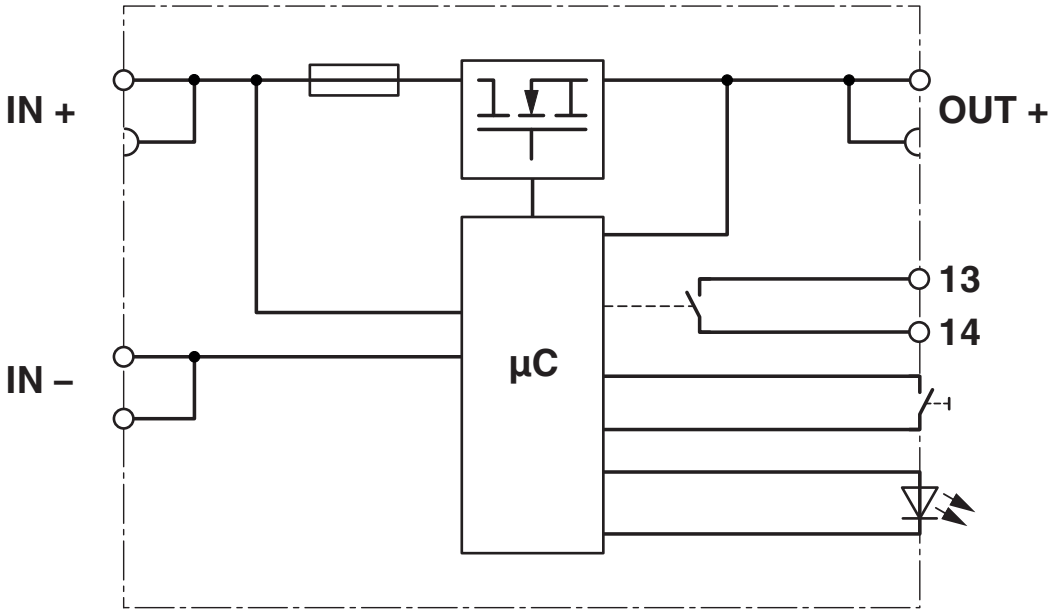
Mounting type	DIN rail: 35 mm

Drawings

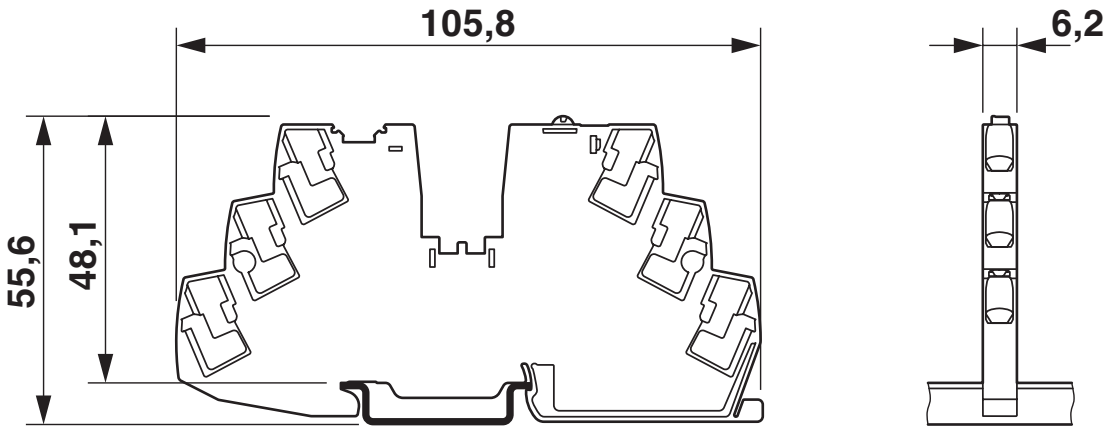
Application drawing



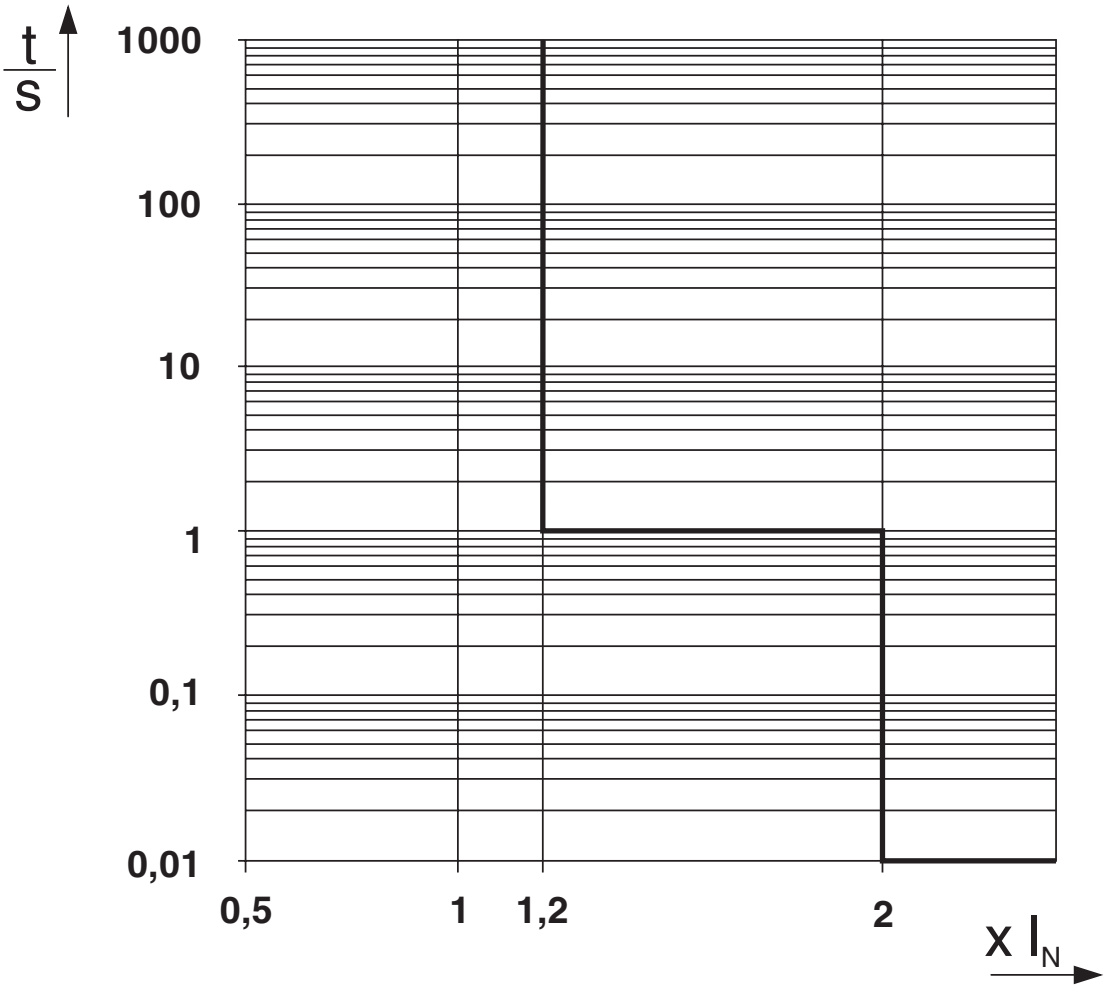
Block diagram



Dimensional drawing

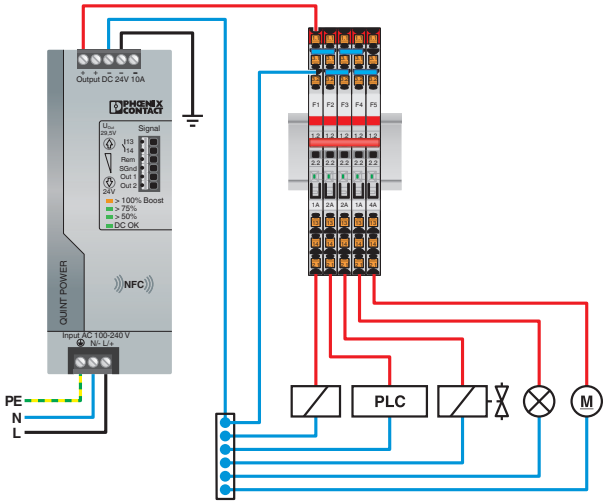


Diagram

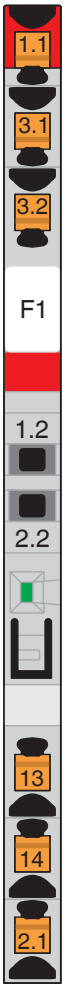


Trigger characteristic in the DC range

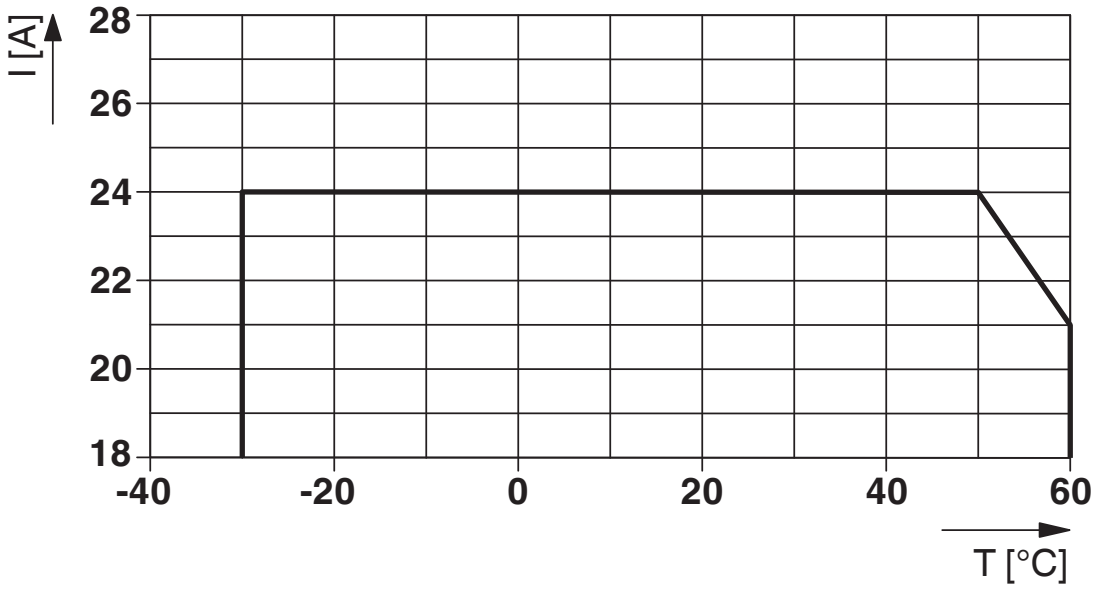
Application drawing



Product drawing

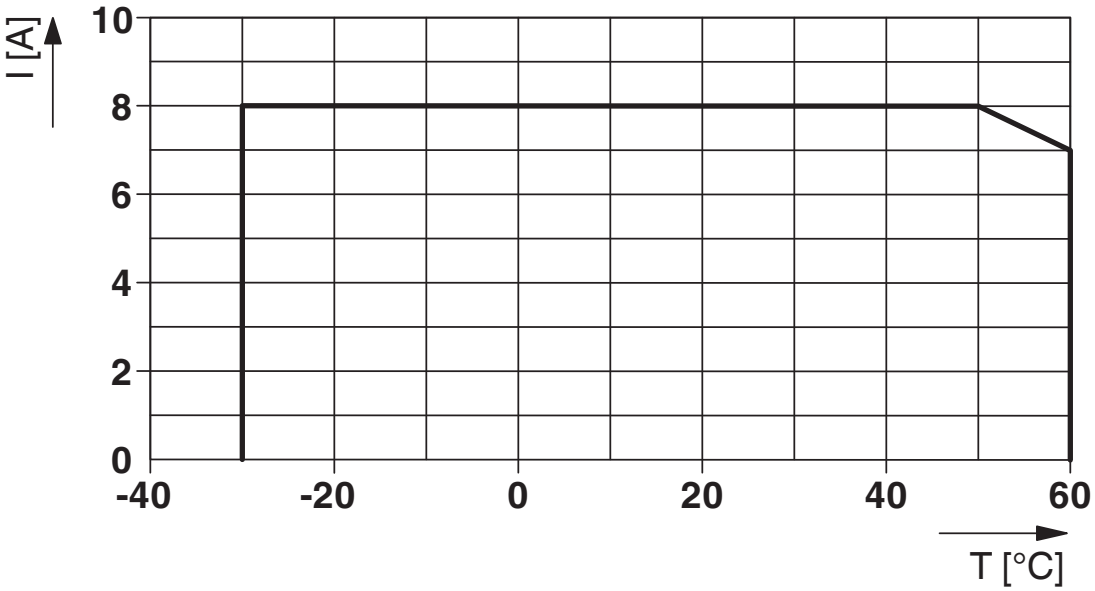


Diagram



Total current input

Diagram



Channel current output

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Electronic circuit breaker - PTCB E1 24DC/1-3A NO

2909909

https://www.phoenixcontact.com/us/products/2909909

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1-channel, electronic circuit breaker for protecting loads at 24 V DC against overload and short circuit. Easy potential distribution with components from the CLIPLINE complete terminal block system. With electronic interlock of the set nominal currents. For installation on DIN rails.

Your advantages

- Simple application setup due to bridging option to CLIPLINE complete terminal block system
- More space in the control cabinet: narrowest protection on just 6 mm width
- Flexible use and reduction of inventory due to adjustable amp values on each device for wide range of applications
- Individual setup for suitable protection, exactly according to your requirements
- Optimum protection for cables and sensors as well as NEC Class 2 circuits by means of an additional internal output fuse

Commercial Data

Item number	2909909
Packing unit	1 pc
Minimum order quantity	1 pc
Note	Made to Order (non-returnable)
Sales Key	C32
Product Key	CLA135
Catalog Page	Page 380 (C-4-2019)
GTIN	4055626408767
Weight per Piece (including packing)	44.3 g
Weight per Piece (excluding packing)	27.58 g
Customs tariff number	85363010
Country of origin	US

Technical Data

Notes

General

Note	EN 50121-3-2: Railway applications - Electromagnetic compatibility - Part 3-2: Rolling stock – Apparatus
	Connection for signal line tested in accordance with EN 61000-4-4 with 1 kV; if necessary, customer must provide appropriate protective measures
	Repeated hard short circuits can reduce the melting integral of the integrated backup fuse.

Product properties

Type	DIN rail module, one-piece
Product type	Device circuit breakers
Number of positions	1
No. of channels	1

Insulation characteristics

Protection class	III
Pollution degree	2

Electrical properties

No. of channels	1

General

Operating voltage	18 V DC ... 27.5 V DC
Rated voltage	24 V DC
Rated current I_N	24 A DC (Total current input)
	3 A DC (Rated current output)
Rated current I_N	1 / 2 / 3 A DC (adjustable)
Rated current (pre-adjusted)	3 A
Rated surge voltage	0.5 kV
Tripping method	E (electronic)
Feedback resistance	max. 35 V DC
Required backup fuse	Only required if I_{max} of the power supply > the short-circuit switching capacity. Integrated failsafe element.
Short-circuit switching capacity	300 A
Dielectric strength	max. 35 V DC (Load circuit)
Fuse	electronic
Efficiency	> 99 %
Closed circuit current I_0	typ. 12 mA
Power dissipation	typ. 0.3 W (No-load operation)
	< 0.9 W (Nominal operation)
Module initialization time	1 s

Waiting time after switch off of a channel	5 s (at overload / short circuit)
Measuring tolerance I	± 15 %
Temperature derating	21 A (Total current at 60°C)
	24 A (Total current at 50°C)
	3 A (Channel current at 60°C)
	3 A (Channel current at 50°C)
MTBF (IEC 61709, SN 29500)	28571428 h (at 25 °C with 21 % load)
	14084507 h (at 40°C with 34.25% load)
	2053388 h (at 60°C with 100% load)
Voltage drop	0.06 V (at 2 A)
Fail-safe element	4 A DC

Load circuit

Shutdown time	≤ 10 ms (for short circuit > 2.0 x I_N)
	1 s (1.2 ... 2.0 x I_N)
Undervoltage switch-off	≤ 17.8 V DC (active)
	≥ 18.8 V DC (inactive)
Overvoltage switch-off	≥ 27.5 V DC (active)
	≤ 27 V DC (inactive)
Max. capacitive load	20000 µF (Depending on the current setting and the short-circuit current available)

Indicator/remote signaling

Connection name	Remote indication circuit
Switching function	N/O contact
Operating voltage	0 V DC ... 30 V DC
Operating current	100 mA DC

Connection data

Main circuit IN+

Connection method	Push-in connection
Stripping length	8 mm
Conductor cross section flexible	0.2 mm² ... 2.5 mm²
Conductor cross section solid	0.2 mm² ... 4 mm²
Conductor cross section AWG	24 ... 12
Conductor cross section, flexible, with ferrule, with plastic sleeve	0.2 mm² ... 2.5 mm²
Conductor cross section flexible, with ferrule without plastic sleeve	0.2 mm² ... 2.5 mm²

Main circuit IN-

Connection method	Push-in connection
Stripping length	8 mm
Conductor cross section flexible	0.2 mm² ... 2.5 mm²
Conductor cross section solid	0.2 mm² ... 4 mm²
Conductor cross section AWG	24 ... 12

Conductor cross section, flexible, with ferrule, with plastic sleeve	0.2 mm² ... 2.5 mm²
Conductor cross section flexible, with ferrule without plastic sleeve	0.2 mm² ... 2.5 mm²

Main circuit OUT

Connection method	Push-in connection
Stripping length	8 mm
Conductor cross section flexible	0.2 mm² ... 2.5 mm²
Conductor cross section solid	0.2 mm² ... 4 mm²
Conductor cross section AWG	24 ... 12
Conductor cross section, flexible, with ferrule, with plastic sleeve	0.2 mm² ... 2.5 mm²
Conductor cross section flexible, with ferrule without plastic sleeve	0.2 mm² ... 2.5 mm²

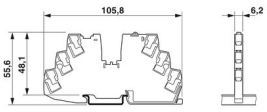
Remote indication circuit

Connection method	Push-in connection
Conductor cross section flexible	0.2 mm² ... 2.5 mm²
Conductor cross section solid	0.2 mm² ... 4 mm²
Conductor cross section AWG	24 ... 14
Conductor cross section, flexible, with ferrule, with plastic sleeve	0.2 mm² ... 2.5 mm²
Conductor cross section flexible, with ferrule without plastic sleeve	0.2 mm² ... 2.5 mm²

LED signaling

Channel LED off	off (Channel switched off)
Channel LED yellow	lit (Channel switched on, channel load > 80%)
	flashing (Programming mode active)
Channel LED green	lit (Channel switched on)
Channel LED red	lit (Channel switched off, over- or undervoltage active)
	ON temporarily (Channel switched off, 5 s cool-down phase, overload or short-circuit release)
	flashing (Channel switched off, ready to be switched back on, overload or short-circuit release)
	flashing quickly (Channel switched off, external voltage at the output, possible installation error)

Dimensions

Dimensional drawing	
Width	6.2 mm
Height	105.8 mm
Depth	55.6 mm (incl. DIN rail 7.5 mm)

Material specifications

Color	traffic grey A RAL 7042
Material	PBT (Housing)
	PBT (Pusher)
Flammability rating according to UL 94	V-0

Environmental and real-life conditions

Ambient conditions

Degree of protection	IP20
Ambient temperature (operation)	-30 °C ... 60 °C
Ambient temperature (storage/transport)	-40 °C ... 70 °C
Altitude	≤ 3000 m up to 52 °C (amsl (above mean sea level))
	≤ 4000 m up to 46 °C (amsl (above mean sea level))
Humidity test	96 h, 95 % RH, 40 °C
Shock (operation)	30g (IEC 60068-2-27, Test Ea)
Vibration (operation)	10 Hz ... 59.6 Hz (Amplitude ±0.35 mm; in accordance with IEC 60068-2-6, Test Fc)
	59.6 Hz … 150 Hz (Acceleration 5g; in accordance with IEC 60068-2-6, Test Fc)
	5 Hz … 100 Hz (Resonance search 4g; resonance frequency 4g; 90 min in accordance with DNV GL Class B)

Approval data

UL approval

Identification	UL/C-UL Listed UL 508
	UL Recognized UL 2367
	NEC Class 2 according to UL 1310
	UL/C-UL Listed ANSI/UL 121201 Class I, Division 2, Groups A, B, C, D; T4 (Hazardous Location)

Shipbuilding approval

Identification	DNV GL

DNV GL data

Temperature	D
Humidity	B
Vibration	B
EMC	B
Enclosure	A

Standards and regulations

Standards/specifications	EN 61000-6-2
Standards/specifications	EN 61000-6-3
Standards/specifications	EN 60068-2-78
Standards/specifications	EN 50178
Standards/specifications	EN 60068-2-6

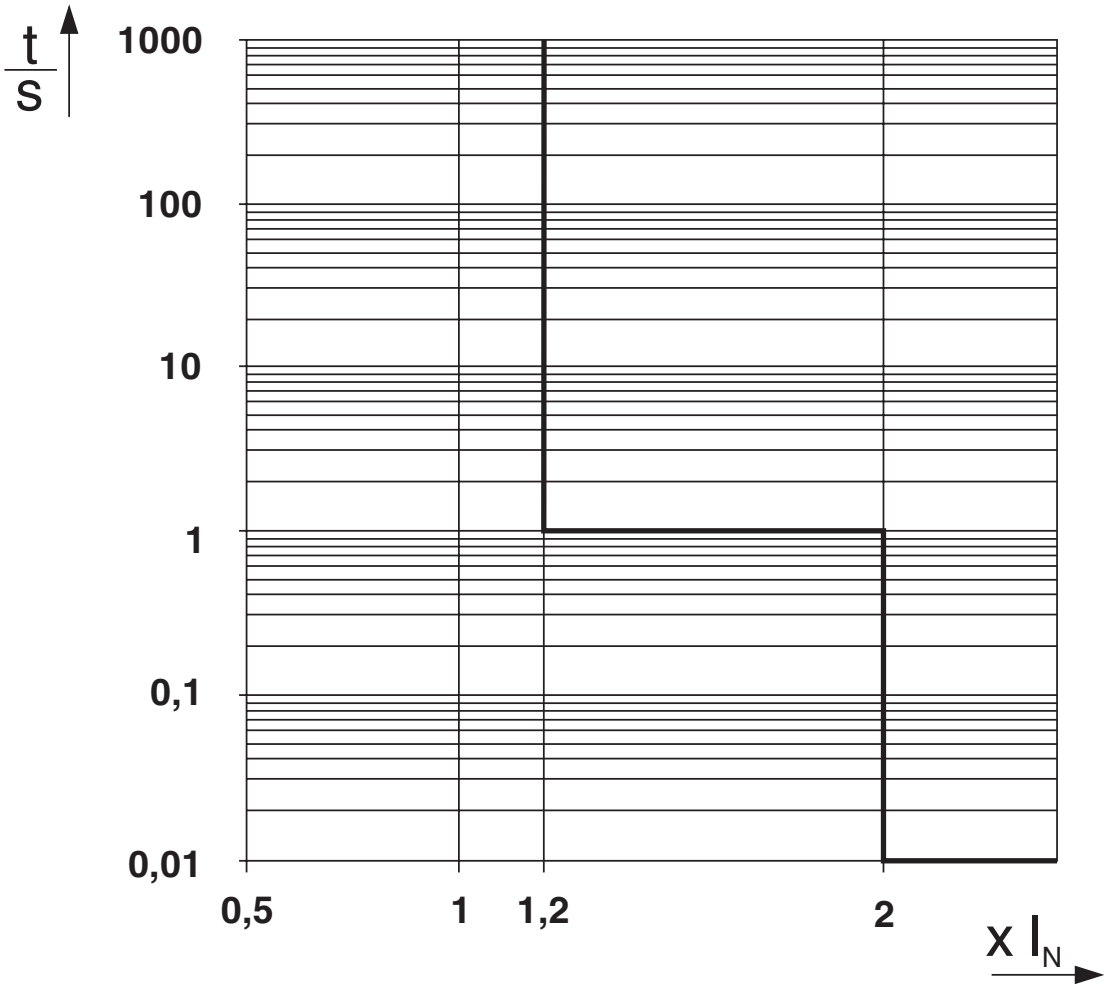
Standards/specifications	EN 60068-2-27
Standards/specifications	EN 60068-2-30
Standards/specifications	EN 61373
Standards/specifications	EN 45545-2

Mounting

Mounting type	DIN rail: 35 mm

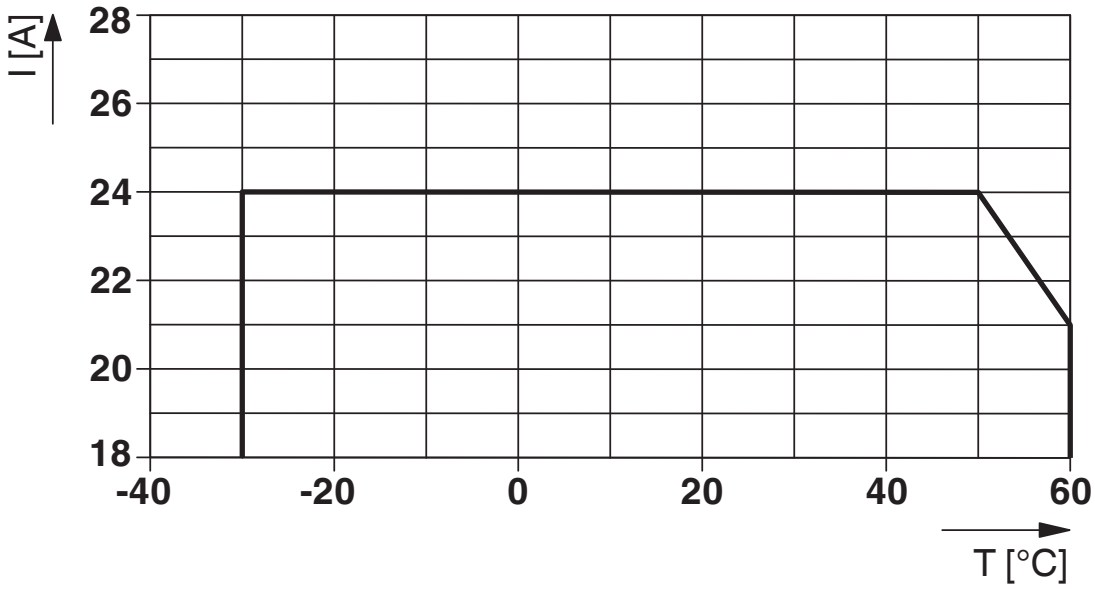
Drawings

Diagram



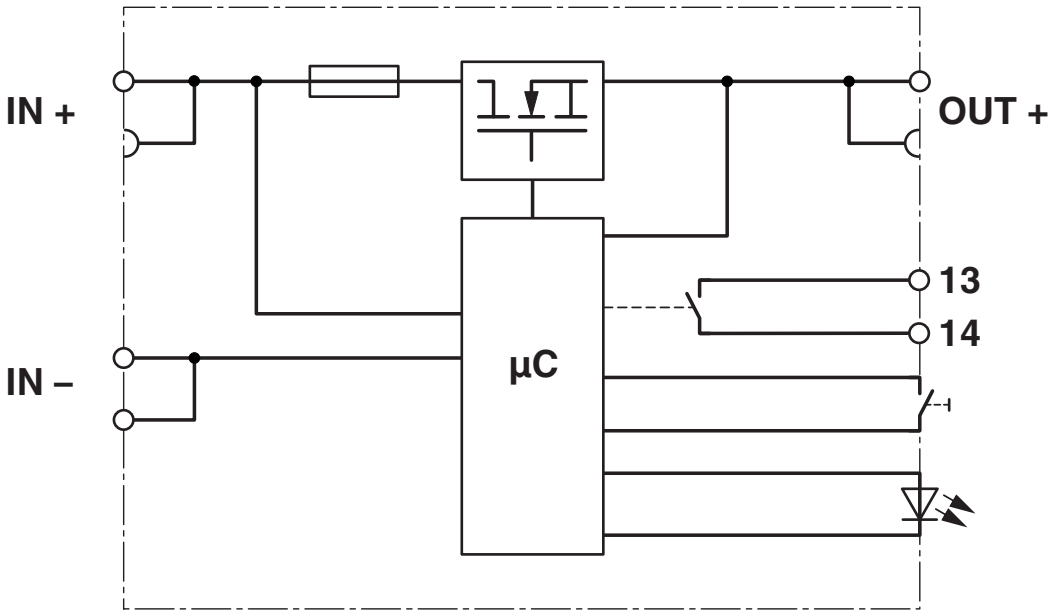
Trigger characteristic in the DC range

Diagram

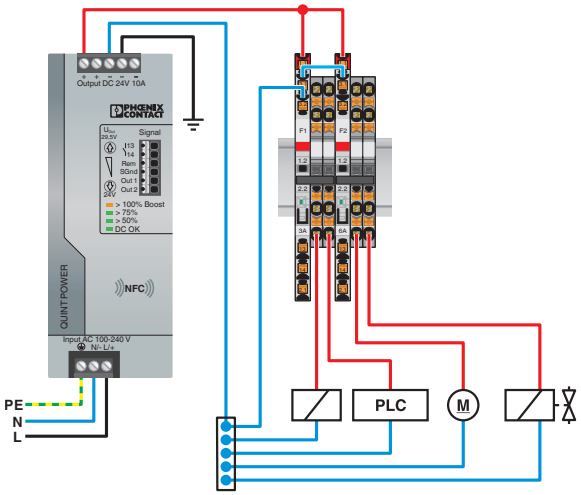


Total current input

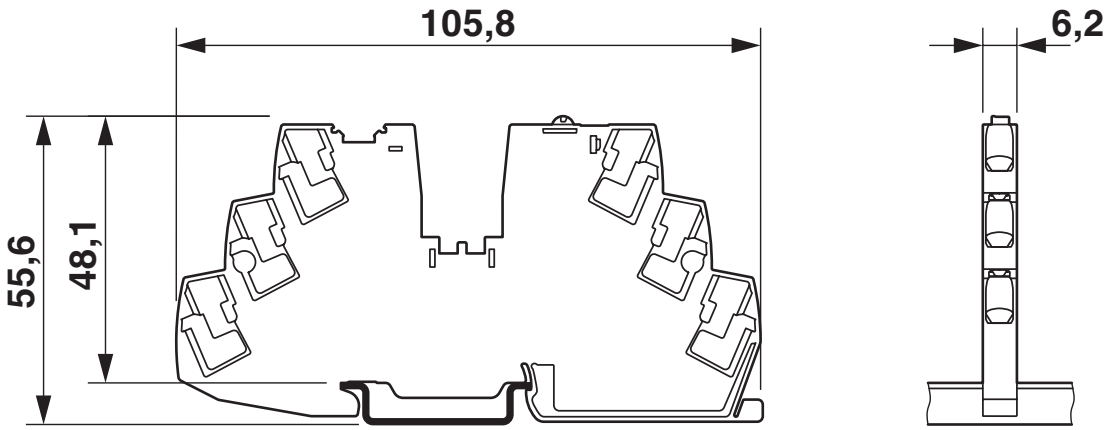
Block diagram



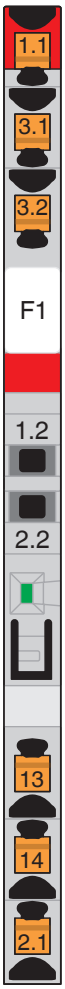
Application drawing



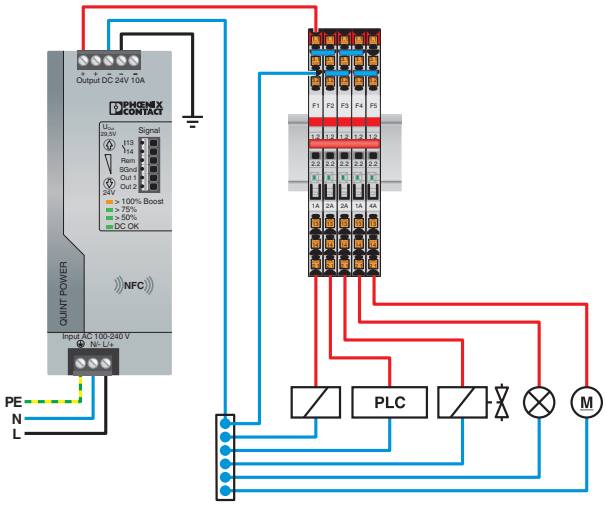
Dimensional drawing



Product drawing



Application drawing



Phoenix Contact USA
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Middletown, PA 17057, United States
(+717) 944-1300
info@phoenixcon.com

Type 1 surge protection device - VAL-US-120/40/1+1-FM

2910349

https://www.phoenixcontact.com/us/products/2910349

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Surge protective device, two channel with remote indicator contact for 120 V AC, 2-wire plus ground.

Commercial Data

Item number	2910349
Packing unit	1 pc
Sales Key	C06
Product Key	CL132U
Catalog Page	Page 93 (C-4-2019)
GTIN	4055626444901
Weight per Piece (including packing)	225.2 g
Weight per Piece (excluding packing)	225.2 g
Customs tariff number	85363030
Country of origin	DE

Technical Data

Product properties

IEC test classification	II
	T2
EN type	T2
IEC power supply system	TN-S
	TT
Type	DIN rail module, two-section, divisible
Product type	Surge arrester
Number of positions	2
Surge protection fault message	Optical, remote indicator contact

Insulation characteristics

Overvoltage category	III
Pollution degree	2

Electrical properties

Nominal frequency f_N	50 Hz (60 Hz)

Indicator/remote signaling

Connection name	Remote fault indicator contact
Switching function	Changeover contact
Operating voltage	5 V AC ... 250 V AC
	30 V DC
Operating current	5 mA AC ... 1.5 A AC
	1 A DC

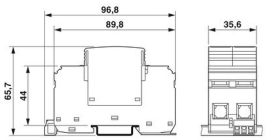
Connection data

Connection method	Screw connection
Screw thread	M5
Tightening torque	4.5 Nm (1.5 mm² ... 16 mm²)
	4.5 Nm (25 mm² ... 35 mm²)
Stripping length	16 mm
Conductor cross section flexible	1.5 mm² ... 25 mm²
Conductor cross section solid	1.5 mm² ... 35 mm²
Conductor cross section AWG	15 ... 2

Remote fault indicator contact

Connection method	Screw connection
Screw thread	M2
Tightening torque	0.25 Nm
Conductor cross section flexible	0.14 mm² ... 1.5 mm²
Conductor cross section solid	0.14 mm² ... 1.5 mm²
Conductor cross section AWG	28 ... 16

Dimensions

Dimensional drawing	
Width	35.6 mm
Height	96.8 mm
Depth	65.7 mm (incl. DIN rail 7.5 mm)
Horizontal pitch	2 Div.

Material specifications

Color	jet black RAL 9005
Flammability rating according to UL 94	V-0
CTI value of material	600
Insulating material	PA 6.6/PBT
Material group	I
Housing material	PA 6.6
	PBT

Protective circuit

Mode of protection	L-N
	L-PE
	N-PE
Direction of action	1L-N & N-GND
Nominal voltage U_N	120 V AC (TN-S)
	120 V AC (TT)
Nominal frequency f_N	50 Hz (60 Hz)
Rated load current I_L	80 A
Residual current I_{PE}	≤ 5 µA
Nominal discharge current I_n (8/20) µs	20 kA
Follow current interrupt rating I_{fi} (N-PE)	100 A (305 V AC)
Short-circuit current rating I_{SCCR}	25 kA
Voltage protection level U_p (L-N)	≤ 0.9 kV
Voltage protection level U_p (L-PE)	≤ 1.6 kV
Voltage protection level U_p (N-PE)	≤ 1.5 kV
Residual voltage U_{res} (L-N)	≤ 0.9 kV (at I_n)
	≤ 0.75 kV (at 10 kA)
	≤ 0.6 kV (at 5 kA)
	≤ 0.55 kV (at 3 kA)
Residual voltage U_{res} (L-PE)	≤ 1.6 kV (at I_n)
	≤ 1.2 kV (at 10 kA)
	≤ 1 kV (at 5 kA)

	≤ 0.9 kV (at 3 kA)
Residual voltage U_{res} (N-PE)	≤ 0.4 kV (at I_n)
	≤ 0.25 kV (at 10 kA)
	≤ 0.15 kV (at 5 kA)
	≤ 0.1 kV (at 3 kA)
TOV behavior at U_T (L-N)	208 V AC (5 s / withstand mode)
	240 V AC (120 min / safe failure mode)
TOV behavior at U_T (N-PE)	1200 V AC (200 ms / withstand mode)
Response time t_A (L-N)	≤ 25 ns
Response time t_A (L-PE)	≤ 100 ns
Response time t_A (N-PE)	≤ 100 ns
Max. backup fuse with V-type through wiring	80 A (gG)
Max. backup fuse with branch wiring	125 A (gG)

Environmental and real-life conditions

Ambient conditions

Degree of protection	IP20 (only when all terminal points are used)
Ambient temperature (operation)	-40 °C ... 80 °C
Ambient temperature (storage/transport)	-40 °C ... 80 °C
Altitude	≤ 2000 m (amsl (above mean sea level))
Permissible humidity (operation)	5 % ... 95 %
Shock (operation)	25g (Half-sine / 11 ms / 3x ±X, ±Y, ±Z)
Vibration (operation)	5g (10 ... 500 Hz / 2.5 h / X, Y, Z)

Approval data

UL specifications

Maximum continuous operating voltage MCOV (L-N)	175 V AC
Maximum continuous operating voltage MCOV (L-G)	175 V AC
Maximum continuous operating voltage MCOV (N-G)	305 V AC
Short-circuit current rating (SCCR)	200 kA
Voltage protection rating VPR (L-N)	700 V
Voltage protection rating VPR (L-G)	1800 V
Voltage protection rating VPR (N-G)	1200 V
UL type	type 1
Nominal discharge current I_n	20 kA
Maximum Surge Current per Phase	40 kA
Mode of protection	L-N
	L-G
	N-G
Nominal voltage	120 V AC
Power distribution system	Single phase
Nominal frequency	50/60 Hz
SPD Type	1

UL indicator/remote signaling

AC operating voltage	125 V AC
AC operating current	1 A AC

UL connection data

Tightening torque	30 lb_f-in.
Conductor cross section AWG	14 ... 2

Standards and regulations

Air clearances and creepage distances

Standards/regulations	EN 60664-1 / EN 61643-11
Standards/specifications	IEC 61643-11
Standards/specifications	EN 61643-11

Mounting

Mounting type	DIN rail: 35 mm

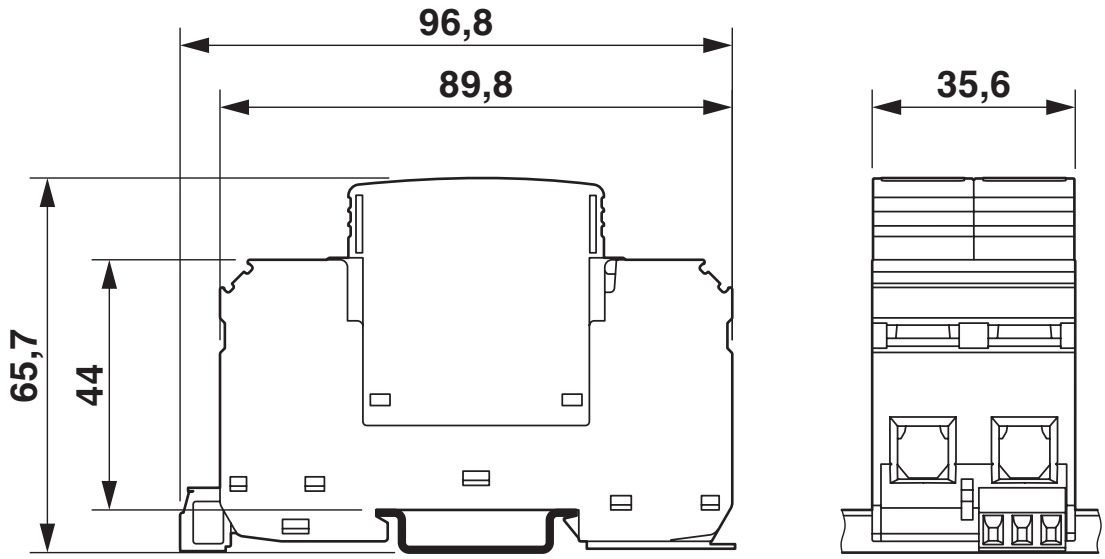
Type 1 surge protection device - VAL-US-120/40/1+1-FM

2910349

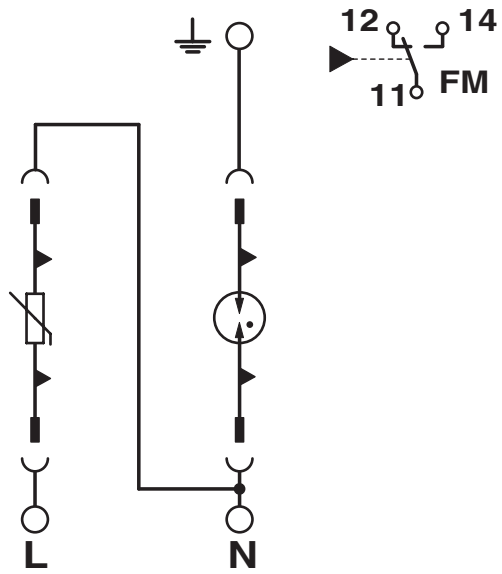
https://www.phoenixcontact.com/us/products/2910349

Drawings

Dimensional drawing



Circuit diagram



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Extract from the online catalog

ELR W1/ 6-24DC

Order No.: 2982090

Illustration shows item ELR W1/ 6-24DC

http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2982090

Electronic reversing load relay, for driving DC motors, with light indicator and protection circuit, output: 10-30 V DC/6 A

T B H

Product notes

WEEE/RoHS-compliant since: 02/08/2007

Commercial data	
GTIN (EAN)	4 017918 943936
sales group	G481
Pack	1 pcs.
Customs tariff	85371099
Catalog page information	Page 169 (IF-2009)

http://www.download.phoenixcontact.com
Please note that the data given here has been taken from the online catalog. For comprehensive information and data, please refer to the user documentation. The General Terms and Conditions of Use apply to Internet downloads.

Technical data

Input data

Input name	Device supply
Protective circuit	Protection against polarity reversal Polarity protection diode
	Surge protection
Operating voltage display	Green LED

Status display	LED yellow, forward running (R), LED yellow, reverse running (L)
Input name	Control input right/left
Nominal input voltage U_N	24 V DC
Input voltage range in reference to U_N	0.8 ... 1.2
Typical input current at U_N	3 mA
Protective circuit	Protection against polarity reversal
	Surge protection
Surge voltage protection	> 33 V DC
Typical response time	200 µs
Status display	LED yellow, forward running (R), LED yellow, reverse running (L)
Current consumption	3 mA
Switchover time R_L/L_L (turn-on time)	80 ms

Output data, load relay

Output name	DC output
Load current	6 A (see derating curve)
Quiescent current	Approx. 7 mA (When switched off)
Type of protection	Protection against polarity reversal
	Surge protection
Surge voltage protection	> 33 V DC
Operating voltage display	Green LED
Current limitation at short-circuits	20 A

Connection data

Type of connection	Screw connection
Stripping length	8 mm
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	6 mm²
Conductor cross section stranded min.	0.2 mm²
Conductor cross section stranded max.	4 mm²
Conductor cross section AWG/kcmil min.	24
Conductor cross section AWG/kcmil max	10
Screw thread	M3

General data

Width	12.5 mm
Height	99 mm

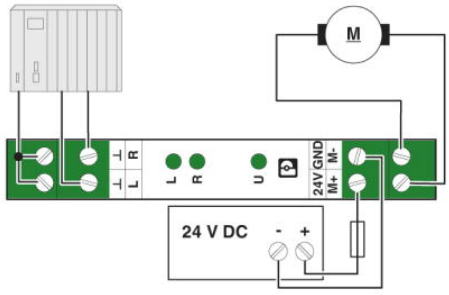
Depth	114.5 mm
Test voltage input/output	2.5 kV AC
Ambient temperature (operation)	-20 °C ... 60 °C
Ambient temperature (storage/transport)	-20 °C ... 70 °C
Mounting position	Vertical (horizontal DIN rail)
Assembly instructions	Any
Operating mode	100% operating factor
Degree of protection	IP20
Name	Air and creepage distances between the power circuits
Standards/regulations	EN 50178
	Basic insulation
Pollution degree	2
Surge voltage category	III

Certificates / Approvals

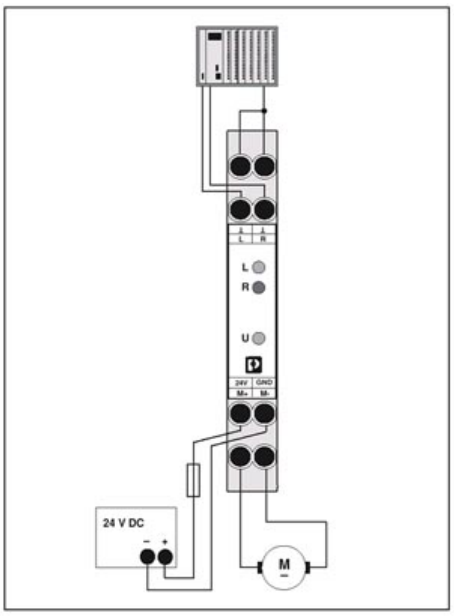
Certification	CUL Listed, UL Listed

Diagrams/Drawings

Connection diagram

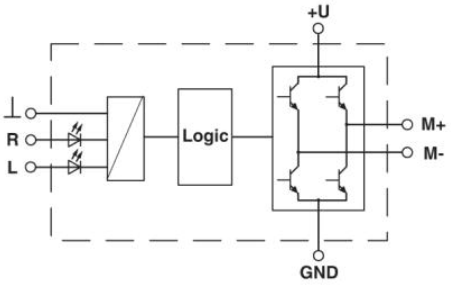


Application drawing

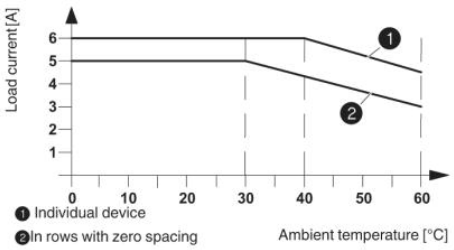


Example application

Block diagram



Diagram



FAQs

- **01. In which way and with which fuse do I have to protect a semiconductor switch against short-circuits and is there a special regulation?**

  No, there is no special regulation for semiconductor switches. You may, however, designate three types of fuse. 1. Motor protection via bi-metal relay or switch, adjusted to the load current of the motor (can be dropped with ELR W3/9 400 MM which includes motor protection). 2. Conductor protection adjusted to the cross section of the conductors (VDE regulation, for example with 1,5 mm² 16A) 3. Semiconductor protection to protect the semiconductor electronics against short-circuit. In this case the tripping characteristic of the fuse must be below the I^2t value of the semiconductor. For devices with a load current of 3 times 9A a 16 A FF is used. This fuse is fast enough to protect the semiconductor against short-circuit, but on the other hand slow enough to switch on a motor (high inrush current).

- **02. For which capacities (in kW) does Phoenix Contact provide electronic load relays and why are there only indications with respect to the maximum current?**

  For a semiconductor the current is the value that sets limits to its capacity. (heat loss that has to be dissipated). Therefore with ELR's the maximum switched currents are mentioned in the data sheet. For example an ELR with 3 times 9 A corresponds to approx. 3 - 4 KW, depending on cos phi.

  Following versions are available from Phoenix Contact :

  1. Load relay 3 times 9 A

  2. Load relay 1 time 25 A

  3. Load relay 1 time 35 A

  4. Reversing loaded relay 3 times 9 A

  5. Reversing loaded relay with motor management 3 times 8 A

- **03. Are the electronic load relays also available with 230 V AC inputs?**

  No, the control and possibly the supply voltage is always effected with 24 V DC (for example directly from the control). Other voltages have to be connected via the interface modules (for example PLC relay or PLC optical coupler).

- **04. Is a supply voltage necessary for the operation of electronic load relays of Phoenix Contact?**

  Yes, for the intelligent device family ELR with Motor Management and for the reversing load realys. In this case it is required for the supply of internal electronics. "Supply voltage = 24 V DC"

- **05. To which fieldbus systems can ELR with Motor Management be connected?**

  The device family ELR MM can be connected via a special gateway to "PROFIBUS-DP V1".

  Gateways for additional bus systems like INTERBUS, CAN DeviceNet™ on demand/in planning process.

  Via the RS-232 Interbus Inline disk the devices can be integrated in an Inline system. Then all bus systems of the Inline family, i.e. INTERBUS, PROFIBUS, CAN and DeviceNet™ are available.

- **06. Are there higher performance classes?**

  At present, the class up to 3 x 9 A (approx. 3 – 4 KW) is three-phase. Single-phase up to 1 x 25 or 1 x 35 A. For the MM range, an extension to 7.5 and 18.5 KW is planned. For HMI 2003, there was a mechanical version for triggering power contactors. Input 3 x 5 A direct, larger currents are measured with a transducer. The motor management functions are therefore available for all performance classes.

- **07. Can a soft start and soft brake be realised with the ELR W 3/9 ...MM devices?**

  No, this function is only planned for the higher performance classes. There is, however, an electronic reversing loaded relay with three-phase soft starter included in the Phoenix Contact product range. Performance class up to 3 times 8 A.

- **08. Can the ELR W3/9... MM only be parameterized with the software ELR-CONF?**

  No, all rudimentary and relevant functions can be adjusted on the device directly via keyboard. With the assembled LC-display all important measured values are readable.

- **09. Which hardware and software equipment is at least required for operation of the ELR-CONF?**

  1. Pentium > 90 MHz 2. 16 MByte main memory 3. 15 MByte free hard disk storage (without Internet Explorer) 4. CD-ROM drive 5. Mouse 6. Windown 95 (with Internet Explorer starting with version 5.0), Windows 98, Windows NT 4.0 with SP4, Windows 2000 or Windows XP 7. Serial interface (COM1... COM2)

- **10. Is it possible to connect the devices of the MM family to the PC or notebook via USB, too?**

  No, the connection only functions via the RS-232 (COM1 or COM2) interface. There are, however, adapters for RS-233 to USB.

- **11. Is it necessary to use a bimetallic protection when using the Motor Management devices?**

  No, a bimetal is not necessary (approval PTB is applied).

- **12. Can the Motor Management devices also be used in the Ex-range?**

  The approval is applied at PTB!

- **13. Is there a minimum load for semiconductor switches?**

  Yes, a minimum switching current is necessary to avoid that the holding current of the semiconductors does not fall below. For example with the ELR W3/9 400 these are 150 mA.

- **14. Can the ELR MM device be used after a frequency transducer?**

  No, because the frequency transducer does not generate a pure Sinus voltage on the output side. The voltage is composed of high frequent signals (up to 40 KHz). The R-C-V protection circuitry of the semiconductor is not suitable for this type of voltage. Furthermore the present generation can only be operated in a frequency range of 45 - 65 Hz.

  An application before a frequency transducer, however, is possible (maybe with corresponding protection circuitry).

- **15. To achieve a longer lifetime electromagnetic contactors are over-dimensioned. Is it necessary to also choose a higher class of the semiconductor switches?**

  No, all ELR are equipped with over-dimensioned power semiconductors. This is necessary to meet the relatively high inrush current (5 to 7fold rated current) of the motor. The current indication on the ELRs (observe the derating) refers to 100% ED. In case of proper use a semiconductor switch achieves > 10 to the power of 9 cycles.

- **16. If a contactor-type reversing starter combination is set up, it has to be locked mechanically and/or electrically. What about a reversal load relay?**

  With the ELR-W no further measures are necessary. The locking of the control inputs, the physically related downtime of the reversal and the wiring of the load side have already been realised in the module.

- **17. Is it possible to use three single-phase load relays for applications in three phase system?**

  Yes!

Address

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Fax +49 5235 3 41200
http://www.phoenixcontact.de

End clamp - CLIPFIX 35-5

3022276

https://www.phoenixcontact.com/us/products/3022276

Please be informed that the data shown in this PDF document is generated from our Online Catalog. Please find the complete data in the user documentation. Our General Terms of Use for Downloads are valid.

Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN rail, with marking option, with parking option for FBS...5, FBS...6, KSS 5, KSS 6, width: 5.15 mm, color: gray

Your advantages

- Large-surface marking
- Design width of just 5.2 mm
- Phoenix Contact has engineered its CLIPFIX end brackets to maintain a secure grip on the various DIN rail systems

Commercial Data

Item number	3022276
Packing unit	1 pc
Minimum order quantity	50 pc
Sales Key	B17
Product Key	BE7111
Catalog Page	Page 538 (C-3-2019)
GTIN	4017918194154
Weight per Piece (including packing)	4.836 g
Weight per Piece (excluding packing)	4.65 g
Customs tariff number	39269097
Country of origin	DE

Technical Data

Product properties

Product type	End block

Dimensions

Width	5.15 mm
Height	35.3 mm
Height NS 35/15	44 mm
Height NS 35/7,5	36.5 mm
Length	48.6 mm

Material specifications

Color	gray
Material	PA
Flammability rating according to UL 94	V0
Static insulating material application in cold	-60 °C
Relative insulation material temperature index (Elec., UL 746 B)	65 °C
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Environmental and real-life conditions

Ambient conditions

Ambient temperature (operation)	-60 °C ... 65 °C (max. short-term operating temperature RTI Elec.)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C
Permissible humidity (storage/transport)	30 % ... 70 %

Mounting

Mounting type	NS 35/7,5
	NS 35/15

Phoenix Contact USA
586 Fulling Mill Road
Middletown, PA 17057, United States
(+717) 944-1300
info@phoenixcon.com

End cover - D-ST 2,5 - 3030417

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End cover, length: 48.6 mm, width: 2.2 mm, height: 29.1 mm, color: gray

RoHS COMPLETE line

Key Commercial Data

Packing unit	1 pc
Minimum order quantity	50 pc
GTIN	4 017918 188047
GTIN	4017918188047
Weight per Piece (excluding packing)	1.948 g
Custom tariff number	85389099
Country of origin	Germany

Technical data

General

Color	gray
Material	PA
Flammability rating according to UL 94	V0

Dimensions

Width	2.2 mm
Length	48.6 mm
Height	29.1 mm

General

Relative insulation material temperature index (Elec., UL 746 B)	130 °C

End cover - D-ST 2,5 - 3030417

Technical data

General

Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	125 °C
Static insulating material application in cold	-60 °C
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Calorimetric heat release NFPA 130 (ASTM E 1354)	27,5 MJ/kg
Smoke gas toxicity NFPA 130 (SMP 800C)	passed
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Ambient conditions

Operating temperature	-60 °C ... 105 °C (max. short-term operating temperature 130°C)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Permissible humidity (storage/transport)	30 % ... 70 %
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C

Standards and Regulations

Flammability rating according to UL 94	V0

Environmental Product Compliance

China RoHS	Environmentally friendly use period: unlimited = EFUP-e
	No hazardous substances above threshold values

Classifications

eCl@ss

eCl@ss 10.0.1	27141133
eCl@ss 11.0	27141133
eCl@ss 4.0	21011300
eCl@ss 4.1	21011300
eCl@ss 5.0	27141100
eCl@ss 5.1	27141100
eCl@ss 6.0	27141100
eCl@ss 7.0	27141133
eCl@ss 9.0	27141133

End cover - D-ST 2,5 - 3030417

Classifications

ETIM

ETIM 2.0	EC000886
ETIM 3.0	EC000886
ETIM 4.0	EC000886
ETIM 6.0	EC000886
ETIM 7.0	EC000886

UNSPSC

UNSPSC 6.01	30211827
UNSPSC 7.0901	39121424
UNSPSC 11	39121424
UNSPSC 12.01	39121424
UNSPSC 13.2	39121425
UNSPSC 18.0	39121425
UNSPSC 19.0	39121425
UNSPSC 20.0	39121425
UNSPSC 21.0	39121425

End cover - D-ST 4

3030420

https://www.phoenixcontact.com/us/products/3030420

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End cover, length: 55.9 mm, width: 2.2 mm, height: 29 mm, color: gray

Commercial Data

Item number	3030420
Packing unit	1 pc
Minimum order quantity	50 pc
Sales Key	B02
Product Key	BE2Z1X
Catalog Page	Page 99 (C-1-2019)
GTIN	4017918188030
Weight per Piece (including packing)	2.169 g
Weight per Piece (excluding packing)	2.135 g
Customs tariff number	85389099
Country of origin	DE

Technical Data

Product properties

Product type	End cover

Ambient conditions

Ambient temperature (operation)	-60 °C ... 105 °C (max. short-term operating temperature RTI Elec.)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C
Permissible humidity (storage/transport)	30 % ... 70 %

Material specifications

Color	gray
Material	PA
Flammability rating according to UL 94	V0
Static insulating material application in cold	-60 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	125 °C
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3
Calorimetric heat release NFPA 130 (ASTM E 1354)	27,5 MJ/kg
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed

Dimensions

Width	2.2 mm
Height	29 mm
Length	55.9 mm

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info@phoenixcon.com

End cover - D-ST 2,5-QUATTRO - 3030514

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End cover, length: 72.2 mm, width: 2.2 mm, height: 29.1 mm, color: gray

RoHS COMPLETE line

Key Commercial Data

Packing unit	1 pc
Minimum order quantity	50 pc
GTIN	4 017918 187972
GTIN	4017918187972
Weight per Piece (excluding packing)	2.800 g
Custom tariff number	85389099
Country of origin	Germany

Technical data

General

Color	gray
Material	PA
Flammability rating according to UL 94	V0

Dimensions

Width	2.2 mm
Length	72.2 mm
Height	29.1 mm

General

Relative insulation material temperature index (Elec., UL 746 B)	130 °C

End cover - D-ST 2,5-QUATTRO - 3030514

Technical data

General

Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	125 °C
Static insulating material application in cold	-60 °C
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Calorimetric heat release NFPA 130 (ASTM E 1354)	27,5 MJ/kg
Smoke gas toxicity NFPA 130 (SMP 800C)	passed
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Ambient conditions

Operating temperature	-60 °C ... 105 °C (max. short-term operating temperature 130°C)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Permissible humidity (storage/transport)	30 % ... 70 %
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C

Standards and Regulations

Flammability rating according to UL 94	V0

Environmental Product Compliance

China RoHS	Environmentally friendly use period: unlimited = EFUP-e
	No hazardous substances above threshold values

Classifications

eCl@ss

eCl@ss 10.0.1	27141133
eCl@ss 11.0	27141133
eCl@ss 4.0	21011300
eCl@ss 4.1	21011300
eCl@ss 5.0	27141100
eCl@ss 5.1	27141100
eCl@ss 6.0	27141100
eCl@ss 7.0	27141133
eCl@ss 9.0	27141133

End cover - D-ST 2,5-QUATTRO - 3030514

Classifications

ETIM

ETIM 2.0	EC000886
ETIM 3.0	EC000886
ETIM 4.0	EC000886
ETIM 6.0	EC000886
ETIM 7.0	EC000886

UNSPSC

UNSPSC 6.01	30211827
UNSPSC 7.0901	39121424
UNSPSC 11	39121424
UNSPSC 12.01	39121424
UNSPSC 13.2	39121425
UNSPSC 18.0	39121425
UNSPSC 19.0	39121425
UNSPSC 20.0	39121425
UNSPSC 21.0	39121425

Fuse plug - P-FU 5X20 LED 24-5

3209248

https://www.phoenixcontact.com/us/products/3209248

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Fuse plug, Suitable for terminal blocks with a width of 5.2 mm and above with TG zone, nom. voltage: 24 V, nominal current: 6.3 A, connection method: Plug-in connection, fuse type: G / 5 x 20, mounting type: Plug-in mounting, color: black

Your advantages

- Large-surface labeling option
- Test contacts on both sides of the fuse
- Versions with bipolar error display
- Can be used for overload/short-circuit protection

Commercial Data

Item number	3209248
Packing unit	1 pc
Minimum order quantity	10 pc
Sales Key	B02
Product Key	BE2Z3X
Catalog Page	Page 414 (C-1-2019)
GTIN	4046356548342
Weight per Piece (including packing)	5.29 g
Weight per Piece (excluding packing)	4.953 g
Customs tariff number	85369095
Country of origin	CN

Technical Data

Notes

General	Suitable for terminal blocks with a width of 5.2 mm and above with TG zone
Notes on operation	Prior to replacing the cartridge fuse, disconnect the fuse connector from the basic terminal block.

Product properties

Product type	Fuse
Pitch	5.2 mm
Potentials	1

Insulation characteristics

Degree of pollution	3

Electrical properties

Fuse	G / 5 x 20
LED voltage range	12 V AC/DC ... 30 V AC/DC
LED current range	0.35 mA ... 0.95 mA

Input data

LED voltage range	12 V AC/DC ... 30 V AC/DC

Connection data

Nominal current	6.3 A (the current is determined by the fuse used)
Maximum load current	6.3 A (the current is determined by the fuse used)
Nominal voltage	24 V (The current is determined by the fuse used, the voltage by the fuse or selected LED display.)

Dimensions

Width	6.2 mm
Height	57.7 mm
Length	25 mm
Pitch	5.2 mm

Material specifications

Color	black
Flammability rating according to UL 94	V0
Insulating material	PA
Static insulating material application in cold	-60 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	130 °C
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3

Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3
Calorimetric heat release NFPA 130 (ASTM E 1354)	28 MJ/kg
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed

Environmental and real-life conditions

Ambient conditions

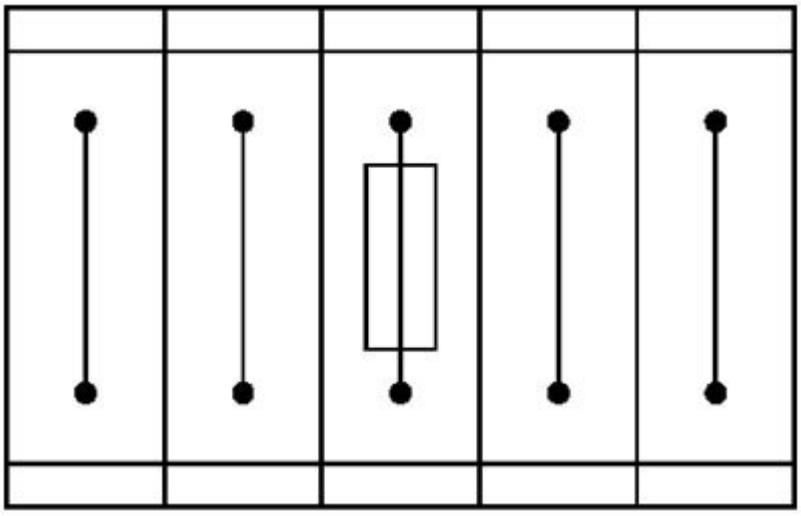
Ambient temperature (operation)	-60 °C ... 105 °C (max. short-term operating temperature RTI Elec.)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C
Permissible humidity (storage/transport)	30 % ... 70 %

Mounting

Mounting type	Plug-in mounting

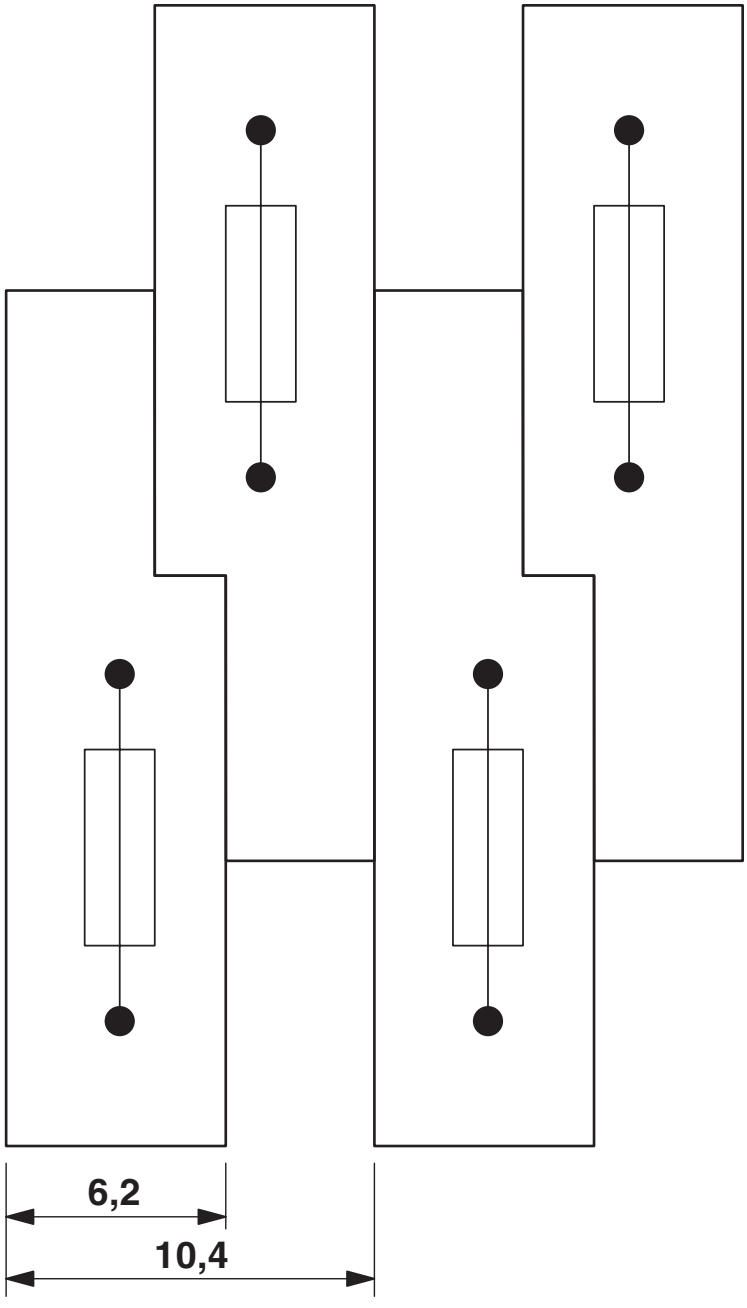
Drawings

Application drawing

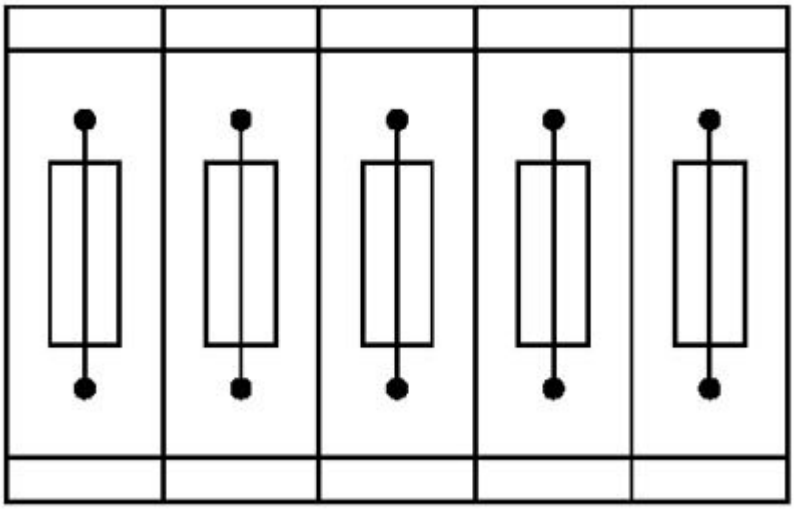


Fuse terminal block in single arrangement,
block consisting of one fuse terminal block and 4 feed-through terminal blocks

Application drawing

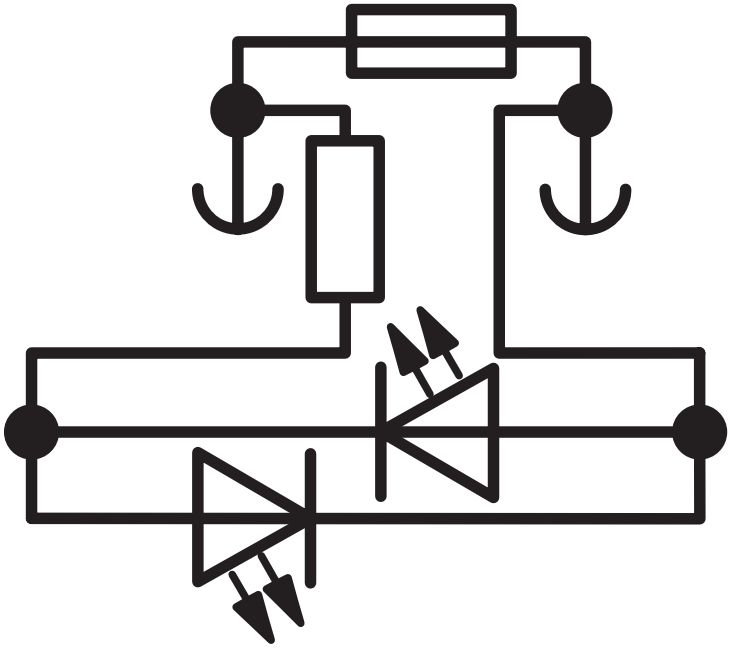


Application drawing



Fuse terminal blocks in interconnected arrangement,
block consisting of 5 fuse terminal blocks

Circuit diagram



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Ground modular terminal block - PT 2,5-PE - 3209536

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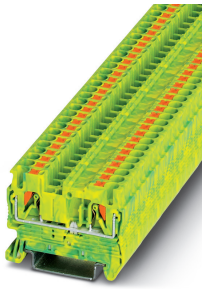


Ground modular terminal block, connection method: Push-in connection, number of connections: 2, cross section: 0.14 mm² - 4 mm², AWG: 26 - 12, width: 5.2 mm, height: 35.3 mm, color: green-yellow, mounting type: NS 35/7,5, NS 35/15

Your advantages

- The Push-in connection terminal blocks are characterized by the system features of the CLIPLINE complete system and by easy and tool-free wiring of conductors with ferrules or solid conductors
- The compact design and front connection enable wiring in a confined space
- In addition to the testing facility in the double function shaft, all terminal blocks provide an additional test connection
- Tested for railway applications

Key Commercial Data

Packing unit	1 pc
Minimum order quantity	50 pc
GTIN	4 046356 329804
GTIN	4046356329804
Weight per Piece (excluding packing)	9.600 g
Custom tariff number	85369010
Country of origin	Germany

Technical data

General

Number of rows	1
Number of connections	2
Nominal cross section	2.5 mm²
Color	green-yellow

Ground modular terminal block - PT 2,5-PE - 3209536

Technical data

General

Insulating material	PA
Flammability rating according to UL 94	V0
Area of application	Railway industry
	Machine building
	Plant engineering
	Process industry
Mounting type	NS 35/7,5
Rated surge voltage	6 kV
Degree of pollution	3
Overvoltage category	III
Insulating material group	I
Maximum load current	with 4 mm² conductor cross section, rigid
Open side panel	Yes
Shock protection test specification	DIN EN 50274 (VDE 0660-514):2002-11
Back of the hand protection	guaranteed
Finger protection	guaranteed
Oscillation, broadband noise test result	Test passed
Test specification, oscillation, broadband noise	DIN EN 50155 (VDE 0115-200):2008-03
Test spectrum	Service life test category 2, bogie-mounted
Test frequency	f_1 = 5 Hz to f_2 = 250 Hz
ASD level	6.12 (m/s²)²/Hz
Acceleration	3.12g
Test duration per axis	5 h
Test directions	X-, Y- and Z-axis
Shock test result	Test passed
Test specification, shock test	DIN EN 50155 (VDE 0115-200):2008-03
Shock form	Half-sine
Acceleration	30g
Shock duration	18 ms
Number of shocks per direction	3
Test directions	X-, Y- and Z-axis (pos. and neg.)
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	125 °C
Static insulating material application in cold	-60 °C
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Calorimetric heat release NFPA 130 (ASTM E 1354)	27,5 MJ/kg

Ground modular terminal block - PT 2,5-PE - 3209536

Technical data

General

Smoke gas toxicity NFPA 130 (SMP 800C)	passed
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Dimensions

Width	5.2 mm
End cover width	2.2 mm
Length	48.5 mm
Height	35.3 mm
Height NS 35/7,5	36.5 mm
Height NS 35/15	44 mm

Connection data

Note	Please observe the current carrying capacity of the DIN rails.
Connection	1 level
Connection method	Push-in connection
Stripping length	8 mm ... 10 mm
Connection in acc. with standard	IEC 60947-7-2
Conductor cross section solid min.	0.14 mm²
Conductor cross section solid max.	4 mm²
Conductor cross section AWG min.	26
Conductor cross section AWG max.	12
Conductor cross section flexible min.	0.14 mm²
Conductor cross section flexible max.	4 mm²
Min. AWG conductor cross section, flexible	26
Max. AWG conductor cross section, flexible	12
Conductor cross section flexible, with ferrule without plastic sleeve min.	0.14 mm²
Conductor cross section flexible, with ferrule without plastic sleeve max.	2.5 mm²
Conductor cross section flexible, with ferrule with plastic sleeve min.	0.14 mm²
Conductor cross section flexible, with ferrule with plastic sleeve max.	2.5 mm²
Two conductors with the same cross section, flexible, with TWIN ferrules, with plastic sleeve, maximum	0.5 mm²
Connection cross sections directly pluggable	0.34 mm² 4 mm²
Conductor cross section solid min.	0.34 mm²
Conductor cross section solid max.	4 mm²
Conductor cross section flexible, with ferrule without plastic sleeve min.	0.34 mm²
Conductor cross section flexible, with ferrule without plastic sleeve max.	2.5 mm²

Ground modular terminal block - PT 2,5-PE - 3209536

Technical data

Connection data

Conductor cross section flexible, with ferrule with plastic sleeve min.	0.34 mm²
Conductor cross section flexible, with ferrule with plastic sleeve max.	2.5 mm²
Internal cylindrical gage	A3

Ambient conditions

Operating temperature	-60 °C ... 105 °C (max. short-term operating temperature 130°C)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Permissible humidity (storage/transport)	30 % ... 70 %
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C

Standards and Regulations

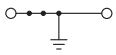
Connection in acc. with standard	CSA

Environmental Product Compliance

China RoHS	Environmentally friendly use period: unlimited = EFUP-e
	No hazardous substances above threshold values

Drawings

Circuit diagram



Classifications

eCl@ss

eCl@ss 10.0.1	27141141
eCl@ss 11.0	27141141
eCl@ss 4.0	27141100
eCl@ss 4.1	27141100
eCl@ss 5.0	27141100
eCl@ss 5.1	27141100
eCl@ss 6.0	27141100
eCl@ss 7.0	27141141
eCl@ss 9.0	27141141

ETIM

ETIM 2.0	EC000901
ETIM 3.0	EC000901

Ground modular terminal block - PT 2,5-PE - 3209536

Classifications

ETIM

ETIM 4.0	EC000901
ETIM 6.0	EC000901
ETIM 7.0	EC000901

UNSPSC

UNSPSC 6.01	30211811
UNSPSC 7.0901	39121410
UNSPSC 11	39121410
UNSPSC 12.01	39121410
UNSPSC 13.2	39121410
UNSPSC 18.0	39121410
UNSPSC 19.0	39121410
UNSPSC 20.0	39121410
UNSPSC 21.0	39121410

Approvals

Approvals

Approvals

DNV GL / NK / CSA / BV / LR / NK / ABS / UL Recognized / cUL Recognized / IECEE CB Scheme / EAC / RS / EAC / LR / VDE Zeichengenehmigung / cULus Recognized

Ex Approvals

IECEx / UL Recognized / cUL Recognized / EAC Ex / NEPSI / ATEX / CCC / cULus Recognized

Approval details

DNV GL	https://approvalfinder.dnvgl.com/	TAE00003JE
NK	http://www.classnk.or.jp/hp/en/	14ME0912

Ground modular terminal block - PT 2,5-PE - 3209536

Approvals

CSA	http://www.csagroup.org/services-industries/product-listing/	13631

mm²/AWG/kcmil	26-12

BV	http://www.veristar.com/portal/veristarinfo/generalinfo/approved/approvedProducts/equipmentAndMaterials	25278/B0 BV

LR	http://www.lr.org/en	12/20038 (E3)

NK	http://www.classnk.or.jp/hp/en/	14ME0913

ABS	http://www.eagle.org/eagleExternalPortalWEB/	16-HG1591536-PDA

UL Recognized	http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 60425

	B	C
mm²/AWG/kcmil	26-12	26-12

cUL Recognized	http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 60425

	B	C
mm²/AWG/kcmil	26-12	26-12

IECEE CB Scheme	http://www.iecee.org/	DE1-62994

mm²/AWG/kcmil	0.2-2.5

Ground modular terminal block - PT 2,5-PE - 3209536

Approvals

EAC		RU C-DE.AI30.B.01102
RS	http://www.rs-head.spb.ru/en/index.php	17.00013.272
EAC		RU C-DE.BL08.B.00644
LR	http://www.lr.org/en	14/20056
VDE Zeichengenehmigung	http://www2.vde.com/de/Institut/Online-Service/VDE-gepruefteProdukte/Seiten/Online-Suche.aspx	40036433

mm²/AWG/kcmil	0.2-2.5

cULus Recognized	

Accessories

Accessories

Bridge

Wire bridge - FBSW 2-5/250MM - 3030172

Wire bridge, length: 250 mm, width: 5.1 mm, number of positions: 1, color: red/black

Ground modular terminal block - PT 2,5-PE - 3209536

Accessories

Wire bridge - FBSW 2-5/60MM - 3030170

Wire bridge, length: 60 mm, width: 5.1 mm, number of positions: 1, color: red/black

Wire bridge - FBSW 2-5/110MM - 3030171

Wire bridge, length: 110 mm, width: 5.1 mm, number of positions: 1, color: red/black

DIN rail

DIN rail perforated - NS 35/ 7,5 PERF 2000MM - 0801733

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/ 7,5 UNPERF 2000MM - 0801681

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

DIN rail perforated - NS 35/ 7,5 WH PERF 2000MM - 1204119

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

Ground modular terminal block - PT 2,5-PE - 3209536

Accessories

DIN rail, unperforated - NS 35/ 7,5 WH UNPERF 2000MM - 1204122

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

---

DIN rail, unperforated - NS 35/ 7,5 AL UNPERF 2000MM - 0801704

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Aluminum, uncoated, length: 2000 mm, color: silver

---

DIN rail perforated - NS 35/ 7,5 ZN PERF 2000MM - 1206421

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 ZN UNPERF 2000MM - 1206434

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 CU UNPERF 2000MM - 0801762

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Copper, uncoated, length: 2000 mm, color: copper-colored

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Ground modular terminal block - PT 2,5-PE - 3209536

Accessories

End cap - NS 35/ 7,5 CAP - 1206560

DIN rail end piece, for DIN rail NS 35/7.5

DIN rail perforated - NS 35/15 PERF 2000MM - 1201730

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/15 UNPERF 2000MM - 1201714

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail perforated - NS 35/15 WH PERF 2000MM - 0806602

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/15 WH UNPERF 2000MM - 1204135

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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Ground modular terminal block - PT 2,5-PE - 3209536

Accessories

DIN rail, unperforated - NS 35/15 AL UNPERF 2000MM - 1201756

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Aluminum, uncoated, length: 2000 mm, color: silver

DIN rail perforated - NS 35/15 ZN PERF 2000MM - 1206599

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/15 ZN UNPERF 2000MM - 1206586

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/15 CU UNPERF 2000MM - 1201895

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Copper, uncoated, length: 2000 mm, color: copper-colored

End cap - NS 35/15 CAP - 1206573

DIN rail end piece, for DIN rail NS 35/15

Ground modular terminal block - PT 2,5-PE - 3209536

Accessories

DIN rail, unperforated - NS 35/15-2,3 UNPERF 2000MM - 1201798

DIN rail, unperforated, Standard profile 2.3 mm, width: 35 mm, height: 15 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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Documentation

Mounting material - PT-IL - 3208090

Operating decal for the push-in Technology

End block

End clamp - CLIPFIX 35 - 3022218

Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN rail, with marking option, width: 9.5 mm, color: gray

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End clamp - CLIPFIX 35-5 - 3022276

Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN rail, with marking option, with parking option for FBS...5, FBS...6, KSS 5, KSS 6, width: 5.15 mm, color: gray

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End clamp - E/NS 35 N - 0800886

End clamp, width: 9.5 mm, color: gray

Ground modular terminal block - PT 2,5-PE - 3209536

Accessories

End cover

End cover - D-ST 2,5 - 3030417

End cover, length: 48.6 mm, width: 2.2 mm, height: 29.1 mm, color: gray

End cover - D-ST 2,5-0,8 OG - 3030511

End cover, length: 48.6 mm, width: 0.8 mm, height: 29 mm, color: orange

Filler plug

Filler plugs - CEC 2,5 - 3062757

Cover for conductor shaft, 10-pos., for spring cage terminal blocks (ST) and terminal blocks with push-in technology (PT) with a width of 5.2 mm

Insulating sleeve

Insulating sleeve - MPS-IH WH - 0201663

Insulating sleeve, color: white

Ground modular terminal block - PT 2,5-PE - 3209536

Accessories

Insulating sleeve - MPS-IH RD - 0201676

Insulating sleeve, color: red

Insulating sleeve - MPS-IH BU - 0201689

Insulating sleeve, color: blue

Insulating sleeve - MPS-IH YE - 0201692

Insulating sleeve, color: yellow

Insulating sleeve - MPS-IH GN - 0201702

Insulating sleeve, color: green

Insulating sleeve - MPS-IH GY - 0201728

Insulating sleeve, color: gray

Ground modular terminal block - PT 2,5-PE - 3209536

Accessories

Insulating sleeve - MPS-IH BK - 0201731

Insulating sleeve, color: black

Insulating sleeve - ISH 2,5/0,2 - 3002843

Insulating sleeve, color: white

Insulating sleeve - ISH 2,5/0,5 - 3002856

Insulating sleeve, color: gray

Insulating sleeve - ISH 2,5/1,0 - 3002869

Insulating sleeve, color: black

Jumper

Plug-in bridge - FBS 2-5 - 3030161

Plug-in bridge, pitch: 5.2 mm, length: 22.7 mm, width: 9 mm, number of positions: 2, color: red

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Ground modular terminal block - PT 2,5-PE - 3209536

Accessories

Plug-in bridge - FBS 3-5 - 3030174

Plug-in bridge, pitch: 5.2 mm, length: 22.7 mm, width: 14.2 mm, number of positions: 3, color: red

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Plug-in bridge - FBS 4-5 - 3030187

Plug-in bridge, pitch: 5.2 mm, length: 22.7 mm, width: 19.4 mm, number of positions: 4, color: red

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Plug-in bridge - FBS 5-5 - 3030190

Plug-in bridge, pitch: 5.2 mm, length: 23 mm, width: 24.6 mm, number of positions: 5, color: red

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Plug-in bridge - FBS 10-5 - 3030213

Plug-in bridge, pitch: 5.2 mm, length: 22.7 mm, width: 50.6 mm, number of positions: 10, color: red

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Plug-in bridge - FBS 20-5 - 3030226

Plug-in bridge, pitch: 5.2 mm, number of positions: 20, color: red

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Ground modular terminal block - PT 2,5-PE - 3209536

Accessories

Plug-in bridge - FBS 50-5 - 3038930

Plug-in bridge, pitch: 5.2 mm, number of positions: 50, color: red

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Plug-in bridge - FBSR 2-5 - 3033702

Plug-in bridge, pitch: 5.2 mm, number of positions: 2, color: red

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Plug-in bridge - FBSR 3-5 - 3001591

Plug-in bridge, pitch: 5.2 mm, number of positions: 3, color: red

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Plug-in bridge - FBSR 4-5 - 3001592

Plug-in bridge, pitch: 5.2 mm, number of positions: 4, color: red

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Plug-in bridge - FBSR 5-5 - 3001593

Plug-in bridge, pitch: 5.2 mm, number of positions: 5, color: red

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Ground modular terminal block - PT 2,5-PE - 3209536

Accessories

Plug-in bridge - FBSR 10-5 - 3033710

Plug-in bridge, pitch: 5.2 mm, number of positions: 10, color: red

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Plug-in bridge - FBS 2-5 BU - 3036877

Plug-in bridge, pitch: 5.2 mm, number of positions: 2, color: blue

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Plug-in bridge - FBS 3-5 BU - 3036880

Plug-in bridge, pitch: 5.2 mm, number of positions: 3, color: blue

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Plug-in bridge - FBS 4-5 BU - 3036893

Plug-in bridge, pitch: 5.2 mm, number of positions: 4, color: blue

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Plug-in bridge - FBS 5-5 BU - 3036903

Plug-in bridge, pitch: 5.2 mm, number of positions: 5, color: blue

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Ground modular terminal block - PT 2,5-PE - 3209536

Accessories

Plug-in bridge - FBS 10-5 BU - 3036916

Plug-in bridge, pitch: 5.2 mm, number of positions: 10, color: blue

Plug-in bridge - FBS 20-5 BU - 3036929

Plug-in bridge, pitch: 5.2 mm, number of positions: 20, color: blue

Plug-in bridge - FBS 50-5 BU - 3032114

Plug-in bridge, pitch: 5.2 mm, number of positions: 50, color: blue

Labeled terminal marker

Zack marker strip - ZB 5 CUS - 0824962

Zack marker strip, can be ordered: Strip, white, labeled according to customer specifications, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 5.15 x 10.5 mm, Number of individual labels: 10

Zack marker strip - ZB 5,LGS:FORTL.ZAHLEN - 1050017

Zack marker strip, Strip, white, labeled, printed horizontally: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 491 ... 500, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 5.15 x 10.5 mm, Number of individual labels: 10

Ground modular terminal block - PT 2,5-PE - 3209536

Accessories

Zack marker strip - ZB 5,QR:FORTL.ZAHLEN - 1050020

Zack marker strip, white, Printed vertically: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 491 ... 500, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 5.15 x 10.5 mm

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Zack marker strip - ZB 5,LGS:GLEICHE ZAHLEN - 1050033

Zack marker strip, Strip, white, labeled, can be labeled with: CMS-P1-PLOTTER, printed horizontally: Identical numbers 1 or 2, etc. up to 100, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 5.15 x 10.5 mm, Number of individual labels: 10

Zack marker strip - ZB 5,LGS:L1-N,PE - 1050415

Zack marker strip, Strip, white, labeled, horizontal: L1, L2, L3, N, PE, L1, L2, L3, N, PE, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 5.15 x 10.5 mm, Number of individual labels: 10

Marker for terminal blocks - UC-TM 5 CUS - 0824581

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 10.5 x 4.6 mm, Number of individual labels: 96

Marker for terminal blocks - UCT-TM 5 CUS - 0829595

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 4.6 x 10.5 mm, Number of individual labels: 72

Ground modular terminal block - PT 2,5-PE - 3209536

Accessories

Zack Marker strip, flat - ZBF 5 CUS - 0825025

Zack Marker strip, flat, can be ordered: Strip, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Zack Marker strip, flat - ZBF 5,LGS:FORTL.ZAHLEN - 0808671

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 491 ... 500, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Zack Marker strip, flat - ZBF 5,QR:FORTL.ZAHLEN - 0808697

Zack Marker strip, flat, Strip, white, labeled, Printed vertically: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 91 ... 100, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Zack Marker strip, flat - ZBF 5,LGS:GERADE ZAHLEN - 0810821

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: consecutive numbers 2 ... 20, 22 ... 40, etc. up to 82 ... 100, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Zack Marker strip, flat - ZBF 5,LGS:UNGERADE ZAHLEN - 0810863

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: Odd numbers 1 - 19, 21 - 39, etc. up to 81 - 99, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Ground modular terminal block - PT 2,5-PE - 3209536

Accessories

Marker for terminal blocks - UC-TMF 5 CUS - 0824638

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 5.2 mm, lettering field size: 4.6 x 5.1 mm, Number of individual labels: 96

Marker for terminal blocks - UCT-TMF 5 CUS - 0829658

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 5.2 mm, lettering field size: 4.4 x 4.7 mm, Number of individual labels: 72

Marker carriers

Marker carriers - STP 5-2-ZB - 3037643

Double marker carrier, snaps onto the spring-cage terminal blocks ST 2.5..., labeled with ZB 5 or ZBF 5

Group marker label for terminal marking - GBS-ZB/26X6 - 0809298

Group marking label, snaps onto terminal center for screw, spring-cage and quick connection terminal blocks, labeled with ESL 26x6 mm or EST 25x6 mm, in the foot part with Zack marker strip, length: 29 mm

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Partition plate

Partition plate - ATP-ST 4 - 3030721

Partition plate, length: 59.8 mm, width: 2 mm, height: 39 mm, color: gray

Ground modular terminal block - PT 2,5-PE - 3209536

Accessories

Spacer plate - DP PS-5 - 3036725

Spacer plate, length: 22.4 mm, width: 5.2 mm, height: 29 mm, number of positions: 1, color: red

Planning and marking software

Software - PROJECT COMPLETE - 1050453

Intuitive planning and marking software for configuring terminal strips and for professional marking of marking materials for terminal blocks, conductors, cables, devices, and systems. The software is available for download

Reducing bridge

Reducing bridge - RB ST (2,5/4)-1,5 - 3038943

Reducing bridge, pitch: 7.1 mm, length: 22.7 mm, width: 10.4 mm, number of positions: 2, color: red

Screwdriver tools

Screwdriver - SZF 1-0,6X3,5 - 1204517

Actuation tool, for ST terminal blocks, also suitable for use as a bladed screwdriver, size: 0.6 x 3.5 x 100 mm, 2-component grip, with non-slip grip

Ground modular terminal block - PT 2,5-PE - 3209536

Accessories

Actuation tool - ST-BW - 1207608

Actuation tool, for all 2.5 mm² - 4.0 mm² spring-cages

Terminal marking

Group marker label for terminal marking - GBS 5-25X12 - 0810588

Group marker label, snaps onto terminal center for screw, spring-cage and quick connection terminal blocks, labeled with a 25 x 12 mm label or manually with the B-STIFT, in the foot part with ZB 5

Zack marker strip - ZB 5 :UNBEDRUCKT - 1050004

Zack marker strip, Strip, white, unlabeled, can be labeled with: PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 5.1 x 10.5 mm, Number of individual labels: 10

Marker for terminal blocks - UC-TM 5 - 0818108

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 10.5 x 4.6 mm, Number of individual labels: 96

Marker for terminal blocks - UCT-TM 5 - 0828734

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: TOPMARK NEO, TOPMARK LASER, BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, THERMOMARK PRIME, THERMOMARK CARD 2.0, THERMOMARK CARD, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 4.6 x 10.5 mm, Number of individual labels: 72

Ground modular terminal block - PT 2,5-PE - 3209536

Accessories

Zack Marker strip, flat - ZBF 5:UNBEDRUCKT - 0808642

Zack Marker strip, flat, Strip, white, unlabeled, can be labeled with: PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.1 x 5.2 mm, Number of individual labels: 10

Marker for terminal blocks - UC-TMF 5 - 0818153

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into flat marker groove, for terminal block width: 5.2 mm, lettering field size: 4.6 x 5.1 mm, Number of individual labels: 96

Marker for terminal blocks - UCT-TMF 5 - 0828744

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: TOPMARK NEO, TOPMARK LASER, BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, THERMOMARK PRIME, THERMOMARK CARD 2.0, THERMOMARK CARD, mounting type: snap into flat marker groove, for terminal block width: 5.2 mm, lettering field size: 4.4 x 4.7 mm, Number of individual labels: 72

Test plug terminal block

Test plugs - MPS-MT - 0201744

Test plugs, with solder connection up to 1 mm² conductor cross section, color: gray

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Test plugs - PS-5 - 3030983

Test plugs, Modular test plug, color: red

Ground modular terminal block - PT 2,5-PE - 3209536

Accessories

Test plugs - PS-5/2,3MM RD - 3038723

Test plugs, color: red

Test socket

Test adapter - PAI-4-FIX-5/6 BU - 3035975

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

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Test adapter - PAI-4-FIX-5/6 OG - 3035974

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

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Test adapter - PAI-4-FIX-5/6 YE - 3035977

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

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Test adapter - PAI-4-FIX-5/6 RD - 3035976

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

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Ground modular terminal block - PT 2,5-PE - 3209536

Accessories

Test adapter - PAI-4-FIX-5/6 GN - 3035978

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 BK - 3035980

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 GY - 3035982

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 VT - 3035979

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 BN - 3035981

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Ground modular terminal block - PT 2,5-PE - 3209536

Accessories

Test adapter - PAI-4-FIX-5/6 WH - 3035983

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

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Warning label printed

Warning label - WS PT 2,5 - 1029026

Warning label, yellow/black, labeled: Lightning flash, mounting type: plug in, for terminal block width: 5.2 mm

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Warning label - WS-DIO PT 2,5 - 1029037

Warning label, yellow/black, labeled: Diode, mounting type: plug in, for terminal block width: 5.2 mm

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Feed-through terminal block - PT 2,5-QUATTRO - 3209578

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Feed-through terminal block, nom. voltage: 800 V, nominal current: 24 A, connection method: Push-in connection, number of connections: 4, cross section: 0.14 mm² - 4 mm², AWG: 26 - 12, width: 5.2 mm, height: 35.3 mm, color: gray, mounting type: NS 35/7,5, NS 35/15

Your advantages

- In addition to the testing facility in the double function shaft, all terminal blocks provide an additional test connection
- The compact design and front connection enable wiring in a confined space
- The Push-in connection terminal blocks are characterized by the system features of the CLIPLINE complete system and by easy and tool-free wiring of conductors with ferrules or solid conductors
- Tested for railway applications

Key Commercial Data

Packing unit	1 pc
Minimum order quantity	50 pc
GTIN	4 046356 329859
GTIN	4046356329859
Weight per Piece (excluding packing)	10.800 g
Custom tariff number	85369010
Country of origin	Germany

Technical data

General

Number of rows	1
Number of connections	4
Potentials	1
Nominal cross section	2.5 mm²

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Technical data

General

Color	gray
Insulating material	PA
Flammability rating according to UL 94	V0
Area of application	Railway industry
	Machine building
	Plant engineering
	Process industry
Mounting type	NS 35/7,5
Rated surge voltage	8 kV
Degree of pollution	3
Overvoltage category	III
Insulating material group	I
Maximum load current	28 A (with 4 mm² conductor cross section, rigid)
Nominal current I_N	24 A (with 2.5 mm² conductor connection cross section)
Nominal voltage U_N	800 V
Open side panel	Yes
Shock protection test specification	DIN EN 50274 (VDE 0660-514):2002-11
Back of the hand protection	guaranteed
Finger protection	guaranteed
Result of surge voltage test	Test passed
Result of power-frequency withstand voltage test	Test passed
Power frequency withstand voltage setpoint	2 kV
Result of the test for mechanical stability of terminal points (5 x conductor connection)	Test passed
Result of flexion and pull-out test	Test passed
Bending test rotation speed	10 rpm
Bending test turns	135
Bending test conductor cross section/weight	0.14 mm² / 0.2 kg
	2.5 mm² / 0.7 kg
Tensile test result	Test passed
Result of tight fit on support	Test passed
Tight fit on carrier	NS 35
Setpoint	1 N
Result of voltage-drop test	Test passed
Result of temperature-rise test	Test passed
Requirement temperature-rise test	Increase in temperature ≤ 45 K
Short circuit stability result	Test passed

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Technical data

General

Conductor cross section short circuit testing	2.5 mm²
Short-time current	0.3 kA
Conductor cross section short circuit testing	4 mm²
Short-time current	0.48 kA
Result of thermal test	Test passed
Proof of thermal characteristics (needle flame) effective duration	30 s
Result of aging test	Test passed
Oscillation, broadband noise test result	Test passed
Test specification, oscillation, broadband noise	DIN EN 50155 (VDE 0115-200):2018-05
Test spectrum	Service life test category 2, bogie-mounted
Test frequency	f_1 = 5 Hz to f_2 = 250 Hz
ASD level	6.12 (m/s²)²/Hz
Acceleration	3.12g
Test duration per axis	5 h
Test directions	X-, Y- and Z-axis
Shock test result	Test passed
Test specification, shock test	DIN EN 50155 (VDE 0115-200):2018-05
Shock form	Half-sine
Acceleration	5g
Shock duration	30 ms
Number of shocks per direction	3
Test directions	X-, Y- and Z-axis (pos. and neg.)
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	125 °C
Static insulating material application in cold	-60 °C
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Calorimetric heat release NFPA 130 (ASTM E 1354)	27,5 MJ/kg
Smoke gas toxicity NFPA 130 (SMP 800C)	passed
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Dimensions

Width	5.2 mm
End cover width	2.2 mm
Length	72.2 mm

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Technical data

Dimensions

Height	35.3 mm
Height NS 35/7,5	36.8 mm
Height NS 35/15	44.3 mm

Connection data

Connection	1 level
Connection method	Push-in connection
Stripping length	8 mm ... 10 mm
Connection in acc. with standard	IEC 60947-7-1
Conductor cross section solid min.	0.14 mm²
Conductor cross section solid max.	4 mm²
Conductor cross section AWG min.	26
Conductor cross section AWG max.	12
Conductor cross section flexible min.	0.14 mm²
Conductor cross section flexible max.	4 mm²
Min. AWG conductor cross section, flexible	26
Max. AWG conductor cross section, flexible	14
Conductor cross section flexible, with ferrule without plastic sleeve min.	0.14 mm²
Conductor cross section flexible, with ferrule without plastic sleeve max.	2.5 mm²
Conductor cross section flexible, with ferrule with plastic sleeve min.	0.14 mm²
Conductor cross section flexible, with ferrule with plastic sleeve max.	2.5 mm²
Two conductors with the same cross section, flexible, with TWIN ferrules, with plastic sleeve, maximum	0.5 mm²
Connection cross sections directly pluggable	0.34 mm² 4 mm²
Conductor cross section solid min.	0.34 mm²
Conductor cross section solid max.	4 mm²
Conductor cross section flexible, with ferrule without plastic sleeve min.	0.34 mm²
Conductor cross section flexible, with ferrule without plastic sleeve max.	2.5 mm²
Conductor cross section flexible, with ferrule with plastic sleeve min.	0.34 mm²
Conductor cross section flexible, with ferrule with plastic sleeve max.	2.5 mm²
Internal cylindrical gage	A3

Ambient conditions

Operating temperature	-60 °C ... 105 °C (max. short-term operating temperature 130°C)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Permissible humidity (storage/transport)	30 % ... 70 %
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Technical data

Standards and Regulations

Connection in acc. with standard	CSA
	IEC 60947-7-1
Flammability rating according to UL 94	V0

Environmental Product Compliance

China RoHS	Environmentally friendly use period: unlimited = EFUP-e
	No hazardous substances above threshold values

Drawings

Circuit diagram

Classifications

eCl@ss

eCl@ss 10.0.1	27141120
eCl@ss 11.0	27141120
eCl@ss 4.0	27141100
eCl@ss 4.1	27141100
eCl@ss 5.0	27141100
eCl@ss 5.1	27141100
eCl@ss 6.0	27141100
eCl@ss 7.0	27141120
eCl@ss 9.0	27141120

ETIM

ETIM 2.0	EC000897
ETIM 3.0	EC000897
ETIM 4.0	EC000897
ETIM 6.0	EC000897
ETIM 7.0	EC000897

UNSPSC

UNSPSC 6.01	30211811
UNSPSC 7.0901	39121410
UNSPSC 11	39121410
UNSPSC 12.01	39121410

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Classifications

UNSPSC

UNSPSC 13.2	39121410
UNSPSC 18.0	39121410
UNSPSC 19.0	39121410
UNSPSC 20.0	39121410
UNSPSC 21.0	39121410

Approvals

Approvals

Approvals

DNV GL / NK / CSA / BV / LR / NK / ABS / UL Recognized / cUL Recognized / IECEE CB Scheme / EAC / EAC / RS / LR / VDE Zeichengenehmigung / cULus Recognized

Ex Approvals

IECEx / UL Recognized / cUL Recognized / EAC Ex / NEPSI / ATEX / CCC / cULus Recognized

Approval details

DNV GL		https://approvalfinder.dnvgl.com/	TAE00003JE

NK	ClassNK	http://www.classnk.or.jp/hp/en/	14ME0912

CSA		http://www.csagroup.org/services-industries/product-listing/	13631

	B	C
Nominal voltage UN	600 V	600 V
Nominal current IN	20 A	20 A
mm²/AWG/kcmil	26-12	26-12

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Approvals

BV	http://www.veristar.com/portal/veristarinfo/generalinfo/approved/approvedProducts/equipmentAndMaterials	25278/B0 BV

LR	http://www.lr.org/en	12/20038 (E3)

NK	http://www.classnk.or.jp/hp/en/	14ME0913

ABS	http://www.eagle.org/eagleExternalPortalWEB/	16-HG1591536-PDA

UL Recognized — http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm — FILE E 60425

	B	C
Nominal voltage UN	600 V	600 V
Nominal current IN	20 A	20 A
mm²/AWG/kcmil	26-12	26-12

cUL Recognized — http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm — FILE E 60425

	B	C
Nominal voltage UN	600 V	600 V
Nominal current IN	20 A	20 A
mm²/AWG/kcmil	26-12	26-12

IECEE CB Scheme	http://www.iecee.org/	DE1-62953

EAC	RU C-DE.AI30.B.01102

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Approvals

EAC		RU C-DE.BL08.B.00644

RS	http://www.rs-head.spb.ru/en/index.php	17.00013.272

LR	http://www.lr.org/en	14/20056

VDE Zeichengenehmigung	http://www2.vde.com/de/Institut/Online-Service/VDE-gepruefteProdukte/Seiten/Online-Suche.aspx	40032222

Nominal voltage UN	800 V
Nominal current IN	24 A
mm²/AWG/kcmil	0.2-2.5

cULus Recognized	

Accessories

Accessories

Bridge

Wire bridge - FBSW 2-5/250MM - 3030172

Wire bridge, length: 250 mm, width: 5.1 mm, number of positions: 1, color: red/black

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Wire bridge - FBSW 2-5/60MM - 3030170

Wire bridge, length: 60 mm, width: 5.1 mm, number of positions: 1, color: red/black

Wire bridge - FBSW 2-5/110MM - 3030171

Wire bridge, length: 110 mm, width: 5.1 mm, number of positions: 1, color: red/black

Component plug terminal block

Component connector - P-CO 2-5 R47K - 3032447

Component connector, with 47 kOhm resistance for wire-break monitoring, pitch: 5.2 mm, length: 8.9 mm, width: 4.1 mm, height: 34.8 mm, number of positions: 2, color: black

Crimping tool

Crimping pliers - CRIMPFOX CENTRUS 6S - 1213144

Crimping pliers, for uninsulated and insulated ferrules, DIN 46228 Part 1 and 4, from 0.14 mm² … 6 mm², also for TWIN ferrules up to 2 x 4 mm², automatic cross section adjustment, lateral insertion, equipped with fall protection

Crimping pliers - CRIMPFOX CENTRUS 10S - 1213154

Crimping pliers, for uninsulated and insulated ferrules, DIN 46228 Part 1 and 4, from 0.14 mm² ... 10 mm², also for TWIN ferrules up to 2 x 4 mm², automatic cross section adjustment, lateral insertion, equipped with fall protection

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Crimping pliers - CRIMPFOX CENTRUS 6H - 1213146

Crimping pliers, for uninsulated and insulated ferrules, DIN 46228 Part 1 and 4, from 0.14 mm² … 6 mm², also for TWIN ferrules up to 2 x 4 mm², automatic cross section adjustment, lateral insertion, equipped with fall protection

Crimping pliers - CRIMPFOX CENTRUS 10H - 1213156

Crimping pliers, for uninsulated and insulated ferrules, DIN 46228 Part 1 and 4, from 0.14 mm² ... 10 mm², also for TWIN ferrules up to 2 x 4 mm², automatic cross section adjustment, lateral insertion, equipped with fall protection

Crimping pliers - CRIMPFOX 10S - 1212045

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.14 mm² ... 10 mm², unlockable pressure lock, lateral entry

Crimping pliers - CRIMPFOX 6H - 1212046

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.14 mm² ... 6 mm², unlockable pressure lock, lateral entry

Crimping pliers - CRIMPFOX 2,5-M - 1212719

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.25 mm² ... 2.5 mm², lateral entry, trapezoidal crimp

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Crimping pliers - CRIMPFOX 6-M - 1212720

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.25 mm² ... 6.0 mm², lateral entry, trapezoidal crimp

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Crimping pliers - CRIMPFOX 6 - 1212034

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.25 mm² ... 6.0 mm², lateral entry, trapezoidal crimp

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Crimping pliers - CRIMPFOX 6T - 1212037

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.25 mm² ... 6 mm², lateral entry, trapezoidal crimp

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Crimping pliers - CRIMPFOX 6T-F - 1212038

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.25 mm² ... 6 mm², front entry, trapezoidal crimp

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Crimping pliers - CRIMPFOX 6S-F - 1212043

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.5 mm² ... 6 mm², front entry, square crimp

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Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Crimping pliers - CRIMPFOX-M - 1212072

Basic pliers, for accommodating dies for a wide range of type of contacts

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Device circuit breakers

Electronic circuit breaker - PTCB E1 24DC/1-8A NO - 2908262

Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit. Simple potential distribution using components from the CLIPLINE complete terminal block system. With electronic locking of the set nominal currents. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/1-3A NO - 2909909

Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit. Simple potential distribution using components from the CLIPLINE complete terminal block system. With electronic locking of the set nominal currents. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/2A NO - 2909903

Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit. Simple potential distribution using components from the CLIPLINE complete terminal block system. With fixed nominal current. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/1-4A NO - 2908261

Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit. Simple potential distribution using components from the CLIPLINE complete terminal block system. With electronic locking of the set nominal currents. For installation on DIN rails.

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Electronic circuit breaker - PTCB E1 24DC/3A NO - 2909904

Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit. Simple potential distribution using components from the CLIPLINE complete terminal block system. With fixed nominal current. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/4A NO - 2909906

Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit. Simple potential distribution using components from the CLIPLINE complete terminal block system. With fixed nominal current. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/6A NO - 2909908

Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit. Simple potential distribution using components from the CLIPLINE complete terminal block system. With fixed nominal current. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/1A NO - 2909902

Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit. Simple potential distribution using components from the CLIPLINE complete terminal block system. With fixed nominal current. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/8A NO - 2909910

Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit. Simple potential distribution using components from the CLIPLINE complete terminal block system. With fixed nominal current. For installation on DIN rails.

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Electronic circuit breaker - PTCB E1 24DC/1-8A SI-R - 1135752

Single-channel, electronic fuse for the protection of 24 V loads. Simple potential distribution using terminal blocks from the CLIPLINE complete system. With status output, reset input, and electronic interlock. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/2A SI-R - 1135749

Single-channel, electronic fuse for the protection of 24 V loads. Simple potential distribution using terminal blocks from the CLIPLINE complete system. With status output, reset input, and electronic interlock. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/1-4A SI-R - 1135753

Single-channel, electronic fuse for the protection of 24 V loads. Simple potential distribution using terminal blocks from the CLIPLINE complete system. With status output, reset input, and electronic interlock. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/4A SI-R - 1135745

Single-channel, electronic fuse for the protection of 24 V loads. Simple potential distribution using terminal blocks from the CLIPLINE complete system. With status output, reset input, and electronic interlock. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/6A SI-R - 1135740

Single-channel, electronic fuse for the protection of 24 V loads. Simple potential distribution using terminal blocks from the CLIPLINE complete system. With status output, reset input, and electronic interlock. For installation on DIN rails.

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Electronic circuit breaker - PTCB E1 24DC/1A SI-R - 1135751

Single-channel, electronic fuse for the protection of 24 V loads. Simple potential distribution using terminal blocks from the CLIPLINE complete system. With status output, reset input, and electronic interlock. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/8A SI-R - 1135734

Single-channel, electronic fuse for the protection of 24 V loads. Simple potential distribution using terminal blocks from the CLIPLINE complete system. With status output, reset input, and electronic interlock. For installation on DIN rails.

DIN rail

DIN rail perforated - NS 35/ 7,5 PERF 2000MM - 0801733

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 UNPERF 2000MM - 0801681

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail perforated - NS 35/ 7,5 WH PERF 2000MM - 1204119

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

DIN rail, unperforated - NS 35/ 7,5 WH UNPERF 2000MM - 1204122

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 AL UNPERF 2000MM - 0801704

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Aluminum, uncoated, length: 2000 mm, color: silver

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DIN rail perforated - NS 35/ 7,5 ZN PERF 2000MM - 1206421

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 ZN UNPERF 2000MM - 1206434

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 CU UNPERF 2000MM - 0801762

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Copper, uncoated, length: 2000 mm, color: copper-colored

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Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

End cap - NS 35/ 7,5 CAP - 1206560

DIN rail end piece, for DIN rail NS 35/7.5

DIN rail perforated - NS 35/15 PERF 2000MM - 1201730

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/15 UNPERF 2000MM - 1201714

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail perforated - NS 35/15 WH PERF 2000MM - 0806602

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/15 WH UNPERF 2000MM - 1204135

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

DIN rail, unperforated - NS 35/15 AL UNPERF 2000MM - 1201756

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Aluminum, uncoated, length: 2000 mm, color: silver

DIN rail perforated - NS 35/15 ZN PERF 2000MM - 1206599

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/15 ZN UNPERF 2000MM - 1206586

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/15 CU UNPERF 2000MM - 1201895

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Copper, uncoated, length: 2000 mm, color: copper-colored

End cap - NS 35/15 CAP - 1206573

DIN rail end piece, for DIN rail NS 35/15

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

DIN rail, unperforated - NS 35/15-2,3 UNPERF 2000MM - 1201798

DIN rail, unperforated, Standard profile 2.3 mm, width: 35 mm, height: 15 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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Documentation

Mounting material - PT-IL - 3208090

Operating decal for the push-in Technology

End block

End clamp - CLIPFIX 35 - 3022218

Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN rail, with marking option, width: 9.5 mm, color: gray

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End clamp - CLIPFIX 35-5 - 3022276

Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN rail, with marking option, with parking option for FBS...5, FBS...6, KSS 5, KSS 6, width: 5.15 mm, color: gray

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End clamp - E/NS 35 N - 0800886

End clamp, width: 9.5 mm, color: gray

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

End cover

End cover - D-ST 2,5-QUATTRO - 3030514

End cover, length: 72.2 mm, width: 2.2 mm, height: 29.1 mm, color: gray

End cover - D-ST 2,5-QUATTRO-0,8 OG - 3030513

End cover, length: 72 mm, width: 0.8 mm, height: 29 mm, color: orange

Cover segment - DS-ST 2,5 - 3036602

End cover segments, large segment: 32.25 x 13.83 x 0.9, small segment: 22.65 x 11.65 x 0.9, color: gray

Filler plug

Filler plugs - CEC 2,5 - 3062757

Cover for conductor shaft, 10-pos., for spring cage terminal blocks (ST) and terminal blocks with push-in technology (PT) with a width of 5.2 mm

Insulating sleeve

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Insulating sleeve - MPS-IH WH - 0201663

Insulating sleeve, color: white

Insulating sleeve - MPS-IH RD - 0201676

Insulating sleeve, color: red

Insulating sleeve - MPS-IH BU - 0201689

Insulating sleeve, color: blue

Insulating sleeve - MPS-IH YE - 0201692

Insulating sleeve, color: yellow

Insulating sleeve - MPS-IH GN - 0201702

Insulating sleeve, color: green

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Insulating sleeve - MPS-IH GY - 0201728

Insulating sleeve, color: gray

Insulating sleeve - MPS-IH BK - 0201731

Insulating sleeve, color: black

Insulating sleeve - ISH 2,5/0,2 - 3002843

Insulating sleeve, color: white

Insulating sleeve - ISH 2,5/0,5 - 3002856

Insulating sleeve, color: gray

Insulating sleeve - ISH 2,5/1,0 - 3002869

Insulating sleeve, color: black

Jumper

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Plug-in bridge - FBS 2-5 - 3030161

Plug-in bridge, pitch: 5.2 mm, length: 22.7 mm, width: 9 mm, number of positions: 2, color: red

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Plug-in bridge - FBS 3-5 - 3030174

Plug-in bridge, pitch: 5.2 mm, length: 22.7 mm, width: 14.2 mm, number of positions: 3, color: red

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Plug-in bridge - FBS 4-5 - 3030187

Plug-in bridge, pitch: 5.2 mm, length: 22.7 mm, width: 19.4 mm, number of positions: 4, color: red

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Plug-in bridge - FBS 5-5 - 3030190

Plug-in bridge, pitch: 5.2 mm, length: 23 mm, width: 24.6 mm, number of positions: 5, color: red

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Plug-in bridge - FBS 10-5 - 3030213

Plug-in bridge, pitch: 5.2 mm, length: 22.7 mm, width: 50.6 mm, number of positions: 10, color: red

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Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Plug-in bridge - FBS 20-5 - 3030226

Plug-in bridge, pitch: 5.2 mm, number of positions: 20, color: red

Plug-in bridge - FBS 50-5 - 3038930

Plug-in bridge, pitch: 5.2 mm, number of positions: 50, color: red

Plug-in bridge - FBSR 2-5 - 3033702

Plug-in bridge, pitch: 5.2 mm, number of positions: 2, color: red

Plug-in bridge - FBSR 3-5 - 3001591

Plug-in bridge, pitch: 5.2 mm, number of positions: 3, color: red

Plug-in bridge - FBSR 4-5 - 3001592

Plug-in bridge, pitch: 5.2 mm, number of positions: 4, color: red

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Plug-in bridge - FBSR 5-5 - 3001593

Plug-in bridge, pitch: 5.2 mm, number of positions: 5, color: red

Plug-in bridge - FBSR 10-5 - 3033710

Plug-in bridge, pitch: 5.2 mm, number of positions: 10, color: red

Plug-in bridge - FBS 2-5 BU - 3036877

Plug-in bridge, pitch: 5.2 mm, number of positions: 2, color: blue

Plug-in bridge - FBS 3-5 BU - 3036880

Plug-in bridge, pitch: 5.2 mm, number of positions: 3, color: blue

Plug-in bridge - FBS 4-5 BU - 3036893

Plug-in bridge, pitch: 5.2 mm, number of positions: 4, color: blue

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Plug-in bridge - FBS 5-5 BU - 3036903

Plug-in bridge, pitch: 5.2 mm, number of positions: 5, color: blue

Plug-in bridge - FBS 10-5 BU - 3036916

Plug-in bridge, pitch: 5.2 mm, number of positions: 10, color: blue

Plug-in bridge - FBS 20-5 BU - 3036929

Plug-in bridge, pitch: 5.2 mm, number of positions: 20, color: blue

Plug-in bridge - FBS 50-5 BU - 3032114

Plug-in bridge, pitch: 5.2 mm, number of positions: 50, color: blue

Labeled terminal marker

Zack marker strip - ZB 5 CUS - 0824962

Zack marker strip, can be ordered: Strip, white, labeled according to customer specifications, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 5.15 x 10.5 mm, Number of individual labels: 10

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Zack marker strip - ZB 5,LGS:FORTL.ZAHLEN - 1050017

Zack marker strip, Strip, white, labeled, printed horizontally: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 491 ... 500, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 5.15 x 10.5 mm, Number of individual labels: 10

Zack marker strip - ZB 5,QR:FORTL.ZAHLEN - 1050020

Zack marker strip, white, Printed vertically: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 491 ... 500, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 5.15 x 10.5 mm

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Zack marker strip - ZB 5,LGS:GLEICHE ZAHLEN - 1050033

Zack marker strip, Strip, white, labeled, can be labeled with: CMS-P1-PLOTTER, printed horizontally: Identical numbers 1 or 2, etc. up to 100, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 5.15 x 10.5 mm, Number of individual labels: 10

Zack marker strip - ZB 5,LGS:L1-N,PE - 1050415

Zack marker strip, Strip, white, labeled, horizontal: L1, L2, L3, N, PE, L1, L2, L3, N, PE, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 5.15 x 10.5 mm, Number of individual labels: 10

Marker for terminal blocks - UC-TM 5 CUS - 0824581

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 10.5 x 4.6 mm, Number of individual labels: 96

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Marker for terminal blocks - UCT-TM 5 CUS - 0829595

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 4.6 x 10.5 mm, Number of individual labels: 72

Zack Marker strip, flat - ZBF 5 CUS - 0825025

Zack Marker strip, flat, can be ordered: Strip, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Zack Marker strip, flat - ZBF 5,LGS:FORTL.ZAHLEN - 0808671

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 491 ... 500, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Zack Marker strip, flat - ZBF 5,QR:FORTL.ZAHLEN - 0808697

Zack Marker strip, flat, Strip, white, labeled, Printed vertically: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 91 ... 100, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Zack Marker strip, flat - ZBF 5,LGS:GERADE ZAHLEN - 0810821

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: consecutive numbers 2 ... 20, 22 ... 40, etc. up to 82 ... 100, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Zack Marker strip, flat - ZBF 5,LGS:UNGERADE ZAHLEN - 0810863

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: Odd numbers 1 - 19, 21 - 39, etc. up to 81 - 99, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Marker for terminal blocks - UC-TMF 5 CUS - 0824638

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 5.2 mm, lettering field size: 4.6 x 5.1 mm, Number of individual labels: 96

Marker for terminal blocks - UCT-TMF 5 CUS - 0829658

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 5.2 mm, lettering field size: 4.4 x 4.7 mm, Number of individual labels: 72

Marker carriers

Marker carriers - STP 5-2-ZB - 3037643

Double marker carrier, snaps onto the spring-cage terminal blocks ST 2.5..., labeled with ZB 5 or ZBF 5

Group marker label for terminal marking - GBS-ZB/26X6 - 0809298

Group marking label, snaps onto terminal center for screw, spring-cage and quick connection terminal blocks, labeled with ESL 26x6 mm or EST 25x6 mm, in the foot part with Zack marker strip, length: 29 mm

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Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Partition plate

Partition plate - ATP-ST QUATTRO - 3030815

Partition plate, length: 90.9 mm, width: 2 mm, height: 45 mm, color: gray

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Spacer plate - DP PS-5 - 3036725

Spacer plate, length: 22.4 mm, width: 5.2 mm, height: 29 mm, number of positions: 1, color: red

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Planning and marking software

Software - PROJECT COMPLETE - 1050453

Intuitive planning and marking software for configuring terminal strips and for professional marking of marking materials for terminal blocks, conductors, cables, devices, and systems. The software is available for download

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Reducing bridge

Reducing bridge - RB ST (2,5/4)-1,5 - 3038943

Reducing bridge, pitch: 7.1 mm, length: 22.7 mm, width: 10.4 mm, number of positions: 2, color: red

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Screwdriver tools

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Screwdriver - SZF 1-0,6X3,5 - 1204517

Actuation tool, for ST terminal blocks, also suitable for use as a bladed screwdriver, size: 0.6 x 3.5 x 100 mm, 2-component grip, with non-slip grip

Actuation tool - ST-BW - 1207608

Actuation tool, for all 2.5 mm² - 4.0 mm² spring-cages

Terminal marking

Group marker label for terminal marking - GBS 5-25X12 - 0810588

Group marker label, snaps onto terminal center for screw, spring-cage and quick connection terminal blocks, labeled with a 25 x 12 mm label or manually with the B-STIFT, in the foot part with ZB 5

Zack marker strip - ZB 5 :UNBEDRUCKT - 1050004

Zack marker strip, Strip, white, unlabeled, can be labeled with: PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 5.1 x 10.5 mm, Number of individual labels: 10

Marker for terminal blocks - UC-TM 5 - 0818108

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 10.5 x 4.6 mm, Number of individual labels: 96

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Marker for terminal blocks - UCT-TM 5 - 0828734

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: TOPMARK NEO, TOPMARK LASER, BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, THERMOMARK PRIME, THERMOMARK CARD 2.0, THERMOMARK CARD, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 4.6 x 10.5 mm, Number of individual labels: 72

Zack Marker strip, flat - ZBF 5:UNBEDRUCKT - 0808642

Zack Marker strip, flat, Strip, white, unlabeled, can be labeled with: PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.1 x 5.2 mm, Number of individual labels: 10

Marker for terminal blocks - UC-TMF 5 - 0818153

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into flat marker groove, for terminal block width: 5.2 mm, lettering field size: 4.6 x 5.1 mm, Number of individual labels: 96

Marker for terminal blocks - UCT-TMF 5 - 0828744

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: TOPMARK NEO, TOPMARK LASER, BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, THERMOMARK PRIME, THERMOMARK CARD 2.0, THERMOMARK CARD, mounting type: snap into flat marker groove, for terminal block width: 5.2 mm, lettering field size: 4.4 x 4.7 mm, Number of individual labels: 72

Test plug terminal block

Test plugs - MPS-MT - 0201744

Test plugs, with solder connection up to 1 mm² conductor cross section, color: gray

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Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Test plugs - PS-5 - 3030983

Test plugs, Modular test plug, color: red

Test plugs - PS-5/2,3MM RD - 3038723

Test plugs, color: red

Test socket

Test adapter - PAI-4-FIX-5/6 BU - 3035975

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

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Test adapter - PAI-4-FIX-5/6 OG - 3035974

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

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Test adapter - PAI-4-FIX-5/6 YE - 3035977

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

---

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Test adapter - PAI-4-FIX-5/6 RD - 3035976

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 GN - 3035978

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 BK - 3035980

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 GY - 3035982

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 VT - 3035979

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Test adapter - PAI-4-FIX-5/6 BN - 3035981

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 WH - 3035983

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Warning label printed

Warning label - WS PT 2,5 - 1029026

Warning label, yellow/black, labeled: Lightning flash, mounting type: plug in, for terminal block width: 5.2 mm

Warning label - WS-DIO PT 2,5 - 1029037

Warning label, yellow/black, labeled: Diode, mounting type: plug in, for terminal block width: 5.2 mm

Ground modular terminal block - PT 2,5-QUATTRO-PE

3209594

https://www.phoenixcontact.com/us/products/3209594

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Ground modular terminal block, number of connections: 4, connection method: Push-in connection, Rated cross section: 2.5 mm^2, cross section: 0.14 mm^2 - 4 mm^2, mounting type: NS 35/7,5, NS 35/15, color: green-yellow

Your advantages

- In addition to the testing facility in the double function shaft, all terminal blocks provide an additional test connection
- The compact design and front connection enable wiring in a confined space
- The Push-in connection terminal blocks are characterized by the system features of the CLIPLINE complete system and by easy and tool-free wiring of conductors with ferrules or solid conductors
- Tested for railway applications

Commercial Data

Item number	3209594
Packing unit	1 pc
Minimum order quantity	50 pc
Sales Key	B02
Product Key	BE2223
Catalog Page	Page 71 (C-1-2019)
GTIN	4046356329842
Weight per Piece (including packing)	13.456 g
Weight per Piece (excluding packing)	12.775 g
Customs tariff number	85369010
Country of origin	DE

Technical Data

Product properties

Product type	Ground terminal block
Area of application	Railway industry
	Machine building
	Plant engineering
	Process industry
Number of connections	4
Number of rows	1

Insulation characteristics

Overvoltage category	III
Degree of pollution	3

Electrical properties

Rated surge voltage	8 kV
Maximum power dissipation for nominal condition	0.77 W

Connection data

Grounding foot	Yes
Number of connections per level	4
Nominal cross section	2.5 mm²
Note	Please observe the current carrying capacity of the DIN rails.
Stripping length	8 mm ... 10 mm
Internal cylindrical gage	A3
Connection in acc. with standard	IEC 60947-7-2
Conductor cross section solid	0.14 mm² ... 4 mm²
Cross section AWG	26 ... 12 (converted acc. to IEC)
Conductor cross section flexible	0.14 mm² ... 4 mm²
Conductor cross section, flexible [AWG]	26 ... 12 (converted acc. to IEC)
Flexible conductor cross section flexible (ferrule, w/o plastic sleeve)	0.14 mm² ... 2.5 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	0.14 mm² ... 2.5 mm²
Maximum load current	with 4 mm² conductor cross section, rigid
Nominal cross section	2.5 mm²
Cross section AWG	26 ... 12 (converted acc. to IEC)

Connection cross sections directly pluggable

Conductor cross section solid	0.34 mm² ... 4 mm²
Flexible conductor cross section flexible (ferrule, w/o plastic sleeve)	0.5 mm² ... 2.5 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	0.34 mm² ... 2.5 mm²

Ex data

Rated data (ATEX/IECEx)

ATEX certificate	PTB 09 ATEX 1111 U
IEC Ex certificate	IECEx PTB 10.0021 U
Identification	☐ II 2 G Ex eb IIC Gb
Operating temperature range	-60 °C ... 110 °C
Ex-certified accessories	3030514 D-ST 2,5-QUATTRO
	1204517 SZF 1-0,6X3,5
	3022276 CLIPFIX 35-5
	3022218 CLIPFIX 35
output	(Permanent)

Ex connection data General

Nominal cross section	2.5 mm²
Rated cross section AWG	14
Connection capacity rigid	0.14 mm² ... 4 mm²
Connection capacity AWG	26 ... 12
Connection capacity flexible	0.14 mm² ... 2.5 mm²
Connection capacity AWG	26 ... 14

Dimensions

Width	5.2 mm
End cover width	2.2 mm
Height	35.3 mm
Height NS 35/15	44.3 mm
Height NS 35/7,5	36.8 mm
Height	1.437 "
Length	72.2 mm

Material specifications

Color	green-yellow
Flammability rating according to UL 94	V0
Insulating material group	I
Insulating material	PA
Static insulating material application in cold	-60 °C
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed

Mechanical properties

Mechanical data

Open side panel	Yes

Environmental and real-life conditions

Oscillation/broadband noise

Specification	DIN EN 50155 (VDE 0115-200):2008-03
Spectrum	Service life test category 2, bogie-mounted
Frequency	f_1 = 5 Hz to f_2 = 250 Hz
ASD level	6.12 $(m/s^2)^2/Hz$
Acceleration	3.12g
Test duration per axis	5 h
Test directions	X-, Y- and Z-axis
Result	Test passed

Shocks

Specification	DIN EN 50155 (VDE 0115-200):2008-03
Pulse shape	Half-sine
Acceleration	30g
Shock duration	18 ms
Number of shocks per direction	3
Test directions	X-, Y- and Z-axis (pos. and neg.)
Result	Test passed

Ambient conditions

Ambient temperature (operation)	-60 °C ... 105 °C (max. short-term operating temperature RTI Elec.)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C
Permissible humidity (storage/transport)	30 % ... 70 %

Standards and regulations

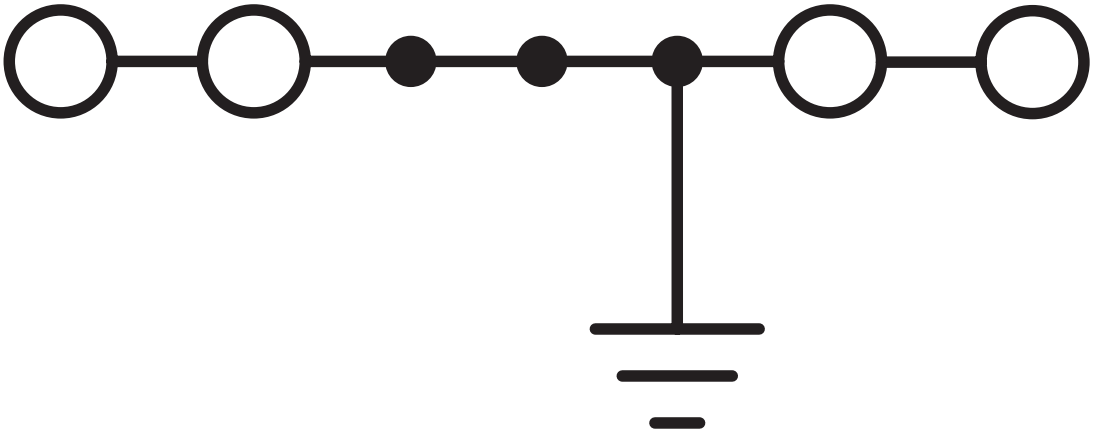
Connection in acc. with standard	IEC 60947-7-2

Mounting

Mounting type	NS 35/7,5
	NS 35/15

Drawings

Circuit diagram



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Multi-level terminal block - PT 2,5-3L

3210499

https://www.phoenixcontact.com/us/products/3210499

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Multi-level terminal block, nom. voltage: 500 V, nominal current: 20 A, connection method: Push-in connection, 1st, 2nd and 3rd level, Rated cross section: 2.5 mm^2, cross section: 0.14 mm^2 - 4 mm^2, mounting type: NS 35/7,5, NS 35/15, color: gray

Your advantages

- In addition to the testing facility in the double function shaft, all terminal blocks provide an additional test connection
- The compact design and front connection enable wiring in a confined space
- The Push-in connection terminal blocks are characterized by the system features of the CLIPLINE complete system and by easy and tool-free wiring of conductors with ferrules or solid conductors
- Tested for railway applications

Commercial Data

Item number	3210499
Packing unit	1 pc
Minimum order quantity	50 pc
Sales Key	B02
Product Key	BE2215
Catalog Page	Page 73 (C-1-2019)
GTIN	4046356422574
Weight per Piece (including packing)	18.133 g
Weight per Piece (excluding packing)	18.066 g
Customs tariff number	85369010
Country of origin	PL

Technical Data

Product properties

Product type	Multi-level terminal block
Area of application	Railway industry
	Machine building
	Plant engineering
Number of connections	6
Number of rows	3
Potentials	3

Insulation characteristics

Overvoltage category	III
Degree of pollution	3

Electrical properties

Rated surge voltage	6 kV
Maximum power dissipation for nominal condition	0.77 W

Connection data

Number of connections per level	2
Nominal cross section	2.5 mm²

1st, 2nd and 3rd level

Stripping length	8 mm ... 10 mm
Internal cylindrical gage	A3
Connection in acc. with standard	IEC 60947-7-1
Conductor cross section solid	0.14 mm² ... 4 mm²
Cross section AWG	26 ... 12 (converted acc. to IEC)
Conductor cross section flexible	0.14 mm² ... 4 mm²
Conductor cross section, flexible [AWG]	26 ... 12 (converted acc. to IEC)
Flexible conductor cross section flexible (ferrule, w/o plastic sleeve)	0.14 mm² ... 2.5 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	0.14 mm² ... 2.5 mm²
2 conductors with the same cross section, flexible, with TWIN ferrule with plastic sleeve	0.5 mm²
Nominal current	20 A
Maximum load current	24 A (with 4 mm² conductor cross section, rigid)
Nominal voltage	500 V
Nominal cross section	2.5 mm²

1st, 2nd and 3rd level Connection cross sections directly pluggable

Conductor cross section solid	0.34 mm² ... 4 mm²
Flexible conductor cross section flexible (ferrule, w/o plastic sleeve)	0.5 mm² ... 2.5 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	0.34 mm² ... 2.5 mm²

Ex data

Rated data (ATEX/IECEx)

ATEX certificate	SEV 13 ATEX 0159 U
IEC Ex certificate	IECEx SEV 13.0005 U
Identification	☐ II 2 GD Ex eb IIC Gb
Operating temperature range	-60 °C ... 110 °C
Ex-certified accessories	3211647 D-PT 2,5-3L
	1204517 SZF 1-0,6X3,5
	3022276 CLIPFIX 35-5
	3022218 CLIPFIX 35
List of bridges	Plug-in bridge / FBS 2-5 / 3030161
	Plug-in bridge / FBS 3-5 / 3030174
	Plug-in bridge / FBS 4-5 / 3030187
	Plug-in bridge / FBS 5-5 / 3030190
	Plug-in bridge / FBS 10-5 / 3030213
	Plug-in bridge / FBS 20-5 / 3030226
Bridge data	14.5 A / 2.5 mm²
Ex temperature increase	40 K (17 A / 2.5 mm²)
Rated voltage	440 V
for bridging with bridge	440 V
- At bridging between non-adjacent terminal blocks	352 V
- At bridging between non-adjacent terminal blocks via PE terminal block	352 V
- At cut-to-length bridging	166 V
- At cut-to-length bridging with cover	352 V
Rated insulation voltage	400 V
output	(Permanent)

Ex level General

Rated current	17 A
Maximum load current	21 A

Ex connection data General

Nominal cross section	2.5 mm²
Rated cross section AWG	14
Connection capacity rigid	0.14 mm² ... 4 mm²
Connection capacity AWG	26 ... 12
Connection capacity flexible	0.14 mm² ... 2.5 mm²
Connection capacity AWG	26 ... 14
output	(Permanent)

Ex level Level 1

Contact resistance	1.2 mΩ
output	(Permanent)

Ex level Level 2

Contact resistance	1.1 mΩ
output	(Permanent)

Ex level Level 3

Contact resistance	0.8 mΩ

Dimensions

Width	5.2 mm
End cover width	2.2 mm
Height	56.4 mm
Height NS 35/15	65.5 mm
Height NS 35/7,5	58 mm
Length	102 mm

Material specifications

Color	gray
Flammability rating according to UL 94	V0
Insulating material group	I
Insulating material	PA
Static insulating material application in cold	-60 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	125 °C
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3
Calorimetric heat release NFPA 130 (ASTM E 1354)	27,5 MJ/kg
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed

Electrical tests

Surge voltage test

Test voltage setpoint	7.3 kV
Result	Test passed

Temperature-rise test

Requirement temperature-rise test	Increase in temperature ≤ 45 K
Result	Test passed
Short-time withstand current 2.5 mm²	0.3 kA
Short-time withstand current 4 mm²	0.48 kA
Result	Test passed

Power-frequency withstand voltage

Test voltage setpoint	1.89 kV
Result	Test passed

Mechanical properties

Mechanical data

Open side panel	Yes

Mechanical tests

Mechanical strength

Result	Test passed

Attachment on the carrier

DIN rail/fixing support	NS 35
Test force setpoint	1 N
Result	Test passed

Test for conductor damage and slackening

Rotation speed	10 rpm
Revolutions	135
Conductor cross section/weight	0.14 mm² / 0.2 kg
	2.5 mm² / 0.7 kg
	4 mm² / 0.9 kg
Result	Test passed

Environmental and real-life conditions

Aging

Temperature cycles	192
Result	Test passed

Needle-flame test

Time of exposure	30 s
Result	Test passed

Oscillation/broadband noise

Specification	DIN EN 50155 (VDE 0115-200):2008-03
Spectrum	Service life test category 1, class B, body mounted
Frequency	f_1 = 5 Hz to f_2 = 150 Hz
ASD level	0.964 $(m/s^2)^2/Hz$
Acceleration	0.58g
Test duration per axis	5 h
Test directions	X-, Y- and Z-axis
Result	Test passed

Shocks

Specification	DIN EN 50155 (VDE 0115-200):2008-03
Pulse shape	Half-sine
Acceleration	5g
Shock duration	30 ms
Number of shocks per direction	3
Test directions	X-, Y- and Z-axis (pos. and neg.)
Result	Test passed

Ambient conditions

Ambient temperature (operation)	-60 °C ... 105 °C (max. short-term operating temperature RTI Elec.)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C
Permissible humidity (storage/transport)	30 % ... 70 %

Standards and regulations

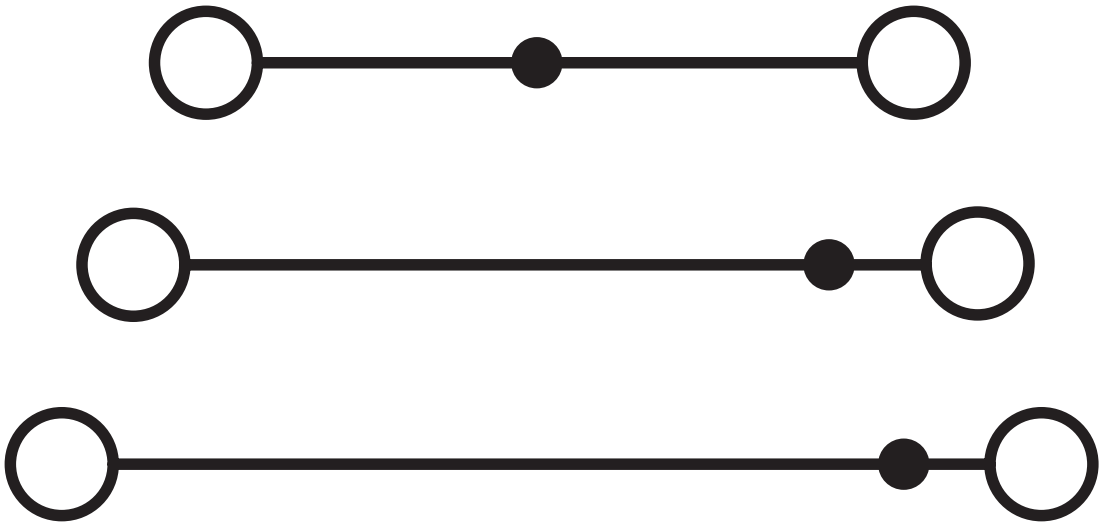
Connection in acc. with standard	IEC 60947-7-1

Mounting

Mounting type	NS 35/7,5
	NS 35/15

Drawings

Circuit diagram



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Installation ground terminal block - PTB 2,5-PE/L/TG

3210539

https://www.phoenixcontact.com/us/products/3210539

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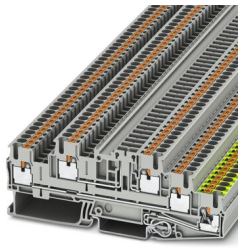


Installation ground terminal block, Current and voltage are determined by the plug used., nom. voltage: 400 V, nominal current: 22 A, Push-in connection, Rated cross section: 2.5 mm^2, cross section: 0.14 mm^2 - 4 mm^2, Push-in connection, Rated cross section: 2.5 mm^2, cross section: 0.14 mm^2 - 4 mm^2, mounting type: NS 35/7,5, NS 35/15, color: gray

Your advantages

- Double function shafts on all levels

Commercial Data

Item number	3210539
Packing unit	1 pc
Minimum order quantity	50 pc
Sales Key	B02
Product Key	BE2232
Catalog Page	Page 95 (C-1-2019)
GTIN	4046356693769
Weight per Piece (including packing)	21.396 g
Weight per Piece (excluding packing)	21.396 g
Customs tariff number	85369010
Country of origin	PL

Technical Data

Notes

General	Current and voltage are determined by the plug used.

Product properties

Product type	Ground terminal block
Number of connections	5
Number of rows	3
Potentials	2

Insulation characteristics

Overvoltage category	III
Degree of pollution	3

Electrical properties

Rated surge voltage	4 kV
Maximum power dissipation for nominal condition	0.77 W

Connection data

Grounding foot	Yes
Number of connections per level	2
Nominal cross section	2.5 mm²

Level 1+2

Note	Please observe the current carrying capacity of the DIN rails.
Stripping length	8 mm ... 10 mm
Internal cylindrical gage	A3
Conductor cross section solid	0.14 mm² ... 4 mm²
Cross section AWG	26 ... 12 (converted acc. to IEC)
Conductor cross section flexible	0.14 mm² ... 4 mm²
Conductor cross section, flexible [AWG]	26 ... 12 (converted acc. to IEC)
Flexible conductor cross section flexible (ferrule, w/o plastic sleeve)	0.14 mm² ... 2.5 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	0.14 mm² ... 2.5 mm²
2 conductors with the same cross section, flexible, with TWIN ferrule with plastic sleeve	0.5 mm²
Nominal current	22 A (with a 2.5 mm² conductor cross section)
Maximum load current	24 A (with 4 mm² conductor cross section)
	28 A (with 4 mm² conductor cross section and 3-pos. terminal block)
Nominal voltage	400 V (phase conductor/phase conductor)
	250 V (phase conductor/PE)
Nominal cross section	2.5 mm²

Level 3

Stripping length	8 mm ... 10 mm
Conductor cross section solid	0.14 mm² ... 4 mm²
Cross section AWG	26 ... 12 (converted acc. to IEC)
Conductor cross section flexible	0.14 mm² ... 4 mm²
Conductor cross section, flexible [AWG]	26 ... 12 (converted acc. to IEC)
Flexible conductor cross section flexible (ferrule, w/o plastic sleeve)	0.14 mm² ... 2.5 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	0.14 mm² ... 2.5 mm²
2 conductors with the same cross section, flexible, with TWIN ferrule with plastic sleeve	0.5 mm²
Nominal current	16 A (with a 2.5 mm² conductor cross section)
Maximum load current	16 A (with 4 mm² conductor cross section)
	16 A (with 1.5 mm² conductor cross section and 3-pos. terminal block base)
Nominal voltage	250 V
Nominal cross section	2.5 mm²

Level 1+2 Connection cross sections directly pluggable

Conductor cross section solid	0.34 mm² ... 4 mm²
Flexible conductor cross section flexible (ferrule, w/o plastic sleeve)	0.34 mm² ... 2.5 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	0.34 mm² ... 2.5 mm²

Level 3 Connection cross sections directly pluggable

Conductor cross section solid	0.34 mm² ... 4 mm²
Flexible conductor cross section flexible (ferrule, w/o plastic sleeve)	0.34 mm² ... 2.5 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	0.34 mm² ... 2.5 mm²

Dimensions

Width	5.2 mm
End cover width	2.2 mm
Height NS 35/15	49.8 mm
Height NS 35/7,5	42.3 mm
Length	118 mm

Material specifications

Color	gray
Flammability rating according to UL 94	V0
Insulating material group	I
Insulating material	PA
Static insulating material application in cold	-60 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	130 °C
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3

Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3
Calorimetric heat release NFPA 130 (ASTM E 1354)	28 MJ/kg
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed

Electrical tests

Surge voltage test

Test voltage setpoint	7.3 kV
Result	Test passed

Temperature-rise test

Requirement temperature-rise test	Increase in temperature ≤ 45 K
Result	Test passed
Short-time withstand current 2.5 mm²	0.3 kA
	0.18 kA
Result	Test passed

Power-frequency withstand voltage

Test voltage setpoint	1.89 kV
Result	Test passed

Mechanical properties

Mechanical data

Open side panel	Yes

Mechanical tests

Mechanical strength

Result	Test passed

Attachment on the carrier

DIN rail/fixing support	NS 35
Test force setpoint	1 N
Result	Test passed

Test for conductor damage and slackening

Rotation speed	10 rpm
Revolutions	135
Conductor cross section/weight	0.14 mm² / 0.2 kg
	2.5 mm² / 0.7 kg
	4 mm² / 0.9 kg
Result	Test passed

Environmental and real-life conditions

Aging

Temperature cycles	192
Result	Test passed

Needle-flame test

Time of exposure	30 s
Result	Test passed

Oscillation/broadband noise

Specification	DIN EN 50155 (VDE 0115-200):2008-03
Spectrum	Service life test category 2, bogie-mounted
Frequency	f_1 = 5 Hz to f_2 = 250 Hz
ASD level	6.12 (m/s²)²/Hz
Acceleration	3.12g
Test duration per axis	5 h
Test directions	X-, Y- and Z-axis
Result	Test passed

Shocks

Specification	DIN EN 50155 (VDE 0115-200):2008-03
Pulse shape	Half-sine
Acceleration	30g
Shock duration	18 ms
Number of shocks per direction	3
Test directions	X-, Y- and Z-axis (pos. and neg.)
Result	Test passed

Ambient conditions

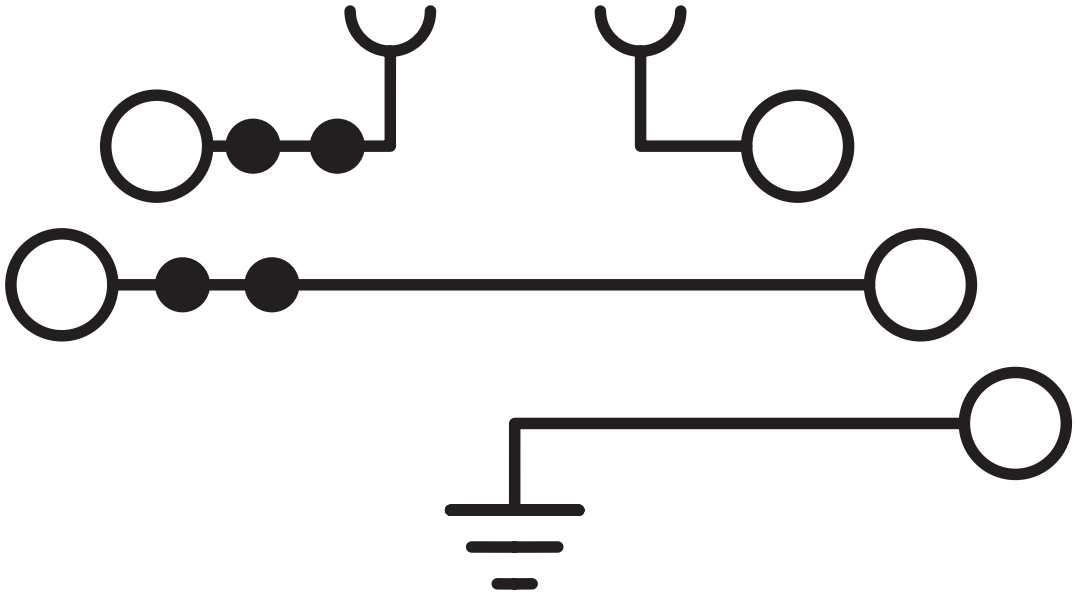
Ambient temperature (operation)	-60 °C ... 105 °C (max. short-term operating temperature RTI Elec.)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Ambient temperature (assembly)	-5 °C ... 70 °C
Permissible humidity (storage/transport)	30 % ... 70 %

Mounting

Mounting type	NS 35/7,5
	NS 35/15

Drawings

Circuit diagram



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Double-level terminal block - PTTB 2,5 - 3210567

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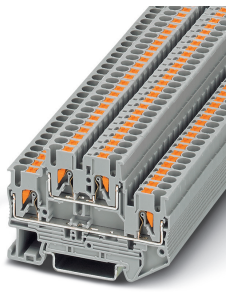


Double-level terminal block, connection method: Push-in connection, cross section: 0.14 mm² - 4 mm², AWG: 26 - 12, width: 5.2 mm, color: gray, mounting type: NS 35/7,5, NS 35/15

Your advantages

- The Push-in connection terminal blocks are characterized by the system features of the CLIPLINE complete system and by easy and tool-free wiring of conductors with ferrules or solid conductors
- The compact design and front connection enable wiring in a confined space
- In addition to the testing facility in the double function shaft, all terminal blocks provide an additional test connection
- Tested for railway applications

Key Commercial Data

Packing unit	1 pc
GTIN	4 046356 418980
GTIN	4046356418980
Weight per Piece (excluding packing)	11.200 g
Custom tariff number	85369010
Country of origin	China

Technical data

General

Number of rows	2
Number of connections	4
Nominal cross section	2.5 mm²
Color	gray
Insulating material	PA

Double-level terminal block - PTTB 2,5 - 3210567

Technical data

General

Flammability rating according to UL 94	V0
Area of application	Railway industry
Rated surge voltage	6 kV
Degree of pollution	3
Overvoltage category	III
Insulating material group	I
Connection in acc. with standard	IEC 60947-7-1
Nominal current I_N	22 A (with 2.5 mm² conductor connection cross section)
Maximum load current	26 A (with 4 mm² conductor cross section, rigid)
Nominal voltage U_N	500 V
Open side panel	Yes
Shock protection test specification	DIN EN 50274 (VDE 0660-514):2002-11
Back of the hand protection	guaranteed
Finger protection	guaranteed
Result of surge voltage test	Test passed
Surge voltage test setpoint	7.3 kV
Result of power-frequency withstand voltage test	Test passed
Power frequency withstand voltage setpoint	1.89 kV
Checking the mechanical stability of terminal points (5 x conductor connection)	Test passed
Result of flexion and pull-out test	Test passed
Bending test rotation speed	10 rpm
Bending test turns	135
Bending test conductor cross section/weight	0.14 mm² / 0.2 kg
	2.5 mm² / 0.7 kg
	4 mm² / 0.9 kg
Tensile test result	Test passed
Result of tight fit on support	Test passed
Tight fit on carrier	NS 35
Setpoint	1 N
Result of voltage-drop test	Test passed
Result of temperature-rise test	Test passed
Short circuit stability result	Test passed
Conductor cross section short circuit testing	2.5 mm²
Short-time current	0.3 kA
Conductor cross section short circuit testing	4 mm²
Short-time current	0.48 kA

Double-level terminal block - PTTB 2,5 - 3210567

Technical data

General

Result of aging test	Test passed
Ageing test for screwless modular terminal block temperature cycles	192
Result of thermal test	Test passed
Proof of thermal characteristics (needle flame) effective duration	30 s
Oscillation, broadband noise test result	Test passed
Test specification, oscillation, broadband noise	DIN EN 50155 (VDE 0115-200):2008-03
Test spectrum	Service life test category 2, bogie-mounted
Test frequency	f_1 = 5 Hz to f_2 = 250 Hz
ASD level	6.12 $(m/s^2)^2/Hz$
Acceleration	3.12g
Test duration per axis	5 h
Test directions	X-, Y- and Z-axis
Shock test result	Test passed
Test specification, shock test	DIN EN 50155 (VDE 0115-200):2008-03
Shock form	Half-sine
Acceleration	30g
Shock duration	18 ms
Number of shocks per direction	3
Test directions	X-, Y- and Z-axis (pos. and neg.)
Relative insulation material temperature index (Elec.; UL 746 B)	130 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	130 °C
Static insulating material application in cold	-60 °C
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed
Calorimetric heat release NFPA 130 (ASTM E 1354)	28 MJ/kg
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Dimensions

Width	5.2 mm
End cover width	2.2 mm
Length	68 mm
Height	45.8 mm
Height NS 35/7,5	47.5 mm
Height NS 35/15	55 mm

Double-level terminal block - PTTB 2,5 - 3210567

Technical data

Connection data

Connection method	Push-in connection
Conductor cross section solid min.	0.14 mm²
Conductor cross section solid max.	4 mm²
Conductor cross section flexible min.	0.14 mm²
Conductor cross section flexible max.	4 mm²
Conductor cross section AWG min.	26
Conductor cross section AWG max.	12
Conductor cross section flexible, with ferrule without plastic sleeve min.	0.14 mm²
Conductor cross section flexible, with ferrule without plastic sleeve max.	2.5 mm²
Conductor cross section flexible, with ferrule with plastic sleeve min.	0.14 mm²
Conductor cross section flexible, with ferrule with plastic sleeve max.	2.5 mm²
Two conductors with the same cross section, flexible, with TWIN ferrules, with plastic sleeve, maximum	0.5 mm²
Stripping length	8 mm ... 10 mm
Internal cylindrical gage	A4

Standards and Regulations

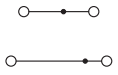
Connection in acc. with standard	CSA
	IEC 60947-7-1
Flammability rating according to UL 94	V0

Environmental Product Compliance

China RoHS	Environmentally friendly use period: unlimited = EFUP-e
	No hazardous substances above threshold values

Drawings

Circuit diagram



Classifications

eCl@ss

eCl@ss 10.0.1	27141120
eCl@ss 11.0	27141120
eCl@ss 4.0	27141100
eCl@ss 4.1	27141100
eCl@ss 5.0	27141100

Double-level terminal block - PTTB 2,5 - 3210567

Classifications

eCl@ss

eCl@ss 5.1	27141100
eCl@ss 6.0	27141100
eCl@ss 7.0	27141120
eCl@ss 9.0	27141120

ETIM

ETIM 2.0	EC000897
ETIM 3.0	EC000897
ETIM 4.0	EC000897
ETIM 6.0	EC000897
ETIM 7.0	EC000897

UNSPSC

UNSPSC 6.01	30211811
UNSPSC 7.0901	39121410
UNSPSC 11	39121410
UNSPSC 12.01	39121410
UNSPSC 13.2	39121410
UNSPSC 18.0	39121410
UNSPSC 19.0	39121410
UNSPSC 20.0	39121410
UNSPSC 21.0	39121410

Approvals

Approvals

Approvals

DNV GL / NK / CSA / BV / LR / NK / ABS / UL Recognized / cUL Recognized / IECEE CB Scheme / EAC / RS / EAC / LR / VDE Zeichengenehmigung / cULus Recognized

Ex Approvals

IECEx / EAC Ex / NEPSI / ATEX / CCC

Approval details

Double-level terminal block - PTTB 2,5 - 3210567

Approvals

DNV GL	https://approvalfinder.dnvgl.com/	TAE00003JE

NK	http://www.classnk.or.jp/hp/en/	14ME0912

CSA	http://www.csagroup.org/services-industries/product-listing/	13631

	B	C	D
Nominal voltage UN	300 V	300 V	600 V
Nominal current IN	20 A	20 A	5 A
mm²/AWG/kcmil	26-12	26-12	26-12

BV	http://www.veristar.com/portal/veristarinfo/generalinfo/approved/approvedProducts/equipmentAndMaterials	25278/B0 BV

LR	http://www.lr.org/en	12/20038 (E3)

NK	http://www.classnk.or.jp/hp/en/	14ME0913

ABS	http://www.eagle.org/eagleExternalPortalWEB/	16-HG1591536-PDA

UL Recognized	http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 60425

	B	C	D
Nominal voltage UN	300 V	300 V	600 V
Nominal current IN	20 A	20 A	5 A
mm²/AWG/kcmil	26-12	26-12	26-12

Double-level terminal block - PTTB 2,5 - 3210567

Approvals

cUL Recognized		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 60425

	B	C	D
Nominal voltage UN	300 V	300 V	600 V
Nominal current IN	20 A	20 A	5 A
mm²/AWG/kcmil	26-12	26-12	26-12

IECEE CB Scheme		http://www.iecee.org/	DE1-62953
EAC			RU C-DE.AI30.B.01102
RS		http://www.rs-head.spb.ru/en/index.php	17.00013.272
EAC			RU C-DE.BL08.B.00644
LR		http://www.lr.org/en	14/20056
VDE Zeichengenehmigung		http://www2.vde.com/de/Institut/Online-Service/VDE-gepruefteProdukte/Seiten/Online-Suche.aspx	40032222

Nominal voltage UN	500 V
Nominal current IN	22 A
mm²/AWG/kcmil	0.2-2.5

Double-level terminal block - PTTB 2,5 - 3210567

Approvals

cULus Recognized

Accessories

Accessories

Bridge

Wire bridge - FBSW 2-5/250MM - 3030172

Wire bridge, length: 250 mm, width: 5.1 mm, number of positions: 1, color: red/black

Wire bridge - FBSW 2-5/60MM - 3030170

Wire bridge, length: 60 mm, width: 5.1 mm, number of positions: 1, color: red/black

Wire bridge - FBSW 2-5/110MM - 3030171

Wire bridge, length: 110 mm, width: 5.1 mm, number of positions: 1, color: red/black

Wire bridge - FBSW 2-5/250MM - 3030172

Wire bridge, length: 250 mm, width: 5.1 mm, number of positions: 1, color: red/black

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Wire bridge - FBSW 2-5/60MM - 3030170

Wire bridge, length: 60 mm, width: 5.1 mm, number of positions: 1, color: red/black

Wire bridge - FBSW 2-5/110MM - 3030171

Wire bridge, length: 110 mm, width: 5.1 mm, number of positions: 1, color: red/black

Component plug terminal block

Component connector - P-CO 2-5 R47K - 3032447

Component connector, with 47 kOhm resistance for wire-break monitoring, pitch: 5.2 mm, length: 8.9 mm, width: 4.1 mm, height: 34.8 mm, number of positions: 2, color: black

Crimping tool

Crimping pliers - CRIMPFOX CENTRUS 6S - 1213144

Crimping pliers, for uninsulated and insulated ferrules, DIN 46228 Part 1 and 4, from 0.14 mm² … 6 mm², also for TWIN ferrules up to 2 x 4 mm², automatic cross section adjustment, lateral insertion, equipped with fall protection

Crimping pliers - CRIMPFOX CENTRUS 10S - 1213154

Crimping pliers, for uninsulated and insulated ferrules, DIN 46228 Part 1 and 4, from 0.14 mm² ... 10 mm², also for TWIN ferrules up to 2 x 4 mm², automatic cross section adjustment, lateral insertion, equipped with fall protection

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Crimping pliers - CRIMPFOX CENTRUS 6H - 1213146

Crimping pliers, for uninsulated and insulated ferrules, DIN 46228 Part 1 and 4, from 0.14 mm² … 6 mm², also for TWIN ferrules up to 2 x 4 mm², automatic cross section adjustment, lateral insertion, equipped with fall protection

Crimping pliers - CRIMPFOX CENTRUS 10H - 1213156

Crimping pliers, for uninsulated and insulated ferrules, DIN 46228 Part 1 and 4, from 0.14 mm² ... 10 mm², also for TWIN ferrules up to 2 x 4 mm², automatic cross section adjustment, lateral insertion, equipped with fall protection

Crimping pliers - CRIMPFOX 10S - 1212045

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.14 mm² ... 10 mm², unlockable pressure lock, lateral entry

Crimping pliers - CRIMPFOX 6H - 1212046

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.14 mm² ... 6 mm², unlockable pressure lock, lateral entry

Crimping pliers - CRIMPFOX 2,5-M - 1212719

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.25 mm² ... 2.5 mm², lateral entry, trapezoidal crimp

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Crimping pliers - CRIMPFOX 6-M - 1212720

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.25 mm² ... 6.0 mm², lateral entry, trapezoidal crimp

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Crimping pliers - CRIMPFOX 6 - 1212034

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.25 mm² ... 6.0 mm², lateral entry, trapezoidal crimp

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Crimping pliers - CRIMPFOX 6T - 1212037

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.25 mm² ... 6 mm², lateral entry, trapezoidal crimp

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Crimping pliers - CRIMPFOX 6T-F - 1212038

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.25 mm² ... 6 mm², front entry, trapezoidal crimp

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Crimping pliers - CRIMPFOX 6S-F - 1212043

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.5 mm² ... 6 mm², front entry, square crimp

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Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Crimping pliers - CRIMPFOX-M - 1212072

Basic pliers, for accommodating dies for a wide range of type of contacts

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DIN rail

DIN rail perforated - NS 35/ 7,5 PERF 2000MM - 0801733

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 UNPERF 2000MM - 0801681

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail perforated - NS 35/ 7,5 WH PERF 2000MM - 1204119

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 WH UNPERF 2000MM - 1204122

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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Double-level terminal block - PTTB 2,5 - 3210567

Accessories

DIN rail, unperforated - NS 35/ 7,5 AL UNPERF 2000MM - 0801704

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Aluminum, uncoated, length: 2000 mm, color: silver

DIN rail perforated - NS 35/ 7,5 ZN PERF 2000MM - 1206421

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/ 7,5 ZN UNPERF 2000MM - 1206434

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/ 7,5 CU UNPERF 2000MM - 0801762

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Copper, uncoated, length: 2000 mm, color: copper-colored

End cap - NS 35/ 7,5 CAP - 1206560

DIN rail end piece, for DIN rail NS 35/7.5

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

DIN rail perforated - NS 35/15 PERF 2000MM - 1201730

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/15 UNPERF 2000MM - 1201714

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail perforated - NS 35/15 WH PERF 2000MM - 0806602

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/15 WH UNPERF 2000MM - 1204135

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/15 AL UNPERF 2000MM - 1201756

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Aluminum, uncoated, length: 2000 mm, color: silver

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Double-level terminal block - PTTB 2,5 - 3210567

Accessories

DIN rail perforated - NS 35/15 ZN PERF 2000MM - 1206599

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/15 ZN UNPERF 2000MM - 1206586

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/15 CU UNPERF 2000MM - 1201895

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Copper, uncoated, length: 2000 mm, color: copper-colored

End cap - NS 35/15 CAP - 1206573

DIN rail end piece, for DIN rail NS 35/15

DIN rail, unperforated - NS 35/15-2,3 UNPERF 2000MM - 1201798

DIN rail, unperforated, Standard profile 2.3 mm, width: 35 mm, height: 15 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

Documentation

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Mounting material - PT-IL - 3208090

Operating decal for the push-in Technology

End block

End clamp - CLIPFIX 35 - 3022218

Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN rail, with marking option, width: 9.5 mm, color: gray

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End clamp - CLIPFIX 35-5 - 3022276

Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN rail, with marking option, with parking option for FBS...5, FBS...6, KSS 5, KSS 6, width: 5.15 mm, color: gray

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End clamp - E/NS 35 N - 0800886

End clamp, width: 9.5 mm, color: gray

End cover

End cover - D-PTTB 2,5 - 3211634

End cover, length: 68 mm, width: 2.2 mm, height: 39.6 mm, color: gray

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Filler plug

Filler plugs - CEC 2,5 - 3062757

Cover for conductor shaft, 10-pos., for spring cage terminal blocks (ST) and terminal blocks with push-in technology (PT) with a width of 5.2 mm

Front adapter

Front adapters - VIP-PA-PWR/20XOE/ 2,0M/S7 - 2904725

VIP power cabling, universal front adapter for connection to all popular 20-pos. SIMATIC S7-300 I/O modules, via 20 individual wires in rope structure, not assembled (field connection, e.g., via 20 modular terminal blocks), cable length: 2 m

Front adapters - VIP-PA-PWR/40XOE/ 2,0M/S7 - 2904732

VIP power cabling, universal front adapter for connection to all popular 40-pos. SIMATIC S7-300 I/O modules, via 40 individual wires in rope structure, not assembled (field connection, e.g., via 40 modular terminal blocks), cable length: 2 m

Insulating sleeve

Insulating sleeve - MPS-IH WH - 0201663

Insulating sleeve, color: white

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Insulating sleeve - MPS-IH RD - 0201676

Insulating sleeve, color: red

Insulating sleeve - MPS-IH BU - 0201689

Insulating sleeve, color: blue

Insulating sleeve - MPS-IH YE - 0201692

Insulating sleeve, color: yellow

Insulating sleeve - MPS-IH GN - 0201702

Insulating sleeve, color: green

Insulating sleeve - MPS-IH GY - 0201728

Insulating sleeve, color: gray

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Insulating sleeve - MPS-IH BK - 0201731

Insulating sleeve, color: black

Insulating sleeve - ISH 2,5/0,2 - 3002843

Insulating sleeve, color: white

Insulating sleeve - ISH 2,5/0,5 - 3002856

Insulating sleeve, color: gray

Insulating sleeve - ISH 2,5/1,0 - 3002869

Insulating sleeve, color: black

Jumper

Plug-in bridge - FBS 2-5 - 3030161

Plug-in bridge, pitch: 5.2 mm, length: 22.7 mm, width: 9 mm, number of positions: 2, color: red

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Plug-in bridge - FBS 3-5 - 3030174

Plug-in bridge, pitch: 5.2 mm, length: 22.7 mm, width: 14.2 mm, number of positions: 3, color: red

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Plug-in bridge - FBS 4-5 - 3030187

Plug-in bridge, pitch: 5.2 mm, length: 22.7 mm, width: 19.4 mm, number of positions: 4, color: red

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Plug-in bridge - FBS 5-5 - 3030190

Plug-in bridge, pitch: 5.2 mm, length: 23 mm, width: 24.6 mm, number of positions: 5, color: red

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Plug-in bridge - FBS 10-5 - 3030213

Plug-in bridge, pitch: 5.2 mm, length: 22.7 mm, width: 50.6 mm, number of positions: 10, color: red

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Plug-in bridge - FBS 20-5 - 3030226

Plug-in bridge, pitch: 5.2 mm, number of positions: 20, color: red

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Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Plug-in bridge - FBS 50-5 - 3038930

Plug-in bridge, pitch: 5.2 mm, number of positions: 50, color: red

Plug-in bridge - FBSR 2-5 - 3033702

Plug-in bridge, pitch: 5.2 mm, number of positions: 2, color: red

Plug-in bridge - FBSR 3-5 - 3001591

Plug-in bridge, pitch: 5.2 mm, number of positions: 3, color: red

Plug-in bridge - FBSR 4-5 - 3001592

Plug-in bridge, pitch: 5.2 mm, number of positions: 4, color: red

Plug-in bridge - FBSR 5-5 - 3001593

Plug-in bridge, pitch: 5.2 mm, number of positions: 5, color: red

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Plug-in bridge - FBSR 10-5 - 3033710

Plug-in bridge, pitch: 5.2 mm, number of positions: 10, color: red

Plug-in bridge - FBS 2-5 BU - 3036877

Plug-in bridge, pitch: 5.2 mm, number of positions: 2, color: blue

Plug-in bridge - FBS 3-5 BU - 3036880

Plug-in bridge, pitch: 5.2 mm, number of positions: 3, color: blue

Plug-in bridge - FBS 4-5 BU - 3036893

Plug-in bridge, pitch: 5.2 mm, number of positions: 4, color: blue

Plug-in bridge - FBS 5-5 BU - 3036903

Plug-in bridge, pitch: 5.2 mm, number of positions: 5, color: blue

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Plug-in bridge - FBS 10-5 BU - 3036916

Plug-in bridge, pitch: 5.2 mm, number of positions: 10, color: blue

Plug-in bridge - FBS 20-5 BU - 3036929

Plug-in bridge, pitch: 5.2 mm, number of positions: 20, color: blue

Plug-in bridge - FBS 50-5 BU - 3032114

Plug-in bridge, pitch: 5.2 mm, number of positions: 50, color: blue

Labeled terminal marker

Zack Marker strip, flat - ZBF 5 CUS - 0825025

Zack Marker strip, flat, can be ordered: Strip, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Zack Marker strip, flat - ZBF 5,LGS:FORTL.ZAHLEN - 0808671

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 491 ... 500, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Zack Marker strip, flat - ZBF 5,QR:FORTL.ZAHLEN - 0808697

Zack Marker strip, flat, Strip, white, labeled, Printed vertically: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 91 ... 100, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Zack Marker strip, flat - ZBF 5,LGS:GERADE ZAHLEN - 0810821

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: consecutive numbers 2 ... 20, 22 ... 40, etc. up to 82 ... 100, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Zack Marker strip, flat - ZBF 5,LGS:UNGERADE ZAHLEN - 0810863

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: Odd numbers 1 - 19, 21 - 39, etc. up to 81 - 99, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Marker for terminal blocks - UC-TMF 5 CUS - 0824638

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 5.2 mm, lettering field size: 4.6 x 5.1 mm, Number of individual labels: 96

Marker for terminal blocks - UCT-TMF 5 CUS - 0829658

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 5.2 mm, lettering field size: 4.4 x 4.7 mm, Number of individual labels: 72

Marker carriers

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Marker carriers - STP 5-2 - 0800967

Double marker carrier, snaps onto the double-level spring-cage terminal block STTB 2,5, STTB 4, PTTB 2,5, PTTB 4 can be marked with UC-TM 5, ZB 5 or UC-TMF 5, ZBF 5

Marker carriers - STP 5-2/S - 0800970

Double marker carrier, snaps onto the double-level spring-cage terminal block ZFKK 1,5, with MSTBV or ICV pick-off

Partition plate

Partition plate - ATP-STTB 4 - 3030747

Partition plate, length: 88.7 mm, width: 2 mm, height: 53 mm, color: gray

Spacer plate - DP PS-5 - 3036725

Spacer plate, length: 22.4 mm, width: 5.2 mm, height: 29 mm, number of positions: 1, color: red

Planning and marking software

Software - PROJECT COMPLETE - 1050453

Intuitive planning and marking software for configuring terminal strips and for professional marking of marking materials for terminal blocks, conductors, cables, devices, and systems. The software is available for download

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Screwdriver tools

Screwdriver - SZF 1-0,6X3,5 - 1204517

Actuation tool, for ST terminal blocks, also suitable for use as a bladed screwdriver, size: 0.6 x 3.5 x 100 mm, 2-component grip, with non-slip grip

Actuation tool - ST-BW - 1207608

Actuation tool, for all 2.5 mm² - 4.0 mm² spring-cages

Terminal marking

Zack Marker strip, flat - ZBF 5:UNBEDRUCKT - 0808642

Zack Marker strip, flat, Strip, white, unlabeled, can be labeled with: PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.1 x 5.2 mm, Number of individual labels: 10

Marker for terminal blocks - UC-TMF 5 - 0818153

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into flat marker groove, for terminal block width: 5.2 mm, lettering field size: 4.6 x 5.1 mm, Number of individual labels: 96

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Marker for terminal blocks - UCT-TMF 5 - 0828744

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: TOPMARK NEO, TOPMARK LASER, BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, THERMOMARK PRIME, THERMOMARK CARD 2.0, THERMOMARK CARD, mounting type: snap into flat marker groove, for terminal block width: 5.2 mm, lettering field size: 4.4 x 4.7 mm, Number of individual labels: 72

Test plug terminal block

Reducing plug - RPS - 0201647

Reducing plug, color: gray

Test plugs - MPS-MT - 0201744

Test plugs, with solder connection up to 1 mm² conductor cross section, color: gray

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Test plugs - PS-5 - 3030983

Test plugs, Modular test plug, color: red

Test plugs - PS-5/2,3MM RD - 3038723

Test plugs, color: red

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Test socket

Test adapter - PAI-4-FIX-5/6 BU - 3035975

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 OG - 3035974

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 YE - 3035977

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 RD - 3035976

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 GN - 3035978

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Test adapter - PAI-4-FIX-5/6 BK - 3035980

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 GY - 3035982

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 VT - 3035979

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 BN - 3035981

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 WH - 3035983

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Vertical bridge

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Potential bridge - FBS-PV - 3032185

Vertical potential bridge, to connect the upper and lower level

---

Warning label printed

Warning label - WS PT 2,5 - 1029026

Warning label, yellow/black, labeled: Lightning flash, mounting type: plug in, for terminal block width: 5.2 mm

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Warning label - WS-DIO PT 2,5 - 1029037

Warning label, yellow/black, labeled: Diode, mounting type: plug in, for terminal block width: 5.2 mm

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End cover - D-PTTB 2,5 - 3211634

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End cover, length: 68 mm, width: 2.2 mm, height: 39.6 mm, color: gray

RoHS COMPLETE line

Key Commercial Data

Packing unit	1 pc
Minimum order quantity	50 pc
GTIN	4 046356 428378
GTIN	4046356428378
Weight per Piece (excluding packing)	3.250 g
Custom tariff number	85389099
Country of origin	Germany

Technical data

General

Color	gray
Material	PA
Flammability rating according to UL 94	V0

Dimensions

Width	2.2 mm
End cover width	2.2 mm
Length	68 mm
Height	39.6 mm
Height NS 35/7,5	47.5 mm

End cover - D-PTTB 2,5 - 3211634

Technical data

Dimensions

Height NS 35/15	55 mm

General

Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	130 °C
Static insulating material application in cold	-60 °C
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Calorimetric heat release NFPA 130 (ASTM E 1354)	28 MJ/kg
Smoke gas toxicity NFPA 130 (SMP 800C)	passed
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Ambient conditions

Operating temperature	-60 °C ... 105 °C (max. short-term operating temperature 130°C)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Permissible humidity (storage/transport)	30 % ... 70 %
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C

Standards and Regulations

Flammability rating according to UL 94	V0

Environmental Product Compliance

China RoHS	Environmentally friendly use period: unlimited = EFUP-e
	No hazardous substances above threshold values

Classifications

eCl@ss

eCl@ss 10.0.1	27141133
eCl@ss 11.0	27141133
eCl@ss 4.0	21011300
eCl@ss 4.1	21011300
eCl@ss 5.0	27141100
eCl@ss 5.1	27141100
eCl@ss 6.0	27141100

End cover - D-PTTB 2,5 - 3211634

Classifications

eCl@ss

eCl@ss 7.0	27141133
eCl@ss 9.0	27141133

ETIM

ETIM 2.0	EC000886
ETIM 3.0	EC000886
ETIM 4.0	EC000886
ETIM 6.0	EC000886
ETIM 7.0	EC000886

UNSPSC

UNSPSC 6.01	30211827
UNSPSC 7.0901	39121424
UNSPSC 11	39121424
UNSPSC 12.01	39121424
UNSPSC 13.2	39121425
UNSPSC 18.0	39121425
UNSPSC 19.0	39121425
UNSPSC 20.0	39121425
UNSPSC 21.0	39121425

End cover - D-PT 2,5-3L

3211647

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End cover, length: 102.2 mm, width: 2.2 mm, height: 50.2 mm, color: gray

Commercial Data

Item number	3211647
Packing unit	1 pc
Minimum order quantity	50 pc
Sales Key	B02
Product Key	BE2Z1X
Catalog Page	Page 73 (C-1-2019)
GTIN	4046356428385
Weight per Piece (including packing)	6.388 g
Weight per Piece (excluding packing)	5 g
Customs tariff number	85389099
Country of origin	DE

Technical Data

Product properties

Product type	End cover

Ambient conditions

Ambient temperature (operation)	-60 °C ... 105 °C (max. short-term operating temperature RTI Elec.)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C
Permissible humidity (storage/transport)	30 % ... 70 %

Material specifications

Color	gray
Material	PA
Flammability rating according to UL 94	V0
Static insulating material application in cold	-60 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	130 °C
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3
Calorimetric heat release NFPA 130 (ASTM E 1354)	28 MJ/kg
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed

Dimensions

Width	2.2 mm
End cover width	2.2 mm
Height	50.2 mm
Length	102.2 mm

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Feed-through terminal block - PT 6

3211813

https://www.phoenixcontact.com/us/products/3211813

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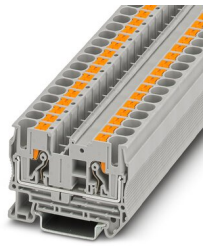


Feed-through terminal block, nom. voltage: 1000 V, nominal current: 41 A, connection method: Push-in connection, Rated cross section: 6 mm^2, cross section: 0.5 mm^2 - 10 mm^2, mounting type: NS 35/7,5, NS 35/15, color: gray

Your advantages

- In addition to the testing facility in the double function shaft, all terminal blocks provide an additional test connection
- The Push-in connection terminal blocks are characterized by the system features of the CLIPLINE complete system and by easy and tool-free wiring of conductors with ferrules or solid conductors
- The compact design and front connection enable wiring in a confined space
- Tested for railway applications

Commercial Data

Item number	3211813
Packing unit	1 pc
Minimum order quantity	50 pc
Sales Key	B02
Product Key	BE2211
Catalog Page	Page 111 (C-1-2019)
GTIN	4046356494656
Weight per Piece (including packing)	14.98 g
Weight per Piece (excluding packing)	13.98 g
Customs tariff number	85369010
Country of origin	CN

Technical Data

Product properties

Product type	Feed-through terminal block
Number of positions	1
Area of application	Railway industry
	Machine building
	Plant engineering
Number of connections	2
Number of rows	1
Potentials	1

Insulation characteristics

Overvoltage category	III
Degree of pollution	3

Electrical properties

Rated surge voltage	8 kV
Maximum power dissipation for nominal condition	1.31 W

Connection data

Number of connections per level	2
Nominal cross section	6 mm²
Stripping length	10 mm ... 12 mm
Internal cylindrical gage	A5
Connection in acc. with standard	IEC 60947-7-1
Conductor cross section solid	0.5 mm² ... 10 mm²
Cross section AWG	20 ... 8 (converted acc. to IEC)
Conductor cross section flexible	0.5 mm² ... 10 mm²
Conductor cross section, flexible [AWG]	20 ... 8 (converted acc. to IEC)
Flexible conductor cross section flexible (ferrule, w/o plastic sleeve)	0.5 mm² ... 6 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	0.5 mm² ... 6 mm²
2 conductors with the same cross section, flexible, with TWIN ferrule with plastic sleeve	0.5 mm² ... 1.5 mm² When using TWIN ferrules, we recommend a minimum ferrule length of 13 mm.
Nominal current	41 A
Maximum load current	52 A (with 10 mm² conductor cross section, rigid)
Nominal voltage	1000 V
Nominal cross section	6 mm²

Connection cross sections directly pluggable

Conductor cross section solid	1 mm² ... 10 mm²
Flexible conductor cross section flexible (ferrule, w/o plastic sleeve)	1 mm² ... 6 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	1 mm² ... 6 mm²

Ex data

Rated data (ATEX/IECEx)

ATEX certificate	SEV 13 ATEX 0159 U
IEC Ex certificate	IECEx SEV 13.0005 U
Identification	☐ II 2 GD Ex eb IIC Gb
Operating temperature range	-60 °C ... 110 °C
Ex-certified accessories	3212044 D-PT 6
	3024481 ATP-ST 6
	1204520 SZF 2-0,8X4,0
	3022276 CLIPFIX 35-5
	3022218 CLIPFIX 35
List of bridges	Plug-in bridge / FBS 2-8 / 3030284
	Plug-in bridge / FBS 3-8 / 3030297
	Plug-in bridge / FBS 4-8 / 3030307
	Plug-in bridge / FBS 5-8 / 3030310
	Plug-in bridge / FBS 6-8 / 3032470
	Plug-in bridge / FBS 10-8 / 3030323
Bridge data	35 A / 6 mm²
Ex temperature increase	40 K (36.5 A / 6 mm²)
Rated voltage	550 V
for bridging with bridge	550 V
- At bridging between non-adjacent terminal blocks	275 V
- At bridging between non-adjacent terminal blocks via PE terminal block	275 V
- At cut-to-length bridging	220 V
- At cut-to-length bridging with cover	275 V
- At cut-to-length bridging with partition plate	550 V
Rated insulation voltage	500 V
output	(Permanent)

Ex level General

Rated current	36.5 A
Maximum load current	46 A
Contact resistance	0.48 mΩ

Ex connection data General

Nominal cross section	6 mm²
Rated cross section AWG	10
Connection capacity rigid	0.5 mm² ... 10 mm²
Connection capacity AWG	20 ... 8
Connection capacity flexible	0.5 mm² ... 6 mm²
Connection capacity AWG	20 ... 10

Dimensions

Width	8.2 mm
End cover width	2.2 mm
Height	42.2 mm
Height NS 35/15	51 mm
Height NS 35/7,5	43.5 mm
Length	57.7 mm

Material specifications

Color	gray
Flammability rating according to UL 94	V0
Insulating material group	I
Insulating material	PA
Static insulating material application in cold	-60 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	125 °C
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3
Calorimetric heat release NFPA 130 (ASTM E 1354)	27,5 MJ/kg
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed

Electrical tests

Surge voltage test

Test voltage setpoint	9.8 kV
Result	Test passed

Temperature-rise test

Requirement temperature-rise test	Increase in temperature ≤ 45 K
Result	Test passed
Short-time withstand current 6 mm²	0.72 kA
Result	Test passed

Power-frequency withstand voltage

Test voltage setpoint	2.2 kV
Result	Test passed

Mechanical properties

Mechanical data

Open side panel	Yes

Mechanical tests

Mechanical strength

Result	Test passed

Attachment on the carrier

DIN rail/fixing support	NS 35
Test force setpoint	5 N
Result	Test passed

Test for conductor damage and slackening

Rotation speed	10 rpm
Revolutions	135
Conductor cross section/weight	0.5 mm² / 0.3 kg
	6 mm² / 1.4 kg
	10 mm² / 2 kg
Result	Test passed

Environmental and real-life conditions

Aging

Temperature cycles	192
	192
Result	Test passed
	Test passed

Needle-flame test

Time of exposure	30 s
Result	Test passed

Oscillation/broadband noise

Specification	DIN EN 50155 (VDE 0115-200):2018-05
Spectrum	Service life test category 2, bogie-mounted
Frequency	f_1 = 5 Hz to f_2 = 250 Hz
ASD level	6.12 (m/s²)²/Hz
Acceleration	3.12g
Test duration per axis	5 h
Test directions	X-, Y- and Z-axis
Result	Test passed

Shocks

Specification	DIN EN 50155 (VDE 0115-200):2018-05
Pulse shape	Half-sine
Acceleration	30g
Shock duration	18 ms
Number of shocks per direction	3
Test directions	X-, Y- and Z-axis (pos. and neg.)
Result	Test passed

Ambient conditions

Ambient temperature (operation)	-60 °C ... 105 °C (max. short-term operating temperature RTI Elec.)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C
Permissible humidity (storage/transport)	30 % ... 70 %

Standards and regulations

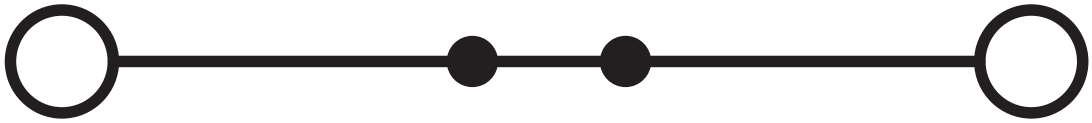
Connection in acc. with standard	IEC 60947-7-1

Mounting

Mounting type	NS 35/7,5
	NS 35/15

Drawings

Circuit diagram



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Disconnect terminal block - PT 4-TG

3211922

https://www.phoenixcontact.com/us/products/3211922

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Disconnect terminal block, Current and voltage are determined by the plug used., nom. voltage: 500 V, nominal current: 20 A, connection method: Push-in connection, Rated cross section: 4 mm^2, cross section: 0.2 mm^2 - 6 mm^2, mounting: NS 35/7,5, NS 35/15, color: gray

Your advantages

- The compact design and front connection enable wiring in a confined space
- In addition to the testing facility in the double function shaft, all terminal blocks provide an additional test connection
- The Push-in connection terminal blocks are characterized by the system features of the CLIPLINE complete system and by easy and tool-free wiring of conductors with ferrules or solid conductors
- Tested for railway applications

Commercial Data

Item number	3211922
Packing unit	1 pc
Minimum order quantity	50 pc
Sales Key	B02
Product Key	BE2232
Catalog Page	Page 103 (C-1-2019)
GTIN	4046356482561
Weight per Piece (including packing)	8.448 g
Weight per Piece (excluding packing)	8.43 g
Customs tariff number	85369010
Country of origin	PL

Technical Data

Notes

General	Current and voltage are determined by the plug used.

Product properties

Product type	Disconnect terminal block
Area of application	Railway industry
	Machine building
	Plant engineering
Number of connections	2
Number of rows	1
Potentials	1

Insulation characteristics

Overvoltage category	III
Degree of pollution	3

Electrical properties

Rated surge voltage	6 kV
Maximum power dissipation for nominal condition	1.02 W

Connection data

Number of connections per level	2
Nominal cross section	4 mm²
Stripping length	10 mm ... 12 mm
Internal cylindrical gage	A4
Connection in acc. with standard	IEC 60947-7-1
Conductor cross section solid	0.2 mm² ... 6 mm²
Cross section AWG	24 ... 10 (converted acc. to IEC)
Conductor cross section flexible	0.2 mm² ... 6 mm²
Conductor cross section, flexible [AWG]	24 ... 10 (converted acc. to IEC)
Flexible conductor cross section flexible (ferrule, w/o plastic sleeve)	0.25 mm² ... 4 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	0.25 mm² ... 4 mm²
2 conductors with the same cross section, flexible, with TWIN ferrule with plastic sleeve	0.5 mm² ... 1 mm²
Nominal current	20 A
Maximum load current	20 A (with 6 mm² conductor cross section, rigid)
Nominal voltage	500 V (Current and voltage are determined by the plug used.)
Nominal cross section	4 mm²

Connection cross sections directly pluggable

Conductor cross section solid	0.5 mm² ... 6 mm²
Flexible conductor cross section flexible (ferrule, w/o plastic	0.5 mm² ... 4 mm²

sleeve)	
Flexible conductor cross section (ferrule with plastic sleeve)	0.5 mm² ... 4 mm²

Dimensions

Width	6.2 mm
End cover width	2.2 mm
Height NS 35/15	44 mm
Height NS 35/7,5	36.5 mm
Height	1.437 "
Length	56 mm

Material specifications

Color	gray
Flammability rating according to UL 94	V0
Insulating material group	I
Insulating material	PA
Static insulating material application in cold	-60 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	125 °C
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3
Calorimetric heat release NFPA 130 (ASTM E 1354)	27,5 MJ/kg
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed

Electrical tests

Surge voltage test

Test voltage setpoint	7.3 kV
Result	Test passed

Temperature-rise test

Requirement temperature-rise test	Increase in temperature ≤ 45 K
Result	Test passed
Short-time withstand current 2.5 mm²	0.3 kA
Result	Test passed

Power-frequency withstand voltage

Test voltage setpoint	1.89 kV
Result	Test passed

Mechanical properties

Mechanical data

Open side panel	Yes

Mechanical tests

Mechanical strength

Result	Test passed

Attachment on the carrier

DIN rail/fixing support	NS 35
Test force setpoint	1 N
Result	Test passed

Test for conductor damage and slackening

Rotation speed	10 rpm
Revolutions	135
Conductor cross section/weight	0.2 mm² / 0.2 kg
	4 mm² / 0.9 kg
	6 mm² / 1.4 kg
Result	Test passed

Environmental and real-life conditions

Aging

Temperature cycles	192
Result	Test passed

Needle-flame test

Time of exposure	30 s
Result	Test passed

Oscillation/broadband noise

Specification	DIN EN 50155 (VDE 0115-200):2018-05
Spectrum	Service life test category 2, bogie-mounted
Frequency	f_1 = 5 Hz to f_2 = 250 Hz
ASD level	6.12 (m/s²)²/Hz
Acceleration	3.12g
Test duration per axis	5 h
Test directions	X-, Y- and Z-axis
Result	Test passed

Shocks

Specification	DIN EN 50155 (VDE 0115-200):2018-05
Pulse shape	Half-sine
Acceleration	30g
Shock duration	18 ms
Number of shocks per direction	3

Test directions	X-, Y- and Z-axis (pos. and neg.)
Result	Test passed

Ambient conditions

Ambient temperature (operation)	-60 °C ... 105 °C (max. short-term operating temperature RTI Elec.)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C
Permissible humidity (storage/transport)	30 % ... 70 %

Standards and regulations

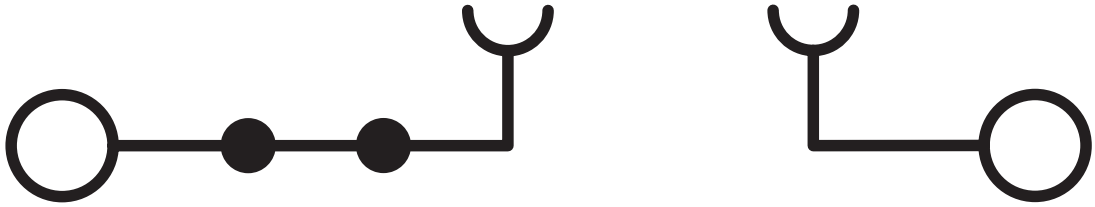
Connection in acc. with standard	IEC 60947-7-1

Mounting

Mounting type	NS 35/7,5
	NS 35/15

Drawings

Circuit diagram



Phoenix Contact USA
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(+717) 944-1300
info@phoenixcon.com

POWER PS SONIC
TRUSTED BATTERY SOLUTIONS

PS SERIES

General Purpose | Emergency Lighting | Medical | Fire & Security

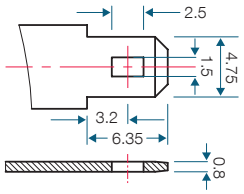
PS-1250

12V 5.0 AH @ 20-hr.
12V 4.6 AH @ 10-hr.

Rechargeable Sealed Lead Acid Battery
PS – General Purpose Series

TERMINALS: (mm)

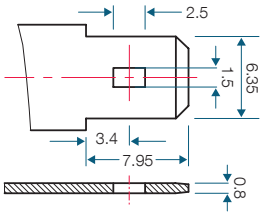
F1: Quick disconnect tabs, 0.187" x 0.032" – Mate with AMP. INC. FASTON "187" series



Torque – Not Applicable

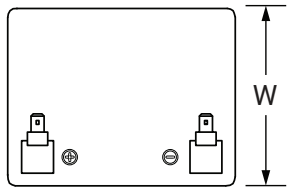
OR

F2: Quick disconnect tabs, 0.250" x 0.032" – Mate with AMP. INC FASTON "250" series



Torque – Not Applicable

DIMENSIONS: inch (mm)

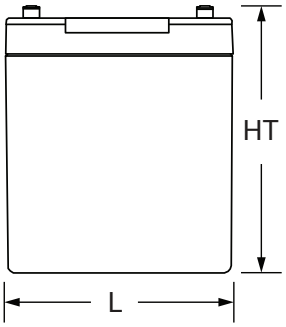


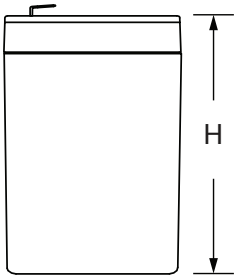
L: 3.54 (90)
W: 2.76 (70)
H: 3.98 (101)
HT: 4.21 (107)

Tolerances for L, W, and HT are +/- 0.04 in. (+/- 1mm)

Tolerances for H dimensions are + 0.08 (+ 2mm) and

-0.04 in. (- 1mm) All data subject to change without notice.





FEATURES

- Absorbent Glass Mat (AGM) technology for superior performance
- Valve regulated, maintenance free spill proof construction
- Power/volume ratio yielding excellent energy density
- Rugged vibration and impact resistant ABS case and cover
- Gas recombination technology
- 5 year design life

APPROVALS

- Approved for transport by air. D.O.T., I.A.T.A., F.A.A. and C.A.B. certified
- U.L. recognized
- ISO9001:2015 – Quality management systems

PERFORMANCE SPECIFICATIONS

Nominal Voltage	12 volts (6 cells)
Nominal Capacity	
20-hr. (0.250A, 10.5V)	5.00 AH
10-hr. (0.465A, 10.5V)	4.65 AH
5-hr. (0.850A, 10.5V)	4.25 AH
1-hr. (2.96A, 9.6V)	2.96 AH
Approximate Weight	3.06 lbs. (1.39 kg)
Internal Resistance (approx.)	48.0 miliohms
Max Short-Duration Discharge Current (5 Sec.)	75.0 amperes
Shelf Life	
PS series batteries may be stored for up to 6 months at 25 C(77 F) and then a freshening charge is required. For higher temperatures the time interval will be shorter.	
Operating Temperature Range	
Charge	5°F (-15°C) to 122°F (50°C)
Discharge	-4°F (-20°C) to 140°F (60°C)
Case	ABS Plastic
Power Sonic Chargers	PSC-121000ACX

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power-sonic.com

Rev04: 03/22

POWER PS SONIC
TRUSTED BATTERY SOLUTIONS

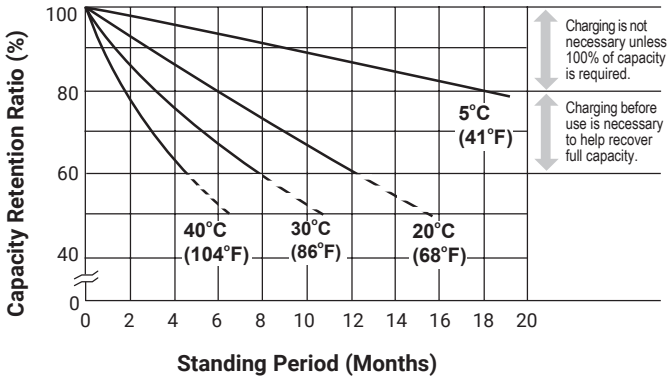
PS SERIES

PS-1250

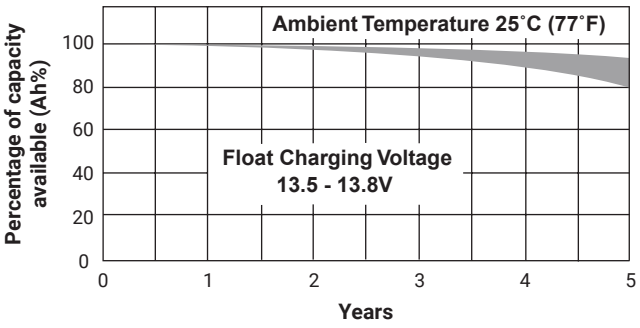
12V 5.0 AH @ 20-hr.
12V 4.6 AH @ 10-hr.

Rechargeable Sealed Lead Acid Battery
PS – General Purpose Series

SHELF LIFE & STORAGE



LIFE CHARACTERISTICS IN STAND-BY USE



CHARGING

Cycle Applications: Apply constant voltage charge at 14.4V – 15.0V at 25°C (77°F) Initial charging current should be set at less than 0.25C Amps. Switch to float charge to avoid overcharging.

"Float" or "Stand-By" Service: Apply constant voltage charge at 13.5V – 13.8V at 25°C (77°F) Initial charging current should be set at less than 0.25C Amps. When held at this voltage, the battery will seek its own current level and maintain itself in a fully charged condition.

Temperature Compensation: Charging Voltage for both Cyclic and Standby applications should be regulated in relation to ambient temperature. As temperature rises charging voltage should be reduced to prevent overcharge and increased as temperature falls to avoid undercharge.

For further charging information including temperature compensation factors, see Power Sonic Technical Manual/ Power Sonic Charger specifications.

APPLICATIONS

- General purpose
- Emergency lighting
- Medical
- Fire and security

CHARGERS

Power Sonic offers a wide range of chargers suitable for batteries with a variety of capacities.

Please refer to our website for more information on our switch mode and transformer type chargers.

Please contact our technical department for advice if you have difficulty in locating a suitable charger.

FURTHER INFORMATION

Please refer to our website **www.power-sonic.com** for a complete range of useful downloads, such as product catalogs, material safety data sheets (MSDS), ISO certification, etc.

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Saginaw Control and Engineering
95 Midland Road Saginaw, MI 48638-5770
(800) 234-6871 - Fax: (989) 799-4524
SCE@SaginawControl.com

SCE-42EL3612SSLPPL

Product Specifications:

Part Number: SCE-42EL3612SSLPPL
Description: S.S. LPPL Enclosure
Height: 42.00"
Width: 36.00"
Depth: 12.00"
Price Code: S9
List Price: $2,598.45
Catalog Page: 270
Est. Ship Weight: 124.00 lbs

Construction
- 0.075 In. stainless steel Type 304.
- Seams continuously welded and ground smooth.
- Flange trough collar around all sides of door opening.
- Collar studs 3/8-16 provided for mounting optional panels.
- Mounting holes in back of the enclosure for wall mounting.
- Mounting hardware, sealing washers and hole plugs included.
- Stainless steel concealed hinges.
- Removable and interchangeable doors.
- Black zinc die cast keylocking/padlocking handles.
- 3-point latching mechanism.
- Removable print pocket.
- Pour in place oil & water resistant gasket
- Ground stud on door and body.

Application
Designed to house electrical and electronic controls, instrumentation and components in indoor or outdoor locations. For outdoor application a drip shield and drain vent is recommended.

For details about the design, performance expectations, applications and design suggestions - See Design Considerations www.saginawcontrol.com/instman/considerations.pdf

Finish
#4 Brushed finish on all exterior surfaces. Optional sub-panels are powder coated white.

Industry Standards - (IS6)
- NEMA Type 3R, 4, 4X, 12 and Type 13
- UL Listed Type 3R, 4, 4X and 12
- CSA Type 4, 4X and 12
- IEC 60529
- IP 66

Notes
Special Instructions apply for IS3, IS4 and IS6 to maintain the environmental rating of Type 3R for these parts. Instructions are located on the enclosure door. Drip shield is required on IS3, drip shield is recommended on IS4 and IS6. Drain holes are required on all.

Optional Accessories
SCE-42P36 Subpanel, Bent
SCE-42P36GALV Subpanel, Bent Galvanized
SCE-BVK Breather Vent
SCE-DF42EL36LP Panel, Dead Front (Wall Mount)
SCE-DS36SS Shield, S.S. Drip
SCE-ELMFK4 Foot Kit, EL Mounting (4pc.)
SCE-ELSP3 KIT, Swing-Out Panel (20 High & Up)
SCE-RD42EL36SSLPPL Door, Replacement

Similar Part Numbers
SCE-30EL2412SSLPPLS.S. LPPL Enclosure
SCE-30EL3012SSLPPLS.S. LPPL Enclosure
SCE-36EL2412SSLPPLS.S. LPPL Enclosure
SCE-36EL3012SSLPPLS.S. LPPL Enclosure
SCE-36EL3612SSLPPLS.S. LPPL Enclosure
SCE-48EL3612SSLPPLS.S. LPPL Enclosure
SCE-48EL3616SSLPPLS.S. LPPL Enclosure

Installation Information
- Sealing Washer Specifications
- Dead Front Wall Mount With 3 Point Latching Hardware
- EL Flush Mount Frame
- Dead Front Wall Mount Installation Instructions
- Swing Panel ELSP3 for Encl. Height > 16
- Drip Shield Kit Assembly

Saginaw Control and Engineering
95 Midland Road Saginaw, MI 48638-5770
(800) 234-6871 - Fax: (989) 799-4524
SCE@SaginawControl.com

SCE-48P36GALV

Product Specifications:

Part Number: SCE-48P36GALV
Description: Subpanel, Bent Galvanized
Height: 45.00"
Width: 33.00"
Depth: 0.88"
Price Code: P3
List Price: $197.66
Catalog Page: 444
Est. Ship Weight: 46.00 lbs

Application
Subpanels are constructed from galvanized or galvannealed steel for direct bonding of electrical components. Size determines steel thickness.

Industry Standards - (IS17)
- NEMA Not Applicable
- UL Not Applicable
- CSA N/A

Similar Part Numbers
SCE-36P24GALVSubpanel, Bent Galvanized
SCE-36P30GALVSubpanel, Bent Galvanized
SCE-36P36GALVSubpanel, Bent Galvanized
SCE-40P24GALVSubpanel, Bent Galvanized
SCE-42P24GALVSubpanel, Bent Galvanized
SCE-42P30GALVSubpanel, Bent Galvanized
SCE-42P36GALVSubpanel, Bent Galvanized
SCE-42P42GALVSubpanel, Bent Galvanized
SCE-42P52GALVSubpanel, Bent Galvanized
SCE-48P24GALVSubpanel, Bent Galvanized

Installation Information
- Galvanized Subpanel Details & Grounding
- Sub-Plate SCE-72P72GALV in SCE-7272**ULP all depths

LED LIGHTS

Features

- Available with motion sensor or on/off switch
- Motion sensor version detects the motion of the enclosure door being opened and automatically turns light on
- Combined AC & DC voltage range allows the universal use with a single model
- Daisy chain cables allows the user to connect up to 16 lights with AC voltage and up to 8 lights with DC voltage
- Includes both magnets and screw mount clip for mounting to all types of surfaces with no need for additional mounting accessories
- Long light service life of 60,000 hours

CATALOG NUMBERS	OPERATING VOLTAGE	ACTIVATION METHOD	LIGHT INTENSITY	LAMP TYPE	SUPPLIED MOUNTING METHOD	DIMENSIONS (HXWXD)
SL24265VMS	24-265V AC/DC, 50/60 Hz	Motion Sensor	400	LED, 120 degree angle	Magnet and Screw Mount	14.07x1.26x1.40 (357x32x36)
SL24265V0OS	24-265V AC/DC, 50/60 Hz	On/Off Switch	400	LED, 120 degree angle	Magnet and Screw Mount	14.07x1.26x1.23 (357x32x31)

CATALOG NUMBERS	PRODUCT DESCRIPTION	VOLTAGE AC	FREQUENCY	CURRENT RATING	VOLTAGE DC	RATED CURRENCY	DIMENSIONS (HXWXD)
CSLF	Connector, Strip Light, Female	—	—	—	—	—	—
CSLM	Connector, Strip Light, Male	—	—	—	—	—	—
PCSLW118	Cable, Power, Strip Light, Female 1 End, 118"	—	—	—	—	—	—
DCCSLW19	Cable, Daisy Chain, Strip Light, Male/Female, 19"	—	—	—	—	—	—
DCCSLW39	Cable, Daisy Chain, Strip Light, Male/Female, 39"	—	—	—	—	—	—
CDS138	Cable, Strip Light to Door Switch, Female, 138"	—	—	—	—	—	—
DSPP	Door Switch, End Limit, Plain Plunger	24 - 400V	50/60 Hz	10 - 1.8 A	24 - 250V	28 - 0.27 A	2.80x1.19x1.18 (71x30x30)
DSRP	Door Switch, End Limit, Roller Plunger	24 - 400V	50/60 Hz	10 - 1.8 A	24 - 250V	28 - 0.27 A	3.30x1.19x1.18 (84x30x30
DSPPRB	Door Switch, End Limit, Plain Plunger w Release Button	24 - 400V	50/60 Hz	10 - 1.8 A	24 - 250V	28 - 0.27 A	3.56x1.19x1.53 (90x30x39)
SDLS	Slide, Door Limit Switch	—	—	—	—	—	2.56x1.57x0.45 (65x40x11)

Technical Data

Allen-Bradley

194R-N30-1753
194R-PY
194R-N1

Fused and Non-Fused Disconnect Switches

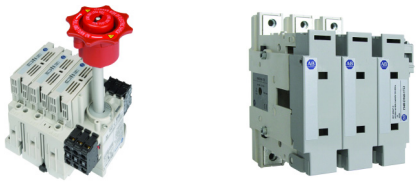
Bulletin 194R

Summary of Changes

This publication contains new and updated information as indicated in the following table.

Topic	Pages
Updated product descriptions	13
Updated quantity that is required and package quantity for terminal shields	16
Updated enclosure dimensions	48-49

Overview

	 Bulletin 194R-C, J, H, B, D, F, L, N, NU	 Bulletin 194R-NE
Product Type	Fused and non-fused rotary disconnect switches	Non-fused IEC rotary disconnect switches
Current Range	20…1200 A	125…1250 A
Main Applications	• UL 98 ratings "suitable as service entrance disconnecting means" • UL 508, CSA ratings "suitable as at-motor disconnect" • UL and IEC applications	• Disconnecting means • IEC applications
Functionality	• 3- or 4-pole fusible or non-fusible disconnect for standard OFF-ON or emergency stop in a main panel disconnect application • 4th pole available as modular accessory • Test mode switch position	• 3- or 4-pole non-fusible disconnect for standard OFF-ON or emergency stop in a main panel disconnect application • 4th pole available as modular accessory
Mounting Styles	20…63 A: DIN Rail/Panel mounting; 100…1250 A: Panel mounting	Panel mounting
Handles	• Available in rotary styles, UL Type 1/3R/4/4X/12, IP66, standard, or test mode versions • Handle colors in black and red/yellow and padlockable versions • 30 A/60 A legend markers (optional) — uses Cat. No. 1492-MS6X12 markers	• Available in rotary styles, UL Type 1/3R/4/4X/12, IP66, or standard versions • Handle colors in black and red/yellow and padlockable versions
Open Switch or Enclosed	• Open switch • Enclosed: UL/CSA rated enclosure for 20…63 A devices	• Open switch
UL/CSA Electrical Ratings:		
Rated Voltage U_e	690V AC	690V AC
Rated Current I_e	20…1200 A	125…1250 A
Rated Power P_e [FLA]	Varies w/ 1- or 3-phase switch, voltage	Varies w/ 1- or 3-phase switch, voltage
Short-Circuit Ratings	200 kA	200 kA
Mechanical Life [ops]	Up to 10 000	Up to 10 000
IEC Rated Current I_e		
Ambient Operational Temperature	-20…+60 °C (-4…+140 °F)	-20…+60 °C (-4…+140 °F)
Ambient Enclosed Temperature	-20…+60 °C (-4…+140 °F)	-20…+60 °C (-4…+140 °F)
Ambient Storage Temperature	-40…+65 °C (-40…+149 °F)	-40…+65 °C (-40…+149 °F)
Protection class per IEC 529	• Disconnects with terminal shroud or terminal screen: IP20 • 194R-J100-1753, front mounting: IP20 • Fuse carriers: IP30	• Front-mounted disconnects with terminal shroud or terminal screen: IP20
Optional Accessories	• IP66 handles • Multi-length shafts • Auxiliary contacts • Terminal covers • NFPA 79 internal handle with shaft	• IP66 handles • Multi-length shafts • Auxiliary contacts • Terminal covers

Standards Compliance and Certifications—Bulletin 194R-C, J, H, B, D, F, L, N, NU

Standards Compliance
UL 98
UL 508
CSA C22.2, No. 14
IEC/EN 60947-3 Low Voltage Switchgear and Controlgear part 3
BS EN60947-3
VDE 0660
NEMA KS-1

Certifications
CE Marked
CSA Certified (File No. LR1234)
UL Listed (File No. E 14841, Guide NLRV; File No. E 47426, Guide WHTY)

Standards Compliance and Certifications—Bulletin 194R-NE

Standards Compliance		Certifications
IEC/EN 60947-3 Low Voltage Switchgear and Controlgear part 3		CE Marked

Product Overview

The Bulletin 194R line of fused and non-fused rotary disconnect switches provides the flexibility to meet worldwide applications. The disconnect switches are UL Listed and CSA Certified and are designed to meet IEC 60947-3, VDE, DIN, BS, and applicable NEMA requirements.

Features

- 20 A...1250 A Sizes
- Fused switch versions:
  - BS88 -DIN
  - CSA HRCII-C - CSA HRCI-MISC - HRC-L
  - UL Class J- UL Class CC - UL Class L
  - NFC
- IP66 (Type 3R, 3, 12, 4, 4X) operating handle ingress ratings
- Handle with or without test mode
- Padlockable handle for up to three padlocks
- 6 auxiliary contacts can be added
- Suitable as service entrance disconnecting means (UL 98)
- Suitable as at-motor disconnecting means (UL 508)

Catalog Number Explanation

Fourth pole (20...63 A), additional auxiliary contacts, and handle options available in accessory section.

Cat. No. 194R-J30-1753

Cat. No. 194R-NE160-1753

194R	–	J	30	–	1753	S
		a	b		c	d

a	
Fuse Type	
Code	**Description**
C	UL Class CC, CSA Type HRCI-MISC
J	UL Class J, CSA Type HRCI-J
H	CSA Type HRCII-C
B	BS88(3)
D	DIN(3)
F	NFC(3)
L	UL Class L, CSA Type HRC-L
N	Non-fused (20…63 A)(1)
NE	Non-fused, IEC (100…1250 A)(1)(2)
NU	Non-fused, UL (100…1200 A)(1)

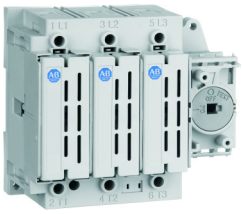
b	
Load Size(3)	
Code	**Description**
20	20 A (BS88)
25	25 A (NFC)
30	30 A (CC, J, HRCI-J)
	30 A (non-fused)
	30 A (HRCII-C)
32	32 A (BS88, NFC)
	32 A (DIN)
60	60 A (J, HRCI-J, HRCII-C)
	60 A (non-fused)
63	63 A (BS88, DIN, NFC)
100	100 A (BS88, DIN, NFC, J, HRCI-J)
125	125 A (BS88, DIN, NFC, Non-fused)
160	160 A (BS88, DIN, NFC, Non-fused)
200	200 A (BS88, DIN, NFC, J, HRCI-J, non-fused)
250	250 A (BS88, DIN, NFC, J, HRCI-J, non-fused)
400	400 A (BS88, DIN, NFC, J, HRCI-J, non-fused)
600	600 A (BS88, DIN, NFC, J, HRCI-J, non-fused)
630	630 A (BS88, DIN, NFC, non-fused)
800	800 A (BS88, DIN, NFC, L, HRCI-L, non- fused)
1200	1200 A (Non-fused)
1250	1250 A (BS88, DIN, non-fused)

c	
No. of Poles	
Code	**Description**
1753	3-poleswitch
1754	4-pole switch (non-fused:100…1250 A)

d	
Fuse Indication	
Code	**Description**
blank	No fuse status indication
S	Fuse status indication (20…63 A)

(1) Non-fused disconnect switches must use separately installed fuses for upstream short-circuit protection
(2) Does not carry UL Certification.
(3) Fuse classes BS88, DIN, and NFC are not suitable for use in North American applications

UL/CSA Non-fused Disconnect Switches



Cat. No. 194R-N30-1753

Cat. No. 194R-J100-1753

Note: Your order must include 1) Cat. No. of disconnect switch, 2) shaft, 3) handle, and 4) any accessories.

Fuse Description	Rated Current [A](1)	No. of Poles	Maximum Hp Ratings							Dim. Ref.	Cat. No.
			1-Phase (60 Hz)		3-Phase (60 Hz)			DC			
			120V	240V	240V	480V	600V	125V	250V		
Non-fused disconnect switches must use separately installed fuses for upstream short circuit protection.	30	3	2	3	7.5	15	20	3	5	A2	194R-N30-1753
	60	3	3	10	15	30	40	5	10	B2	194R-N60-1753
	100	3	7-1/2	15	30	75	100	10	15	F1	194R-NU100-1753
		4	7-1/2	15	30	75	100	10	15	F1	194R-NU100-1754
	200	3	—	50	75	150	200	15	15	F1	194R-NU200-1753
		4	—	50	75	150	200	15	15	F1	194R-NU200-1754
	400	3	—	—	125	250	350	20	50	F2	194R-NU400-1753
		4	—	—	125	250	350	20	50	F2	194R-NU400-1754
	600	3	—	—	200	400	350	20	50	F3	194R-NU600-1753
		4	—	—	200	400	350	20	50	F3	194R-NU600-1754
	800	3	—	—	200	500	500	—	—	F4	194R-NU800-1753
		4	—	—	200	500	500	—	—	F4	194R-NU800-1754
	1200	3	—	—	200	500	500	—	—	F4	194R-NU1200-1753
		4	—	—	200	500	500	—	—	F4	194R-NU1200-1754

(1) 30 A UL-rated device has I_{the} of 40 A per IEC. 60 A UL-rated device has I_{the} of 80 A per IEC.

Operating Handles (Accepts 3 Padlocks)

	Description	For Use With	Color	Degree of Protection	Cat. No.
	Padlockable handle, standard	• Bul. 194R disconnect switches up to 60 A	Black	Type 3R, 3, 12, 4, 4X	194R-PB
			Red/Yellow	Type 3R, 3, 12, 4, 4X	194R-PY
	Padlockable handle, test mode	• Bul. 194R disconnect switches up to 60 A	Black	Type 3R, 3, 12, 4, 4X	194R-PBT
			Red/Yellow	Type 3R, 3, 12, 4, 4X	194R-PYT
	Operating Handle Standard orientation with defeater	• IEC Non-fused disconnect switches: 125…630 A • IEC Fused disconnect switches: 100…400 A • UL Disconnect switches: 100…400 A	Black	IP66 (Type 1, 3R, 12, 4, 4X)	194R-HM4
			Red/Yellow	IP66 (Type 1, 3R, 12, 4, 4X)	194R-HM4E
		• IEC Non-fused disconnect switches: 800…1250 A • IEC Fused disconnect switches: 630…1250 A • UL Non-fused disconnect switches: 600…1200 A • UL Fused disconnect switches: 600…800 A	Black with light gray cover	IP65 (Type 1, 3R, 12, 4, 4X)	194R-HM4-L
			Red/Yellow	IP65 (Type 1, 3R, 12, 4, 4X)	194R-HM4E-L
	Operating Handle Standard orientation without defeater	• IEC Non-fused disconnect switches: 800…1250 A • IEC Fused disconnect switches: 630…1250 A • UL Non-fused disconnect switches: 600…1200 A • UL Fused disconnect switches: 600…800 A	Black with light gray cover	IP65 (Type 1, 3R, 12, 4, 4X)	194R-HM4-N2-L
			Red/Yellow	IP65 (Type 1, 3R, 12, 4, 4X)	194R-HM4E-N2-L

OSHA Lockout/Tag Out Compliance (LOTO)

OSHA CFR36 Section 1910 mandates that disconnect switches be able to be locked out while in the OFF position during servicing. All Bulletin 194R handles comply with this important safety requirement. See NFPA Article 430 for disconnect requirements of motor applications.

Operating Shafts

	Description	For Use With	Operating Shaft Length	Cat. No.
	Extension shaft, Standard length	140U-P*, 194R-P*, and 194R- P*T handles	12 in. (30.48 cm)	194R-S1
			21 in. (53.34 cm)	194R-S2
	Extension shaft, Standard length	Bul. 194R-HM handles for • IEC Non-fused disconnect switches: 125...630 A • IEC Fused disconnect switches: 100...400 A • UL Disconnect switches: 100...400 A	12.6 in. (320 mm)	194R-R7
	Extension Shaft, Extended length		22.8 in. (580 mm)	194R-R8
	Extension shaft, Standard length	Bul. 194R-HM handles for • IEC Non-fused disconnect switches: 800...1250 A • UL Non-fused disconnect switches: 600...1200A	12.6 in. (320 mm)	194R-R9
	Extension Shaft, Extended length		22.0 in. (560 mm)	194R-R10
	Extension shaft, Standard length	Bul. 194R-HM handles for • IEC Fused disconnect switches: 630...1250 A • UL Fused disconnect switches: 600...800 A	12.6 in. (320 mm)	194R-R11
	Extension Shaft, Extended length		22.0 in. (560 mm)	194R-R12

NFPA 79 Internal Operating Handle with Shaft

	Description	For Use With	Operating Shaft Length	Cat. No.
	NFPA 79 internal operating handle with shaft • Permits operation of the disconnect switch when the panel door is open, in compliance with NFPA 79	140U-P*, 194R-P*, and 194R-P*T handles	12 in. (30.48 cm)	194R-N1
			21 in. (53.34 cm)	194R-N2
		100…400 A UL fused disconnect switches	12.6 in. (320 mm)	194R-HM4-NFPA1
			22 in. (560 mm)	194R-HM4-NFPA3
		600…800 A UL fused disconnect switches	12.6 in. (320 mm)	194R-HM4-NFPA2
			22 in. (560 mm)	194R-HM4-NFPA4

Terminal Shields

	Description	For Use With	No. of Poles	Mounting Position	Disconnect Switch Dim. Ref.	Qty Required per Disconnect Switch	Pkg. Qty	Cat. No.
	30 A IP20 Terminal Shroud (three terminals)	—	—	—	A1, A2	2	2	194R-30-C3
	60 A IP20 Terminal Shroud (three terminals)	—	—	—	B1, B2	2	2	194R-60-C3
	30 A IP20 Terminal Shroud (one terminal)	—	—	—	A1, A2	2	2	194R-30-C1
	60 A IP20 Terminal Shroud (one terminal)	—	—	—	B1, B2	2	2	194R-60-C1
	Terminal Shroud	IEC Non-fused switches, 125…160 A	3	Line or load side	F1	2	3	194R-LNC7
			4			2	4	194R-LNC8
		IEC Non-fused switches, 250 A	3		F2	2	3	194R-LNC9
			4			2	4	194R-LNC10
		IEC Non-fused switches, 400…630 A	3		F3	2	3	194R-LNC11
			4			2	4	194R-LNC12
	IEC Terminal Shield	IEC Non-fused switches, 800 A	3	Line or load side	F4	2	1	194R-LNC13
			4			2	1	194R-LNC14
		IEC Non-fused switches, 1250 A	3		F5	2	1	194R-LNC15
			4			2	1	194R-LNC16

Non-Fused Disconnect Switches for CSA and UL Class Applications

Non-fused disconnect switches must be used with separately installed fuses.

Table 5 - Electrical Ratings, 30 A and 60 A Devices

Cat. No.		194R-N30-1753		194R-N60-1753	
Maximum Voltage, AC	[V]	600		600	
Maximum Voltage, DC	[V]	250		250	
Ampere Rating	[A]	30		60	
Maximum Short-circuit Prospective Fault Current	[kA]	200		200	
Maximum Hp, 3-Phase AC					
200V, 60 Hz	[Hp]	7.5	3	15	7.5
240V, 60 Hz	[Hp]	7.5	3	15	7.5
480V, 60 Hz	[Hp]	15	5	30	15
600V, 60 Hz	[Hp]	20	7.5	50	15
Maximum Hp, 1-Phase AC					
120V, 60 Hz	[Hp]	2	0.5	3	1.5
240V, 60 Hz	[Hp]	3	1.5	10	3
Maximum Hp, DC					
125V DC	[Hp]	3	2	5	5
250V DC	[Hp]	5	5	10	10
Power Lost	[W]	2		6	

Table 6 - Electrical Ratings, 100 . . . 1200 A Devices

Cat. No.		194R-NU100	194R-NU200	194R-NU400	194R-NU600	194R-NU800	194R-NU1200
Rated Current	[A]	100	200	400	600	800	1200
Standards Compliance		UL 98, IEC					
Ratings per UL/CSA							
Maximum Voltage, AC	[V]	600					
Maximum Voltage, DC	[V]	250					
Maximum Short-circuit Fault Current	[kA]	200	200	200	200	100	100
Fuse Type		J	J	J	J	L	L
Max. Fuse Rating	[A]	100	200	400	600	800	1200
Max. Hp Rating, 3-phase							
240V	[Hp]	30	75	125	200	200	200
480V	[Hp]	75	150	250	400	500	500
600V	[Hp]	100	200	350	350	500	500
Max. Hp Rating, DC							
125V, 2 poles in series	[Hp]	10	15	20	20	—	—
240V, 3 poles in series	[Hp]	15	15	50	50	—	

Table 7 - Mechanical Data, 30 . . .200 A Devices

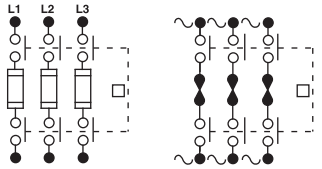
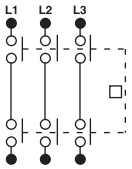
Cat. No.		194R-N30	194R-N60	194R-NU100	194R-NU200
Degree of Protection (per IEC 60947-3), Switch Only		IP20	IP20	—	—
Degree of Protection (per IEC 60947-3), Switch with Terminal Shield and Fuse Carriers		IP20	IP20	IP20	IP20
Mechanical Endurance	[Operations]	10 000	10 000	10 000	10 000
Operating Torque (Maximum)	[N•m]	3.5	3.5	10	10
	[Lb•in]	35	35	88.5	88.5
Terminal Capacity, Power Terminals	[mm^2]	2.5…10	2.5…25	300 MCM	300 MCM
	[AWG]	#14...#8	#14...#4	#6	#6
Terminal Capacity, Auxiliary Contact Terminals	[mm^2]	2.5…10	2.5…25	—	—
	[AWG]	#14...#8	#14...#4		
Maximum Number of Auxiliary Circuits		6	6	2	2
Approximate Weight	[kg]	0.81	1.14	1.67/2.1	1.67/2.1
	[lbs]	1.78	2.52	3.7/4.3	3.7/4.3
Minimum Enclosure Size	Height [mm (in.)]	248 (9-3/4)	248 (9-3/4)	610 (24)	610 (24)
	Width [mm (in.)]	171 (6-3/4)	197 (7-3/4)	406 (16)	406 (16)
	Depth [mm (in.)]	111 (4-3/8)	111 (4-3/8)	152 (6)	152 (6)
Switch Dimension Reference (See dimension drawings.)		A2	B2	F1	F1

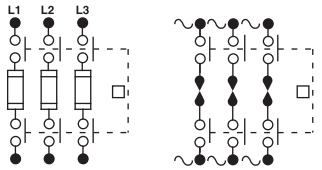
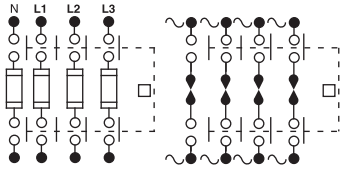
Table 8 - Mechanical Data, 400 . . .1200 A Devices

Cat. No.		194R-NU400	194R-NU600	194R-NU800	194R-NU1200
Degree of Protection (per IEC 60947-3), Switch Only		IP20	IP20	—	—
Degree of Protection (per IEC 60947-3), Switch with Terminal Shield and Fuse Carriers		IP20	IP20	IP20	IP20
Mechanical Endurance	[Operations]	6 000	6 000	3 500	3 500
Operating Torque (Maximum)	[N•m]	14.5	37	50	50
	[Lb•in]	128.3	327.5	442	442
Terminal Capacity, Power Terminals	[mm^2]	600 MCM	2 x 600 MCM	4 x 600 MCM	4 x 600 MCM
	[AWG]	#2	2 x #2	4 x #2	4 x #2
Maximum Number of Auxiliary Circuits		2	2	2	2
Approximate Weight	[kg]	3/3.8	8.2/10.3	11.6/14.5	11.6/14.5
	[lbs]	6.6/8.4	18.1/22.7	25.6/32	25.6/32
Switch Dimension Reference (See dimension drawings.)		F2	F3	F4	F4

Wiring Schematic

Figure 1 - Wiring Schematic

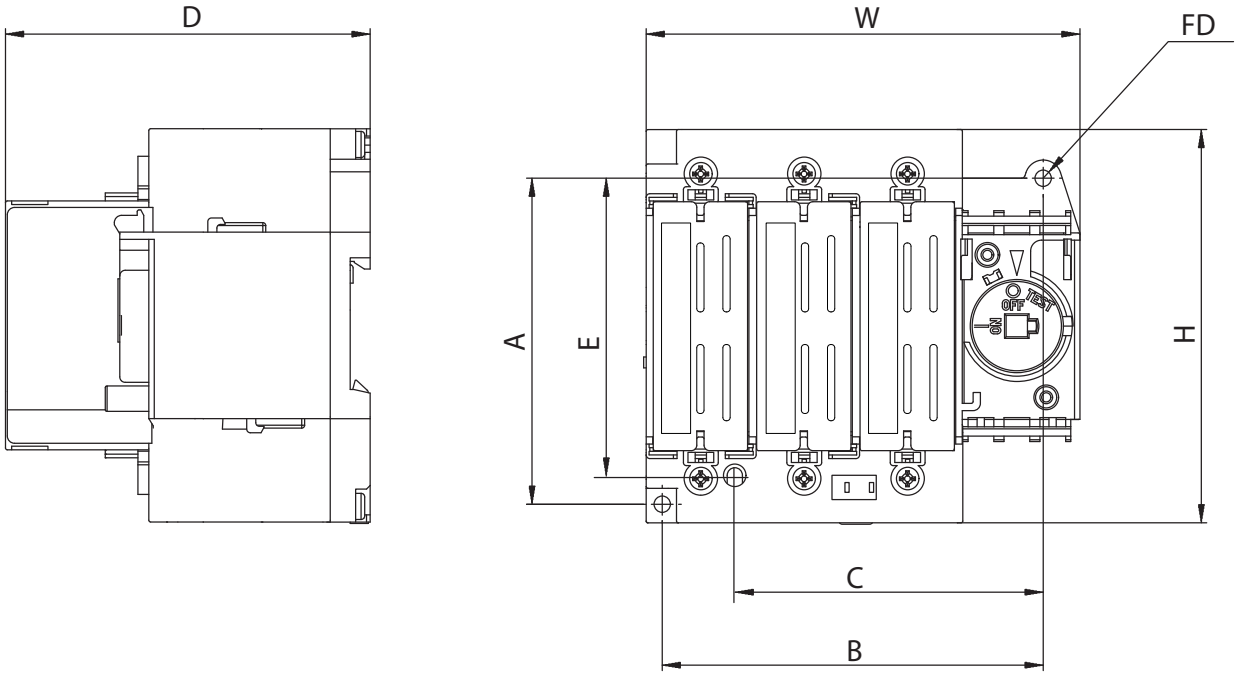
UL LISTED, CSA CERTIFIED	DIMENSION REFERENCE	CIRCUIT
Cat. No.		
194R-C30-1753 194R-J30-1753 194R-J60-1753 194R-H30-1753 194R-H60-1753	A1 A1 B1 B1 B1	
194R-N30-1753 194R-N60-1753	A2 B2	

IEC SWITCHES	DIMENSION REFERENCE	CIRCUIT
Cat. No.		
194R-B20-1753 194R-B32-1753 194R-B63-1753 194R-D32-1753 194R-D63-1753 194R-F25-1753 194R-F32-1753 194R-F63-1753	A1 A1 B1 B1 B1 A1 A1 B1	
194R-⁎-1754	See Column W4 for the width of the 4-pole switch	

Approximate Dimensions

Dimensions are in millimeters (inches). Dimensions are not intended to be used for manufacturing purposes.

Figure 2 - Disconnect Switch Dimension References A1, A2, B1, and B2 (30 A and 60 A)

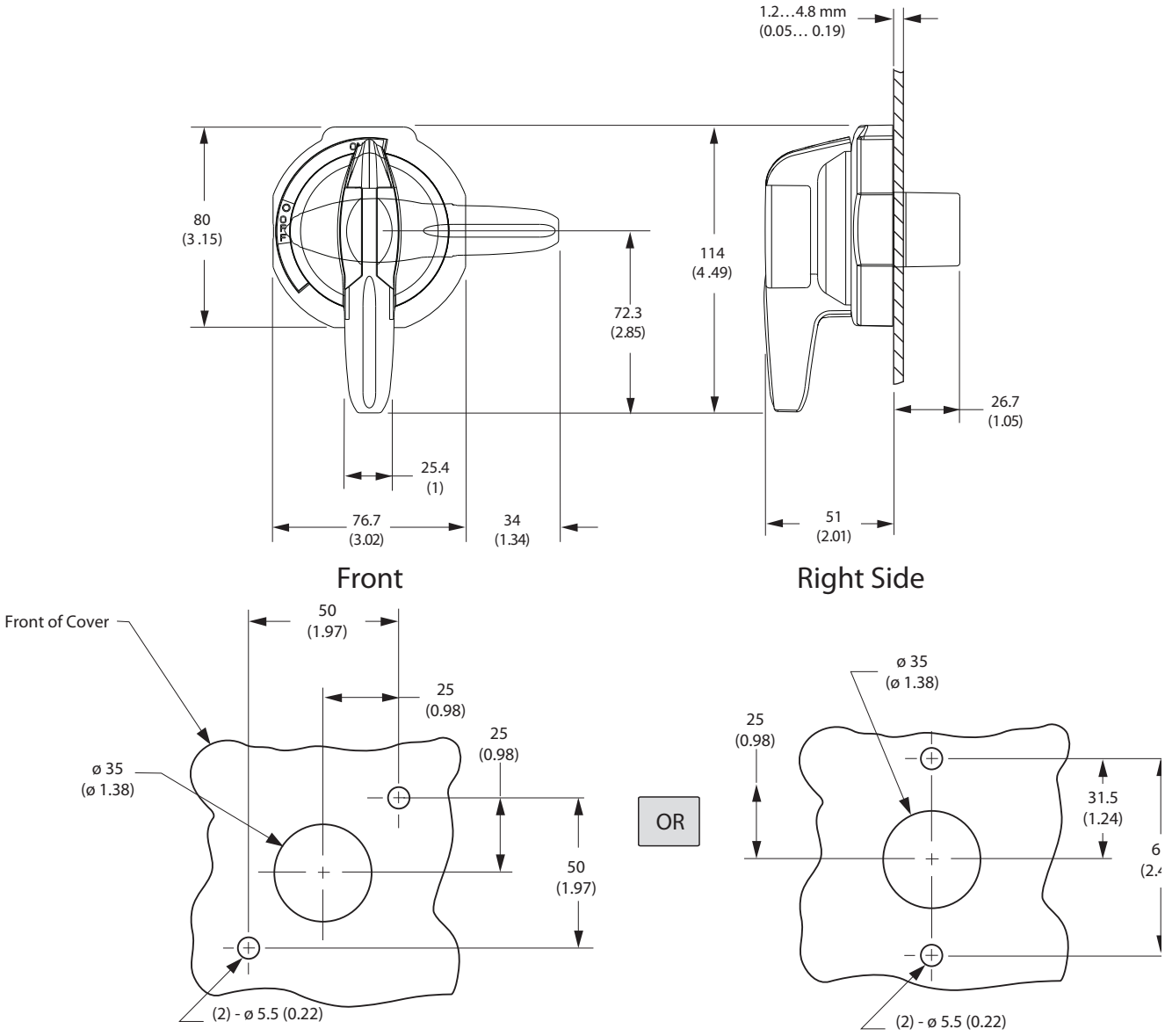


Disconnect Switch Dimension Reference	Approximate Dimensions [mm (in.)]								
	H	W (3-pole)	W (4-pole)	D	A	B	C[(1)]	E[(1)]	FD
A1	108 (4-1/4)	120 (4-3/4)	149 (5-7/8)	101 (4)	90 (3-9/16)	105 (4-1/8)	85 (3-11/32)	82 (3-15/64)	2-M4, 2-#8
A2	108 (4-1/4)	120 (4-3/4)	149 (5-7/8)	80 (3-1/8)	90 (3-9/16)	105 (4-1/8)	85 (3-11/32)	82 (3-15/64)	2-M4, 2-#8
B1	113 (4-29/64)	142 (5-19/32)	179 (7-3/64)	114 (4-31/64)	100 (3-15/16)	120 (4-23/32)	—	—	4-M4, 4-#8
B2	113 (4-29/64)	142 (5-19/32)	179 (7-3/64)	93 (3-43/64)	100 (3-15/16)	120 (4-23/32)	—	—	4-M4, 4-#8

(1) Mounting holes for backward compatibility with Bulletin 194R legacy switches.

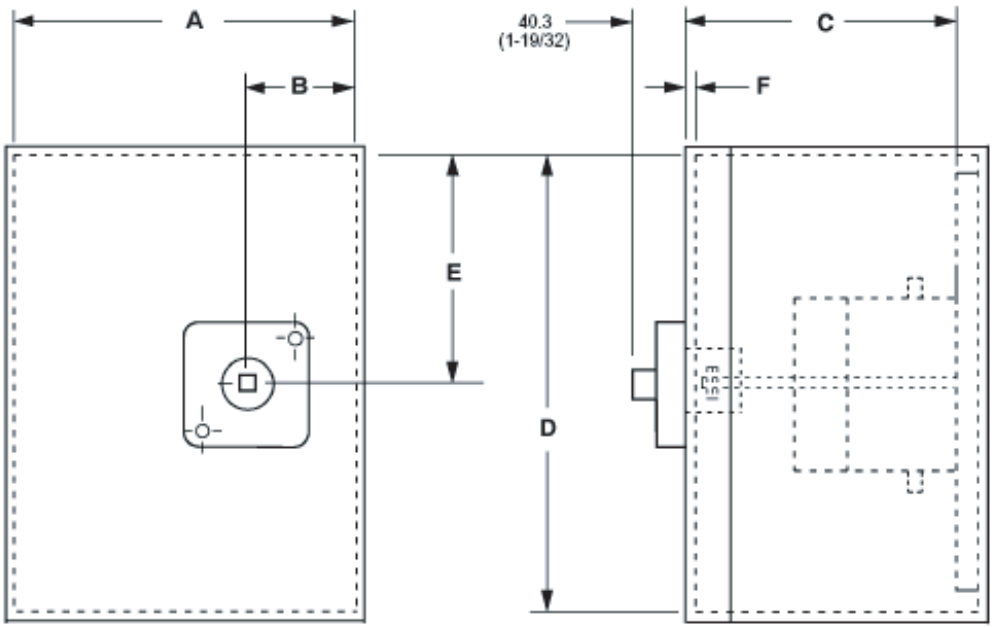
Operating Handles

Figure 18 - Cat. Nos. 194R-P…/140U-P…



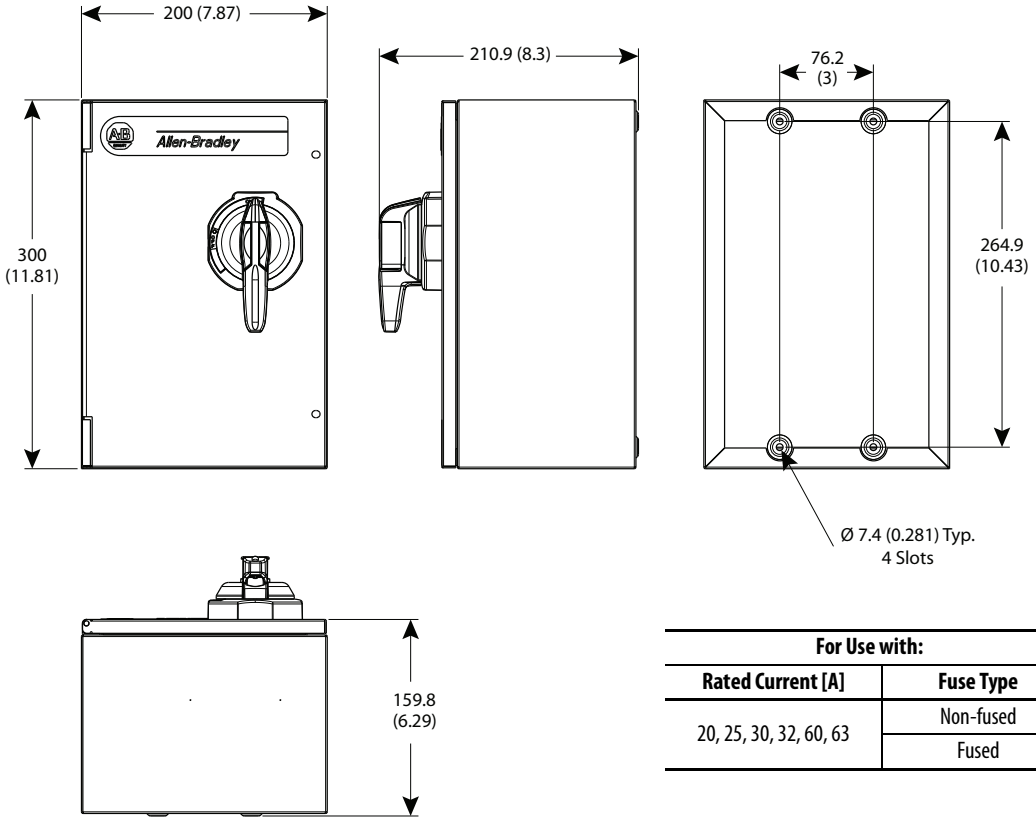
Enclosures

Figure 22 - Disconnect Switch Dimension References: A1, A2, B1, B2 (30 A and 60 A) Enclosure and Operating Handle



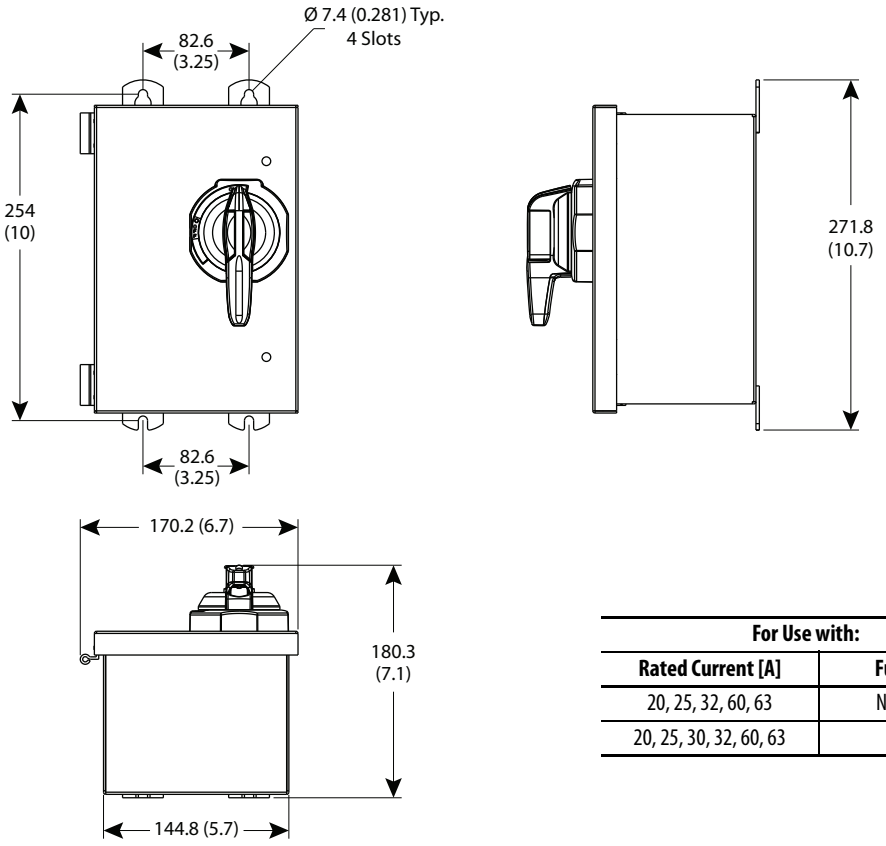
Cat. No.	Dimension Reference	A	B	C		D	E	F	
		Maximum	Minimum	Minimum	Maximum	Minimum	Minimum	Minimum	Maximum
194R-B20-1753	A1	171 (6-3/4)	45 (1-49/64)	147.6 (5-13/16)	454 (17-7/8)	248 (9-3/4)	89 (3-1/2)	1.4 (1/16)	4/78 (3/16)
194R-B32-1753									
194R-C30-1753									
194R-F32-1753									
194R-J30-1753									
194R-N30-1753	A2	171 (6-3/4)	45 (1-49/64)	111 (4-3/8)	454 (17-7/8)	248 (9-3/4)	89 (3-1/2)	1.4 (1/16)	4/78 (3/16)
194R-B63-1753	B1	197 (7-3/4)	45 (1-49/64)	147.6 (5-13/16)	454 (17-7/8)	248 (9-3/4)	105 (4-9/64)	1.4 (1/16)	4/78 (3/16)
194R-D32-1753									
194R-D63-1753									
194R-F63-1753									
194R-H30-1753									
194R-H60-1753									
194R-J60-1753									
194R-N60-1753	B2	197 (7-3/4)	45 (1-49/64)	111 (4-3/8)	454 (17-7/8)	248 (9-3/4)	105 (4-9/64)	1.4 (1/16)	4/78 (3/16)

Figure 23 - IP66 (Type 3/4/12) Watertight, Dusttight Sheet Metal Enclosure



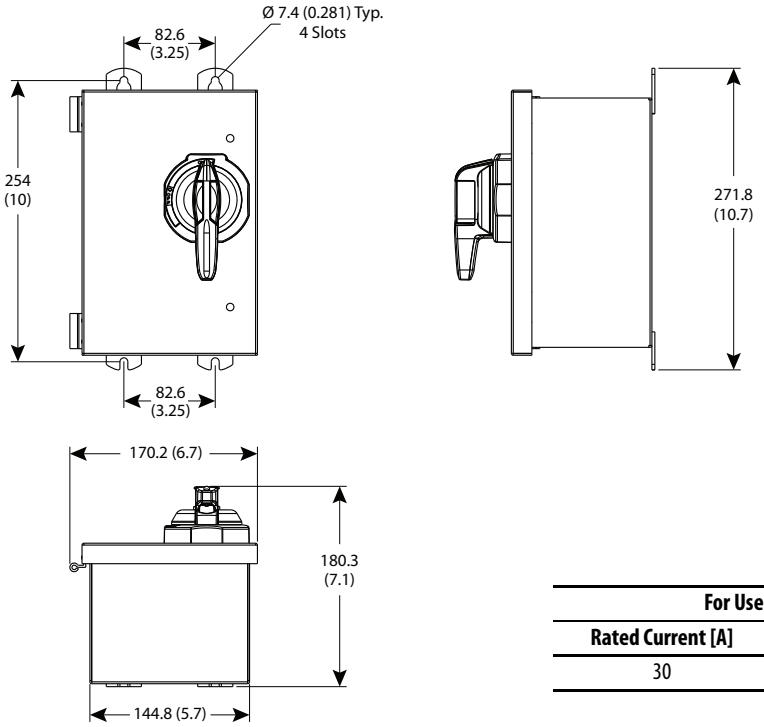
For Use with:	
Rated Current [A]	**Fuse Type**
20, 25, 30, 32, 60, 63	Non-fused
	Fused

Figure 24 - Type 4/4X Watertight, Corrosion-resistant Stainless Steel Enclosure



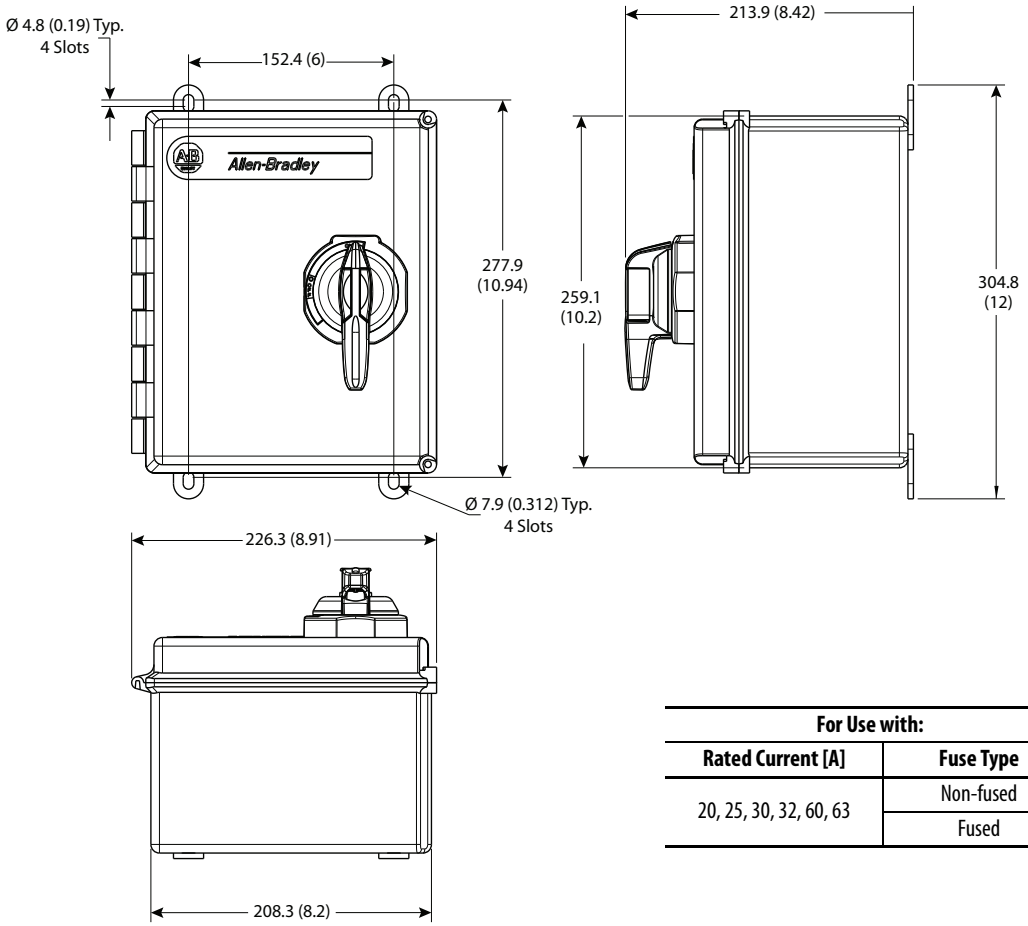
For Use with:	
Rated Current [A]	**Fuse Type**
20, 25, 32, 60, 63	Non-fused
20, 25, 30, 32, 60, 63	Fused

Figure 25 - Type 4/4X Watertight, Corrosion-resistant Stainless Steel Enclosure



For Use with:	
Rated Current [A]	**Fuse Type**
30	Non-fused

Figure 26 - IP66 (Type 3/4/4X/12) Corrosion-resistant, Non-metallic Enclosure



For Use with:	
Rated Current [A]	**Fuse Type**
20, 25, 30, 32, 60, 63	Non-fused
	Fused

Bulletin 1492 DIN Rail Receptacle

Advantages

- Quick to snap on 35 mm DIN rail and easy to wire
- Available with ground fault current interrupt (GFCI) or standard duplex outlets
- Feature of visual indication of power included with GFCI receptacle

1492-REC15G
GFCI Receptacle

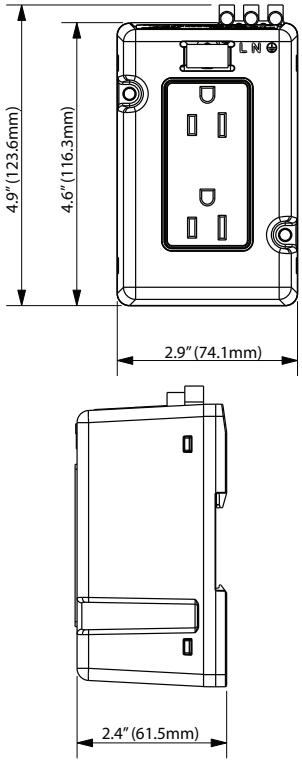
1492-REC15
Standard Duplex Receptacle

Overview

The Bulletin 1492 DIN rail receptacle is an enclosed 15 Amp power outlet. It is a convenient power source for portable computers or test devices for in-the-panel troubleshooting.

Technical Specifications for the DIN Rail Receptacle		
	1492-REC15	1492-REC15G
Mechanical Ratings		
	15 Amp Duplex	15 Amp GFCI
Operating Temperatures	-13°F to 140°F (-25°C to 60°C)	
Storage Temperatures, Short Term	-31°F to 176°F (-35°C to 80°C)	
Terminal Wire Sizes	#20 - #10 AWG solid or stranded	
Terminal Torque	7 lb.-in. (.79 Nm)	
Electrical Ratings		
Device Ratings	15 Amp, 125V	15 Amp, 125V
Operating Frequency	50 - 60 Hz	
Dielectric Voltage	Withstands 2000V per UL498	Withstands 1500V per UL498
Current Interrupting	N/A	10 kA
Trip Level	N/A	5±1 mA
Material Listing		
Enclosure Cover, Flammability	PBT/polycarbonate blend, UL94 rating V0 @ .63mm	
Enclosure Base, Flammability	Polyamide 6/6 30% GF, UL94 rating V0 @ .63mm	
Spring	Stainless Steel	
Standards and Certifications		
	UL 508A (file # E54866)	
	cULus	
	UL498	UL 498, UL 943
	NEMA WD-6	
	NEMA 5-15R	

Dimensions



	Cat. No.	Pkg. Qty.
Marking Systems Marker Card:	1492-MS10x17 (40/card)	5

LISTEN. THINK. SOLVE.®

Allen-Bradley • Rockwell Software

Rockwell Automation

Publication 1492-PP023A-EN-E – February 2009

Technical Data

Original Instructions

Allen-Bradley

PanelView 5310 Terminals Specifications

Catalog Numbers 2713P-T6CD1, 2713P-T6CD1-B, 2713P-T7WD1, 2713P-T7WD1-B, 2713P-T9WD1, 2713P-T9WD1-B, 2713P-T10CD1, 2713P-T10CD1-B, 2713P-T12WD1, 2713P-T12WD1-B

The PanelView™ 5310 terminals are operator interface devices that monitor and control devices attached to ControlLogix® 5570 and 5580, and CompactLogix™ L1, L2, and L3 controllers over an EtherNet/IP™ network. Animated graphic and text displays provide operators with a view into the operating state of a machine or process. Operators interact with the control system by using the touch screen.

The PanelView 5310 terminals include these features and capabilities:

- Tightly integrated control and design environment allows information to be shared between the PanelView 5310 terminal and the Logix platforms.
- The Studio 5000® environment provides one point of access for the Studio 5000 View Designer® and Studio 5000 Logix Designer® applications.(1)
- Connection to one ControlLogix 5570, ControlLogix 5580, or CompactLogix L1, L2, or L3 controller with revision 27 firmware or later.
- Supports a maximum of 100 user-defined screens.
- Supports a maximum of 4,000 Logix-based alarms.(1)
- Easily configured screen navigation menu.

(1) PanelView 5310 firmware can support up to 4,000 Logix-based alarms in a single controller if you use Studio 5000 View Designer application version 5 and Studio 5000 Logix Designer application version 32 or higher. Of the 4,000 alarms, no more than 1,000 can be instruction-based. Earlier versions of the Studio 5000 View Designer or Studio 5000 Logix Designer applications can support up to 1,000 Logix-based alarms.

Summary of Changes

This publication contains new and updated information as indicated in this table.

Topic	Page
Increased maximum number of user-defined screens from 50 to 100.	1
Increased maximum number of Logix-based alarms from 1,000 to 4,000, and added footnote.	1
Added operating altitude row to Environmental Specifications table.	2
Updated URL for Rockwell Automation Product Certifications website.	2, 6
Added catalog numbers for 8-GB and 32-GB SD cards, and revised footnote in SD Cards table.	6
Added SD card content below SD Cards table.	6

Environmental Specifications

This table provides environmental specifications for the PanelView 5310 terminals.

Attribute	Value
Temperature, operating	0…50 °C (32…122 °F)
Temperature, nonoperating	-25…+70 °C (-13…+158 °F)
Relative humidity	5…95% without condensation
Vibration	0.012 pk-pk, 10…57 Hz 2 g peak at 57…500 Hz
Shock, operating	15 g at 11 ms
Shock, nonoperating	30 g at 11 ms
Altitude, operating	Sea level to 2,000 m (6,562 ft)
Enclosure ratings	NEMA and UL Type 4X, 12, 13, and classified by UL as IP66 (when mounted on a flat surface of an equivalent enclosure)

Certifications

This table provides certification information for the PanelView 5310 terminals.

Certification[1]	Value
c-UL-us	c-UL-us Listed to UL 61010-1, UL 61010-2-201, CAN/CSA-C22.2 No. 61010-1, and CAN/CSA-C22.2 No. 61010-2-201; see 2713P-CT002
CE (EMC)	European Union EMC Directive, compliance with: • EN 61131-2; Programmable Controllers (pertinent EMC sections); see 2713P-CT004
EAC	Russian Customs Union TP TC 020/2011 EMC Technical Regulation; see 2713P-CT001
EtherNet/IP	ODVA conformance tested to EtherNet/IP specifications; see 2713P-CT005
KC	KC registered; see 2713P-CT001
RCM	Australian Radiocommunications Act, compliance with: • EN 61000-6-4; Industrial Emissions; see 2713P-CT003
RoHS	• China RoHS • European RoHS • Turkey RoHS (EEE Yönetmeliğine Uygundur. In Conformity with the EEE Regulation.)

(1) When marked. See the Rockwell Automation® Product Certifications site at rok.auto/certifications for declarations of conformity, certificates, and other certification details.

Technical Specifications

This section provides technical specifications for the PanelView 5310 terminals.

Technical Specifications - PanelView 5310 Terminals

Attribute	6-in. Touch 2713P-T6CD1 2713P-T6CD1-B[1]	7-in. Wide Touch 2713P-T7WD1 2713P-T7WD1-B[1]	9-in. Wide Touch 2713P-T9WD1 2713P-T9WD1-B[1]	10.4-in. Touch 2713P-T10CD1 2713P-T10CD1-B[1]	12.1-in. Wide Touch 2713P-T12WD1 2713P-T12WD1-B[1]
Operator input	Touch				
Display type	Color TFT LCD (thin-film-transistor, liquid-crystal display)				
Display size, diagonal	5.7-in. screen	7-in. widescreen	9-in. widescreen	10.4-in. screen	12.1-in. widescreen
View area, W x H	115 x 86 mm (4.5 x 3.4 in.)	152 x 91 mm (6.0 x 3.6 in.)	196 x 118 mm (7.7 x 4.6 in.)	211 x 158 mm (8.3 x 6.2 in.)	261 x 163 mm (10.3 x 6.4 in.)
Display resolution/ aspect ratio	640 x 480 VGA/4:3	800 x 480 WVGA/5:3	800 x 480 WVGA/5:3	800 x 600 SVGA/4:3	1280 x 800 WXGA/16:10
Color depth	24-bit color graphics (16.7 million colors)				
Brightness, typical	300 cd/m^2 (Nits)				
Backlight	• Light-emitting diode, non-replaceable • Life: 50,000 h min at 40 °C (104 °F) to half-brightness				
Backlight power consumption, typical	2.4 W	3 W	3.5 W	4 W	5 W
Touch screen	• Analog resistive • Actuation rating: 1 million presses • Operating force: <100 grams				
Battery (real-time clock backup)	• Accuracy: +/-2 minutes per month. • Battery life: 4 years min at 25 °C (77 °F) • Replacement: CR2032 lithium coin cell				
Memory RAM User available	 1 GB RAM 1 GB nonvolatile storage for projects				
Secure Digital (SD) card slot	One SD card slot for external storage; supports cat. no. 1784-SD*x* cards. See Secure Digital (SD) Cards on page 6.				
USB ports Host Device	 One USB high-speed 2.0 host port (type A) supports removable drives for external storage. One high-speed 2.0 device port (type B) supports connection to host computer (available in a future release).				
Ethernet port	One 10/100Base-T, Auto MDI/MDI-X Ethernet port for controller communication.				
Status indicators	STS (status, green), ERR (error, red)				
Software	Studio 5000 environment provides single portal to View Designer and Logix Designer applications.				
Electrical					
USB host port (type A)	0.5 A at 5V DC				
Input voltage	24V DC nom (18…30V DC)				
Power consumption, max	13 W		14 W	15 W	16 W
Power consumption, typical	9 W		11 W	12 W	12 W
Power dissipation	31 BTU/hr.		38 BTU/hr.	41 BTU/hr.	41 BTU/hr.
Inrush current, max	15 A				
Power supply	Supports safety extra low voltage and protected extra low voltage 24V DC supplies[2][3]				

Technical Specifications - PanelView 5310 Terminals (Continued)

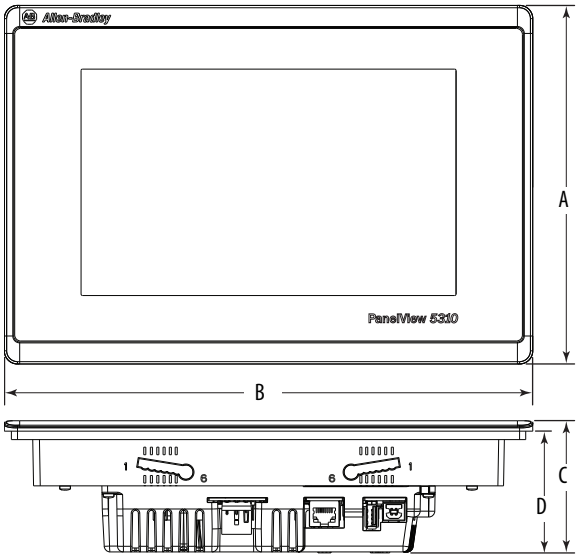
Attribute	6-in. Touch 2713P-T6CD1 2713P-T6CD1-B(1)	7-in. Wide Touch 2713P-T7WD1 2713P-T7WD1-B(1)	9-in. Wide Touch 2713P-T9WD1 2713P-T9WD1-B(1)	10.4-in. Touch 2713P-T10CD1 2713P-T10CD1-B(1)	12.1-in. Wide Touch 2713P-T12WD1 2713P-T12WD1-B(1)
Mechanical					
Weight, approx	0.79 kg (1.7 lb)	2.0 kg (4.4 lb)	2.41 kg (5.31 lb)	3.35 kg (7.39 lb)	3.65 kg (8.0 lb)
Terminal dimensions, approx	See PanelView 5310 Terminal and Cutout Dimensions on this page.				
Cutout dimensions, approx	See PanelView 5310 Terminal and Cutout Dimensions on this page.				

(1) Add -B to the end of a catalog number to order a terminal without the Allen-Bradley® logo and product identification, for example, 2713P-T7WD1-B.
(2) DC-powered terminals support safety extra low voltage (SELV) and protective extra-low voltage (protected extra low voltage) 24V DC power supplies, such as catalog numbers 1606-XLP95E, 1606-XLP100E, and 2711P-RSACDIN.
(3) Where PELV is defined in IEC 61131-2.

Terminal Dimensions

This section provides dimensions for the PanelView 5310 terminals. The 9-inch widescreen terminal is shown for illustrative purposes. All other terminal sizes look similar.

PanelView 5310 Terminal Dimensions - (9-in. widescreen terminal shown)



PanelView 5310 Terminal and Cutout Dimensions

Terminal Size (in.)	Input Type	Terminal Dimensions				Cutout Dimensions	
		Height (A) mm (in.)	Width (B) mm (in.)	Overall Depth (C) mm (in.)	Mounted Depth (D) mm (in.)	Height (A) mm (in.)	Width (B) mm (in.)
6	Touch	153 (6.0)	186 (7.3)	69.5 (2.74)	64 (2.5)(1)	123 (4.84)	156 (6.14)
7		178 (7.0)	237 (9.3)			148 (5.82)	207 (8.15)
9		190 (7.48)	280 (11.02)			162 (6.38)	252 (9.92)
10.4		252 (9.92)	297 (11.69)			224 (8.82)	269 (10.59)
12.1		246 (9.69)	340 (13.39)			218 (8.58)	312 (12.28)

(1) When mounted in a panel, the front of the bezel extends less than 6 mm (0.24 in.) from the panel.

Studio 5000 Environment

Use the Studio 5000 environment to create HMI applications for the PanelView 5310 terminal platform. This environment includes these major components:

- **Studio 5000 View Designer** – you can create and design a project for a specific PanelView 5310 terminal and download the project to the terminal.

  You can create an application for any PanelView 5310 terminal and reuse that same application across the entire platform.
- **Studio 5000 Logix Designer** – you can develop control logic for a CompactLogix or ControlLogix controller and download the logic to the controller.

In the Studio 5000 environment, you can create an application for any PanelView 5310 terminal and reuse that same application across the entire platform.

Accessories

This section lists accessories for the PanelView 5310 terminals.

Power Supplies and Replacement Power Terminal Blocks

Cat. No.	Description	Quantity
1606-XLB120E	DIN rail power supply, 24…28V DC output voltage, 120 W	1
1606-XLP100E	DIN rail power supply, 24…28V DC output voltage, 100 W	1
1606-XLP95E	DIN rail power supply, 24…28V DC output voltage, 95 W	1
2711P-RSACDIN	DIN rail power supply, AC-to-DC, 85…265V AC, 47…63 Hz	1
2711-TBDC	3-pin DC power terminal block	10

Mounting Hardware

Cat. No.	Description	Quantity
2711P-RMCP(1)	Mounting levers (black)	16

(1) Catalog number 2711P-RMCP mounting levers are used with the PanelView 5310 terminals. Do not use gray mounting levers; they are not compatible with PanelView 5310 terminals.

Secure Digital (SD) Cards(1)

Cat. No.	Description
1784-SD1	1 GB SD card
1784-SD2	2 GB SD card
1784-SDHC8	8-GB SDHC card
1784-SDHC32	32-GB SDHC card
2711C-RCSD	USB to SD adapter for SD card

(1) To help reduce the chance of corruption when you use SD Cards or USB drives with the terminal, Rockwell Automation recommends that you use only the above SD card catalog numbers.

The SD™ and SDHC™ accessory cards in the above table have been designed to meet industrial robustness and environmental requirements. Rockwell Automation recommends that you use these accessory cards with the terminal to help reduce the chances of corruption. Studio 5000 View Designer software requires the following for SD cards that are inserted into the HMI device:

- 4 GB of free space
- A supported SDHC card type, preferably one listed in the Secure Digital (SD) Cards table
- An environmental rating for the PanelView 5000 environment
- A supported format of either FAT32 or ext3

USB Programming Cable

Cat. No.	Description	Length
6189V-USBCBL2	Programming cable that connects the device port of the terminal to a USB host port of a computer	1.8 m (5.9 ft)

Battery Replacement

Cat. No.	Description	Quantity
2711P-RY2032	Lithium coin cell battery, CR2032 equivalent	1

Additional Resources

These documents contain more information about related products from Rockwell Automation.

Resource	Description
Visualization Solutions Selection Guide, publication VIEW-SG001	Provides an overview of the visualization products (includes catalog number selections) offered by Rockwell Automation.
PanelView 5310 Terminals User Manual, publication 2713P-UM001	Provides information on how to install, operate, configure, and troubleshoot the PanelView 5310 terminals.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines on how to install a Rockwell Automation industrial system.
Product Certifications website, rok.auto/certifications	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at https://www.rockwellautomation.com/global/literature-library/overview.page.

Notes:

Rockwell Automation Support

Use the following resources to access support information.

Technical Support Center	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	www.rockwellautomation.com/knowledgebase
Local Technical Support Phone Numbers	Locate the phone number for your country.	www.rockwellautomation.com/global/support/get-support-now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	www.rockwellautomation.com/literature
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	www.rockwellautomation.com/global/support/pcdc.page

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete the How Are We Doing? form at https://literature.rockwellautomation.com/idc/groups/literature/documents/du/ra-du002_-en-e.pdf.

Rockwell Automation maintains current product environmental information on its website at http://www.rockwellautomation.com/rockwellautomation/about-us/sustainability-ethics/product-environmental-compliance.page.

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Technical Data

Original Instructions

Allen-Bradley by ROCKWELL AUTOMATION

5069-IB16
5069-IF8
5069-OF8
5069-RTB18-SPRING
5069-RTB64-SPRING

Compact 5000 I/O Modules and EtherNet/IP Adapters

Catalog Numbers

Digital I/O Modules	5069-IA16, 5069-IB16, 5069-IB16F, 5069-IB16K, 5069-IB6F-3W, 5069-OA16, 5069-OB8, 5069-OB16, 5069-OB16F, 5069-OB16K, 5069-OW4I, 5069-OW16, 5069-OX4I
Analog I/O Modules	5069-IF8, 5069-IY4, 5069-IY4K, 5069-OF4, 5069-OF4K, 5069-OF8
High-speed Counter Module	5069-HSC2xOB4
Safety I/O Modules	5069-IB8S, 5069-IB8SK, 5069-OBV8S, 5069-OBV8SK
Serial Module	5069-SERIAL
Field Potential Distributor	5069-FPD
Address Reserve Module	5069-ARM
EtherNet/IP Adapters	5069-AENTR, 5069-AENTRK, 5069-AEN2TR

The Compact 5000™ I/O architecture provides a wide range of input and output modules to span many applications, from high-speed digital to process control. The architecture uses Producer/Consumer technology that allows input information and output status to be shared among multiple Logix 5000™ controllers.

Compact 5000 I/O modules are used as local I/O modules in CompactLogix™ 5380 and Compact GuardLogix® 5380 controller systems or as remote I/O modules with CompactLogix 5380, Compact GuardLogix 5380 controllers, and some other Logix 5000 controllers. The modules are configured with the Studio 5000 Logix Designer® application.

The I/O modules require a removable terminal block (RTB) to connect field-side wiring. RTBs are not included with the I/O modules. You must order RTBs separately.

Summary of Changes

The publication was revised for the following changes:

- The 5069-IF8 module specifications were updated to indicate the following.

Common mode voltage (channel to channel)	±10V (Current mode and 3-wire RTD mode) ±2V (Voltage mode)

See page 54.

- The 5069-IY4 and 5069-IY4K module specifications were updated to indicate the following:

Common mode voltage (channel to channel)	±10V (Current mode and 3-wire RTD mode) ±2V (Voltage mode)

See page 66.

Power Compact 5000 I/O Modules

There are different types of power that are used with Compact 5000 I/O modules.

Power Type	Description	Related Specifications	
		Name	Description
Module (MOD) Power	System-side power that is used to operate a local or remote system. Power passes across a MOD Power bus. Modules draw current from the bus and pass the remaining current to the next module.	MOD Power	Level of MOD Power current that the module draws from the MOD Power bus
		MOD Power Passthrough, max	Maximum level of MOD Power current that the module can pass to the next module.
Sensor/ Actuator (SA) Power	Field-side power that some modules uses to power field-side devices. Power passes across an SA Power bus. Some modules draw current from the bus and pass the remaining current to the next module. Other modules do not draw current from the bus but do pass the current to the next module. You use 5069-FPD field potential distributors to establish new SA Power buses in a system. **IMPORTANT**: Remember the following: • If the system includes DC type modules and AC type modules, you must use a field potential distributor to install them on separate SA Power buses. • You cannot install AC type modules directly next to a Compact GuardLogix 5380 controller. You must first install a field potential distributor.	SA Power	Level of SA Power current that the module draws from the SA Power bus
		SA Power Passthrough, max	Maximum level of SA Power current that the module can pass to the next module.
Local Actuator (LA) Power	Field-side power that some Compact 5000 I/O modules use instead of SA power. Modules that use LA power **do not use SA power**. They only pass SA power to the next to the next I/O module in the system. You must install modules that use LA Power on an SA Power bus with the same module type. For example, you must install a 5069-OB8 module on an SA Power bus that includes DC type modules.	LA Power	Maximum level of LA Power current that you can apply to the module, by channel, group, or module.

For more information on MOD power, SA power, and LA power, see the user manuals listed in Additional Resources on page 137.

Digital I/O Modules

I/O Type	Cat. No.	Description	Pages
AC digital input	5069-IA16	79...264V AC 16-point, input module	4
DC digital input	5069-IB16	10...32V DC 16-point, sinking input module	9
	5069-IB16K	10...32V DC 16-point, conformal coated sinking input module	
	5069-IB16F	10...32V DC 16-point, sinking fast input module	
	5069-IB6F-3W	10...32V DC 6-point, 3-wire, sinking fast input module	14
AC digital output	5069-OA16	85...264V AC 16-point, output module	19
DC digital output	5069-OB8	10...32V DC 8-point, sourcing high-current output module	24
	069-OB16	10...32V DC 8-point, sourcing high-current output module	29
	5069-OB16K	10...32V DC 16-point, conformal coated sourcing output module	
	5069-OB16F	10...32V DC 16-point, sourcing fast output module	
Relay output	5069-OW4I	5...264V AC /125V DC 4-point, isolated normally open relay output module	35
	5069-OW16	5...264V AC/125V DC 16-point, normally open relay output module	40
	5069-OX4I	5...264V AC /125V DC 4-point, isolated normally open/normally closed relay output module	45

5069-IB16, 5069-IB16K, and 5069-IB16F Digital 16-point Sinking Input Modules

The following figure shows a wiring diagram for the 5069-IB16, 5069-IB16K, and 5069-IB16F modules.

5069-IB16, 5069-IB16K, and 5069-IB16F Wiring Diagram

Channel Connections

The example shows devices that are connected to channels 0, 3, and 6. You are not restricted to using only those channels. You can connect devices to any channel or combination of channels as needed.

SA Power

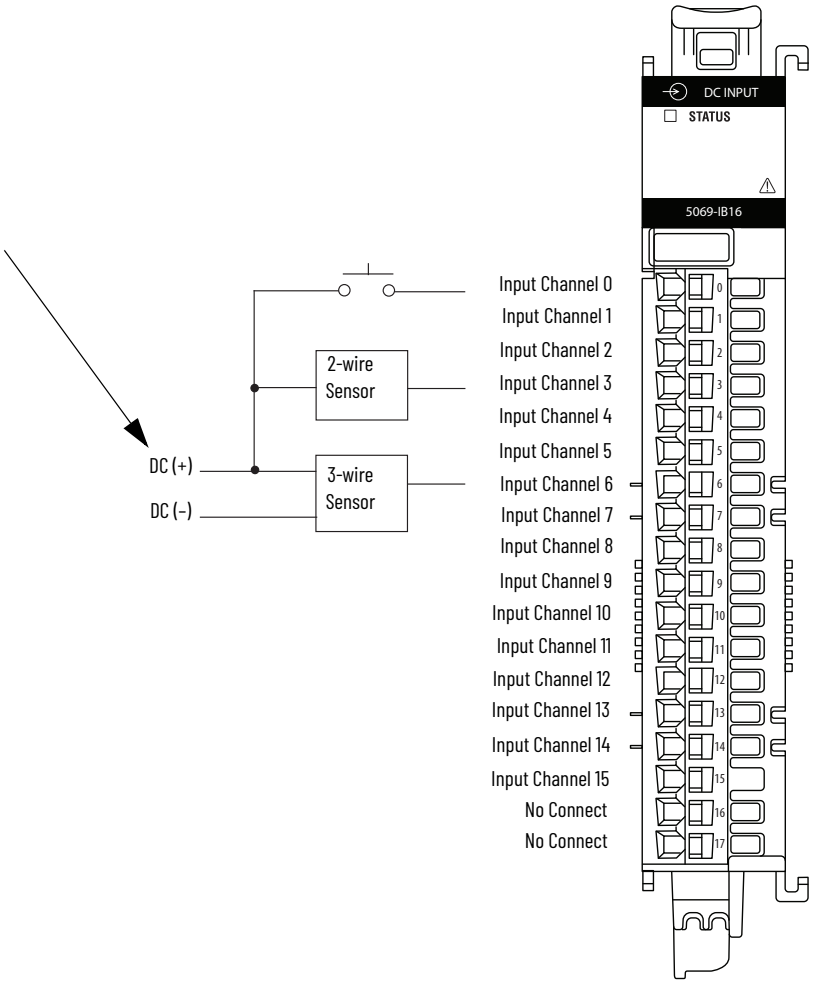
Connections to an external power supply that provides SA power via the SA Power RTB on one of the following:

- CompactLogix 5380 controller
- Compact GuardLogix 5380 controller
- CompactLogix 5480 controller
- 5069-AENTR or 5069-AEN2TR EtherNet/IP Adapter
- 5069-FPD field potential distributor

IMPORTANT: Remember the following:

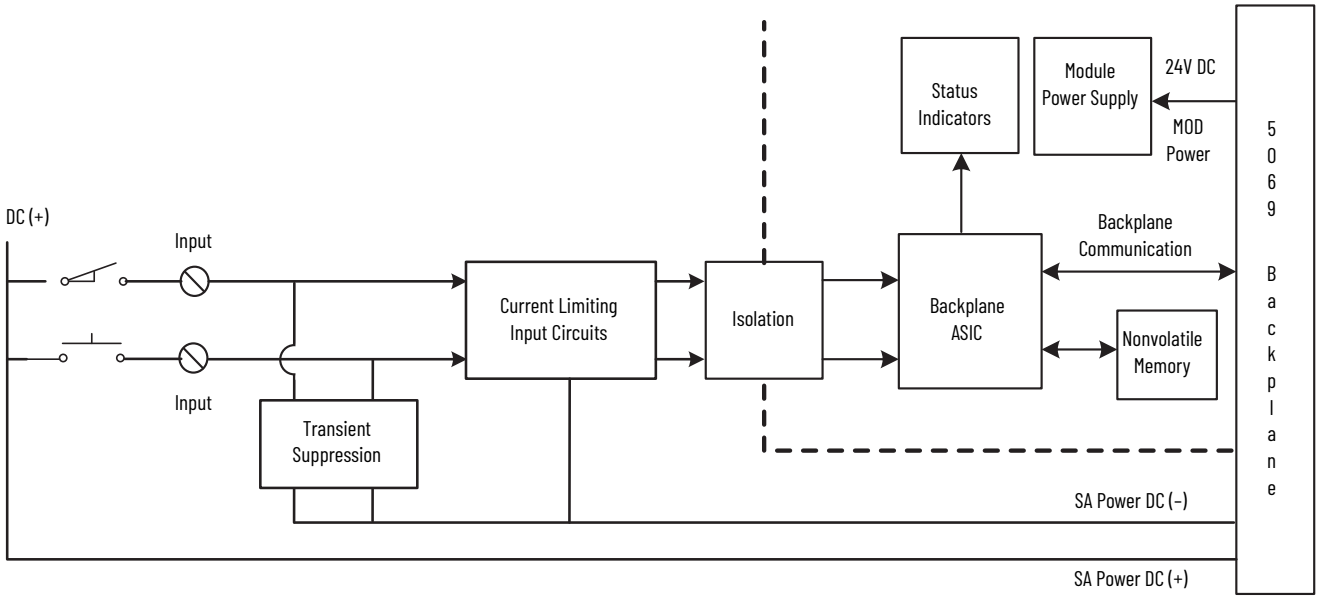
- The 5069-IB16, 5069-IB16K, and 5069-IB16F modules use DC SA power. You must connect DC power to the component, that is, controller, adapter, or field potential distributor, that provides SA Power to the modules.
- The 5069-IB16, 5069-IB16K, and 5069-IB16F module inputs use a shared common. The inputs have a return through internal module circuitry to the SA (–) terminal on the SA Power RTB.
- If you install modules in a system that use AC SA power and DC SA power, you must install them on separate SA power buses.
- You use a 5069-FPD field potential distributor to establish a new SA Power bus in a system. SA Power buses are isolated from each other. To keep the modules on separate SA Power buses, complete these steps.
  1. Install the modules that use one type of SA power, for example DC, to the right of the adapter or controller, that is, the first SA Power bus.
  2. Install the 5069-FPD field potential distributor to establish a second SA Power bus.
  3. Install the modules that use the other type of SA power, for example AC, on the second SA Power bus.

IMPORTANT: The 5069-IB16K and 5069-IB16K modules are wired the same as the wiring diagram that is shown for the 5069-IB16 module.



The following figure shows a functional block diagram for the 5069-IB16, 5069-IB16K, and 5069-IB16F modules.

5069-IB16, 5069-IB16K, and 5069-IB16F Functional Block Diagram



Technical Specifications - 5069-IB16, 5069-IB16K, and 5069-IB16F

Attribute	5069-IB16, 5069-IB16K	5069-IB16F
On-state voltage, min	10V DC	
On-state voltage, nom	24V DC	
On-state voltage, max	32V DC	
On-state current, min	4 mA @ 10V	
On-state current, nom	6 mA @ 24V DC	
On-state current, max	7.4 mA @ 32V DC	
Off-state voltage, max	5V DC	
Off-state current, max	1.5 mA	
Input impedance, min	1.33 kΩ	
Input impedance, nom	4.1 kΩ	
Input impedance, max	7.0 kΩ	
Inrush current, max	< 250 mA peak (decaying to, 37% in 22 ms, without activation)	
Input delay time (screw to backplane)		
Off to On	≤ 100 µs, ±10 µs @ 25 °C (77 °F)	≤ 10 µs, ±1 µs @ 25 °C (77 °F)
On to Off	≤ 100 µs, ±10 µs @ 25 °C (77 °F)	≤ 10 µs, ±1 µs @ 25 °C (77 °F)
Input drift over temperature span	±100 ns/°C (55.6 ns/°F) from 0...60 °C (32...140 °F)	< 10 ns/°C (5.56 ns/°F) from 0...60 °C (32...140 °F)
Input On to Off minimum pulse width	60 µs	6 µs
Input Off to On minimum pulse width	60 µs	6 µs

Technical Specifications - 5069-IB16, 5069-IB16K, and 5069-IB16F

Attribute	5069-IB16, 5069-IB16K	5069-IB16F
Input filter time		
Off to On	Hardware delay: 50 µs + filter time User-selectable filter time: 0…50 ms	Hardware delay: 2 µs + filter time User-selectable filter time: 0…50 ms
On to Off	Hardware delay: 50 µs + filter time User-selectable filter time: 0…50 ms	Hardware delay: 3 µs + filter time User-selectable filter time: 0…50 ms
Reverse polarity protection	Yes	
Overvoltage protection, max	36V (fuse protected)	
Pulse and period measurements	Not supported	±2 µs
Counter frequency	0 - f_{max} = 500 Hz (inv period 2 ms)	0 - f_{max} = 30 kHz (inv period 33.3 µs)
Frequency counter	0 - f_{max} = 500 Hz (inv period 2 ms)	0 - f_{max} = 30 kHz (inv period 33.3 µs)
Timestamp of inputs	Not supported	±10 µs accuracy 1 ns resolution
Overrides	Not supported	
Pulse latching	Not supported	Supported
Events	Not supported	Four events supported (triggered by any input or simple counters)
Pattern matching	Not supported	Supported
Extended counters	Not supported	

General Specifications - 5069-IB16, 5069-IB16K, and 5069-IB16F

Attribute	5069-IB16, 5069-IB16K	5069-IB16F
Inputs	16 Channels (1 group of 16), sinking	
Voltage category	12/24V DC Sink	
Voltage and current ratings		
Input ratings	4…7.4 mA per channel @ 10…32V DC	
MOD Power	75 mA @ 18…32V DC	
MOD Power Passthrough, max[1]	9.55 A @ 18…32V DC	
SA Power	200 mA @ 10…32V DC	
SA Power Passthrough, max[2]	9.95 A @ 10…32V DC	
Power dissipation, max	3.9 W	
Thermal dissipation, max	13.3 BTU/hr	
Isolation voltage	250V (continuous), Basic Insulation Type No isolation between SA Power and input ports No isolation between individual input ports	
Module keying	Electronic keying via programming software	
Indicators	1 green/red module status indicator 16 yellow/red I/O status indicators	
Slot width	1	
Dimensions (HxWxD), approx	144.57 x 22 x 105.42 mm (5.69 x 0.87 x 4.15 in.)	
DIN rail	Compatible zinc-plated chromate-passivated steel DIN rail. You can use the EN50022 - 35 x 7.5 mm (1.38 x 0.30 in.) DIN rail.	

General Specifications - 5069-IB16, 5069-IB16K, and 5069-IB16F

Attribute	5069-IB16, 5069-IB16K	5069-IB16F
RTB	One of these RTB types. • 5069-RTB18-SPRING RTB • 5069-RTB18-SCREW RTB **IMPORTANT**: You must order RTBs separately. RTBs do not ship with Compact 5000 I/O modules. We recommend that you order only the RTB type that your system requires.	
RTB torque (5069-RTB18-SCREW RTB only)	0.4 N·m (3.5 lb·in)	
RTB keying	None	
Wire category(3)	2 - input ports 2 - power ports 1 wire per terminal for each signal port	
Wire size		
5069-RTB18-SPRING connections	0.5…1.5 mm^2 (22…16 AWG) solid or stranded shielded copper wire rated at 105 °C (221 °F), or greater, 2.9 mm (0.11 in.) max diameter including insulation, single wire connection only.	
5069-RTB18-SCREW connections	0.5…1.5 mm^2 (22…16 AWG) solid or stranded shielded copper wire rated at 105 °C (221 °F), or greater, 3.5 mm (0.14 in.) max diameter including insulation, single wire connection only.	
Insulation stripping length	5069-RTB18-SPRING connections: 10 mm (0.39 in.) 5069-RTB18-SCREW connections: 12 mm (0.47 in.)	
Weight, approx	175 g (0.39 lb)	
Enclosure type	None (open-style)	
North American temp code	T4	
ATEX/IECEx temp code	T4	
IECEx temp code	T4	

(1) Level of MOD Power current that passes through the module depends on the system configuration, such as, module slot location and the other module types that are used in the system. For more information, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, 5069-UM001, CompactLogix 5480 Controllers User Manual, 5069-UM002, and Compact 5000 EtherNet/IP Adapters User Manual, 5069-UM004.

(2) Level of SA Power current that passes through the module depends on the system configuration, such as, module slot location and the other module types that are used in the system. For more information, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, 5069-UM001, CompactLogix 5480 Controllers User Manual, 5069-UM002, and Compact 5000 EtherNet/IP Adapters User Manual, 5069-UM004.

(3) Use this Conductor Category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 5069-IB16, 5069-IB16K, and 5069-IB16F

Attribute	5069-IB16, 5069-IB16K, 5069-IB16F
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air, max	60 °C (140 °F)
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…+85 °C (-40…+185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	5 g @ 10…500 Hz

Environmental Specifications - 5069-IB16, 5069-IB16K, and 5069-IB16F

Attribute	5069-IB16, 5069-IB16K, 5069-IB16F
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	IEC 61000-6-4
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% pulse 100% AM at 900 MHz 10V/m with 200 Hz 50% pulse 100% AM at 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV @ 5 kHz on power ports ±3 kV @ 5 kHz on input ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on power ports ±1 kV line-line (DM) and ±2 kV line-earth (CM) on input ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Voltage variation IEC 61000-4-29	10 ms interruption on MOD Power port

Certifications - 5069-IB16, 5069-IB16K, and 5069-IB16F

Certification[1]	5069-IB16, 5069-IB16K, 5069-IB16F
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
CE	European Union 2014/30/EU EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2014/35/EU LVD, compliant with: • EN 61010-2-201; Control Equipment Safety Requirements European Union 2011/65/EU RoHS, compliant with: • EN 50581; Technical documentation
RCM	Australian Radiocommunications Act, compliant with: EN 61000-6-4; Industrial Emissions
Ex	European Union 2014/34/EU ATEX Directive, compliant with: • EN 60079-0; General Requirements • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • II 3 G Ex nA IIC T4 Gc • DEMKO 15 ATEX 1484X
IECEx	IECEx System, compliant with: • IEC 60079-0; General Requirements • IEC 60079-15; Potentially Explosive Atmospheres, Protection "n" • II 3 G Ex nA IIC T4 Gc • IECEx UL 15.0055X
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3
EAC	Russian Customs Union TR CU 020/2011 EMC Technical Regulation Russian Customs Union TR CU 004/2011 LV Technical Regulation

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Analog I/O Modules

I/O Type	Cat. No.	Description	Page
Analog input	5069-IF8	8-channel current/voltage input module	50
	5069-IY4	4-channel current/voltage/RTD/Thermocouple input module	58
	5069-IY4K	4-channel conformal coated current/voltage/RTD/Thermocouple input module	
Analog output	5069-OF4	4-channel current/voltage output module	73
	5069-OF4K	4-channel conformal coated current/voltage output module	
	5069-OF8	8-channel current/voltage output module	

5069-IF8 Analog 8-channel Current/Voltage Input Module

The following table lists the devices that are supported with the 5069-IF8 module.

Device	Mode(s)[1]	Supported	Wiring Diagram Example
2-wire analog device 4-wire analog device[2]	Current	Yes	page 51
	Voltage		page 52
	Combination of current and voltage	Yes	page 53
1-wire analog device 3-wire analog device	N/A - These devices are not supported regardless of the channel mode configuration.	No	—
2-wire Thermocouple device			
2-wire RTD device 3-wire RTD device			

(1) Make sure that the channel configuration in your Logix Designer application project matches the input device type that is connected to the channel. You choose the input type in the Channels category on the Module Properties dialog box. For example, if a current input device is connected to channel 0 on the module, the module configuration for channel must be Input Type = Current.

(2) These devices are 2-wire current and voltage devices with 2-wire sensor power connections.

The following figure shows a wiring diagram for the 5069-IF8 module with channels configured for current mode.

5069-IF8 Wiring Diagram - Current Mode

Channel Connections

The diagram shows devices that are connected to channels 0, 2, 5, and 7. You are not restricted to using only this channel.
You can connect devices to any channel or combination of channels as needed.

IMPORTANT

- Place additional loop devices, for example, strip chart recorders, at either **A** location in the current loop.
- Use separate external power supplies to provide SA power to the system and to power external devices that are connected to the module.
- This module has only two shield terminals. Compact 5000 I/O module RTBs only support one wire per terminal.

If you connect more than two devices to the module, you can ground two devices at the shield terminals.
You must ground the remaining devices somewhere else, such as, to the DIN rail via a terminal strip. In this case, use the same power supply to power the additional devices. If separate power supplies are used to power the additional devices, ground the power supplies at the same ground location.

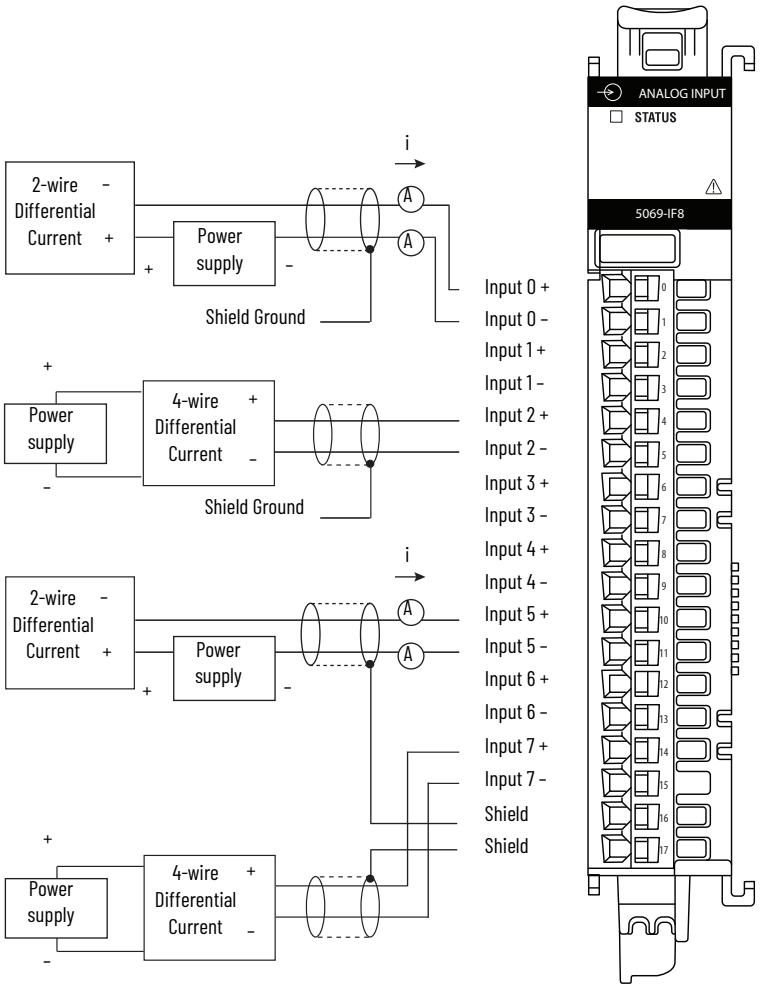
SA Power

Connections to an external power supply that provides SA power are made via the SA Power RTB on one of the following:

- CompactLogix 5380 controller
- Compact GuardLogix 5380 controller
- CompactLogix 5480 controller
- 5069-AENTR or 5069-AEN2TR EtherNet/IP Adapter
- 5069-FPD field potential distributor

IMPORTANT: Remember the following:

- The 5069-IF8 module uses DC SA power. You must connect DC power to the component, that is, controller, adapter, or field potential distributor, that provides SA Power to the modules.
- If you install modules in a system that use AC SA power and DC SA power, you must install them on separate SA power buses.
- You use a 5069-FPD field potential distributor to establish a new SA Power bus in a system. SA Power buses are isolated from each other. To keep the modules on separate SA Power buses, complete these steps.
  1. Install the modules that use one type of SA power, for example DC, to the right of the adapter or controller, that is, the first SA Power bus.
  2. Install the 5069-FPD field potential distributor to establish a second SA Power bus.
  3. Install the modules that use the other type of SA power, for example AC, on the second SA Power bus.



The following figure shows a wiring diagram for the 5069-IF8 module with channels configured for voltage mode.

5069-IF8 Wiring Diagram - Voltage Mode

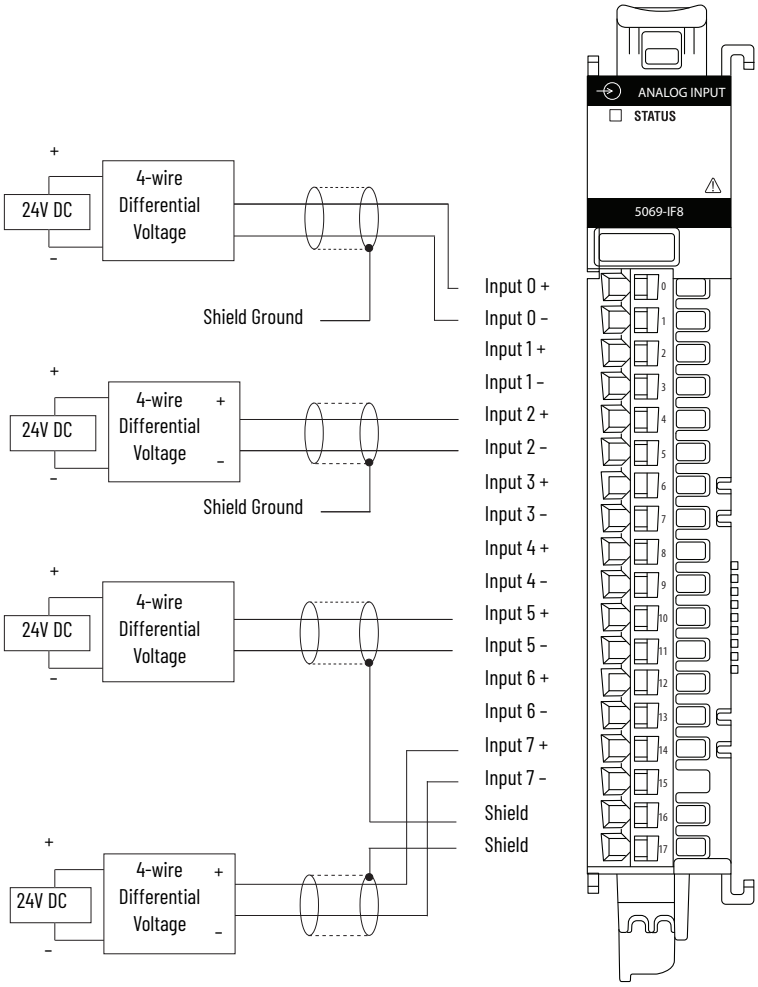
Channel Connections

The diagram shows devices that are connected to channels 0, 2, 5, and 7. You are not restricted to using only this channel.
You can connect devices to any channel or combination of channels as needed.

IMPORTANT

- Use separate external power supplies to provide SA power to the system and to power external devices that are connected to the module.
- This module has only two shield terminals. Compact 5000 I/O module RTBs only support one wire per terminal.

If you connect more than two devices to the module, you can ground two devices at the shield terminals.
You must ground the remaining devices somewhere else, such as, to the DIN rail via a terminal strip. In this case, use the same power supply to power the additional devices. If separate power supplies are used to power the additional devices, ground the power supplies at the same ground location.



The following figure shows a wiring diagram for the 5069-IF8 module with different device types connected to different channels. The device type and mode configuration for each channel must match.

5069-IF8 Wiring Diagram – Combination of Device Types Connected to the Module

Channel Connections

The diagram shows devices that are connected to channels 0, 2, 5, and 7. You are not restricted to using only this channel.
You can connect devices to any channel or combination of channels as needed.

IMPORTANT

- Place additional loop devices, for example, strip chart recorders, at either **A** location in the current loop.
- Use separate external power supplies to provide SA power to the system and to power external devices that are connected to the module.
- This module has only two shield terminals. Compact 5000 I/O module RTBs only support one wire per terminal.

If you connect more than two devices to the module, you can ground two devices at the shield terminals.
You must ground the remaining devices somewhere else, such as, to the DIN rail via a terminal strip. In this case, use the same power supply to power the additional devices. If separate power supplies are used to power the additional devices, ground the power supplies at the same ground location.

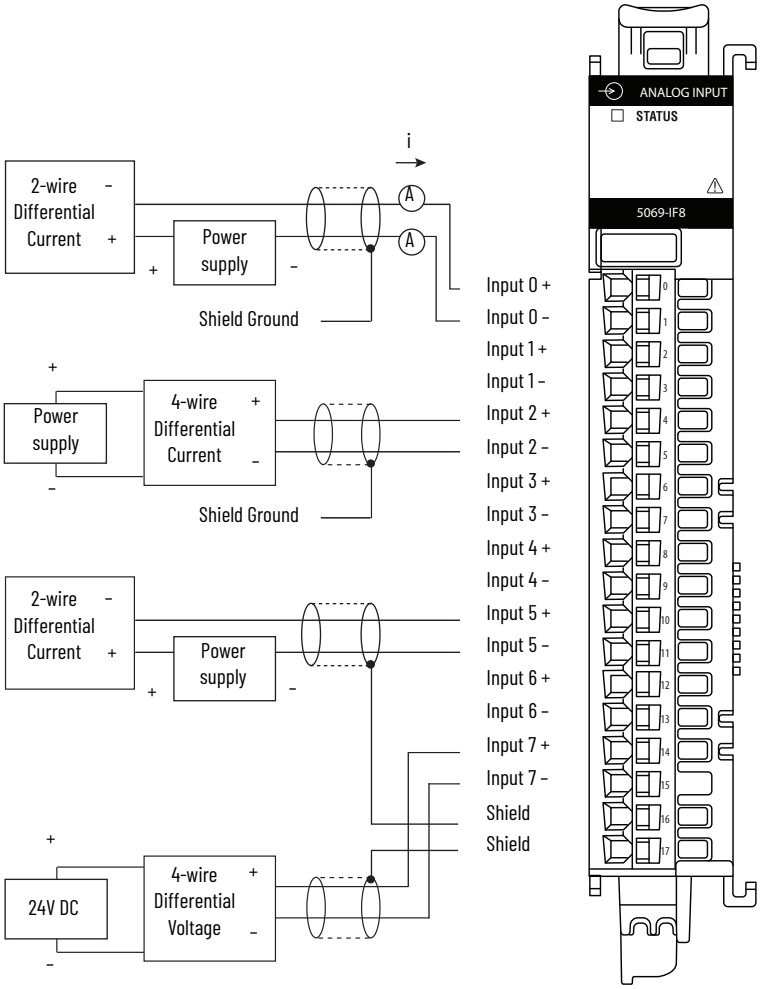
SA Power

Connections to an external power supply that provides SA power are made via the SA Power RTB on one of the following:

- CompactLogix 5380 controller
- Compact GuardLogix 5380 controller
- CompactLogix 5480 controller
- 5069-AENTR or 5069-AEN2TR EtherNet/IP Adapter
- 5069-FPD field potential distributor

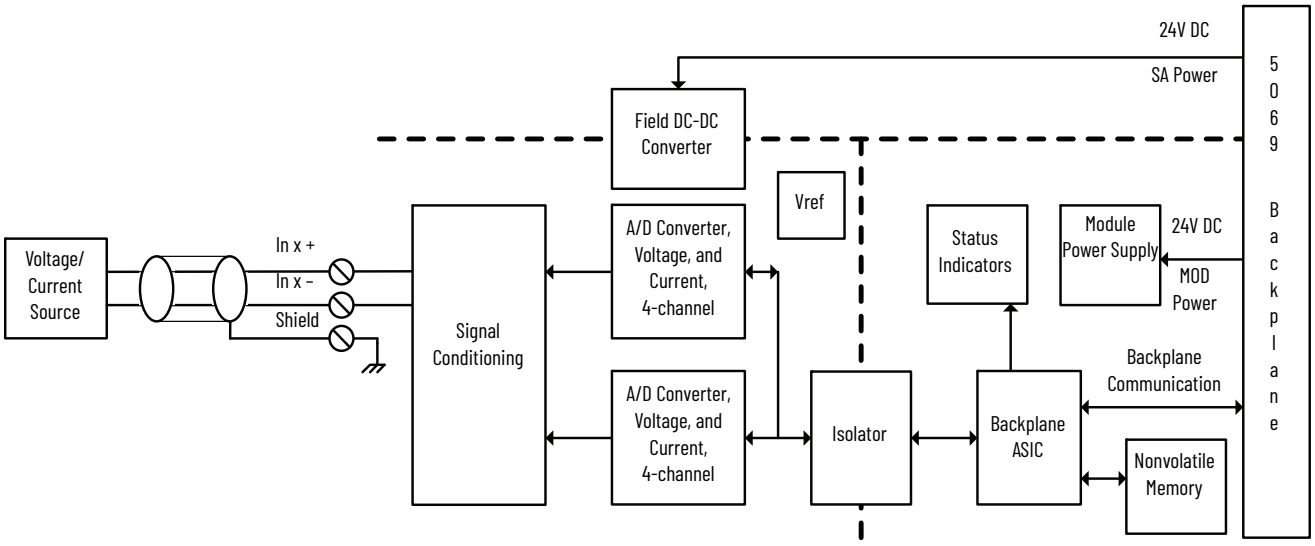
IMPORTANT: Remember the following:

- The 5069-IF8 module uses DC SA power. You must connect DC power to the component, that is, controller, adapter, or field potential distributor, that provides SA Power to the modules.
- If you install modules in a system that use AC SA power and DC SA power, you must install them on separate SA power buses.
- You use a 5069-FPD field potential distributor to establish a new SA Power bus in a system. SA Power buses are isolated from each other. To keep the modules on separate SA Power buses, complete these steps.
  1. Install the modules that use one type of SA power, for example DC, to the right of the adapter or controller, that is, the first SA Power bus.
  2. Install the 5069-FPD field potential distributor to establish a second SA Power bus.
  3. Install the modules that use the other type of SA power, for example AC, on the second SA Power bus.



The following figure shows a functional block diagram for the 5069-IF8 module.

5069-IF8 Functional Block Diagram



Technical Specifications - 5069-IF8

Attribute	5069-IF8
Inputs	8 differential
Input range, voltage	±10V 0…10V 0…5V
Input range, current	0…20 mA 4…20 mA
Input impedance	Voltage: >1 MΩ Current: 90 Ω typical, 70…110 Ω range
Common mode voltage (channel to channel)	±10V (Current mode) ±2V (Voltage mode)
Module conversion method	Sigma-Delta, Two 24-bit multiplexed ADC
Resolution, voltage[1] (16 bits at 10 Hz notch filter)	±10.5V: <320 µV/count (15 bits plus sign bipolar) 0…10.5V: <160 µV/count (16 bits unipolar) 0…5.25V: <80 µ/V count (16 bits unipolar)
Resolution, current[1] (16 bits at 10 Hz notch filter)	0…21 mA: <0.32 µA/count (16 bits) 3.6…21 mA: <0.27 µA/count (16 bits)
Calibrated accuracy at 25 °C	Voltage 0.10% full scale Current 0.10% full scale
Accuracy drift with temperature	Voltage 0.20% full scale Current 0.30% full scale
Input Total Unadjusted Error (TUE)[2] (Over full temperature range)	Voltage 0.30% full scale Current 0.40% full scale
Scan Time Per channel Per group (channel group 0…3 or channel group 4…7)	 625 µs 2.5 ms
Notch filter at minimum RPI (0.2 ms, 1 channel enabled)	62.5 kHz

Technical Specifications - 5069-IF8

Attribute	5069-IF8
Minimum notch filter frequency at RPI of 2.5 ms	10 kHz
Step response time to 63% of value (Notch filter 10 kHz)	7.5 ms
Input notch filter (Hz) selections	5, 10 (50/60 Default), 15, 20, 50, 60, 100, 200, 500, 1000, 2500, 5000, 10000, 15625, 25000, 31250, 62500
Input anti-aliasing filter cutoff frequency, nom	500 Hz
Input digital filter	First order lag, 0 ms (Default)...32,767 ms (32.767 s)
HART handheld compliance	Add an external 250 Ω resistor into the current loop for HART transmitter compliance.
Overvoltage protection, max	Voltage and Current modes: ± 30V DC
Overcurrent protection, max	Current mode: ±30 mA
Data value during overload condition	Full scale, overrange flag, Data uncertain / data bad
Open circuit detection time	Voltage: + full scale, < 2 s Current: 4...20 mA range, <2 s
Onboard data alarming	Yes
Scaling to engineering units	Yes
Real-time channel sampling	Yes
Data format	IEEE 32-bit floating point

(1) Notch filter dependent.

(2) Includes offset, gain, non-linearity, and repeatability error terms.

General Specifications - 5069-IF8

Attribute	5069-IF8
Voltage and current ratings	
MOD Power	75 mA @ 18...32V DC
MOD Power Passthrough, max(1)	9.55 A @ 18...32V DC
SA Power	100 mA @ 18...32V DC
SA Power Passthrough, max(2)	9.95 A @ 18...32V DC
Do not exceed 10 A MOD or SA Power (Passthrough) current draw.	
Power dissipation, max	Voltage mode: 2.1 W Current mode: 2.4 W
Thermal dissipation, max	Voltage mode: 7.2 BTU/hr Current mode: 8.2 BTU/hr
Isolation voltage	250V (continuous), Basic Insulation Type 50V Functional Isolation between SA power and input ports No isolation between individual Input ports
Calibration methods	Factory calibrated User-performed (optional)
Module keying	Electronic keying via programming software
Indicators	1 green/red module status indicator 8 yellow/red I/O status indicator
Slot width	1
Common mode noise rejection ratio	130 dB @ 50/60 Hz
Normal mode noise rejection ratio	65 dB @ 50/60 Hz, notch filter dependent
Dimensions (HxWxD), approx	144.57 x 22 x 105.42 mm (5.69 x 0.87 x 4.15 in.)

General Specifications - 5069-IF8

Attribute	5069-IF8
DIN rail	Compatible zinc-plated chromate-passivated steel DIN rail. You can use the EN50022 - 35 x 7.5 mm (1.38 x 0.30 in.) DIN rail.
RTB	One of these RTB types. • 5069-RTB18-SPRING RTB • 5069-RTB18-SCREW RTB **IMPORTANT**: You must order RTBs separately. RTBs do not ship with Compact 5000 I/O modules. We recommend that you order only the RTB type that your system requires.
RTB torque (5069-RTB18-SCREW RTB only)	0.4 N•m (3.5 lb•in)
RTB keying	None
Wire category(3)	2 - shielded input ports 2 - power ports 1 wire per terminal for each signal port
Wire size	
5069-RTB18-SPRING removable terminal block	0.5…1.5 mm^2 (22…16 AWG) solid or stranded copper wire rated at 105 °C (221 °F), or greater, 2.9 mm (0.11 in.) max diameter including insulation
5069-RTB18-SCREW removable terminal block	0.5…1.5 mm^2 (22…16 AWG) solid or stranded copper wire rated at 105 °C (221 °F), or greater, 3.5 mm (0.14 in.) max diameter including insulation
Insulation stripping length	
5069-RTB18-SPRING connections	10 mm (0.39 in.)
5069-RTB18-SCREW connections	12 mm (0.47 in.)
Weight, approx	175 g (0.39 lb)
Enclosure type	None (open-style)
North American temperature code	T4
ATEX temp code	T4
IECEx temp code	T4

(1) Level of MOD Power current that passes through the module depends on the system configuration, such as, module slot location and the other module types that are used in the system. For more information, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, 5069-UM001, CompactLogix 5480 Controllers User Manual, 5069-UM002, and Compact 5000 EtherNet/IP Adapters User Manual, 5069-UM004.

(2) Level of SA Power current that passes through the module depends on the system configuration, such as, module slot location and the other module types that are used in the system. For more information, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, 5069-UM001, CompactLogix 5480 Controllers User Manual, 5069-UM002, and Compact 5000 EtherNet/IP Adapters User Manual, 5069-UM004.

(3) Use this Conductor Category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 5069-IF8

Attribute	5069-IF8
Temperature, operating IEC 60068-2-1 (Test Ab, Operating Cold), IEC 60068-2-2 (TestBb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air, max	60 °C (140 °F)
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…+85 °C (-40…+185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	5 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g

Environmental Specifications - 5069-IF8

Attribute	5069-IF8
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	IEC 61000-6-4
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 880% AM from 80...2000 MHz 10V/m with 200 Hz 50% pulse 100% AM at 900 MHz 10V/m with 200 Hz 50% pulse 100% AM at 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV @ 5 kHz on power ports ±3 kV @ 5 kHz on shielded input ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on power ports ±2 kV line-earth (CM) on shielded input ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Voltage variation IEC 61000-4-29	10 ms interruption on MOD Power port

Certifications - 5069-IF8

Certification(1)	5069-IF8
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
CE	European Union 2014/30/EU EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2014/35/EU LVD, compliant with: • EN 61010-2-201; Control Equipment Safety Requirements European Union 2011/65/EU RoHS, compliant with: • EN 50581; Technical documentation
RCM	Australian Radiocommunications Act, compliant with: EN 61000-6-4; Industrial Emissions
Ex	European Union 2014/34/EU ATEX Directive, compliant with: • EN 60079-0; General Requirements • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • II 3 G Ex nA IIC T4 Gc • DEMKO 15 ATEX 1484X
IECEx	IECEx System, compliant with: • IEC 60079-0; General Requirements • IEC 60079-15; Potentially Explosive Atmospheres, Protection "n" • II 3 G Ex nA IIC T4 Gc • IECEx UL 15.0055X
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3
EAC	Russian Customs Union TR CU 020/2011 EMC Technical Regulation Russian Customs Union TR CU 004/2011 LV Technical Regulation

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

5069-OF4, 5069-OF4K, and 5069-OF8 Analog Current/Voltage Output Modules

The following figure shows a wiring diagram for the 5069-OF4 and 5069-OF4K modules when used in current mode.

5069-OF4 and 5069-OF4K Wiring Diagram - Current Mode

Channel Connections

The diagram shows a device that is connected to channels 0, 2, and 3. You aren't restricted to using only these channels. You can connect devices to any channel or combination of channels as needed.

IMPORTANT: Remember the following:

- Place more loop devices, for example, strip chart recorders, at either **A** location in the current loop.
- This module has only two shield terminals. Compact 5000 I/O module RTBs only support one wire per terminal.
- If you connect more than two devices to the module, you can ground two devices at the shield terminals. You must ground the remaining devices somewhere else, such as, to the DIN rail via a terminal strip

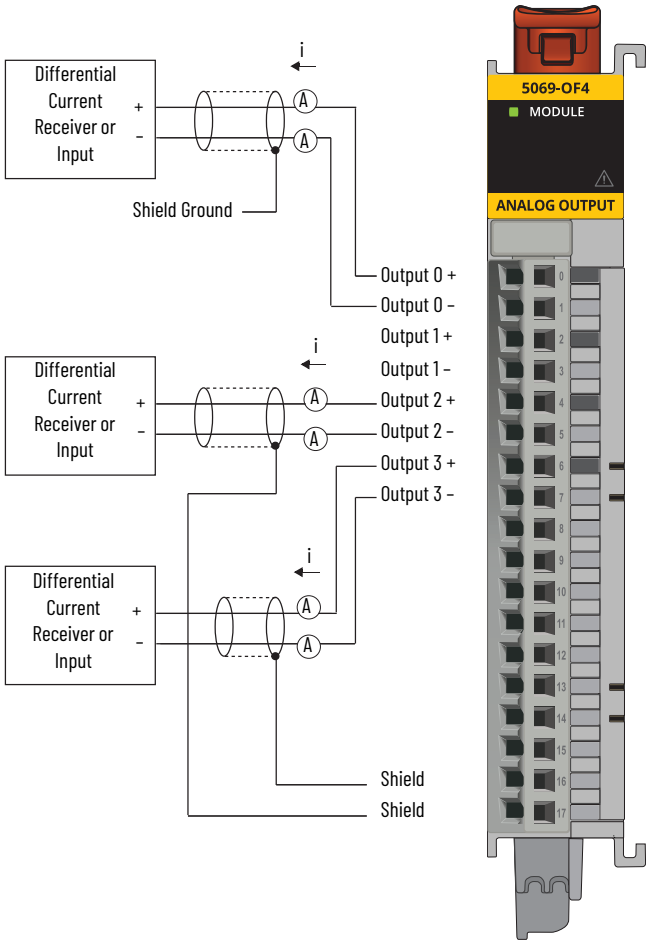
SA Power

Connections to an external power supply that provides SA power are made via the SA power RTB on one of the following:

- CompactLogix 5380 controller
- Compact GuardLogix 5380 controller
- CompactLogix 5480 controller
- 5069-AENTR or 5069-AEN2TR EtherNet/IP Adapter
- 5069-FPD field potential distributor

IMPORTANT: Remember the following:

- The 5069-OF4 module uses DC SA power. You must connect DC power to the component, that is, controller, adapter, or field potential distributor, that provides SA power to the modules.
- If you install modules in a system that use AC SA power and DC SA power, you must install them on separate SA power buses.
- You use a 5069-FPD field potential distributor to establish a new SA power bus in a system. SA power buses are isolated from each other. To keep the modules on separate SA power buses, complete these steps.
  1. Install the modules that use one type of SA power, for example DC, to the right of the adapter or controller, that is, the first SA power bus.
  2. Install the 5069-FPD field potential distributor to establish a second SA power bus.
  3. Install the modules that use the other type of SA power, for example AC, on the second SA power bus.



The following figure shows a wiring diagram for the 5069-OF8 module when used in current mode.

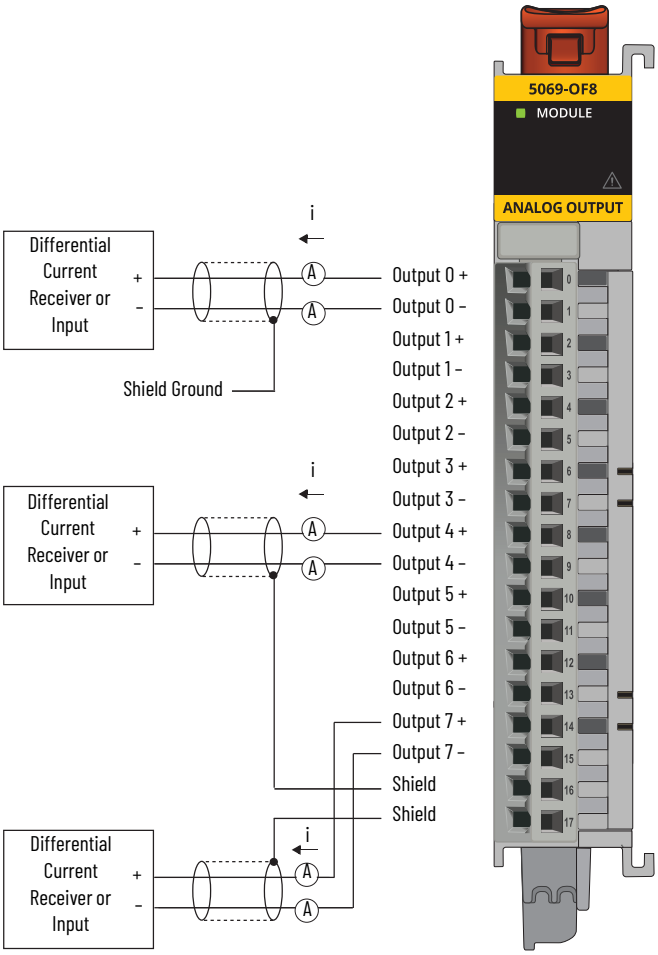
5069-OF8 Wiring Diagram - Current Mode

Channel Connections

The diagram shows devices that are connected to channels 0, 4, and 7. You aren't restricted to using only those channels. You can connect devices to any channel or combination of channels as needed.

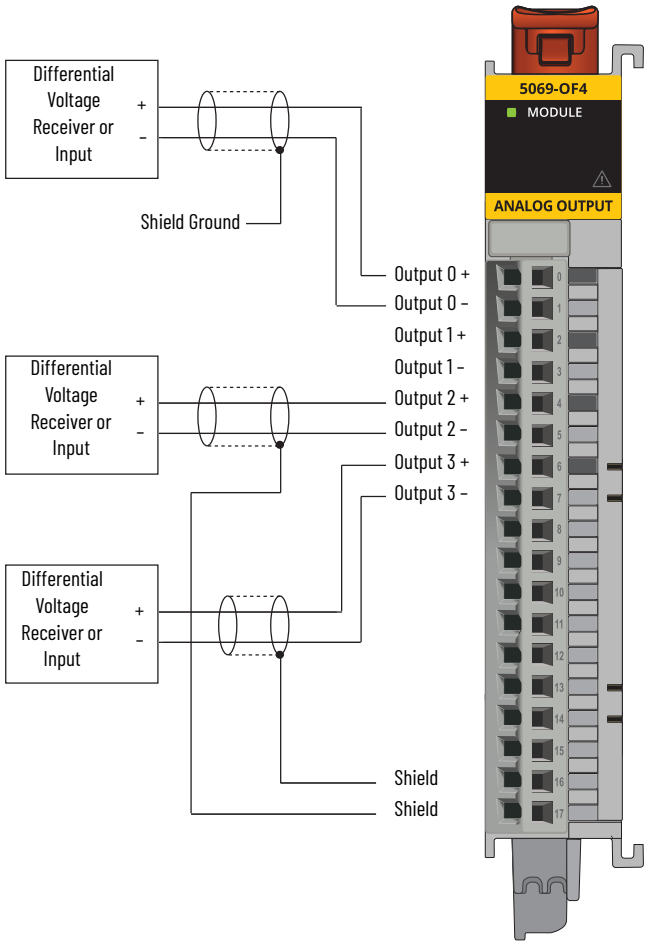
IMPORTANT: Remember the following:

- Place more loop devices, for example, strip chart recorders, at either **A** location in the current loop.
- This module has only two shield terminals. Compact 5000 I/O module RTBs only support one wire per terminal.
- If you connect more than two devices to the module, you can ground two devices at the shield terminals. You must ground the remaining devices somewhere else, such as, to the DIN rail via a terminal strip.



The following figure shows a wiring diagram for the 5069-OF4 and 5069-OF4K modules when used in voltage mode.

5069-OF4 and 5069-OF4K Wiring Diagram - Voltage Mode



Channel Connections

The diagram shows a device that is connected to channels 0, 2, and 3. You aren't restricted to using only these channels. You can connect devices to any channel or combination of channels as needed.

IMPORTANT: Remember the following:

- This module has only two shield terminals. Compact 5000 I/O module RTBs only support one wire per terminal.
- If you connect more than two devices to the module, you can ground two devices at the shield terminals. You must ground the remaining devices somewhere else, such as, to the DIN rail via a terminal strip.
- The 5069-OF4K module uses the same wiring diagram as shown for the 5069-OF4 module.

The following figure shows a wiring diagram for the 5069-OF8 module when used in voltage mode.

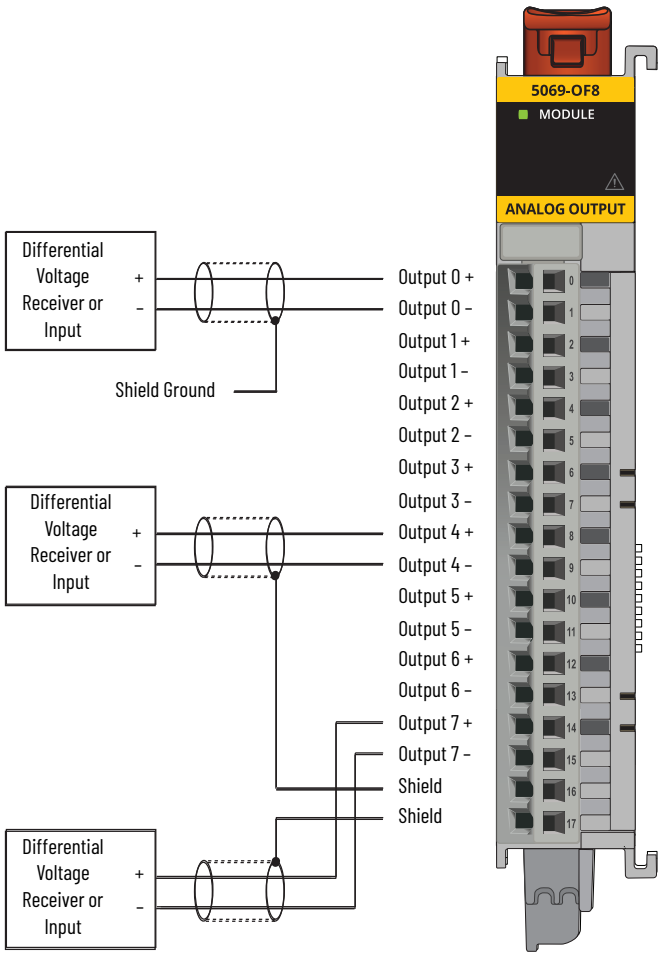
5069-OF8 Wiring Diagram - Voltage Mode

Channel Connections

The diagram shows a device that is connected to channels 0, 2, and 3. You aren't restricted to using only these channels. You can connect devices to any channel or combination of channels as needed.

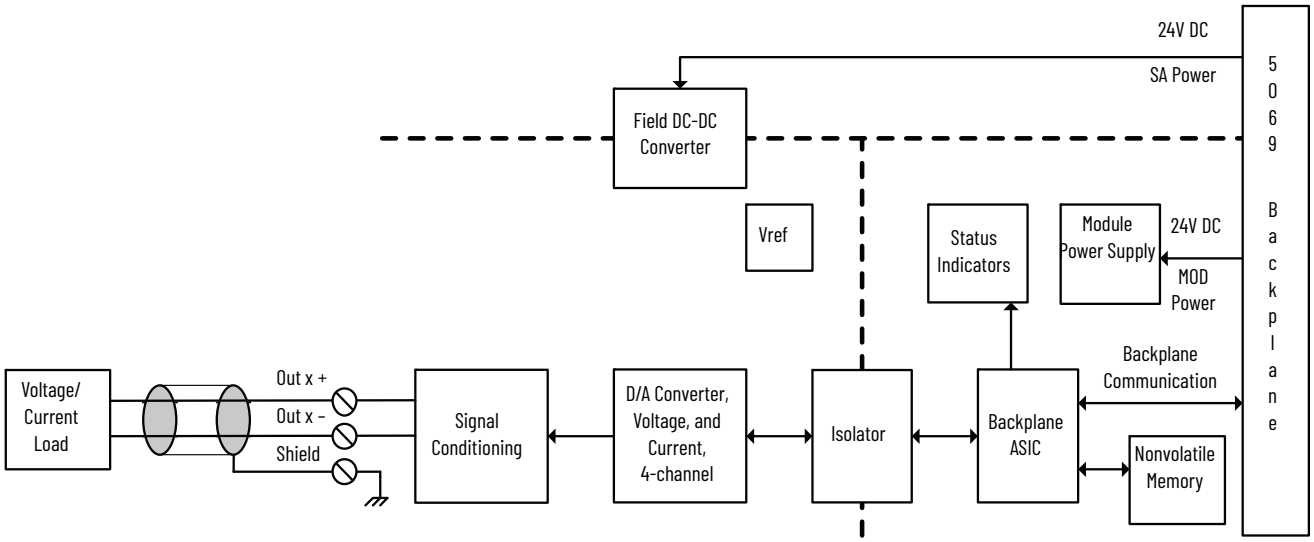
IMPORTANT: This module has only two shield terminals. Compact 5000 I/O module RTBs only support one wire per terminal.

If you connect more than two devices to the module, you can ground two devices at the shield terminals. You must ground the remaining devices somewhere else, such as, to the DIN rail via a terminal strip.



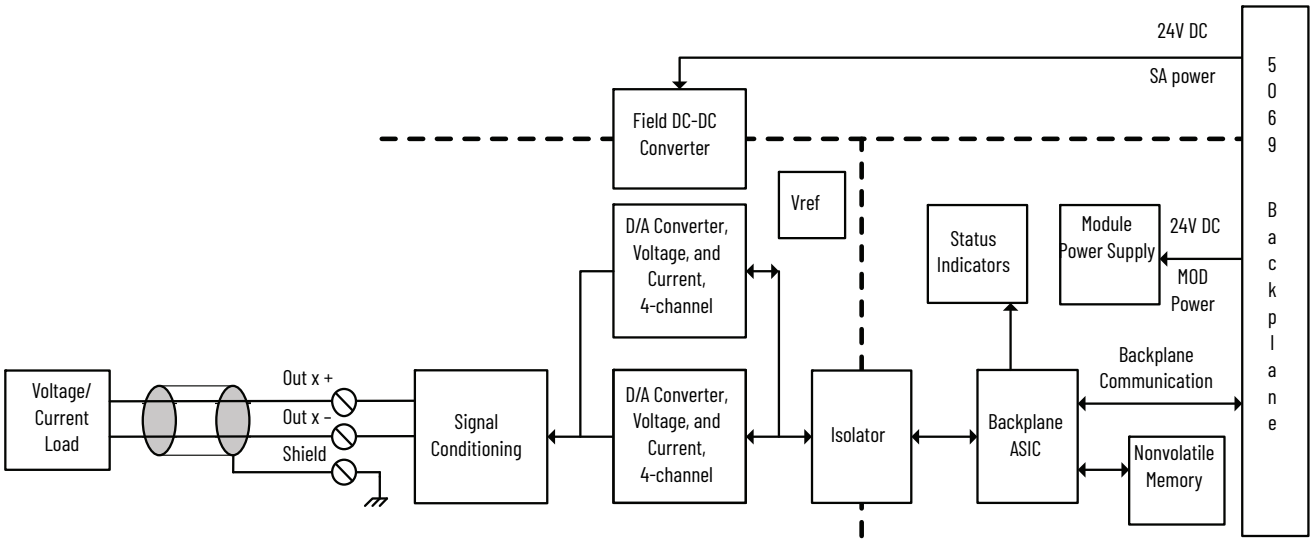
The following figure shows a functional block diagram for the 5069-OF4 and 5069-OF4K modules.

5069-OF4 and 5069-OF4K Functional Block Diagram



The following figure shows a functional block diagram for the 5069-OF8 module.

5069-OF8 Functional Block Diagram



Technical Specifications - 5069-OF4, 5069-OF4K, 5069-OF8

Attribute	5069-OF4, 5069-OF4K	5069-OF8
Outputs	4 voltage or current	8 voltage or current
Output range, voltage	± 10V 0...10V 0...5V	
Output range, current	0...20 mA 4...20 mA	
Resolution	16 bits across ± 10.5V - 320 µV/bit 16 bits across 10.5V - 160 µV/bit 16 bits across 5.25V - 80 µV/bit 16 bits across 21 mA - 320 nA/bit	
Drive capability	Voltage - 1000 Ω min Current - 500 Ω max	
Capacitive load, max (voltage mode only)	1 µF	
Inductive load, max (current mode only)	1 mH	
Open circuit detection	Current mode only	
Short circuit detection	Voltage mode only – output electronically limited to 16 mA or less	
Data format	IEEE 32-bit floating point	
Module conversion method	R-Ladder DAC, monotonicity with no missing codes	
Conversion time per channel	25 µs	
Scan time • Per group 0...3 (OF4/OF8) • Per group 0...7 (OF8 only)	 1.0 ms 2.0 ms	
Step response time to 63% of value	Voltage mode – 18 µs max Current mode – 1 ms max	
Overvoltage protection, max	± 32V DC	
Repeatability	0.05%	
Calibrated accuracy at 25 °C (77 °F)	Voltage - 0.10% full scale Current - 0.10% full scale	
Accuracy drift with temperature	Voltage - 0.30% full scale Current - 0.50% full scale	

General Specifications - 5069-OF4, 5069-OF4K, and 5069-OF8

Attribute	5069-OF4, 5069-OF4K	5069-OF8
Voltage and current ratings		
Analog output ratings	+/–10V DC, 0…20 mA per channel	
Mod power	75 mA @ 18…32V DC	
Mod power Passthrough, max[1]	9.55 A @ 18…32V DC	
SA power	150 mA @ 18…32V DC	250 mA @ 18…32V DC
SA power Passthrough, max[2]	9.95 A @ 18…32V DC	
Power dissipation, max	3.3 W	5.3 W
Thermal dissipation, max	11.3 BTU/hr	18.1 BTU/hr
Isolation voltage	250V (continuous), Basic Insulation Type 50V Functional Isolation between SA power and output ports No isolation between individual output ports	
Calibration methods	Factory Calibrated User-performed (optional)	
Module keying	Electronic keying via programming software	
Indicators	1 green/red module status indicator 4 yellow/red I/O status indicators	1 green/red module status indicator 8 yellow/red I/O status indicators
Slot width	1	
Dimensions (HxWxD), approx	144.57 x 22 x 105.42 mm (5.69 x 0.87 x 4.15 in.)	
DIN rail	Compatible zinc-plated chromate-passivated steel DIN rail. You can use the EN50022 - 35 x 7.5 mm (1.38 x 0.30 in.) DIN rail.	
RTB	One of these RTB types. • 5069-RTB18-SPRING RTB • 5069-RTB18-SCREW RTB **IMPORTANT**: You must order RTBs separately. RTBs do not ship with Compact 5000 I/O modules. We recommend that you order only the RTB type that your system requires.	
RTB torque (5069-RTB18-SCREW RTB only)	0.4 N•m (3.5 lb•in)	
RTB keying	None	
Wire category[3]	2 - shielded input ports 2 - power ports 1 wire per terminal for each signal port	
Wire size		
5069-RTB18-SPRING removable terminal block	0.5…1.5 mm^2 (22…16 AWG) solid or stranded copper wire rated at 105 °C (221 °F), or greater, 2.9 mm (0.11 in.) max diameter including insulation	
5069-RTB18-SCREW removable terminal block	0.5…1.5 mm^2 (22…16 AWG) solid or stranded copper wire rated at 105 °C (221 °F), or greater, 3.5 mm (0.14 in.) max diameter including insulation	
Insulation-stripping length		
5069-RTB18-SPRING connections	10 mm (0.39 in.)	
5069-RTB18-SCREW connections	12 mm (0.47 in.)	

General Specifications - 5069-OF4, 5069-OF4K, and 5069-OF8

Attribute	5069-OF4, 5069-OF4K	5069-OF8
Weight, approx	175 g (0.39 lb)	
Enclosure type	None (open-style)	
North American temp code	T4	
ATEX temp code	T4	
IECEx temp code	T4	

(1) Level of Mod power current that passes through the module depends on the system configuration, such as, module slot location and the other module types that are used in the system. For more information, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, 5069-UM001, CompactLogix 5480 Controllers User Manual, 5069-UM002, and Compact 5000 EtherNet/IP Adapters User Manual, 5069-UM004.

(2) Level of SA power current that passes through the module depends on the system configuration, such as, module slot location and the other module types that are used in the system. For more information, see the CompactLogix 5380 and Compact GuardLogix 5380 Controllers User Manual, 5069-UM001, CompactLogix 5480 Controllers User Manual, 5069-UM002, and Compact 5000 EtherNet/IP Adapters User Manual, 5069-UM004.

(3) Use this Conductor Category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 5069-OF4, 5069-OF4K, and 5069-OF8

Attribute	5069-OF4, 5069-OF4K, 5069-OF8
Temperature, operating IEC 60068-2-1 (Test Ab, Operating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Operating Thermal Shock)	0...60 °C (32...140 °F)
Temperature, surrounding air, max	60 °C (140 °F)
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40...+85 °C (-40...+185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5...95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	5 g @ 10...500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	IEC 61000-6-4
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine wave 80% AM from 80...200 MHz 10V/m with 200 Hz 50% pulse 100% AM at 900 MHz 10V/m with 200 Hz 50% pulse 100% AM at 1890 MHz 3V/m with 1 kHz sine wave 80% AM from 2000...2700 MHz

Environmental Specifications - 5069-OF4, 5069-OF4K, and 5069-OF8

Attribute	5069-OF4, 5069-OF4K, 5069-OF8
EFT/B immunity IEC 61000-4-4	±4 kV @ 5 kHz on power ports ±3 kV @ 5 kHz on shielded output ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on power ports ±2 kV line-earth (CM) on shielded output ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine wave 80% AM from 150 kHz...80 MHz
Voltage variation IEC 61000-4-29	10 ms interruption on Mod power port

Certifications - 5069-OF4, 5069-OF4K, and 5069-OF8

Certification(1)	5069-OF4, 5069-OF4K, 5069-OF8
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
CE	European Union 2014/30/EU EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2014/35/EU LVD, compliant with: • EN 61010-2-201; Control Equipment Safety Requirements European Union 2011/65/EU RoHS, compliant with: • EN 50581; Technical documentation
RCM	Australian Radiocommunications Act, compliant with: EN 61000-6-4; Industrial Emissions
Ex	European Union 2014/34/EU ATEX Directive, compliant with: • EN 60079-0; General Requirements • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • II 3 G Ex nA IIC T4 Gc • DEMKO 15 ATEX 1484X
IECEx	IECEx System, compliant with: • IEC 60079-0; General Requirements • IEC 60079-15; Potentially Explosive Atmospheres, Protection "n" • II 3 G Ex nA IIC T4 Gc • IECEx UL 15.0055X
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3
EAC	Russian Customs Union TR CU 020/2011 EMC Technical Regulation Russian Customs Union TR CU 004/2011 LV Technical Regulation

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Technical Data

Original Instructions

5069-L310ER
5069-ECR

Allen-Bradley
by ROCKWELL AUTOMATION

CompactLogix 5380, Compact GuardLogix 5380, and CompactLogix 5480 Controllers Specifications

Bulletin 5069

Summary of Changes

This publication contains the following new or updated information. This list includes substantive updates only and is not intended to reflect all changes.

Topic	Page
Added CompactLogix™ 5380 Process controllers (5069-L320ERP, 5069-L340ERP).	Throughout
Added I/O Capacity and Message Rate Capacity specifications for controllers.	3, 7, 16

Catalog Numbers

This publication is applicable to these controllers:

CompactLogix 5380 Controller Catalog Numbers	5069-L306ER, 5069-L306ERM, 5069-L310ER, 5069-L310ERM, 5069-L310ER-NSE, 5069-L320ER, 5069-L320ERM, 5069-L320ERMK, 5069-L330ER, 5069-L330ERM, 5069-L330ERMK, 5069-L340ER, 5069-L340ERM, 5069-L350ERM, 5069-L350ERMK, 5069-L380ERM, 5069-L3100ERM
CompactLogix 5380 Process Controller Catalog Numbers	5069-L320ERP, 5069-L340ERP
Compact GuardLogix 5380 SIL 2 Controller Catalog Numbers	5069-L306ERS2, 5069-L306ERMS2, 5069-L310ERS2, 5069-L310ERMS2,5069-L320ERS2, 5069-L320ERS2K, 5069-L320ERMS2, 5069-L320ERMS2K, 5069-L330ERS2, 5069-L330ERS2K, 5069-L330ERMS2, 5069-L330ERMS2K, 5069-L340ERS2, 5069-L340ERMS2, 5069-L350ERS2, 5069-L350ERS2K, 5069-L350ERMS2, 5069-L350ERMS2K, 5069-L380ERS2, 5069-L380ERMS2, 5069-L3100ERS2, 5069-L3100ERMS2
Compact GuardLogix 5380 SIL 3 Controller Catalog Numbers	5069-L306ERMS3, 5069-L310ERMS3, 5069-L320ERMS3, 5069-L320ERMS3K, 5069-L330ERMS3, 5069-L330ERMS3K, 5069-L340ERMS3, 5069-L350ERMS3, 5069-L350ERMS3K, 5069-L380ERMS3, 5069-L3100ERMS3
CompactLogix 5480 Controller Catalog Number	5069-L430ERMW, 5069-L450ERMW, 5069-4100ERMW, 5069-L4200ERMW

CompactLogix 5380 Controllers

CompactLogix™ 5380 controllers are part of the Logix 5000™ family of controllers. The controllers provide a scalable controller solution to address a wide variety of applications. The applications range from standalone systems to more complex systems with devices that are connected to the controller via an EtherNet/IP™ network.

The controllers are mounted on a DIN rail. They can monitor and control local and remote I/O modules, and other devices connected to an EtherNet/IP network. The CompactLogix 5380 controllers support this functionality:

- Use of Compact 5000™ I/O module as local I/O and remote I/O modules.
- Use Compact 5000 I/O modules, and other I/O modules, as remote I/O modules.
- Support for Integrated Motion over an EtherNet/IP network (not all controllers).
- Use of Dual-IP mode or Linear/DLR mode.
- Use of two Ethernet ports that let the controller connect to EtherNet/IP device-level and enterprise-level networks.
- Use of 1784-SD1, 1784-SD2, 1784-SDHC8, 1784-SDHC32, 9509-CMSDCD4 Secure Digital (SD) card for nonvolatile memory.
- USB programming port for temporary connection.
- CompactLogix 5380 Process controllers (5069-L320ERP, 5069-L340ERP) support PlantPAx® 5.0, and are conformal coated to add a layer of protection when exposed to harsh, corrosive environments. For more information, see the PlantPAx DCS Configuration and Implementation User Manual, publication PROCES-UM100.

Features - CompactLogix 5380 Controllers

Feature	5069-L306ER, 5069-L306ERM	5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM	5069-L320ER, 5069-L320ERM, 5069-L320ERMK, 5069-L320ERP	5069-L330ER, 5069-L330ERM, 5069-L330ERMK	5069-L340ER, 5069-L340ERM, 5069-L340ERP	5069-L350ERM, 5069-L350ERMK	5069-L380ERM	5069-L3100ERM
Controller tasks Continuous Periodic Event	32 tasks 1000 programs/task All event triggers							
Built-in communication ports	1 - USB port 2 - Ethernet ports **IMPORTANT**: Consider the following: When the controller operates in Dual-IP mode, each Ethernet port requires a unique IP address. When the controller operates in Linear/DLR mode, the controller uses only one IP address.							
USB port communication	USB 2.0, Type B Full speed (12 Mbps) Programming, configuration, firmware update, and online edits only							
Ethernet performance	10 Mbps, 100 Mbps, 1 Gbps Full-duplex only							
I/O Capacity (Class 0/1) (1)	128,000 packets/second							
Message Rate Capacity HMI/MSG (Class 3) (1)	2000 messages/second							
EtherNet/IP modes supported	Dual-IP mode (Available with the Studio 5000 Logix Designer® application, version 29.00.00 or later) Linear/DLR mode							
EtherNet/IP network topologies supported	DLR Star Linear							
EtherNet/IP nodes supported, max (2)	16	24	40	60	90	120	150	180
Socket interfaces supported, max	32							
Integrated motion (3)	5069-L306ERM	5069-L310ERM	5069-L320ERM, 5069-L320ERMK, 5069-L320ERP	5069-L330ERM, 5069-L330ERMK	5069-L340ERM, 5069-L340ERP	5069-L350ERM, 5069-L350ERMK	5069-L380ERM	5069-L3100ERM

Features - CompactLogix 5380 Controllers (Continued)

Feature	5069-L306ER, 5069-L306ERM	5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM	5069-L320ER, 5069-L320ERM, 5069-L320ERMK, 5069-L320ERP	5069-L330ER, 5069-L330ERM, 5069-L330ERMK	5069-L340ER, 5069-L340ERM, 5069-L340ERP	5069-L350ERM, 5069-L350ERMK	5069-L380ERM	5069-L3100ERM
Number of axes supported, max(4)	256							
Number of CIP™ Drive axes (Position loop-configured) supported, max(5)	5069-L306ERM: 2	5069-L310ERM: 4	5069-L320ERM, 5069-L320ERMK, 5069-L320ERP: 8	5069-L330ERM, 5069-L330ERMK: 16	5069-L340ERM, 5069-L340ERP: 20	24	28	32
Programming languages	Ladder Diagram (LD) Structured Text (ST) Function Block Diagram (FBD) Sequential Function Chart (SFC)							

(1) I/O numbers are maximums; they assume no HMI/MSG. HMI/MSG numbers are maximums, they assume no I/O. Maximums assume the processor is target, not originator. Packet rates vary depending on packet size. For more details, see Troubleshoot EtherNet/IP Application Technique, publication ENET-AT003, and the EDS file for a specific catalog number.

(2) The maximum number of nodes that are listed represents when the controller is used with the Logix Designer application, version 31 or later. Some controllers can be used with earlier Logix Designer application versions. The maximum number of nodes that a controller supports can be fewer in Logix Designer application, versions 30 or earlier.

(3) Only CompactLogix 5380 controllers that have an M or P in their catalog number support Integrated Motion on EtherNet/IP networks.

(4) Any combination of CIP Drive, Virtual, Consumed, Regenerative AC/DC Converter and Non-Regenerative AC/DC Converter axis types.

(5) The maximum number of CIP Drive axes (configured for Position Loop) that can be included in the total integrated motion axes count for a controller.

Technical Specifications - CompactLogix 5380 Controllers

Attribute	5069-L306ER, 5069-L306ERM	5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM	5069-L320ER, 5069-L320ERM, 5069-L320ERMK, 5069-L320ERP	5069-L330ER, 5069-L330ERM, 5069-L330ERMK	5069-L340ER, 5069-L340ERM, 5069-L340ERP	5069-L350ERM, 5069-L350ERMK	5069-L380ERM	5069-L3100ERM
User memory	0.6 MB	1 MB	2 MB	3 MB	4 MB	5 MB	8 MB	10 MB
Optional nonvolatile memory	• 1784-SD1 (1 GB) • 1784-SD2 (2 GB), ships with controller • 1784-SDHC8 (8 GB) • 1784-SDHC32 (32 GB) • 9509-CMSDCD4 (4 GB) CodeMeter CmCard card							
Local I/O modules, max	8	8	16	31(1)	31	31	31	31
MOD Power voltage range	18...32V DC							
MOD Power current, max	450 mA							
MOD Power inrush	850 mA for 125 ms							
MOD Power passthrough(2)	9.55 A @ 18...32V DC							
MOD Power current rating, max	10 A Do not exceed 10 A current draw at the MOD Power RTB.							
SA Power voltage ranges(3)	0...32V DC 0...240V AC, 47...63 Hz ATEX/IECEX, 125V AC max							
SA Power current, max(3)	10 mA (DC power) 25 mA (AC power)							
SA Power passthrough(3), (4)	9.95 A @ 0...32V DC 9.975 A @ 0...240V AC, 47...63 Hz ATEX/IECEX, 125V AC max							
SA Power current rating, max (3)	10 A (AC or DC power) Do not exceed 10 A current draw at the SA Power RTB.							
Power dissipation, max	8.5 W							
Thermal dissipation, max	29 BTU/hr							
Isolation voltage	300V (continuous), Basic Insulation Type, SA, and MOD Power to Backplane 300V (continuous), Basic Insulation Type, SA to MOD Power 300V (continuous), Basic Insulation Type, Ethernet to Backplane 300V (continuous), Double Insulation Type, Ethernet to MOD Power 300V (continuous), Double Insulation Type, Ethernet to SA Power 50V (continuous), Functional Insulation Type, Ethernet to USB 300V (continuous), Basic Insulation Type, USB to Backplane 300V (continuous), Double Insulation Type, USB to MOD Power 300V (continuous), Double Insulation Type, USB to SA Power No isolation between Ethernet ports Type tested at 1500V AC for 60 s							
Weight, approx	0.768 kg (1.693 lb)							

Technical Specifications - CompactLogix 5380 Controllers (Continued)

Attribute	5069-L306ER, 5069-L306ERM	5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM	5069-L320ER, 5069-L320ERM, 5069-L320ERMK, 5069-L320ERP	5069-L330ER, 5069-L330ERM, 5069-L330ERMK	5069-L340ER, 5069-L340ERM, 5069-L340ERP	5069-L350ERM, 5069-L350ERMK	5069-L380ERM	5069-L3100ERM
Dimensions (HxWxD), approx	143.97 x 98.10 x 136.81 mm (5.67 x 3.86 x 5.39 in.)							
Location	DIN rail mount (horizontal mount only)							
DIN rail	Compatible zinc-plated, chromate steel DIN rail. EN50022 - 35 x 7.5 mm (1.38 x 0.30 in.)							
Removable terminal block	RTBs are available in separately ordered 5069 RTB kits. The MOD power connection uses a 4-point RTB, and the SA power connection uses a 6-point RTB. The following kits are available: • Kit catalog number 5069-RTB64-SCREW contains RTB catalog numbers 5069-RTB6-SCREW and 5069-RTB4-SCREW. • Kit catalog number 5069-RTB64-SPRING contains RTB catalog numbers 5069-RTB6-SPRING and 5069-RTB4-SPRING.							
Terminal block torque	5069-RTB4-SCREW & 5069-RTB6-SCREW: 0.4 N•m (3.5 lb•in) 5069-RTB4-SPRING & 5069-RTB6-SPRING: Torque does not apply							
Wire size	5069-RTB4-SCREW, 5069-RTB6-SCREW connections: 0.5…1.5 mm^2 (22…16 AWG) solid or stranded copper wire that is rated at 105 °C (221 °F), or greater, 3.5 mm (0.14 in.) max diameter including insulation, single wire connection only 5069-RTB4-SPRING, 5069-RTB6-SPRING connections: 0.5…1.5 mm^2 (22…16 AWG) solid or stranded copper wire that is rated at 105 °C (221 °F), or greater, 2.9 mm (0.11 in.) max diameter including insulation, single wire connection only Ethernet connections: Ethernet Cabling and Installation according to IEC 61918 and IEC 61784-5-2							
Insulation stripping length	5069-RTB4-SCREW, 5069-RTB6-SCREW connections: 12 mm (0.47 in.) 5069-RTB4-SPRING, 5069-RTB6-SPRING connections: 10 mm (0.39 in.)							
Wire category(5)	3 - on USB port 1 - on power ports 2 - on Ethernet ports							
Enclosure	None (open-style)							
North American temperature code	T4							
ATEX temperature code	T4							
IECEx temperature code	T4							

(1) When you use these controllers with the Studio 5000 Logix Designer application, version 29.00.00, the application limits the number of local I/O modules in the project to 16. For more information, see the Rockwell Automation Knowledgebase article #942580, '5380 CompactLogix controllers limited to 16 local 5069 modules in version 29 of Studio 5000® environment.The document is available at http://www.rockwellautomation.com/knowledgebase.
With the Logix Designer application, version 30.00.00 or later, the controllers support as many as 31 local I/O modules.

(2) Maximum level of MOD Power current that the controller can pass through to the next module in the system. The specific level of current passed through varies based on system configuration.

(3) SA power specifications are based on the number and type of Compact 5000 I/O modules that are used in the system. If the set of I/O modules that are used in the system require AC and DC voltage, you must install a 5069-FPD field potential distributor to separate the module types.

(4) Maximum level of SA Power current that the controller can pass through to the next module in the system. The specific level of current passed through varies based on system configuration.

(5) Use this Conductor Category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - CompactLogix 5380 Controllers

Attribute	5069-L306ER, 5069-L306ERM, 5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM, 5069-L320ER, 5069-L320ERM, 5069-L320ERMK, 5069-L320ERP, 5069-L330ER, 5069-L330ERM, 5069-L330ERMK, 5069-L340ER, 5069-L340ERM, 5069-L340ERP, 5069-L350ERM, 5069-L350ERMK, 5069-L380ERM, 5069-L3100ERM
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0 °C < Ta < +60 °C (+32 °F <Ta < +140 °F)
Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…+85 °C (-40…+185 °F)
Temperature, surrounding air, max	60 °C (140 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	5 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	IEC 61000-6-4

Environmental Specifications - CompactLogix 5380 Controllers (Continued)

Attribute	5069-L306ER, 5069-L306ERM, 5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM, 5069-L320ER, 5069-L320ERM, 5069-L320ERMK, 5069-L320ERP, 5069-L330ER, 5069-L330ERM, 5069-L330ERMK, 5069-L340ER, 5069-L340ERM, 5069-L340ERP, 5069-L350ERM, 5069-L350ERMK, 5069-L380ERM, 5069-L3100ERM
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	± 4 kV at 5 kHz on power ports ± 2 kV at 5 kHz on Ethernet ports
Surge transient immunity IEC 61000-4-5	± 1 kV line-line (DM) and ± 2 kV line-earth (CM) on power ports ± 2 kV line-earth (CM) on Ethernet ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Voltage variation IEC 61000-4-29	10 ms interruption on MOD Power port

Certifications - CompactLogix 5380 Controllers

Certification[1]	5069-L306ER, 5069-L306ERM, 5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM, 5069-L320ER, 5069-L320ERM, 5069-L320ERMK, 5069-L320ERP, 5069-L330ER, 5069-L330ERM, 5069-L330ERMK, 5069-L340ER, 5069-L340ERM, 5069-L340ERP, 5069-L350ERM, 5069-L350ERMK, 5069-L380ERM, 5069-L3100ERM
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
CE	European Union 2014/30/EU EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2014/35/EU LVD, compliant with: • EN 61010-2-201; Control Equipment Safety Requirements European Union 2011/65/EU RoHS, compliant with: • EN 50581; Technical documentation
RCM	Australian Radiocommunications Act, compliant with: • EN 61000-6-4; Industrial Emissions
Ex	European Union 2014/34/EU ATEX Directive, compliant with: • EN 60079-0; General Requirements • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • II 3 G Ex nA IIC T4 Gc • DEMKO 15 ATEX 1455X when used at or below 125V AC
IECEx	IECEx System, compliant with: • IEC 600079-0: General Requirements • IEC 60079-15; Potentially Explosive Atmospheres, Protection "n" • II 3 G Ex nA IIC T4 Gc • IECEx UL 15.0007X when used at or below 125V AC
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: • Article 58-2 of Radio Waves Act, Clause 3 **IMPORTANT**: This certification does not apply to the following catalog numbers: 5069-L320ERMK, 5069-L330ERMK, 5069-L350ERMK
EAC	Russian Customs Union TR CU 020/2011 EMC Technical Regulation
EtherNet/IP	ODVA conformance tested to EtherNet/IP specifications

(1) See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Controller Minimum Spacing Requirements

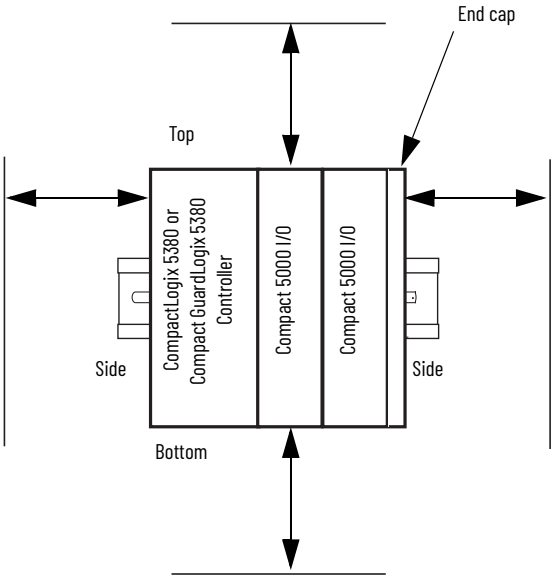
The minimum distance between the CompactLogix 5380 system or Compact GuardLogix 5380 system and enclosure walls, wireways, and adjacent equipment varies based on the current operating temperature.

The minimum distances on all sides of the system are as follows:

- **CompactLogix 5380 Standard and Process Controllers**
  - 50.80 mm (2.00 in.) at 55 °C (131 °F)
  - 101.60 mm (4.00 in) at 60 °C (140 °F)
- **Compact GuardLogix 5380 SIL 2 Controller**

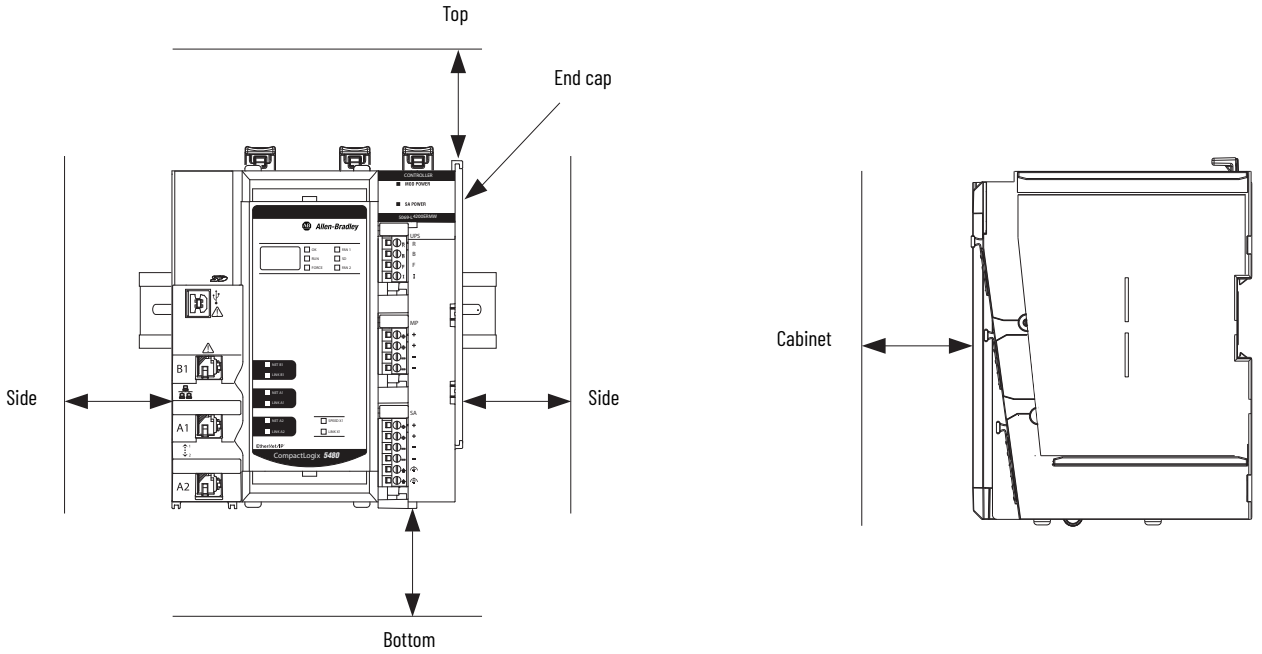
  Series A catalog numbers:
  - 50.8 mm (2.00 in.) at 50 °C (122 °F)
  - 101.6 mm (4.00 in.) at 55 °C (131 °F)
  - 152.4 mm (6.00 in) at 60 °C (140 °F)

  Series B catalog numbers:
  - 50.8 mm (2.00 in.) at 55 °C (131 °F)
  - 101.6 mm (4.00 in.) at 60 °C (140 °F)
- **Compact GuardLogix 5380 SIL 3 Controller**
  - 50.8 mm (2.00 in.) at 55 °C (131 °F)
  - 101.6 mm (4.00 in.) at 60 °C (140 °F)



The minimum distance on of a system that includes only a CompactLogix 5480 controller is as follows:

- 25.00 mm (0.98 in.) between the sides and the cabinet
- 25.00 mm (0.98 in.) between the front of the controller and the cabinet
- 50.00 mm (1.96 in.) between the top and bottom and the cabinet
  We recommend that you install the controller near the bottom of the enclosure, where ambient temperature is lower.

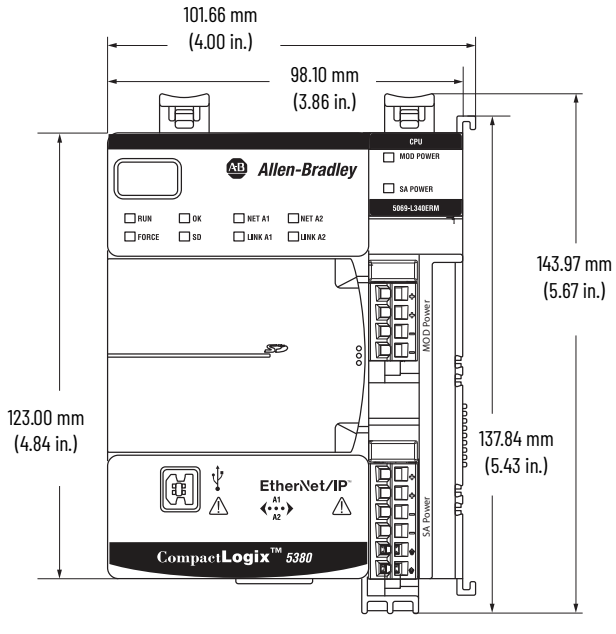


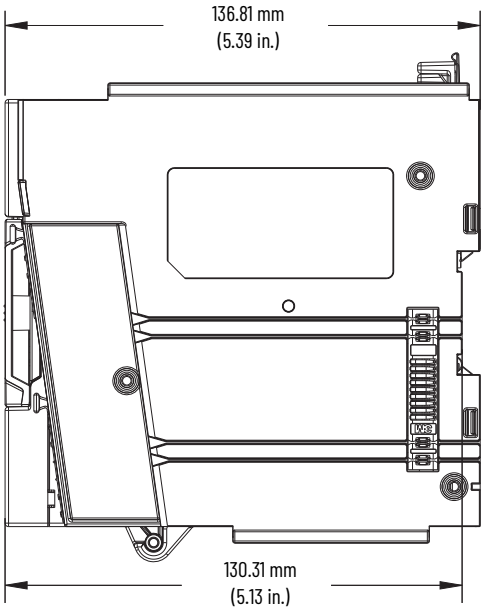
IMPORTANT If Compact 5000 I/O modules are installed next to a CompactLogix 5380, Compact GuardLogix 5380, or CompactLogix 5480 controller, you must mount the system horizontally.

You mount CompactLogix 5480 controllers in any orientation if there are no Compact 5000 I/O modules installed next to the controller.

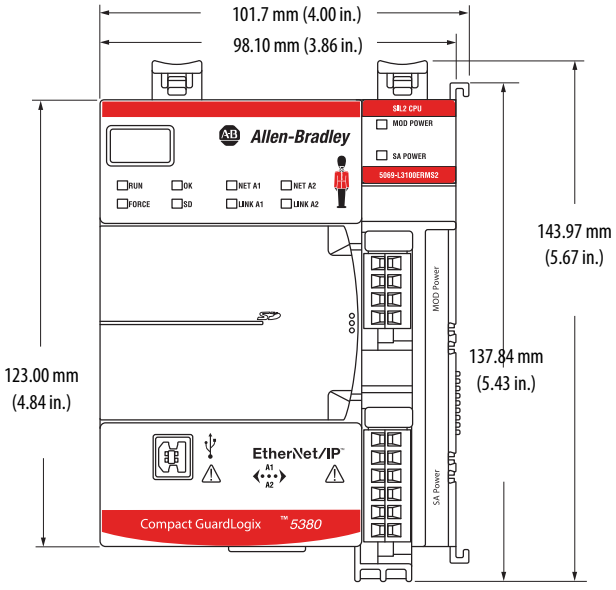
Controller Dimensions

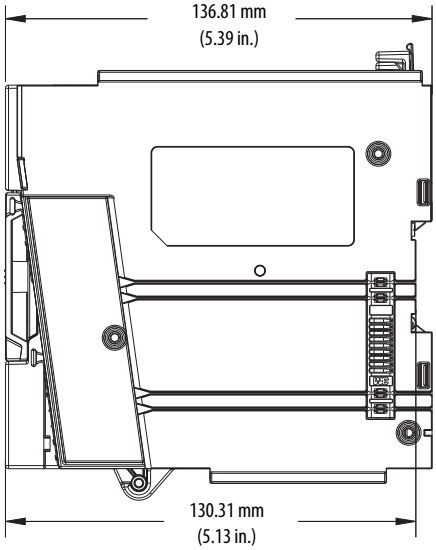
CompactLogix 5380





Compact GuardLogix 5380 SIL 2 Controller





Controller Use with Other Devices

Your controller can control and communicate with the following devices:

- Control I/O Modules
- Communicate with Display Devices
- Communicate with Other Controllers

Control I/O Modules

The CompactLogix 5380 and Compact GuardLogix 5380 controllers can monitor and control local and remote I/O modules.

Local I/O Modules

- A CompactLogix 5380 and CompactLogix 5480 system supports Compact 5000 I/O standard modules as local I/O modules.
- A Compact GuardLogix 5380 system supports Compact 5000 I/O standard and safety modules as local modules.

The number of local I/O modules that are supported in a CompactLogix 5380 system or Compact GuardLogix 5380 system varies by controller catalog number.

Cat. No.	Local Compact 5000 I/O Modules Supported, Max	
	Standard I/O Modules	Any Combination of Standard and Safety I/O Modules
5069-L306ER, 5069-L306ERM	8	—
5069-L306ERS2, 5069-L306ERMS2, 5069-L306ERMS3		8
5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM	8	—
5069-L310ERS2, 5069-L310ERMS2, 5069-L310ERMS3		8
5069-L320ER, 5069-L320ERM, 5069-L320ERMK, 5069-L320ERP	16	—
5069-L320ERS2, 5069-L320ERMS2, 5069-L320ERS2K, 5069-L320ERMS2K, 5069-L320ERMS3, 5069-L320ERMS3K		16
5069-L330ER, 5069-L330ERM(1), 5069-L330ERMK(1)	31	—
5069-L330ERS2, 5069-L330ERMS2, 5069-L330ERS2K, 5069-L330ERMS2K, 5069-L330ERMS3, 5069-L330ERMS3K		31
5069-L340ER, 5069-L340ERM, 5069-L340ERP	31	—
5069-L340ERS2, 5069-L340ERMS2, 5069-L340ERMS3		31
5069-L350ERM, 5069-L350ERMK	31	—
5069-L350ERS2, 5069-L350ERMS2, 5069-L350ERS2K, 5069-L350ERMS2K, 5069-L350ERMS3, 5069-L350ERMS3K		31
5069-L380ERM	31	—
5069-L380ERS2, 5069-L380ERMS2, 5069-L380ERMS3		31
5069-L3100ERM	31	—
5069-L3100ERS2, 5069-L3100ERMS2, 5069-L3100ERMS3		31
5069-L430ERMW, 5069-L450ERMW, 5069-4100ERMW, 5069-L4200ERMW	31	—

(1) When you use these controllers with the Logix Designer application, version 29.00.00, the application limits the number of local I/O modules in the project to 16. For more information, see the Rockwell Automation Knowledgebase article #942580, '5380 CompactLogix controllers limited to 16 local 5069 modules in version 29 of Studio 5000®.' The document is available at http://www.rockwellautomation.com/knowledgebase. With the Logix Designer application, version 30.00.00 or later, the controllers support 31 local I/O modules.

Remote I/O Modules

The controllers can connect to these remote I/O modules over an EtherNet/IP network.

IMPORTANT For maximum performance, we recommend that you use Compact 5000 I/O modules when you use remote I/O modules.

CompactLogix 5380 controllers, Compact GuardLogix 5380, and CompactLogix 5480 controllers support the remote I/O modules in this table. The I/O modules that are listed are **standard I/O modules**.

Module Type	I/O Module Family
Chassis-based I/O	1746 SLC™ I/O
	1756 ControlLogix® I/O
	1769 Compact I/O™
	Compact 5000 I/O standard modules
In-cabinet I/O	1734 POINT I/O™
	1794 FLEX™ I/O
On-Machine™ I/O	1732 ArmorBlock® I/O
	1738 ArmorPOINT® I/O

Only Compact GuardLogix 5380 controllers support the remote I/O modules in this table. The I/O modules that are listed are **safety I/O modules**.

Module Type	I/O Module Family
Chassis-based I/O	Compact 5000 I/O safety modules
	1756 ControlLogix Safety I/O
In-cabinet I/O	CompactBlock™ Guard I/O™
	POINT Guard I/O™
On-Machine™ I/O	1732 ArmorBlock® Guard I/O™

Communicate with Display Devices

The controller can communicate with these display devices over an EtherNet/IP network.

Device Type	Display
Industrial computers	Allen-Bradley® integrated-display rotating media (HDD) and solid-state (SSD) computers
	Allen-Bradley integrated-display computers with keypad
	Allen-Bradley non-display computers
Graphic terminals	PanelView™ Plus and PanelView CE terminals
	PanelView standard terminals
Message displays	InView™ message displays

Communicate with Other Controllers

The controller can communicate with these programmable controllers.

Controller Type	Controller Family
Programmable automation controller	CompactLogix 5370
	CompactLogix 5380
	CompactLogix 5480
	Compact GuardLogix 5370 (safety)
	Compact GuardLogix 5380 (safety)
	ControlLogix 5570
	ControlLogix 5580
	GuardLogix 5570 (safety)
	GuardLogix 5580 (safety)
	1756 Armor™ ContrlLogix (safety)
	1756 Armor™ GuardLogix® (safety)
	1768 Compact GuardLogix (safety)
	1768 CompactLogix
	1769 Modular CompactLogix
	1769 Packaged CompactLogix
Programmable logic controllers	1789 SoftLogix™ 5800
	PowerFlex® with DriveLogix™
	1785 PLC-5®(1)
	1747 SLC™(1)
	1761 MicroLogix™(2)
	1762 MicroLogix(2)
	1763 MicroLogix
	1764 MicroLogix(2)
	1766 MicroLogix

(1) These controllers require a built-in Ethernet port or a 1761-NET-ENI, EtherNet/IP RS-232-C interface to communicate with a CompactLogix 5380 controller over an EtherNet/IP network.

(2) These controllers require a 1761-NET-ENI, EtherNet/IP RS-232-C interface to communicate with a CompactLogix 5380 controller over an EtherNet/IP network.

Ethernet Node Limits

When you configure a CompactLogix 5380, Compact GuardLogix 5380, or CompactLogix 5480 control system, consider the number of Ethernet nodes that are used. The number of Ethernet nodes that you can include in the I/O configuration section in the Logix Designer application project is limited.

Maximum Number of Ethernet Nodes

The number of nodes that are supported in a Logix Designer application project varies by CompactLogix 5380, Compact GuardLogix 5380, and CompactLogix 5480 controller.

The maximum number of nodes that are listed represents when the controller is used with the Logix Designer application, version 31 or later. You can use CompactLogix 5380 controllers with earlier Logix Designer application versions. The maximum number of nodes that a controller supports can be fewer in Logix Designer application, versions 30 or earlier.

Cat. No.	Ethernet Nodes Supported
5069-L306ER, 5069-L306ERM, 5069-L306ERS2, 5069-L306ERMS2, 5069-L306ERMS3	16
5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM, 5069-L310ERS2, 5069-L310ERMS2, 5069-L310ERMS3	24
5069-L320ER, 5069-L320ERM, 5069-L320ERMK, 5069-L320ERP 5069-L320ERS2, 5069-L320ERMS2, 5069-L320ERS2K, 5069-L320ERMS2K, 5069-L320ERMS3, 5069-L320ERMS3K	40
5069-L330ER, 5069-L330ERM, 5069-L330ERMK, 5069-L330ERS2, 5069-L330ERMS2, 5069-L330ERS2K, 5069-L330ERMS2K, 5069-L330ERMS3, 5069-L330ERMS3K	60
5069-L340ER, 5069-L340ERM, 5069-L340ERP 5069-L340ERS2, 5069-L340ERMS2, 5069-L340ERMS3	90
5069-L350ERM, 5069-L350ERMK, 5069-L350ERS2, 5069-L350ERMS2, 5069-L350ERS2K, 5069-L350ERMS2K	120
5069-L380ERM, 5069-L380ERS2, 5069-L380ERMS2, 5069-L380ERMS3	150
5069-L3100ERM, 5069-L3100ERS2, 5069-L3100ERMS2, 5069-L3100ERMS3	180
5069-L430ERMW	60
5069-L450ERMW	120
5069-4100ERMW	180
5069-L4200ERMW	250

Any devices that you add directly to the I/O configuration section are counted toward the Ethernet node limit. The following are examples of devices that must be counted:

- Remote communication adapters
- Devices with an embedded Ethernet port, such as I/O modules, drives, and linking devices
- Remote controllers when a produce/consume connection is established between the two controllers
- HMI devices that are included in the I/O configuration tree
- Third-party devices that are directly connected to the EtherNet/IP network

Accessories

The following accessories are used with a CompactLogix 5380, Compact GuardLogix 5380, or CompactLogix 5480 controller:

- End Cap
- Memory Cards
- Removable Terminal Kits - For CompactLogix 5380 and Compact GuardLogix 5380 controllers, Removable Terminal Blocks (RTB) are available in separately ordered 5069 RTB kits. For CompactLogix 5480 controllers, the required RTB kit ships with the controllers.
- Ethernet Communication Cables

End Cap

You must install an end cap, catalog number 5069-ECR, on the right side of the last module in a CompactLogix 5380, Compact GuardLogix 5380, or CompactLogix 5480 control system. The end cap is shipped with the controller.

SHOCK HAZARD: The end cap covers the exposed interconnections on the last module in the system. If you do not install the end cap before powering the system, equipment damage or injury from electric shock can result.

Memory Cards

Memory cards, also known as Secure Digital (SD) cards, offer nonvolatile memory to store a user program and tag data on a controller. Through the Logix Designer application, you can manually trigger the controller to save to or load from nonvolatile memory or configure the controller to load from nonvolatile memory on powerup.

A 1784-SD2 card ships with the controller. If you need additional SD cards, we recommend that you use one that is available from Rockwell Automation. The following SD cards are available to use with the controllers:

- 1784-SD1 (1 GB)
- 1784-SD2 (2 GB)
- 1784-SDHC8 (8GB)
- 1784-SDHC32 (32 GB)
- 9509-CMSDCD4 (4 GB)

We recommend that you use the SD cards available from Rockwell Automation.

Technical Specifications - 1784-SD1, 1784-SD2, 1784-SDHC8, 1784-SDHC32, 9509-CMSDCD4

Attribute	1784-SD1	1784-SD2	1784-SDHC8	1784-SDHC32	9509-CMSDCD4(1)
Memory	1 GB	2 GB	8 GB	32 GB	4 GB
Supported controllers	CompactLogix 5380, Compact GuardLogix 5380, CompactLogix 5480 controllers				
Weight, approx	1.76 g (0.062 oz)				2 g (0.07 oz)

(1) This card is used when license-based source protection and execution protection features are enabled.

GMA

5 mm x 20 mm Fast-acting glass tube fuses

RoHS

Agency information

- UL Listed, Guide JDYX, File E19180, 63mA-6A
- UL Recognized, Guide JDYX2, File E19180, 7-15A
- CSA Certified, Class 1422-01, File 53787, 63mA-6A
- PSE Approval, 1A-15A

Product features

- Fast-acting, low breaking capacity
- Optional axial leads available
- 5 x 20mm physical size
- Glass tube, silver-plated (63mA-315mA) and nickel-plated (500mA-15A) brass endcap construction
- Designed to UL/CSA 248-14

Ordering

- Specify packaging, product, and option code
- Ratings above 6.3A have a 0.8 mm diameter lead
- With TR2 packaging code, lead wire length is 19.05 mm

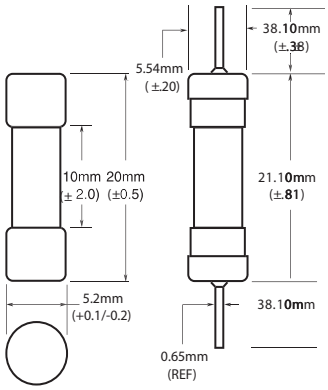
Electrical Characteristics		
Rated Current	% of Amp Rating	Opening Time
63mA - 15A	100%	None
	135%	60 minutes maximum
	200%	2 minutes maximum

Specifications

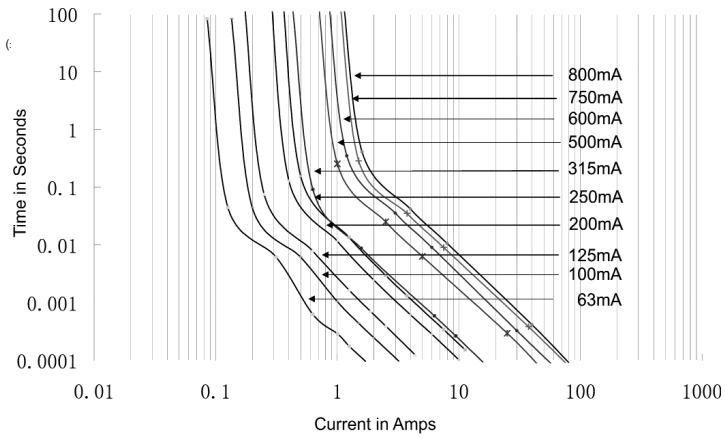
Product Code	Amp Rating	Voltage Rating Vac	Interrupting Rating (amps)*		Typical DC Cold Resistance (Ω)**	Typical Pre-Arc I^2t Vac†	Maximum Voltage Drop (mV)‡
			250Vac	125Vac			
GMA-63-R	63mA	250	35	10,000	15.750	0.00024	4700
GMA-100-R	100mA	250	35	10,000	7.840	0.0001	4300
GMA-125-R	125mA	250	35	10,000	4.895	0.0024	2600
GMA-200-R	200mA	250	35	10,000	2.500	0.001	3400
GMA-250-R	250mA	250	35	10,000	1.735	0.018	2200
GMA-300-R	300mA	250	35	10,000	0.906	0.019	470
GMA-315-R	315mA	250	35	10,000	0.839	0.019	450
GMA-500-R	500mA	250	35	10,000	0.454	0.15	230
GMA-600-R	600mA	250	35	10,000	0.256	0.32	200
GMA-750-R	750mA	250	35	10,000	0.186	0.47	200
GMA-800-R	800mA	250	35	10,000	0.170	0.70	180
GMA-1-R	1	250	35	10,000	0.163	0.48	300
GMA-1.25-R	1.25	250	100	10,000	0.122	0.84	290
GMA-1.5-R	1.5	250	100	10,000	0.090	1.6	270
GMA-1.6-R	1.6	250	100	10,000	0.080	2.0	260
GMA-2-R	2	250	100	10,000	0.066	3.1	250
GMA-2.5-R	2.5	250	100	10,000	0.046	4.9	240
GMA-3-R	3	250	100	10,000	0.039	8.8	215
GMA-3.15-R	3.15	125	-	10,000	0.036	9.7	210
GMA-3.5-R	3.5	125	-	10,000	0.030	13	210
GMA-4-R	4	125	-	10,000	0.026	19	205
GMA-5-R	5	125	-	10,000	0.021	29	200
GMA-6-R	6	125	-	10,000	0.017	45	180
GMA-7-R	7	125	-	200	0.012	150	110
GMA-8-R	8	125	-	200	0.009	280	110
GMA-10-R	10	125	-	200	0.006	280	110
GMA-15-R	15	125	-	150	0.004	950	100

* Interrupting ratings: Interrupting ratings for 63mA - 6A were measured at 70% - 80% power factor on AC. The interrupting ratings for 7A - 15A were measured at 100% power factor on AC.
** DC Cold Resistance (Measured at <10% of rated current)
† Typical Pre-Arching I^2t (I^2t was measured at listed interrupting rating and rated voltage)
‡ Maximum Voltage drop (Voltage drop was measured at 20°C ambient temperature at rated current)

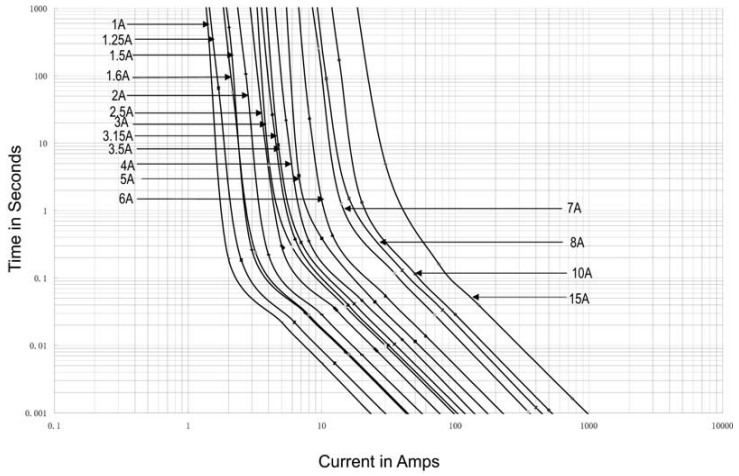
Dimensions - mm



Time-Current Curve – GMA-R 63mA-800mA



Time-Current Curve – GMA-R 1-15A



Packaging Code	
Packaging Code	Description
BK	100 fuses packed into a cardboard carton
BK1	1000 fuses packed into a poly bag
TR2	1500 fuses packed into tape on a reel (19.05mm lead wire length)

Option Code	
Option Code	Description
V	Axial leads - copper tinned wire with nickel-plated brass overcaps

Eaton
Electronics Division
1000 Eaton Boulevard
Cleveland, OH 44122
United States
www.eaton.com/electronics

Printed in USA
Publication No. 2017 BU-SB091174
May 2017

Powering Business Worldwide

Ewon Flexy 201

The Ewon Flexy family is a range of industrial modular gateways that allows universal communication with varied field equipment regardless of the protocol used.

It is possible to configure data acquisition & data logging, routing and more.

The Ewon Flexy 201 is an Ewon gateway based on a 4 Ethernet ports.

Key Benefits

ON-DEMAND REMOTE ACCESS, IT APPROVED	VPN Remote Access Security-certified global cloud infrastructure Easy setup for unmatched connectivity success
LOCAL DATA COLLECTION AND DASHBOARDS	All major PLC protocols for data logging and alarm notification Local web-dashboard for remote monitoring OPC UA server to publish data to factory systems
CENTRAL DATA COLLECTION THROUGH THE INTERNET	Full flexibility to send data to any server (local or cloud) Out of the box solutions with HMS Solution Partners MQTT or HTTPS using embedded BASIC or Java Virtual Machine

PLC Connectivity

Rockwell Automation/Allen Bradley	SLC5/500 Series Micro/Compact/Control Logix Series Micro Series
Siemens	S5 Series* S7-200/300/400/1200/1500** Logo
Schneider Electric	TSX Series M Series (M258, M340,...) Twido Series
Mitsubishi	iQ/FX5 Series Q series L Series FX3 series
VIPA	Speed 7 series
OMRON	C, CJ, CP, CS Series N Series
HITACHI	EH Series
Generic Modbus TCP/RTU	Any Modbus TCP/RTU Slaves (Beckoff, Crouzet, ABB, Delta,...)
Generic OPCUA	Any OPCUA Servers (B&R, Beijer, Beckoff,...)
Generic BACNET IP	Any BACNET IP Servers
Generic SNMP	Any SNMP v1 servers

* polling only, no remote access
** remote access to safety PLC devices (-F series) is not supported

Technical Specifications

Routing	Routing capability between LAN and WAN Ethernet interface and Ethernet to serial gateway.
Ethernet to Serial Gateways	MODBUS TCP to MODBUS RTU, XIP to UNITELWAY, EtherNet/IP&trade, to DF1, FINS TCP to FINS Hostlink, ISO TCP to PPI, MPI (S7) or PROFIBUS (S7), VCOM to ASCII. (Applicable to the serie 200)
Data Acquisition Protocols	OPC UA, MODBUS/RTU, MODBUS/TCP, Unitelway, DF1, PPI, MPI (S7), PROFIBUS (S7), FINS Hostlink, FINS TCP, EtherNet/IP™, ISO TCP, Mitsubishi FX, Mitsubishi Melsec, Hitachi EH, ASCII, BACnet/IP. Stored in 2500 internal tags.
Data Publishing Protocols	OPC UA, Modbus, MQTT, SNMP, HTTPs.
Alarms	Alarms notification by email, SMS, FTP put and/or SNMP traps. 4 Thresholds : low, lowlow, high, highhigh + deadband and activation delay.
Datalogging	Internal database for data logging (real-time logging and historical logging up to 1,000,000 timestamps). Historical data can be exported to DataMailbox or transferred by FTP or email.
SD card reader	A/ for easy commissioning (firmware upgrade, backup, Talk2M registration) B/for Extended User Memory.
Router	IP filtering, IP forwarding, NAT, Port forwarding, Proxy, Routing table, DHCP client/server, NAT 1 :1. (Applicable only to the serie 200)
VPN Tunnelling	Open VPN either through UDP 1194 or TCP 443 (HTTPs port).
VPN Security	VPN sessions are end-to-end encrypted using SSL/TLS protocol. Communications between the remote user and the eWON are fully encrypted using the SSL/TLS protocol, thereby ensuring data authenticity, integrity & confidentiality. Indeed, all users and eWON units are authenticated using x509 SSL certificates and end-to-end traffic is encrypted using strong symmetric & asymmetric algorithms that are part of the SSL/TLS protocol cipher suite.
Programmable	Script interpreter for Basic language, Java 2 Standard Edition environment.
Synchronization	Embedded real-time clock, manual setup via http or automatic via NTP.
File Management	FTP client and server for configuration, firmware update and data transfer.
Website	Embedded web interface with setup wizards for configuration and maintenance (no extra software needed). Authentication with login/password and user management capability. Possibility of uploading custom web GUI. Compatible with viewON web HMI.
User Flash Disk	up to 30MB available for user application.
Mechanicals	Din Rail Mounting Dimensions: 80 x 89 x 134 mm (H x D x W); Weight: < 500 g
Power supply	12 - 24VDC +/-20%, LPS. Consumption: depending on the extension card installed (see Installation guide on our website).

Input/output	2x digital input: 0 to 12/24VDC; 1.5kV isolation. 1x digital output: open drain (MOSFET) 200mA; 1.5 kV isolation.
Flexy base module interface	**Flexyn01*:** 4 x RJ45 Ethernet 10/100Mb switch, 1,5kV isolation
Temperature Range	Operating: -25°C to +60°C, 10 to 95% relative humidity (non-condensing). Storage: -40°C to +70°C, 10 to 95% relative humidity (non-condensing).
Marking	CE, cURus, FCC.
Warranty	36 months

Certifications

Type tests	Temperature - Operating & Storage tested according to: IEC 60068-2-1 Cold test IEC 60068-2-2 Dry heat test IEC 60068-2-14 Change of temperature IEC 60068-2-30 Cyclic damp heat test Vibration & shocks tested according to: IEC 60068-2-27 Bumps IEC 60068-2-64 Vibration (broad-band random) IEC 60068-2-6 Vibration (sinusoidal)
CE	Compliant with: EMC directive 2014/30/EU (Immunity: industrial level) RE directive 2014/53/EU* ROHS2 2011/65/EU directive with amendment 2015/863 REACH regulation * Applicable in combination with a radio extension card (Cellular & WiFi)
FCC/ICC	This product complies with the Part 15 of the FCC rules
Japan	This device complies with Japanese regulations.
Other	Russia FSS notification.
Safety	The product fulfils the requirements of: EN 62368-1:2014 + A11:2017 UL 62368-1 Second Edition CAN/CSA C22.2 No. 62368-1-14 Second Edition EN 60950-1:2006 + A1:2010 + A11:2009 + A12:2011 + A2:2013

Ordering Information

ORDER CODE: Flexy20100_00MA
WARRANTY: 3 years
For purchasing instructions and terms and conditions, see: → How to buy
Do you want the advice of our experts? → Contact Us

Industrial Ethernet Switch - FL SWITCH 1008N

1085256

https://www.phoenixcontact.com/us/products/1085256

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Narrow Ethernet switch, eight RJ45 ports with 10/100 Mbps on all ports, automatic data transmission speed detection, autocrossing function, and QoS

Your advantages

- RJ45 ports support a transmission speed of 10/100 Mbps
- QoS-prioritized (Quality of Service) messages
- Local diagnostic indicators with LEDs
- PROFINET PTCP filter for reliable communication on PROFINET networks
- Enhanced traffic prioritization for automation protocols
- Energy-efficient Ethernet in accord. with IEEE 802.3az
- PROFINET Conformance Class A for real-time data exchange
- Auto negotiation and autocrossing detection simplifies installation and setup

Commercial Data

Item number	1085256
Packing unit	1 pc
Sales Key	D15
Product Key	DNN116
GTIN	4055626833590
Weight per Piece (including packing)	257 g
Weight per Piece (excluding packing)	174 g
Country of origin	TW

Technical Data

Dimensions

Width	22.5 mm
Height	140.4 mm
Depth	92.4 mm

Material specifications

Housing material	Polycarbonate fiber reinforced
	Polycarbonate fiber reinforced

Mounting

Mounting type	DIN rail mounting

Interfaces

Ethernet (RJ45)

Number of interfaces	8
Connection method	RJ45
Note on the connection method	Auto negotiation and autocrossing
Transmission speed	10/100 Mbps
Transmission physics	Ethernet in RJ45 twisted pair
Transmission length	100 m (per segment)
Signal LEDs	Data receive, link status
No. of channels	8 (RJ45 ports)

Product properties

Product type	Switch
MTTF	133.9 Years (MIL-HDBK-217F standard, temperature 25°C, operating cycle 100%)
	1254 Years (SN 29500 standard, temperature 25°C, operating cycle 21%)
	1196 Years (Telcordia standard, 25°C temperature, 21% operating cycle (5 days a week, 8 hours a day))

Switch functions

Basic functions	Unmanaged switch
	Autonegotiation
	Store and Forward switching mode
PROFINET conformance class	Conformance-Class A
MAC address table	2k
Status and diagnostic indicators	LEDs: U_S, link and activity per port
Additional functions	100 BASE-TX/100BASE-FX (IEEE 802.3u)
	Quality of Service (QoS) prioritization (IEEE 802.1p)
	Energy-efficient Ethernet (IEEE 802.3az)

	10Base-T (IEEE 802.3)

Security functions

Basic functions	Unmanaged switch
	Autonegotiation
	Store and Forward switching mode

Electrical properties

Transmission medium	Copper

Supply

Supply voltage (DC)	24 V
Supply voltage (AC)	24 V AC (50/60 Hz)
Supply voltage range	9 V DC ... 32 V DC
	18 V AC ... 30 V AC (50/60 Hz)
Power supply connection	Via COMBICON, max. conductor cross section 2.5 mm²
Residual ripple	3.6 V_{PP} (within the permitted voltage range)
Max. current consumption	173 mA (at 9 V DC)
Typical current consumption	28 mA (at 24 V DC)

Connection data

Connection method	Push-in spring connection
Conductor cross section, rigid	0.2 mm² ... 2.5 mm²
Conductor cross section, flexible	0.2 mm² ... 2.5 mm²
Conductor cross section AWG	24 ... 12
Conductor cross section, flexible, with ferrule, with plastic sleeve	0.25 mm² ... 2.5 mm²
Conductor cross section flexible, with ferrule without plastic sleeve	0.25 mm² ... 2.5 mm²
Stripping length	10 mm

Ambient conditions

Degree of protection	IP30
Ambient temperature (operation)	-10 °C ... 60 °C
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Altitude	2000 m (maximum)
Permissible humidity (operation)	5 % ... 95 % (non-condensing)
Permissible humidity (storage/transport)	5 % ... 95 % (non-condensing)
Shock (operation)	30g (EN 60068-2-27)
Vibration (operation)	in acc. with IEC 60068-2-6: 5g, 150 Hz
Air pressure (operation)	79 kPa ... 108 kPa up to 2000 m above mean sea level (Without derating)
Air pressure (storage/transport)	79 kPa ... 108 kPa up to 2000 m above mean sea level (Without derating)

EMC data

	EN 61000-6-2 EN 61000-4-2 (ESD) Criterion B

Conformance with EMC directives	EN 61000-6-2 EN 61000-4-3 (electromagnetic fields) Criterion A
	EN 61000-6-2 EN 61000-4-4 (EFT burst) Criterion A
	EN 61000-6-2 EN 61000-4-5 (surge) Criterion B
	EN 61000-6-2 EN 61000-4-6 (line noise immunity) Criterion A
	EN 61000-6-2 EN 61000-4-8 (electromagnetic fields) Criterion A
	EN 61000-6-2 Class A
Electromagnetic compatibility	Conformance with EMC Directive 2014/30/EU
Noise emission	EN 61000-6-4:2007 + A1:2011
Noise immunity	EN 61000-6-2:2005

LED signaling

Status display	LEDs: U_S, link and activity per port

Phoenix Contact USA
586 Fulling Mill Road
Middletown, PA 17057, United States
(+717) 944-1300
info@phoenixcon.com

Surge protection device - DT-LAN-CAT.6+ - 2881007

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Surge protection in accordance with Class E_A ($CAT6_A$), for Gigabit Ethernet (up to 10 Gbps), token ring, FDDI/ CDDI, ISDN, and DS1. Suitable for Power over Ethernet (PoE++ / 4PPoE) “Mode A” and “Mode B”. RJ45 attachment plug with separate grounding cable and ground connection snap-on foot for NS 35 DIN rails.

Your advantages

- Can be used in applications up to 10#Gbps with adapted protective circuit
- High power transmission with PoE++ / 4PPoE support
- Easy network integration via RJ45 jacks
- Can be installed in a control cabinet by removing the ground connection adapter

Key Commercial Data

Packing unit	1 pc
GTIN	4 046356 151900
GTIN	4046356151900
Weight per Piece (excluding packing)	320.000 g
Custom tariff number	85363010
Country of origin	Germany

Technical data

Dimensions

Height	102 mm
Width	25 mm
Depth	63.5 mm

Ambient conditions

Ambient temperature (operation)	-40 °C ... 70 °C

Surge protection device - DT-LAN-CAT.6+ - 2881007

Technical data

Ambient conditions

Ambient temperature (storage/transport)	-40 °C ... 70 °C
Permissible humidity (operation)	5 % ... 85 %
Altitude	≤ 4000 m (amsl (above mean sea level))
Degree of protection	IP20

General

Housing material	Zinc die-cast
Color	silver/black
Mounting type	Connection-specific attachment plug and DIN rail, 35 mm
Type	Attachment plug for DIN rail mounting
Number of positions	8
Direction of action	Line-Line & Line-Ground/Shield

Protective circuit

IEC test classification	B2
	C1
	C2
	C3
	D1
Maximum continuous voltage U_C (wire-wire)	≤ 3.3 V DC (±60 V DC/PoE)
Rated current	≤ 1.5 A (25 °C)
Operating effective current I_C at U_C	≤ 1 µA
Residual current I_{PE}	≤ 400 µA
Nominal discharge current I_n (8/20) µs (line-line)	100 A
Nominal discharge current I_n (8/20) µs (line-earth)	2 kA (per signal pair)
Total discharge current I_{total} (8/20) µs	10 kA
Nominal pulse current Ian (10/700) µs (line-line)	≤ 40 A
Nominal pulse current Ian (10/700) µs (line-earth)	≤ 160 A
Output voltage limitation at 1 kV/µs (line-line) spike	≤ 85 V (PoE)
Output voltage limitation at 1 kV/µs (line-earth) spike	≤ 700 V
Output voltage limitation at 1 kV/µs (line-line) static	≤ 9 V
Output voltage limitation at 1 kV/µs (line-earth) static	≤ 700 V
Residual voltage at I_n (line-line)	≤ 15 V
	≤ 100 V (PoE)
Voltage protection level U_p (line-line)	≤ 9 V (B2 - 1 kV / 25 A)
	≤ 100 V (B2 - 1 kV / 25 A - PoE)
	≤ 12 V (C3 - 20 A)
Voltage protection level U_p (line-earth)	≤ 900 V (B2 - 4 kV / 100 A)

Surge protection device - DT-LAN-CAT.6+ - 2881007

Technical data

Protective circuit

	≤ 700 V (C2 - 4 kV / 2 kA)
	≤ 1 kV (C3 - 80 A)
Response time t_A (line-line)	≤ 1 ns
Response time t_A (line-earth)	≤ 100 ns
Input attenuation aE, sym.	≤ 1 dB (up to100 MHz/direct measuring)
	≤ 1 dB (up to 250 MHz/direct measuring)
	≤ 3 dB (up to 500 MHz/direct measuring)
Near-end crosstalk attenuation	≥ 35 dB (250 MHz/100 Ω/link)
	≥ 45 dB (100 MHz / 100 Ω / Link)
	≥ 27 dB (500 MHz / 100 Ω / Link)
	≥ 39 dB (250 MHz/100 Ω/direct measuring)
Capacity (line-line)	typ. 12 pF (f= 1 MHz / VR= 0 V)
Capacity (line-earth)	typ. 2 pF (f= 1 MHz / VR= 0 V)
Surge protection fault message	none
Impulse durability (line-line)	B2 - 1 kV / 25 A
	C3 - 20 A
Impulse durability (line-earth)	B2 - 4 kV / 100 A
	C2 - 4 kV / 2 kA
	C3 - 80 A
	D1 - 1 kA

Connection data

Connection method	RJ45

Connection, equipotential bonding

Connection method	DIN rail NS35

Standards and Regulations

Standards/specifications	IEC 61643-21 2002
	EN 50173-1 2002
	ISO/IEC 11801-Am.1 2006

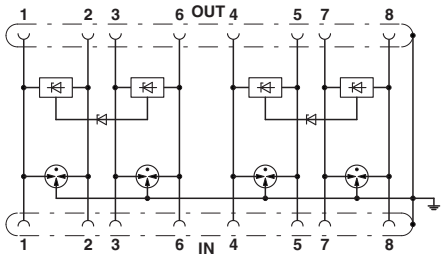
Environmental Product Compliance

REACh SVHC	Lead 7439-92-1
China RoHS	Environmentally friendly use period: unlimited = EFUP-e
	No hazardous substances above threshold values

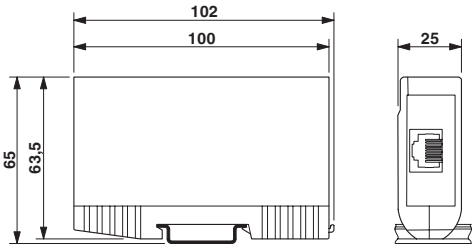
Drawings

Surge protection device - DT-LAN-CAT.6+ - 2881007

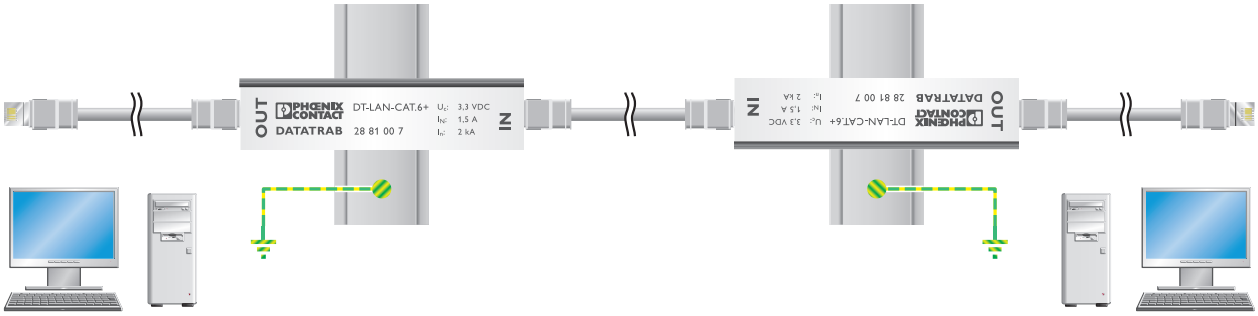
Circuit diagram



Dimensional drawing



Application drawing



Uninterruptible power supply - TRIO-UPS-2G/1AC/24DC/5 - 2907160

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Uninterruptible power supply with integrated power supply unit. For lead AGM energy storage with 1.3 Ah to 12 Ah nominal capacity. Input: 1-phase, output: 24 V DC/5 A. Push-in connection technology

Product Description

Supply DC loads reliably and save space with the TRIO uninterruptible power supplies. An input grid is no longer necessary for startup. Connected industrial PCs can be shut down easily via the integrated USB interface.

Your advantages

- Space saving: Combination of UPS module and power supply in the same housing
- Long buffer times, thanks to large selection of VRLA energy storage systems
- USB interface for connection to higher-level controllers such as industrial PCs
- Startup from energy storage possible, even without mains input
- Universal range of possible applications, thanks to a comprehensive package of approvals and an extended temperature range
- Easy installation, thanks to push-in connection technology

RoHS

Key Commercial Data

Packing unit	1 pc
GTIN	4 055626 166575
GTIN	4055626166575
Weight per Piece (excluding packing)	940.000 g
Custom tariff number	85371091
Country of origin	China

Technical data

Dimensions

Width	60 mm

Uninterruptible power supply - TRIO-UPS-2G/1AC/24DC/5 - 2907160

Technical data

Dimensions

Height	130 mm
Depth	115 mm
Width with alternative assembly	115 mm
Height with alternative assembly	130 mm
Depth with alternative assembly	60 mm
Installation distance right/left	0 mm / 0 mm
Installation distance top/bottom	50 mm / 50 mm

Ambient conditions

Degree of protection	IP20
Inflammability class in acc. with UL 94 (housing / terminal blocks)	V0
Ambient temperature (operation)	-25 °C ... 70 °C (> 60 °C Derating: 2.5 %/K)
Ambient temperature (start-up type tested)	-40 °C
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Max. permissible relative humidity (operation)	≤ 95 % (At +25°C, non-condensing)
Climatic class	3K3 (in acc. with EN 60721)
Degree of pollution	2
Installation height	≤ 4000 m (> 2000 m, observe derating)

Input data

AC input voltage range	100 V AC ... 240 V AC -15 % ... +10 %
Inrush current limiting/I²t	< 0.43 A^2s
Mains buffering time	≥ 15 ms (120 V AC)
Typical response time	60 ms
Input fuse, integrated	6.3 A (slow-blow, internal)

Output data

Nominal output voltage	24 V DC
Setting range of the output voltage (U_{Set})	24 V DC ... 28 V DC (> 24 V constant capacity)
Nominal output current (I_N)	5 A
Dynamic Boost ($I_{Dyn.Boost}$)	7.5 A
Derating	> 60 °C (2.5%/K of P_{Out} nom.)
Control deviation	< 0.75 % (Static load change 10 % ... 90 %)
Maximum power dissipation in no-load condition	< 3 W (230 V AC)
Efficiency	typ. 85 % (120 V AC)
	typ. 87 % (230 V AC)
	typ. 96 % (Battery operation)
Residual ripple	< 20 mV
Connection in parallel	yes, with diode module uncoupled

Uninterruptible power supply - TRIO-UPS-2G/1AC/24DC/5 - 2907160

Technical data

Output data

Surge protection against internal surge voltages	< 30 V DC
Feedback voltage resistance	≤ 35 V DC

General

Net weight	0.75 kg
Insulation voltage input/output	3 kV AC (type test)
	1.5 kV AC (routine test)
Protection class	I
MTBF (IEC 61709, SN 29500)	> 1395470 h (230 V AC, at 25 °C)
	> 825726 h (230 V AC, at 40 °C)
	> 388314 h (230 V AC, at 60 °C)
Mounting position	horizontal DIN rail NS 35, EN 60715
Assembly instructions	alignable: horizontally 0 mm, vertically 50 mm

Connection data, input

Connection method	Push-in connection
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	4 mm²
Conductor cross section flexible min.	0.2 mm²
Conductor cross section flexible max.	2.5 mm²
Conductor cross section AWG min.	24
Conductor cross section AWG max.	12
Stripping length	10 mm

Connection data, output

Connection method	Push-in connection
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	4 mm²
Conductor cross section flexible min.	0.2 mm²
Conductor cross section flexible max.	2.5 mm²
Conductor cross section AWG min.	24
Conductor cross section AWG max.	12
Stripping length	10 mm

Connection data for signaling

Connection method	Push-in connection
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	1.5 mm²
Conductor cross section flexible min.	0.2 mm²

Uninterruptible power supply - TRIO-UPS-2G/1AC/24DC/5 - 2907160

Technical data

Connection data for signaling

Conductor cross section flexible max.	1.5 mm²
Conductor cross section AWG min.	24
Conductor cross section AWG max.	16
Stripping length	8 mm

Charging process

Charge characteristic curve	IU_0U
Charge current	typical
	0.2 A ... 1.5 A (-25°C ... 40°C)
	reduced
	1.5 A ... 0 A (40 °C ... 65 °C)
	default
	1 A (-25°C ... 40°C)

Standards

EMC requirements for noise immunity	EN 61000-6-1
	EN 61000-6-2
EMC requirements for noise emission	EN 61000-6-3
	EN 61000-6-4
Standard - safety for equipment for measurement, control, and laboratory use	IEC 61010-1
Standard – Safety extra-low voltage	IEC 61010 (SELV) / (PELV)
Standard - Safe isolation	DIN VDE 0100-410
Standard - power supply devices for low voltage with DC output	EN 61204-3
Overvoltage category EN 61010-1	II

Conformance/approvals

UL approvals	UL Listed UL 61010
	UL/C-UL Listed ANSI/ISA-12.12.01 Class I, Division 2, Groups A, B, C

EMC data

Electromagnetic compatibility	Conformance with EMC Directive 2014/30/EU
Low Voltage Directive	Conformance with Low Voltage Directive 2014/35/EC
Conducted noise emission	EN 61000-6-3 (Class B)
Noise emission	EN 61000-6-3 (Class B)
DNV GL conducted interference	Class B
Additional text	Area power distribution
DNV GL noise radiation	Class B
Additional text	Bridge and deck area
Electrostatic discharge	EN 61000-4-2

Uninterruptible power supply - TRIO-UPS-2G/1AC/24DC/5 - 2907160

Technical data

EMC data

Contact discharge	6 kV (Test Level 4)
Discharge in air	8 kV (Test Level 4)
Electromagnetic HF field	EN 61000-4-3
Frequency range	80 MHz ... 6 GHz
Test field strength	10 V/m (Test Level 3)
Comments	Criterion B
Fast transients (burst)	EN 61000-4-4
Input	4 kV (Test Level 4 - asymmetrical)
Output	2 kV (Test Level 3 - asymmetrical)
Signal	1 kV (Test Level 4 - asymmetrical)
Comments	Criterion B
Input	2 kV (Test Level 3 - symmetrical)
	4 kV (Test Level 4 - asymmetrical)
Output	1 kV (Test Level 1 - symmetrical)
	2 kV (Test Level 3 - asymmetrical)
Signal	1 kV (Test Level 2 - asymmetrical)
Comments	Criterion B
Conducted interference	EN 61000-4-6
I/O/S	asymmetrical
Frequency range	0.15 MHz ... 80 MHz
Voltage	10 V (Test Level 3)
Comments	Criterion A
Attenuated sinusoidal oscillations (ring wave)	EN 61000-4-12
Input	2 kV (symmetrical)
	4 kV (asymmetrical)
Comments	Criterion B
Criterion A	Normal operating behavior within the specified limits.
Criterion B	Temporary impairment to operational behavior that is corrected by the device itself.

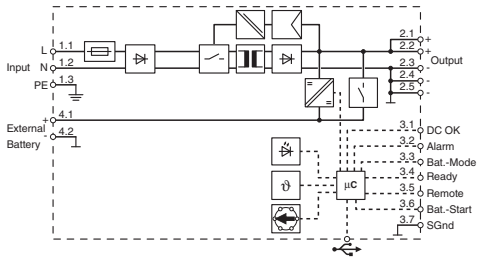
Environmental Product Compliance

REACh SVHC	Lead 7439-92-1

Drawings

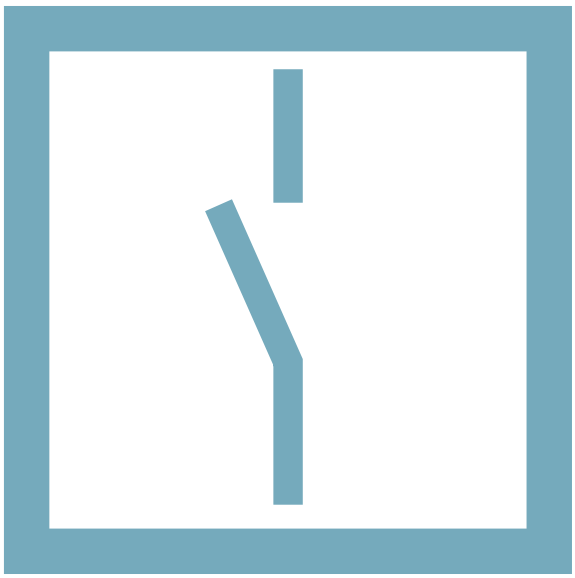
Uninterruptible power supply - TRIO-UPS-2G/1AC/24DC/5 - 2907160

Block diagram



Pictogram

Pictogram



Classifications

eCl@ss

eCl@ss 10.0.1	27040705
eCl@ss 11.0	27040705
eCl@ss 9.0	27040705

Uninterruptible power supply - TRIO-UPS-2G/1AC/24DC/5 - 2907160

Classifications

ETIM

ETIM 6.0	EC000382
ETIM 7.0	EC000382

UNSPSC

UNSPSC 18.0	39121011
UNSPSC 19.0	39121011
UNSPSC 20.0	39121011
UNSPSC 21.0	39121011

Accessories

Accessories

Battery unit

Energy storage - UPS-BAT/PB/24DC/1.2AH - 1274520

Energy storage, VRLA-AGM, 24 V DC, 1.2 Ah, automatic detection and communication with QUINT UPS-IQ

Energy storage - UPS-BAT/PB/24DC/4AH - 1274117

Energy storage, VRLA-AGM, 24 V DC, 4 Ah, automatic detection and communication with QUINT UPS-IQ

Energy storage - UPS-BAT/PB/24DC/7AH - 1274118

Energy storage, VRLA-AGM, 24 V DC, 7 Ah, automatic detection and communication with QUINT UPS-IQ

Uninterruptible power supply - TRIO-UPS-2G/1AC/24DC/5 - 2907160

Accessories

Energy storage - UPS-BAT/PB/24DC/12AH - 1274119

Energy storage, VRLA-AGM, 24 V DC, 12 Ah, automatic detection and communication with QUINT UPS-IQ

Energy storage - UPS-BAT/VRLA-WTR/24DC/13AH - 2320416

Energy storage device, lead AGM, VRLA technology, 24 V DC, 13 Ah, tool-free battery replacement, automatic detection, and communication with QUINT UPS-IQ

Data cable preassembled

Data cable - MINI-SCREW-USB-DATACABLE - 2908217

Used for communication between an industrial PC and Phoenix Contact devices with USB-Mini-B connection.

Thermomagnetic device circuit breaker - TMC 81C 01A - 2907558

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Thermomagnetic device circuit breaker, number of positions: 1, connection method: Screw, cross section: 1 mm² - 35 mm², AWG: 18 - 2, width: 17.6 mm, mounting type: DIN rail: 35 mm, Color: gray

RoHS

Key Commercial Data

Packing unit	1 pc
GTIN	4 055626 214986
GTIN	4055626214986
Weight per Piece (excluding packing)	150.000 g
Country of origin	China

Technical data

General

Mounting type	DIN rail: 35 mm
Color	gray
Number of positions	1

Electrical data

Operating voltage	120 V AC (277 V AC)
	60 V DC
Rated current I_N	1 A
Rated short-circuit switching capacity I_{cn}	10 kA (IC)

Dimensions

Height	116 mm
Width	17.6 mm

Thermomagnetic device circuit breaker - TMC 81C 01A - 2907558

Technical data

Dimensions

Depth	65.7 mm

Ambient conditions

Ambient temperature (operation)	-35 °C ... 70 °C

Connection data

Conductor cross section solid min.	1 mm²
Conductor cross section solid max.	35 mm²
Conductor cross section flexible min.	1 mm²
Conductor cross section flexible max.	35 mm²
Conductor cross section AWG min.	18
Conductor cross section AWG max.	2
Connection method	Screw
Tightening torque max	2 Nm

Standards and Regulations

Standards/specifications	UL 489 IEC 60947-2

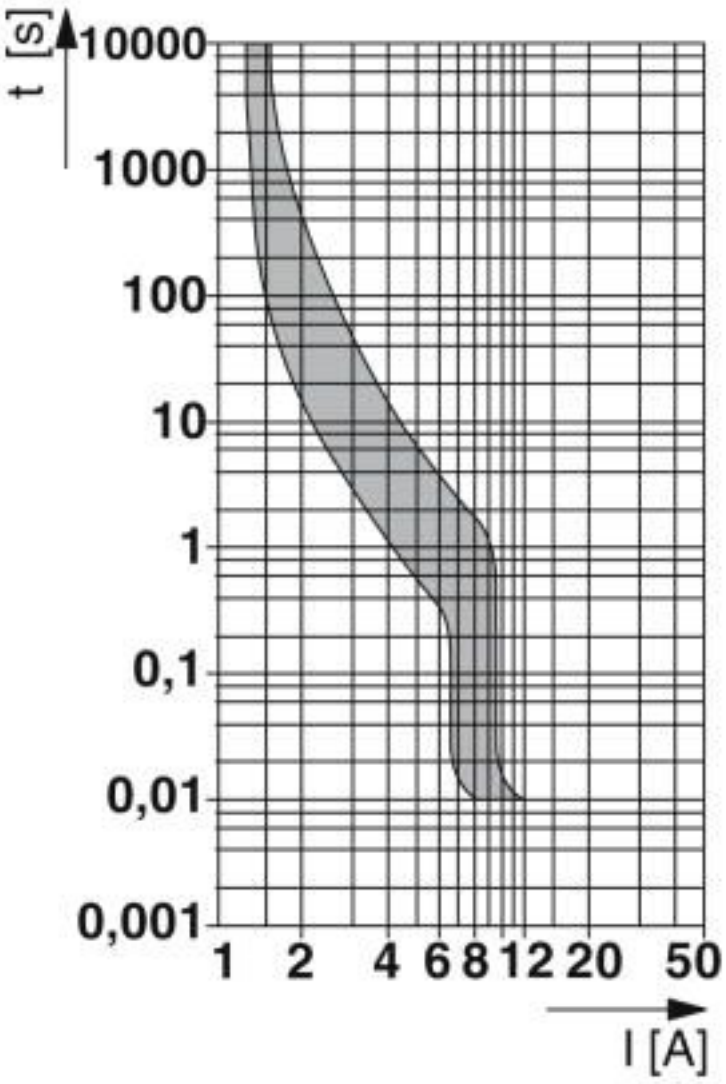
Environmental Product Compliance

REACh SVHC	Lead 7439-92-1
	Cadmium oxide 1306-19-0

Drawings

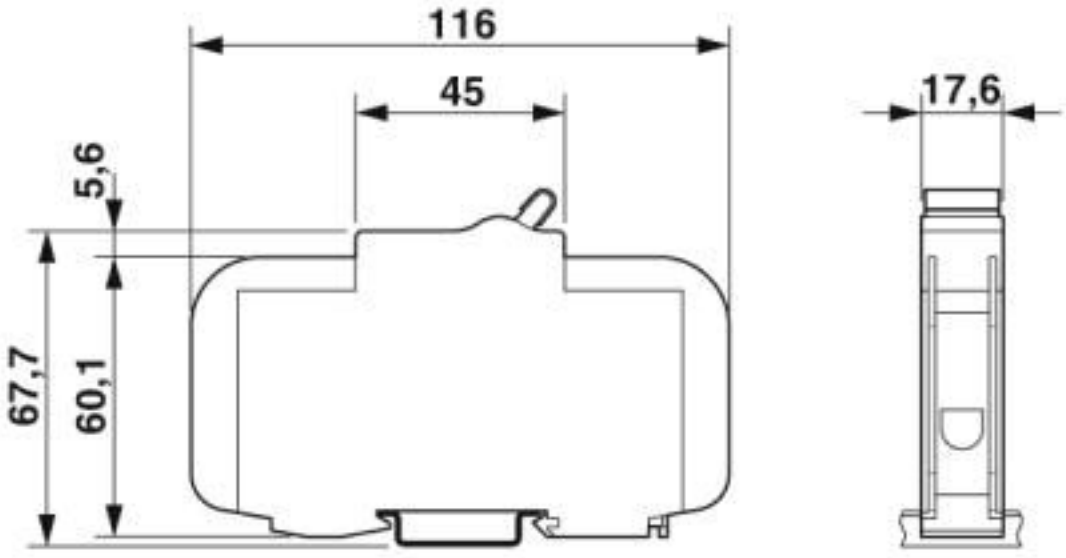
Thermomagnetic device circuit breaker - TMC 81C 01A - 2907558

Diagram



Thermomagnetic device circuit breaker - TMC 81C 01A - 2907558

Dimensional drawing



Classifications

eCl@ss

eCl@ss 10.0.1	27141116
eCl@ss 11.0	27141116
eCl@ss 4.0	27141116
eCl@ss 4.1	27141116
eCl@ss 5.0	27141116
eCl@ss 5.1	27141100
eCl@ss 6.0	27141100
eCl@ss 7.0	27141116
eCl@ss 8.0	27141116
eCl@ss 9.0	27141116

ETIM

ETIM 3.0	EC000899
ETIM 4.0	EC000899
ETIM 5.0	EC000899
ETIM 6.0	EC000899
ETIM 7.0	EC000899

UNSPSC

UNSPSC 6.01	30211812
UNSPSC 7.0901	39121411

Thermomagnetic device circuit breaker - TMC 81C 01A - 2907558

Classifications

UNSPSC

UNSPSC 11	39121411
UNSPSC 12.01	39121411
UNSPSC 13.2	39121620
UNSPSC 18.0	39121410
UNSPSC 19.0	39121410
UNSPSC 20.0	39121410
UNSPSC 21.0	39121410

Approvals

Approvals

Approvals

UL Listed / cUL Listed / cULus Listed

Ex Approvals

Approval details

UL Listed		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 320373
cUL Listed		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 320373
cULus Listed			

Thermomagnetic device circuit breaker - TMC 81C 03A - 2907560

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Thermomagnetic device circuit breaker, number of positions: 1, connection method: Screw, cross section: 1 mm² - 35 mm², AWG: 18 - 2, width: 17.6 mm, mounting type: DIN rail: 35 mm, Color: gray

RoHS

Key Commercial Data

Packing unit	1 pc
GTIN	4 055626 214962
GTIN	4055626214962
Weight per Piece (excluding packing)	150.000 g
Country of origin	China

Technical data

General

Mounting type	DIN rail: 35 mm
Color	gray
Number of positions	1

Electrical data

Operating voltage	120 V AC (277 V AC)
	60 V DC
Rated current I_N	3 A
Rated short-circuit switching capacity I_{cn}	10 kA (IC)

Dimensions

Height	116 mm
Width	17.6 mm

Thermomagnetic device circuit breaker - TMC 81C 03A - 2907560

Technical data

Dimensions

Depth	65.7 mm

Ambient conditions

Ambient temperature (operation)	-35 °C ... 70 °C

Connection data

Conductor cross section solid min.	1 mm²
Conductor cross section solid max.	35 mm²
Conductor cross section flexible min.	1 mm²
Conductor cross section flexible max.	35 mm²
Conductor cross section AWG min.	18
Conductor cross section AWG max.	2
Connection method	Screw
Tightening torque max	2 Nm

Standards and Regulations

Standards/specifications	UL 489 IEC 60947-2

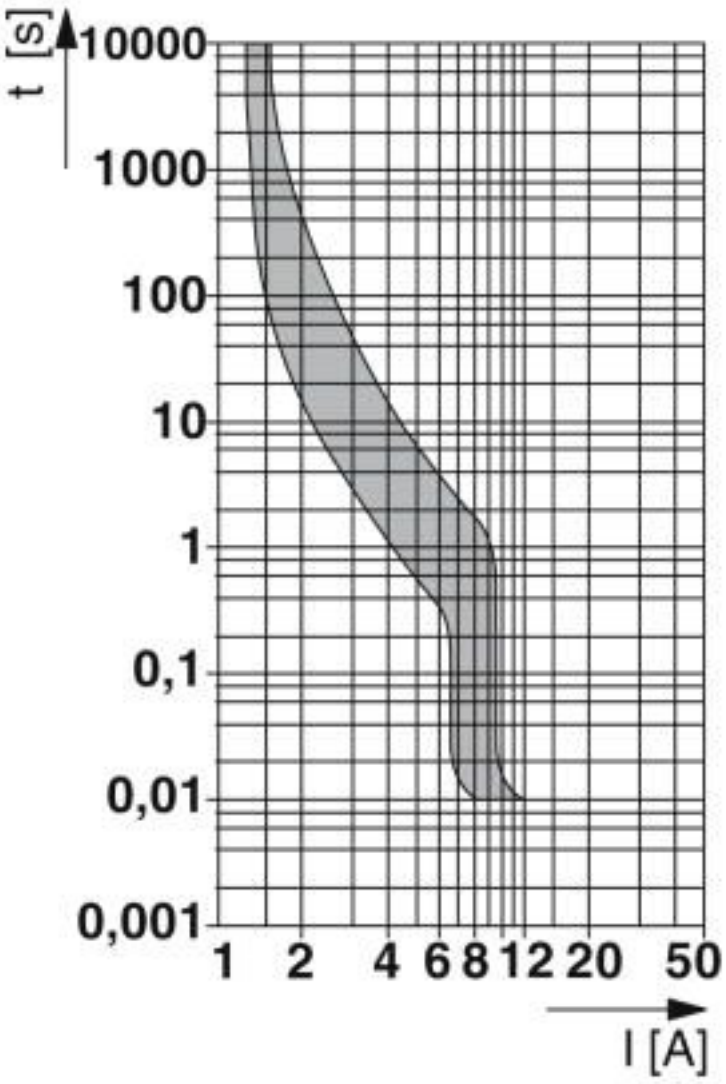
Environmental Product Compliance

REACh SVHC	Lead 7439-92-1
	Cadmium oxide 1306-19-0

Drawings

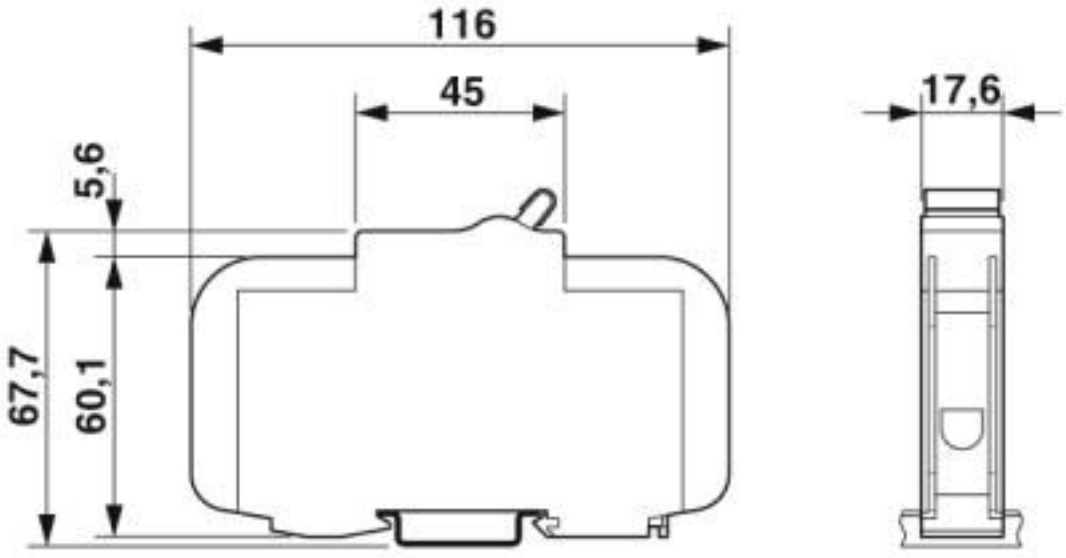
Thermomagnetic device circuit breaker - TMC 81C 03A - 2907560

Diagram



Thermomagnetic device circuit breaker - TMC 81C 03A - 2907560

Dimensional drawing



Classifications

eCl@ss

eCl@ss 10.0.1	27141116
eCl@ss 11.0	27141116
eCl@ss 4.0	27141116
eCl@ss 4.1	27141116
eCl@ss 5.0	27141116
eCl@ss 5.1	27141100
eCl@ss 6.0	27141100
eCl@ss 7.0	27141116
eCl@ss 8.0	27141116
eCl@ss 9.0	27141116

ETIM

ETIM 3.0	EC000899
ETIM 4.0	EC000899
ETIM 5.0	EC000899
ETIM 6.0	EC000899
ETIM 7.0	EC000899

UNSPSC

UNSPSC 6.01	30211812
UNSPSC 7.0901	39121411

Thermomagnetic device circuit breaker - TMC 81C 03A - 2907560

Classifications

UNSPSC

UNSPSC 11	39121411
UNSPSC 12.01	39121411
UNSPSC 13.2	39121620
UNSPSC 18.0	39121410
UNSPSC 19.0	39121410
UNSPSC 20.0	39121410
UNSPSC 21.0	39121410

Approvals

Approvals

Approvals

UL Listed / cUL Listed / cULus Listed

Ex Approvals

Approval details

UL Listed		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 320373
cUL Listed		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 320373
cULus Listed			

Thermomagnetic device circuit breaker - TMC 81C 05A - 2907562

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Thermomagnetic device circuit breaker, number of positions: 1, connection method: Screw, cross section: 1 mm² - 35 mm², AWG: 18 - 2, width: 17.6 mm, mounting type: DIN rail: 35 mm, Color: gray

RoHS

Key Commercial Data

Packing unit	1 pc
GTIN	4 055626 214948
GTIN	4055626214948
Weight per Piece (excluding packing)	141.670 g
Country of origin	China

Technical data

General

Mounting type	DIN rail: 35 mm
Color	gray
Number of positions	1

Electrical data

Operating voltage	120 V AC (277 V AC)
	60 V DC
Rated current I_N	5 A
Rated short-circuit switching capacity I_{cn}	10 kA (IC)

Dimensions

Height	116 mm
Width	17.6 mm

Thermomagnetic device circuit breaker - TMC 81C 05A - 2907562

Technical data

Dimensions

Depth	65.7 mm

Ambient conditions

Ambient temperature (operation)	-35 °C ... 70 °C

Connection data

Conductor cross section solid min.	1 mm²
Conductor cross section solid max.	35 mm²
Conductor cross section flexible min.	1 mm²
Conductor cross section flexible max.	35 mm²
Conductor cross section AWG min.	18
Conductor cross section AWG max.	2
Connection method	Screw
Tightening torque max	2 Nm

Standards and Regulations

Standards/specifications	UL 489 IEC 60947-2

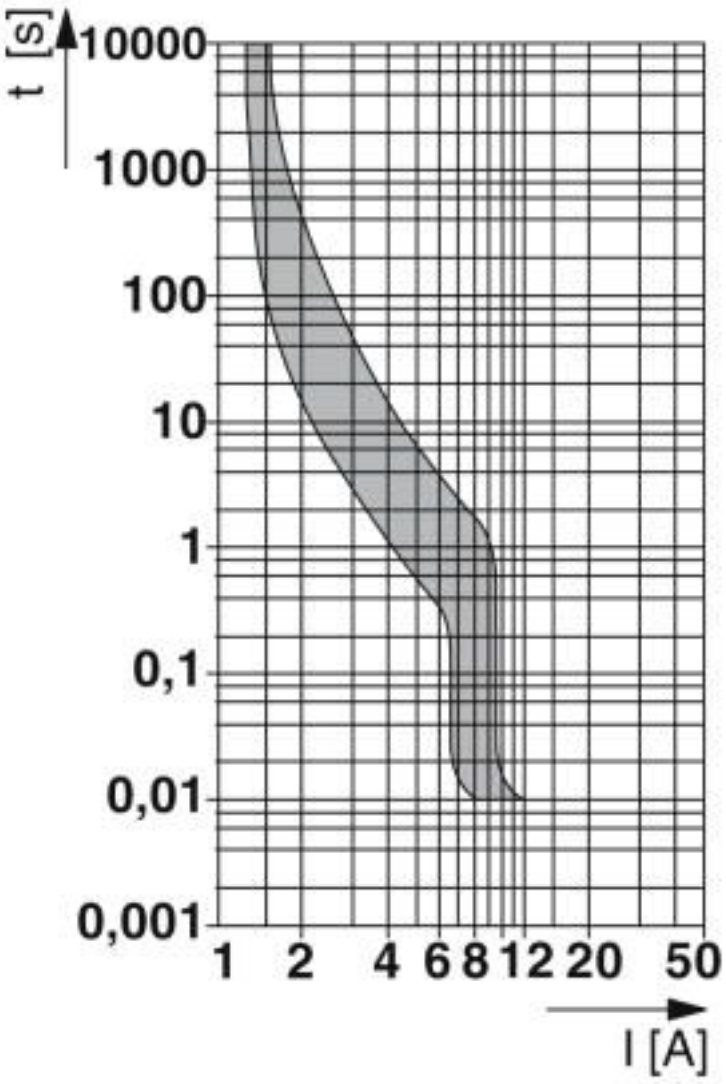
Environmental Product Compliance

REACh SVHC	Lead 7439-92-1
	Cadmium oxide 1306-19-0

Drawings

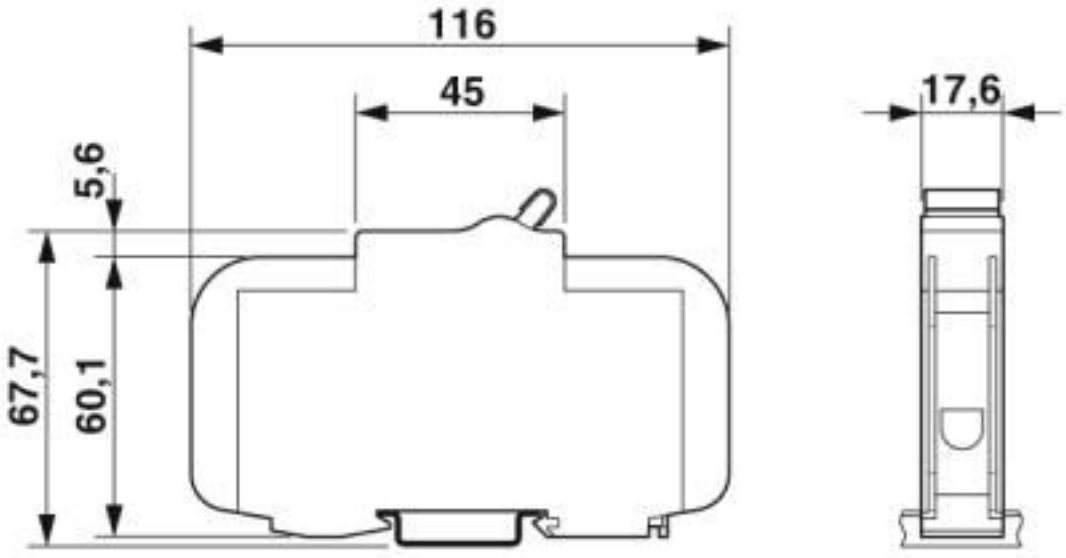
Thermomagnetic device circuit breaker - TMC 81C 05A - 2907562

Diagram



Thermomagnetic device circuit breaker - TMC 81C 05A - 2907562

Dimensional drawing



Classifications

eCl@ss

eCl@ss 10.0.1	27141116
eCl@ss 11.0	27141116
eCl@ss 4.0	27141116
eCl@ss 4.1	27141116
eCl@ss 5.0	27141116
eCl@ss 5.1	27141100
eCl@ss 6.0	27141100
eCl@ss 7.0	27141116
eCl@ss 8.0	27141116
eCl@ss 9.0	27141116

ETIM

ETIM 3.0	EC000899
ETIM 4.0	EC000899
ETIM 5.0	EC000899
ETIM 6.0	EC000899
ETIM 7.0	EC000899

UNSPSC

UNSPSC 6.01	30211812
UNSPSC 7.0901	39121411

Thermomagnetic device circuit breaker - TMC 81C 05A - 2907562

Classifications

UNSPSC

UNSPSC 11	39121411
UNSPSC 12.01	39121411
UNSPSC 13.2	39121620
UNSPSC 18.0	39121410
UNSPSC 19.0	39121410
UNSPSC 20.0	39121410
UNSPSC 21.0	39121410

Approvals

Approvals

Approvals

UL Listed / cUL Listed / cULus Listed

Ex Approvals

Approval details

UL Listed		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 320373
cUL Listed		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 320373
cULus Listed			

Thermomagnetic device circuit breaker - TMC 81D 20A

2907640

https://www.phoenixcontact.com/us/products/2907640

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Thermomagnetic device circuit breaker, number of positions: 1, connection method: Screw, cross section: 1 mm^2 - 35 mm^2, AWG: 18 - 2, mounting type: DIN rail: 35 mm, Color: gray

Commercial Data

Item number	2907640
Packing unit	1 pc
Note	Made to Order (non-returnable)
Sales Key	C29
Product Key	CLA125
GTIN	4055626215075
Weight per Piece (including packing)	222.222 g
Weight per Piece (excluding packing)	222.222 g
Country of origin	CN

Technical Data

Product properties

Type	DIN rail module, one-piece
Product type	Thermomagnetic device circuit breakers
Number of positions	1
Mechanical service life	20000

Electrical properties

Service life electrical	6000

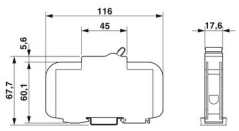
General

Operating voltage	120 V AC (277 V AC)
	60 V DC
Rated current I_N	20 A
Tripping method	TM (thermomagnetic)
Rated short-circuit switching capacity I_{cn}	10 kA (IC)
Fuse	D

Connection data

Tightening torque	... 2 Nm
Conductor cross section solid	1 mm² ... 35 mm²
Cross section AWG	18 ... 2 (converted acc. to IEC)
Conductor cross section flexible	1 mm² ... 35 mm²
Connection method	Screw
Tightening torque, min	2 Nm
Conductor cross section flexible max.	35 mm²
Conductor cross section solid max.	35 mm²

Dimensions

Dimensional drawing	
Width	17.6 mm
Height	116 mm
Depth	65.7 mm

Material specifications

Color	gray

Environmental and real-life conditions

Ambient conditions

Ambient temperature (operation)	-35 °C ... 70 °C
Humidity test	48 h, 95% RH, 40°C (IEC 60068-2-78)
Shock (operation)	30g (11 ms) (IEC 60068-2-11)
Vibration (operation)	±0.38 mm (10-57 Hz), 5g (57...500 Hz) (IEC 60068-2-6, Fc, sine)

Standards and regulations

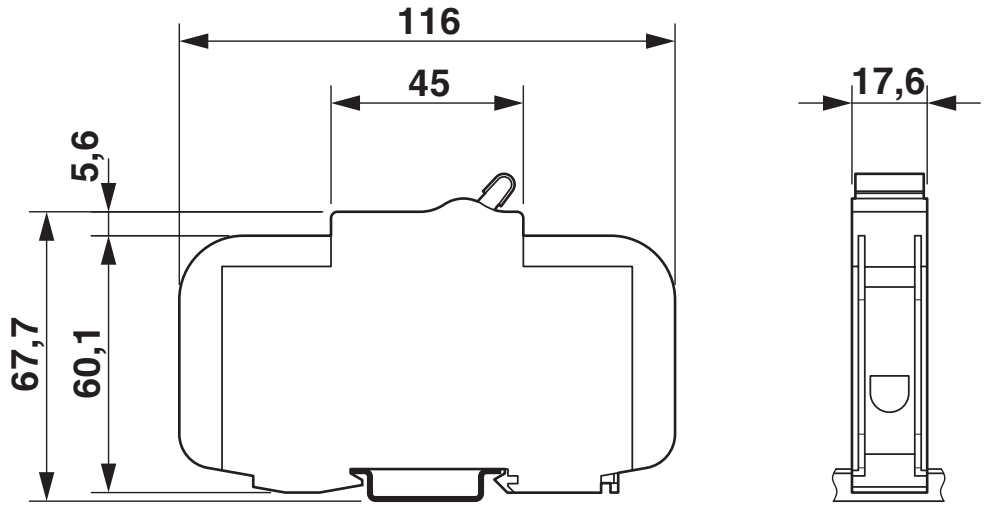
Standards/specifications	UL 489
	IEC 60947-2

Mounting

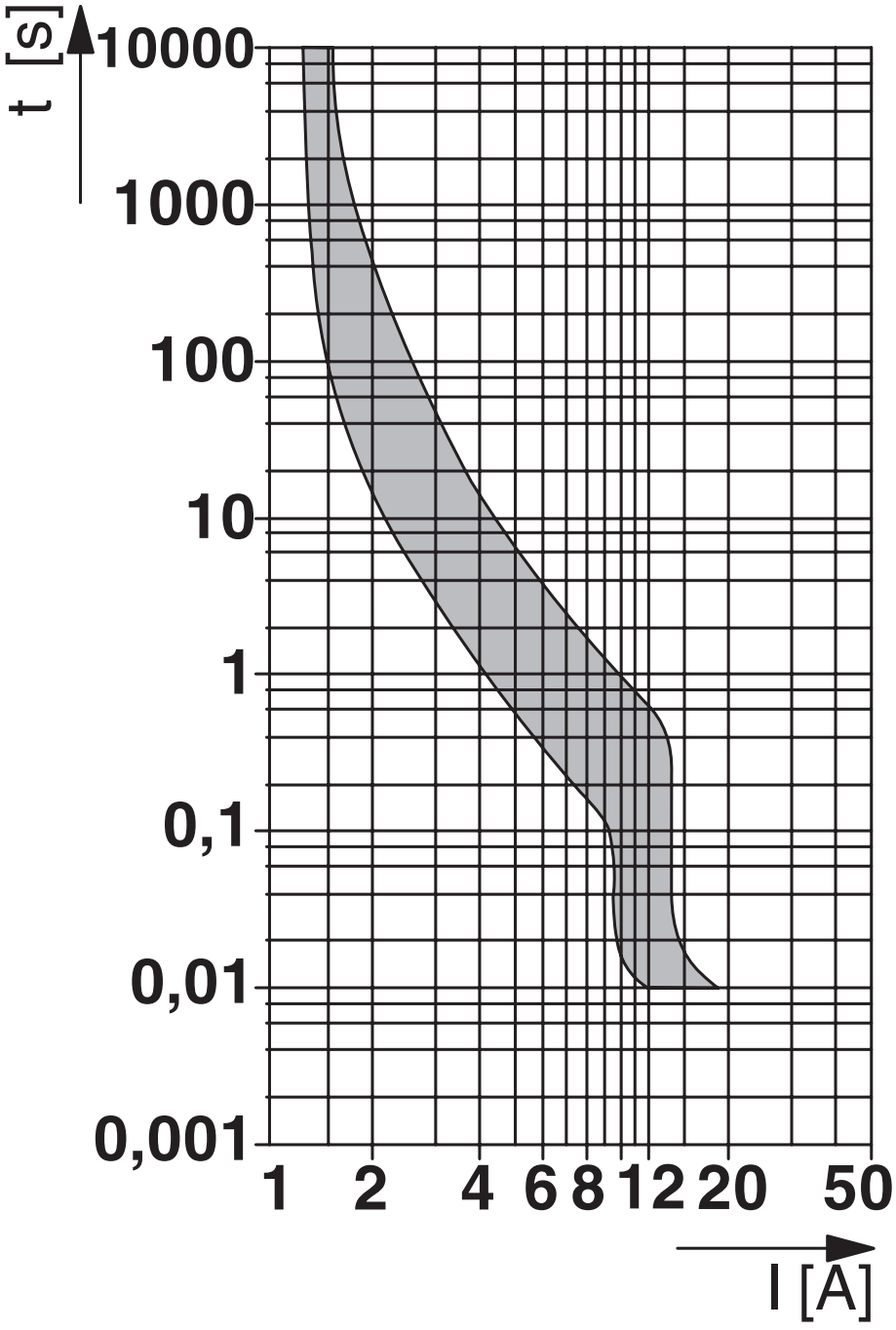
Mounting type	DIN rail: 35 mm

Drawings

Dimensional drawing



Diagram



Phoenix Contact USA
586 Fulling Mill Road
Middletown, PA 17057, United States
(+717) 944-1300
info@phoenixcon.com

Electronic circuit breaker - PTCB E1 24DC/1-8A NO

2908262

https://www.phoenixcontact.com/us/products/2908262

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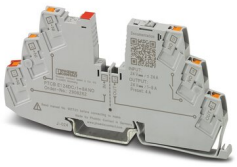


1-channel, electronic circuit breaker for protecting loads at 24 V DC against overload and short circuit. Easy potential distribution with components from the CLIPLINE complete terminal block system. With electronic interlock of the set nominal currents. For installation on DIN rails.

Your advantages

- Simple application setup due to bridging option to CLIPLINE complete terminal block system
- More space in the control cabinet: narrowest protection on just 6 mm width
- Flexible use and reduction of inventory due to adjustable amp values on each device for wide range of applications
- Individual setup for suitable protection, exactly according to your requirements

Commercial Data

Item number	2908262
Packing unit	1 pc
Minimum order quantity	1 pc
Sales Key	C32
Product Key	CLA135
Catalog Page	Page 381 (C-4-2019)
GTIN	4055626323763
Weight per Piece (including packing)	44.26 g
Weight per Piece (excluding packing)	43 g
Customs tariff number	85363010
Country of origin	US

Technical Data

Notes

General

Note	EN 50121-3-2: Railway applications - Electromagnetic compatibility - Part 3-2: Rolling stock – Apparatus
	Connection for signal line tested in accordance with EN 61000-4-4 with 1 kV; if necessary, customer must provide appropriate protective measures
	Repeated hard short circuits can reduce the melting integral of the integrated backup fuse.

Product properties

Type	DIN rail module, one-piece
Product type	Device circuit breakers
Number of positions	1
No. of channels	1

Insulation characteristics

Protection class	III
Pollution degree	2

Electrical properties

No. of channels	1

General

Operating voltage	18 V DC ... 30 V DC
Rated voltage	24 V DC
Rated current I_N	24 A DC (Total current input)
	8 A DC (Rated current output)
Rated current I_N	1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 A DC (adjustable)
Rated current (pre-adjusted)	4 A
Rated surge voltage	0.5 kV
Tripping method	E (electronic)
Feedback resistance	max. 35 V DC
Required backup fuse	Only required if I_{max} of the power supply > the short-circuit switching capacity. Integrated failsafe element.
Short-circuit switching capacity	300 A
Dielectric strength	max. 35 V DC (Load circuit)
Fuse	electronic
Efficiency	> 99 %
Closed circuit current I_0	typ. 12 mA
Power dissipation	typ. 0.3 W (No-load operation)
	< 1.6 W (Nominal operation)
Module initialization time	1 s

Waiting time after switch off of a channel	5 s (at overload / short circuit)
Measuring tolerance I	± 15 %
Temperature derating	21 A (Total current at 60°C)
	24 A (Total current at 50°C)
	7 A (Channel current at 60°C)
	8 A (Channel current at 50°C)
MTBF (IEC 61709, SN 29500)	25641025 h (at 25 °C with 21 % load)
	10989010 h (at 40°C with 34.25% load)
	1149425 h (at 55°C with 100% load)
Voltage drop	0.13 V (at 8 A)
Fail-safe element	15 A DC

Load circuit

Shutdown time	≤ 10 ms (for short circuit > 2.0 x I_N)
	1 s (1.2 ... 2.0 x I_N)
Undervoltage switch-off	≤ 17.8 V DC (active)
	≥ 18.8 V DC (inactive)
Overvoltage switch-off	≥ 30.5 V DC (active)
	≤ 29.5 V DC (inactive)
Max. capacitive load	35000 µF (Depending on the current setting and the short-circuit current available)

Indicator/remote signaling

Connection name	Remote indication circuit
Switching function	N/O contact
Operating voltage	0 V DC ... 30 V DC
Operating current	100 mA DC

Connection data

Main circuit IN+

Connection method	Push-in connection
Stripping length	8 mm
Conductor cross section flexible	0.2 mm² ... 2.5 mm²
Conductor cross section solid	0.2 mm² ... 4 mm²
Conductor cross section AWG	24 ... 12
Conductor cross section, flexible, with ferrule, with plastic sleeve	0.2 mm² ... 2.5 mm²
Conductor cross section flexible, with ferrule without plastic sleeve	0.2 mm² ... 2.5 mm²

Main circuit IN-

Connection method	Push-in connection
Stripping length	8 mm
Conductor cross section flexible	0.2 mm² ... 2.5 mm²
Conductor cross section solid	0.2 mm² ... 4 mm²
Conductor cross section AWG	24 ... 12

Conductor cross section, flexible, with ferrule, with plastic sleeve	0.2 mm² ... 2.5 mm²
Conductor cross section flexible, with ferrule without plastic sleeve	0.2 mm² ... 2.5 mm²

Main circuit OUT

Connection method	Push-in connection
Stripping length	8 mm
Conductor cross section flexible	0.2 mm² ... 2.5 mm²
Conductor cross section solid	0.2 mm² ... 4 mm²
Conductor cross section AWG	24 ... 12
Conductor cross section, flexible, with ferrule, with plastic sleeve	0.2 mm² ... 2.5 mm²
Conductor cross section flexible, with ferrule without plastic sleeve	0.2 mm² ... 2.5 mm²

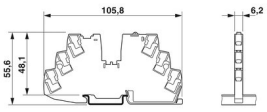
Remote indication circuit

Connection method	Push-in connection
Conductor cross section flexible	0.2 mm² ... 2.5 mm²
Conductor cross section solid	0.2 mm² ... 4 mm²
Conductor cross section AWG	24 ... 14
Conductor cross section, flexible, with ferrule, with plastic sleeve	0.2 mm² ... 2.5 mm²
Conductor cross section flexible, with ferrule without plastic sleeve	0.2 mm² ... 2.5 mm²

LED signaling

Channel LED off	off (Channel switched off)
Channel LED yellow	lit (Channel switched on, channel load > 80%)
	flashing (Programming mode active)
Channel LED green	lit (Channel switched on)
Channel LED red	lit (Channel switched off, over- or undervoltage active)
	ON temporarily (Channel switched off, 5 s cool-down phase, overload or short-circuit release)
	flashing (Channel switched off, ready to be switched back on, overload or short-circuit release)
	flashing quickly (Channel switched off, external voltage at the output, possible installation error)

Dimensions

Dimensional drawing	
Width	6.2 mm
Height	105.8 mm
Depth	55.6 mm (incl. DIN rail 7.5 mm)

Material specifications

Color	traffic grey A RAL 7042
Material	PBT (Housing)
	PBT (Pusher)
Flammability rating according to UL 94	V-0

Environmental and real-life conditions

Ambient conditions

Degree of protection	IP20
Ambient temperature (operation)	-30 °C ... 60 °C
Ambient temperature (storage/transport)	-40 °C ... 70 °C
Altitude	≤ 3000 m up to 52 °C (amsl (above mean sea level))
	≤ 4000 m up to 46 °C (amsl (above mean sea level))
Humidity test	96 h, 95 % RH, 40 °C
Shock (operation)	30g (IEC 60068-2-27, Test Ea)
Vibration (operation)	10 Hz ... 59.6 Hz (Amplitude ±0.35 mm; in accordance with IEC 60068-2-6, Test Fc)
	59.6 Hz … 150 Hz (Acceleration 5g; in accordance with IEC 60068-2-6, Test Fc)
	5 Hz … 100 Hz (Resonance search 4g; resonance frequency 4g; 90 min in accordance with DNV GL Class B)

Approval data

UL approval

Identification	UL/C-UL Listed UL 508
	UL Recognized UL 2367
	UL/C-UL Listed ANSI/UL 121201 Class I, Division 2, Groups A, B, C, D; T4 (Hazardous Location)

Shipbuilding approval

Identification	DNV GL

DNV GL data

Temperature	D
Humidity	B
Vibration	B
EMC	B
Enclosure	A

Standards and regulations

Standards/specifications	EN 61000-6-2
Standards/specifications	EN 61000-6-3
Standards/specifications	EN 60068-2-78
Standards/specifications	EN 50178
Standards/specifications	EN 60068-2-6
Standards/specifications	EN 60068-2-27

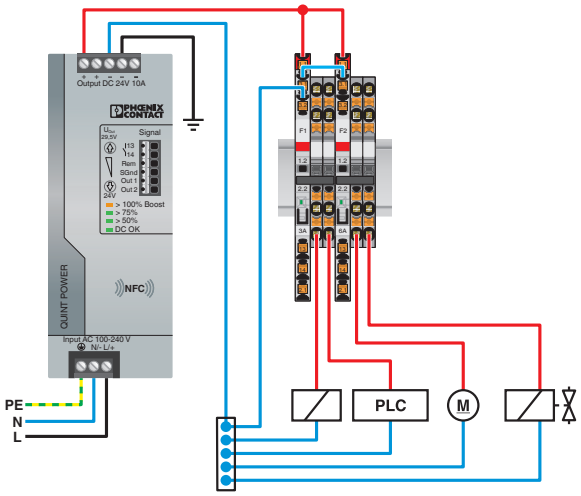
Standards/specifications	EN 60068-2-30
Standards/specifications	EN 61373
Standards/specifications	EN 45545-2

Mounting

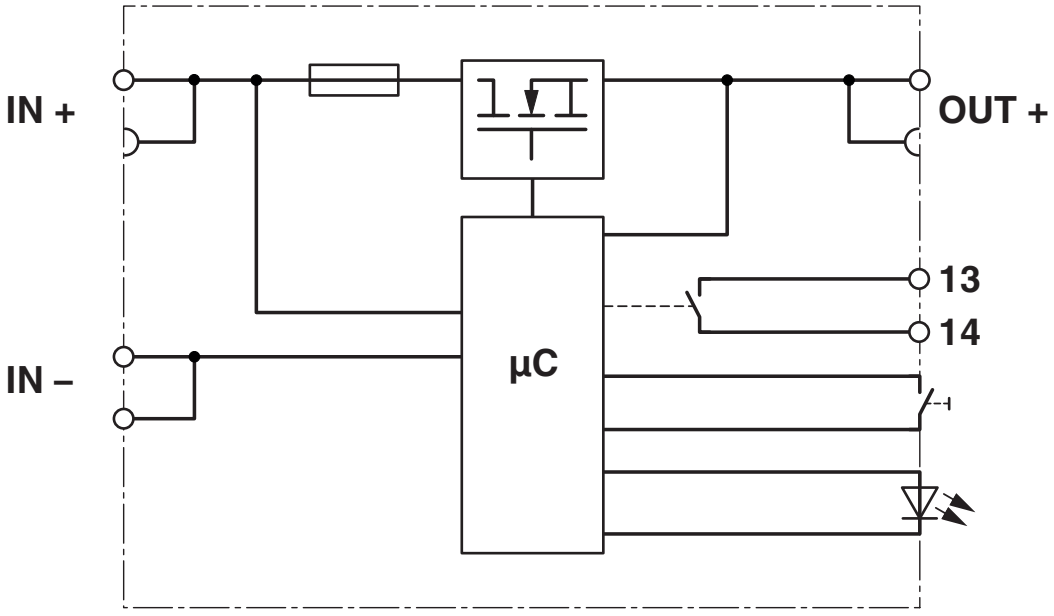
Mounting type	DIN rail: 35 mm

Drawings

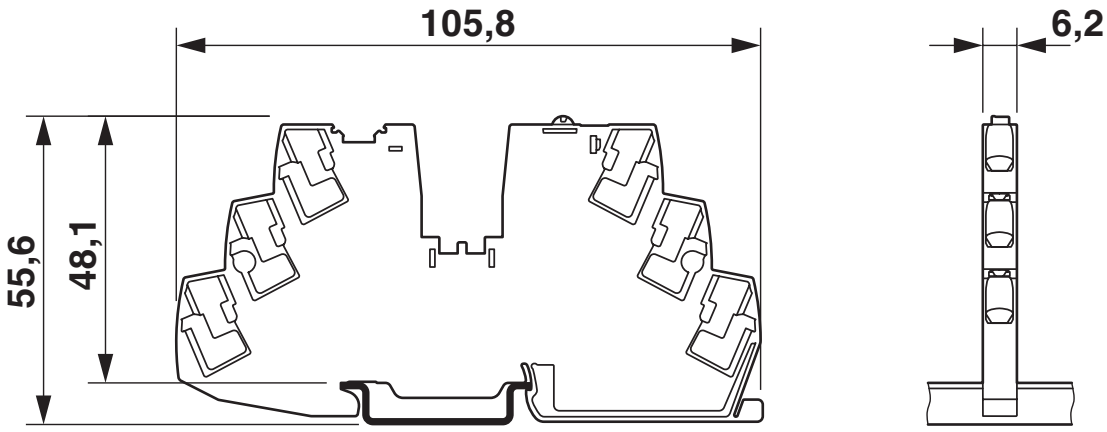
Application drawing



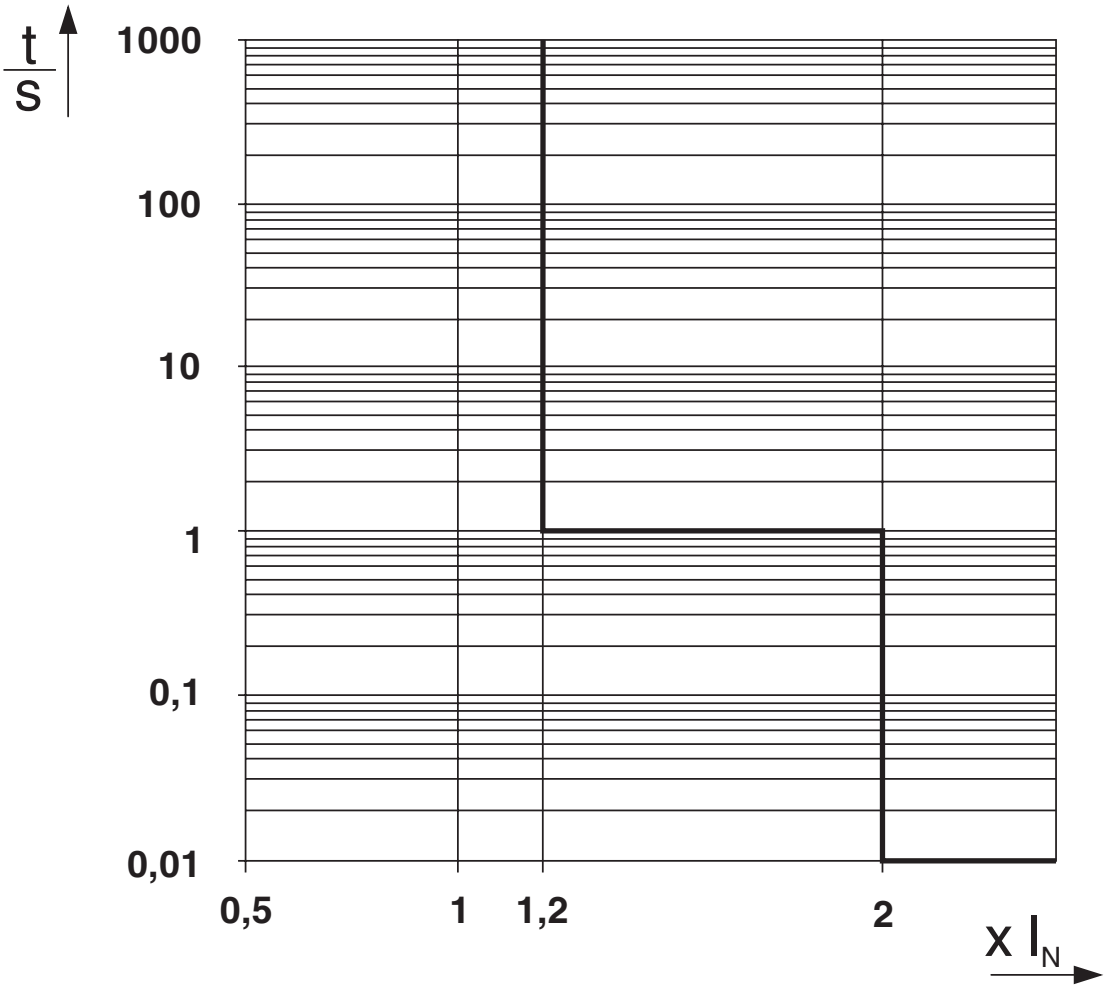
Block diagram



Dimensional drawing

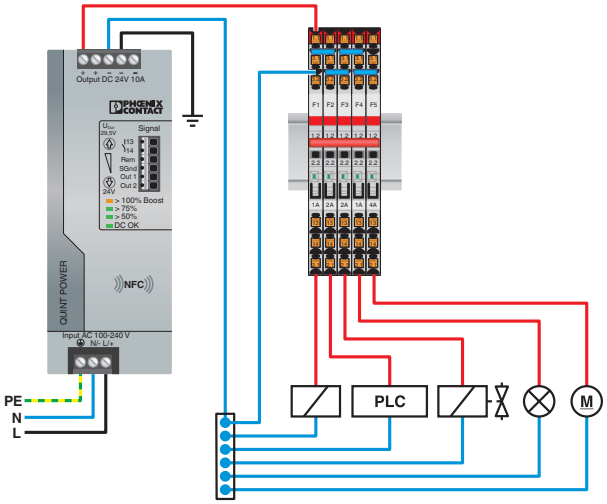


Diagram

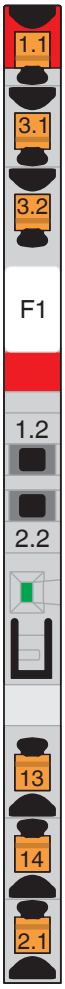


Trigger characteristic in the DC range

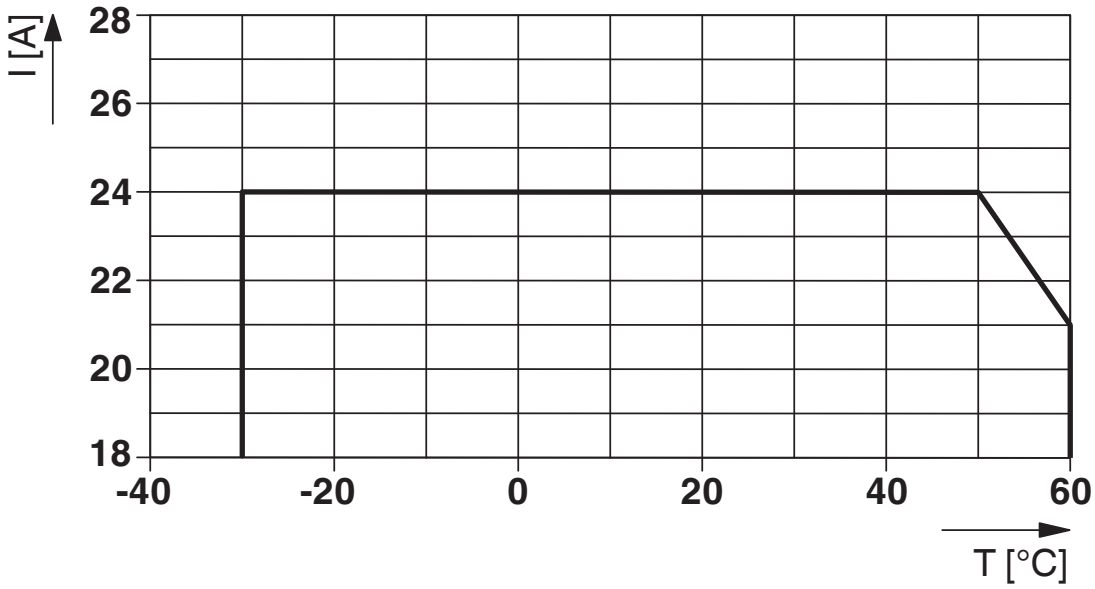
Application drawing



Product drawing

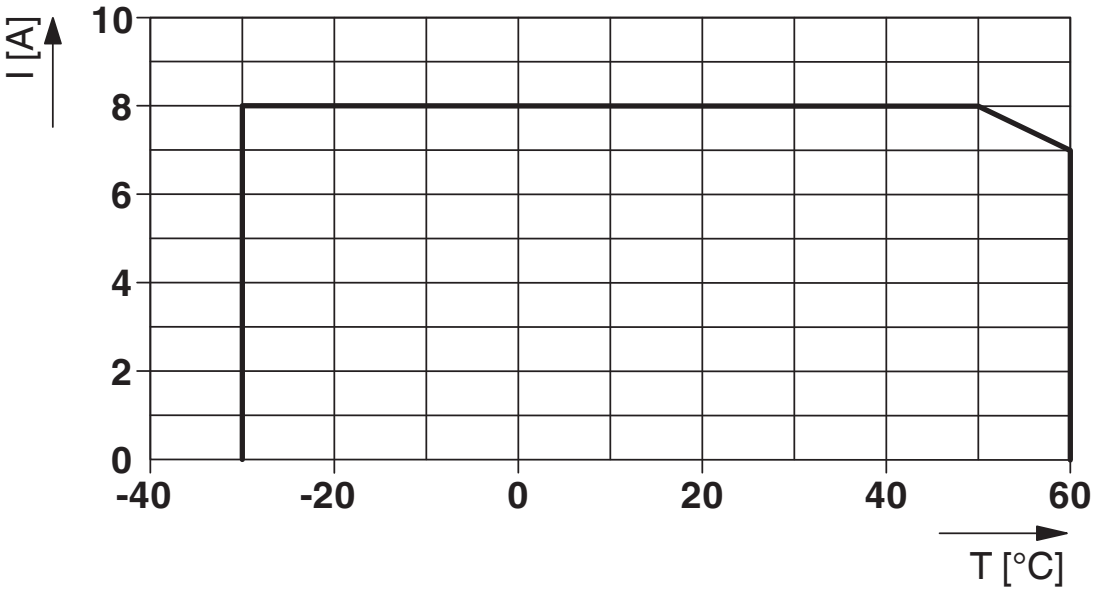


Diagram



Total current input

Diagram



Channel current output

Phoenix Contact USA
586 Fulling Mill Road
Middletown, PA 17057, United States
(+717) 944-1300
info@phoenixcon.com

Electronic circuit breaker - PTCB E1 24DC/1-3A NO

2909909

https://www.phoenixcontact.com/us/products/2909909

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1-channel, electronic circuit breaker for protecting loads at 24 V DC against overload and short circuit. Easy potential distribution with components from the CLIPLINE complete terminal block system. With electronic interlock of the set nominal currents. For installation on DIN rails.

Your advantages

- Simple application setup due to bridging option to CLIPLINE complete terminal block system
- More space in the control cabinet: narrowest protection on just 6 mm width
- Flexible use and reduction of inventory due to adjustable amp values on each device for wide range of applications
- Individual setup for suitable protection, exactly according to your requirements
- Optimum protection for cables and sensors as well as NEC Class 2 circuits by means of an additional internal output fuse

Commercial Data

Item number	2909909
Packing unit	1 pc
Minimum order quantity	1 pc
Note	Made to Order (non-returnable)
Sales Key	C32
Product Key	CLA135
Catalog Page	Page 380 (C-4-2019)
GTIN	4055626408767
Weight per Piece (including packing)	44.3 g
Weight per Piece (excluding packing)	27.58 g
Customs tariff number	85363010
Country of origin	US

Technical Data

Notes

General

Note	EN 50121-3-2: Railway applications - Electromagnetic compatibility - Part 3-2: Rolling stock – Apparatus
	Connection for signal line tested in accordance with EN 61000-4-4 with 1 kV; if necessary, customer must provide appropriate protective measures
	Repeated hard short circuits can reduce the melting integral of the integrated backup fuse.

Product properties

Type	DIN rail module, one-piece
Product type	Device circuit breakers
Number of positions	1
No. of channels	1

Insulation characteristics

Protection class	III
Pollution degree	2

Electrical properties

No. of channels	1

General

Operating voltage	18 V DC ... 27.5 V DC
Rated voltage	24 V DC
Rated current I_N	24 A DC (Total current input)
	3 A DC (Rated current output)
Rated current I_N	1 / 2 / 3 A DC (adjustable)
Rated current (pre-adjusted)	3 A
Rated surge voltage	0.5 kV
Tripping method	E (electronic)
Feedback resistance	max. 35 V DC
Required backup fuse	Only required if I_{max} of the power supply > the short-circuit switching capacity. Integrated failsafe element.
Short-circuit switching capacity	300 A
Dielectric strength	max. 35 V DC (Load circuit)
Fuse	electronic
Efficiency	> 99 %
Closed circuit current I_0	typ. 12 mA
Power dissipation	typ. 0.3 W (No-load operation)
	< 0.9 W (Nominal operation)
Module initialization time	1 s

Waiting time after switch off of a channel	5 s (at overload / short circuit)
Measuring tolerance I	± 15 %
Temperature derating	21 A (Total current at 60°C)
	24 A (Total current at 50°C)
	3 A (Channel current at 60°C)
	3 A (Channel current at 50°C)
MTBF (IEC 61709, SN 29500)	28571428 h (at 25 °C with 21 % load)
	14084507 h (at 40°C with 34.25% load)
	2053388 h (at 60°C with 100% load)
Voltage drop	0.06 V (at 2 A)
Fail-safe element	4 A DC

Load circuit

Shutdown time	≤ 10 ms (for short circuit > 2.0 x I_N)
	1 s (1.2 ... 2.0 x I_N)
Undervoltage switch-off	≤ 17.8 V DC (active)
	≥ 18.8 V DC (inactive)
Overvoltage switch-off	≥ 27.5 V DC (active)
	≤ 27 V DC (inactive)
Max. capacitive load	20000 µF (Depending on the current setting and the short-circuit current available)

Indicator/remote signaling

Connection name	Remote indication circuit
Switching function	N/O contact
Operating voltage	0 V DC ... 30 V DC
Operating current	100 mA DC

Connection data

Main circuit IN+

Connection method	Push-in connection
Stripping length	8 mm
Conductor cross section flexible	0.2 mm² ... 2.5 mm²
Conductor cross section solid	0.2 mm² ... 4 mm²
Conductor cross section AWG	24 ... 12
Conductor cross section, flexible, with ferrule, with plastic sleeve	0.2 mm² ... 2.5 mm²
Conductor cross section flexible, with ferrule without plastic sleeve	0.2 mm² ... 2.5 mm²

Main circuit IN-

Connection method	Push-in connection
Stripping length	8 mm
Conductor cross section flexible	0.2 mm² ... 2.5 mm²
Conductor cross section solid	0.2 mm² ... 4 mm²
Conductor cross section AWG	24 ... 12

Conductor cross section, flexible, with ferrule, with plastic sleeve	0.2 mm² ... 2.5 mm²
Conductor cross section flexible, with ferrule without plastic sleeve	0.2 mm² ... 2.5 mm²

Main circuit OUT

Connection method	Push-in connection
Stripping length	8 mm
Conductor cross section flexible	0.2 mm² ... 2.5 mm²
Conductor cross section solid	0.2 mm² ... 4 mm²
Conductor cross section AWG	24 ... 12
Conductor cross section, flexible, with ferrule, with plastic sleeve	0.2 mm² ... 2.5 mm²
Conductor cross section flexible, with ferrule without plastic sleeve	0.2 mm² ... 2.5 mm²

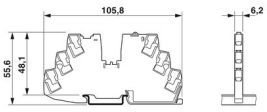
Remote indication circuit

Connection method	Push-in connection
Conductor cross section flexible	0.2 mm² ... 2.5 mm²
Conductor cross section solid	0.2 mm² ... 4 mm²
Conductor cross section AWG	24 ... 14
Conductor cross section, flexible, with ferrule, with plastic sleeve	0.2 mm² ... 2.5 mm²
Conductor cross section flexible, with ferrule without plastic sleeve	0.2 mm² ... 2.5 mm²

LED signaling

Channel LED off	off (Channel switched off)
Channel LED yellow	lit (Channel switched on, channel load > 80%)
	flashing (Programming mode active)
Channel LED green	lit (Channel switched on)
Channel LED red	lit (Channel switched off, over- or undervoltage active)
	ON temporarily (Channel switched off, 5 s cool-down phase, overload or short-circuit release)
	flashing (Channel switched off, ready to be switched back on, overload or short-circuit release)
	flashing quickly (Channel switched off, external voltage at the output, possible installation error)

Dimensions

Dimensional drawing	
Width	6.2 mm
Height	105.8 mm
Depth	55.6 mm (incl. DIN rail 7.5 mm)

Material specifications

Color	traffic grey A RAL 7042
Material	PBT (Housing)
	PBT (Pusher)
Flammability rating according to UL 94	V-0

Environmental and real-life conditions

Ambient conditions

Degree of protection	IP20
Ambient temperature (operation)	-30 °C ... 60 °C
Ambient temperature (storage/transport)	-40 °C ... 70 °C
Altitude	≤ 3000 m up to 52 °C (amsl (above mean sea level))
	≤ 4000 m up to 46 °C (amsl (above mean sea level))
Humidity test	96 h, 95 % RH, 40 °C
Shock (operation)	30g (IEC 60068-2-27, Test Ea)
Vibration (operation)	10 Hz ... 59.6 Hz (Amplitude ±0.35 mm; in accordance with IEC 60068-2-6, Test Fc)
	59.6 Hz … 150 Hz (Acceleration 5g; in accordance with IEC 60068-2-6, Test Fc)
	5 Hz … 100 Hz (Resonance search 4g; resonance frequency 4g; 90 min in accordance with DNV GL Class B)

Approval data

UL approval

Identification	UL/C-UL Listed UL 508
	UL Recognized UL 2367
	NEC Class 2 according to UL 1310
	UL/C-UL Listed ANSI/UL 121201 Class I, Division 2, Groups A, B, C, D; T4 (Hazardous Location)

Shipbuilding approval

Identification	DNV GL

DNV GL data

Temperature	D
Humidity	B
Vibration	B
EMC	B
Enclosure	A

Standards and regulations

Standards/specifications	EN 61000-6-2
Standards/specifications	EN 61000-6-3
Standards/specifications	EN 60068-2-78
Standards/specifications	EN 50178
Standards/specifications	EN 60068-2-6

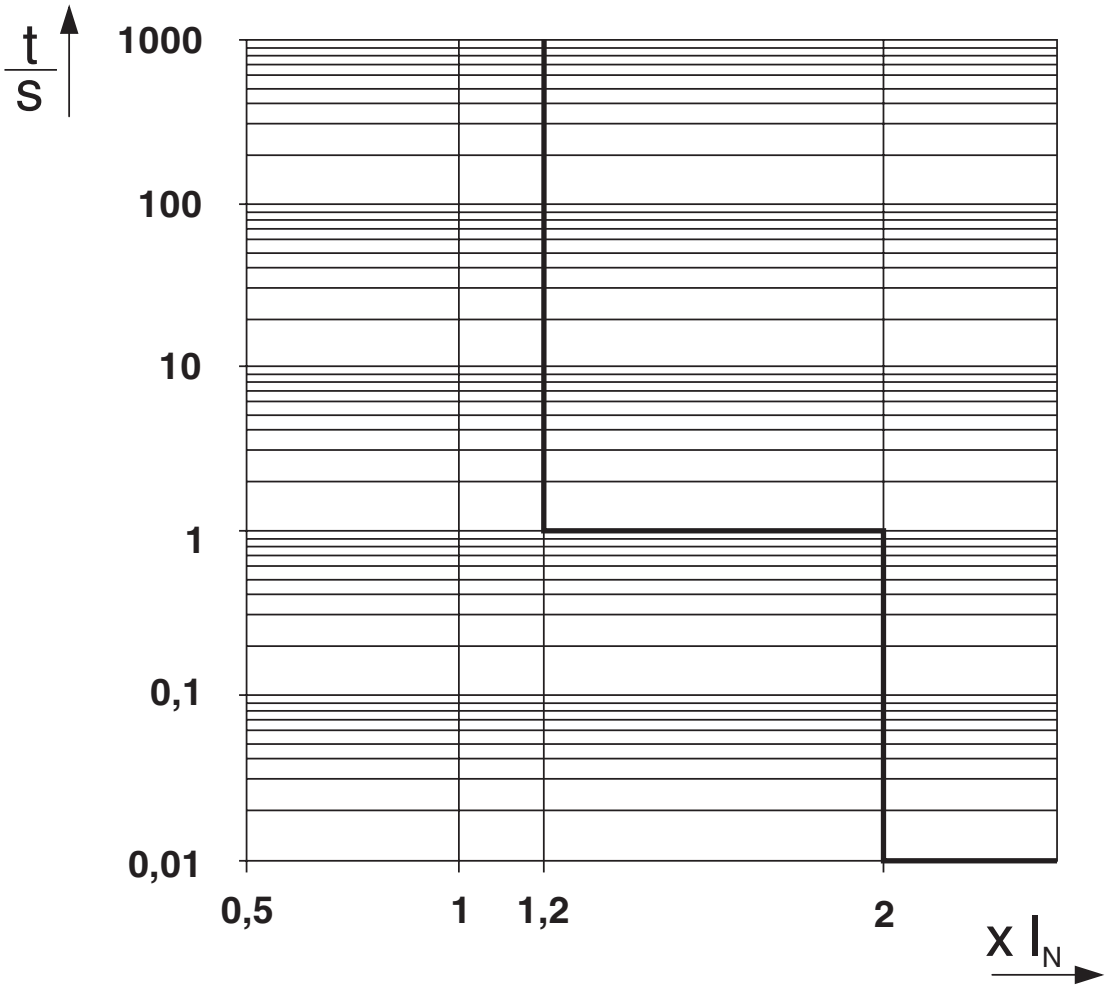
Standards/specifications	EN 60068-2-27
Standards/specifications	EN 60068-2-30
Standards/specifications	EN 61373
Standards/specifications	EN 45545-2

Mounting

Mounting type	DIN rail: 35 mm

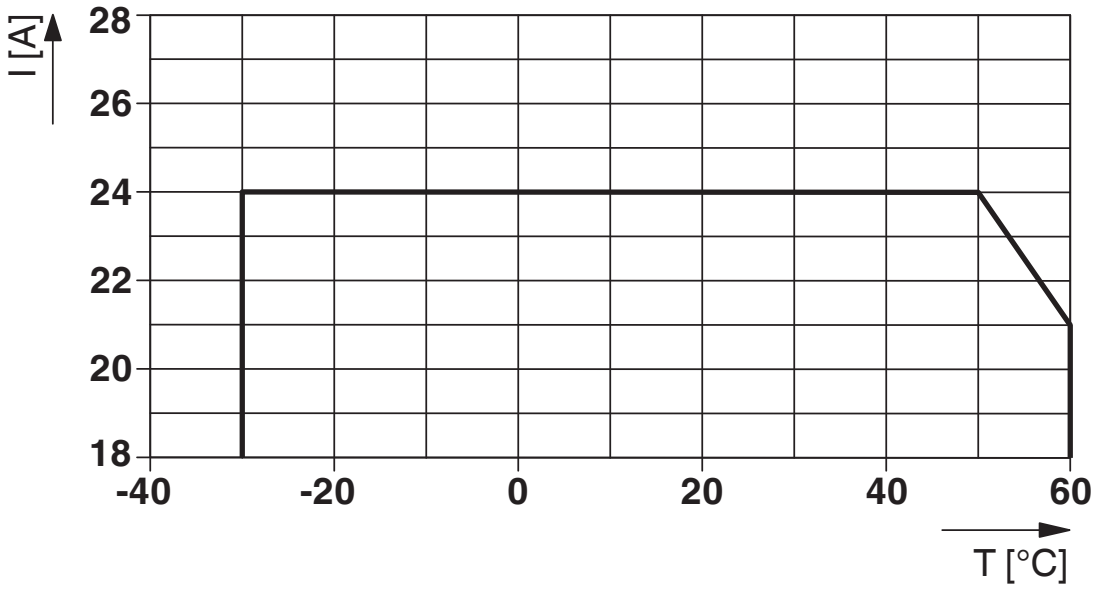
Drawings

Diagram



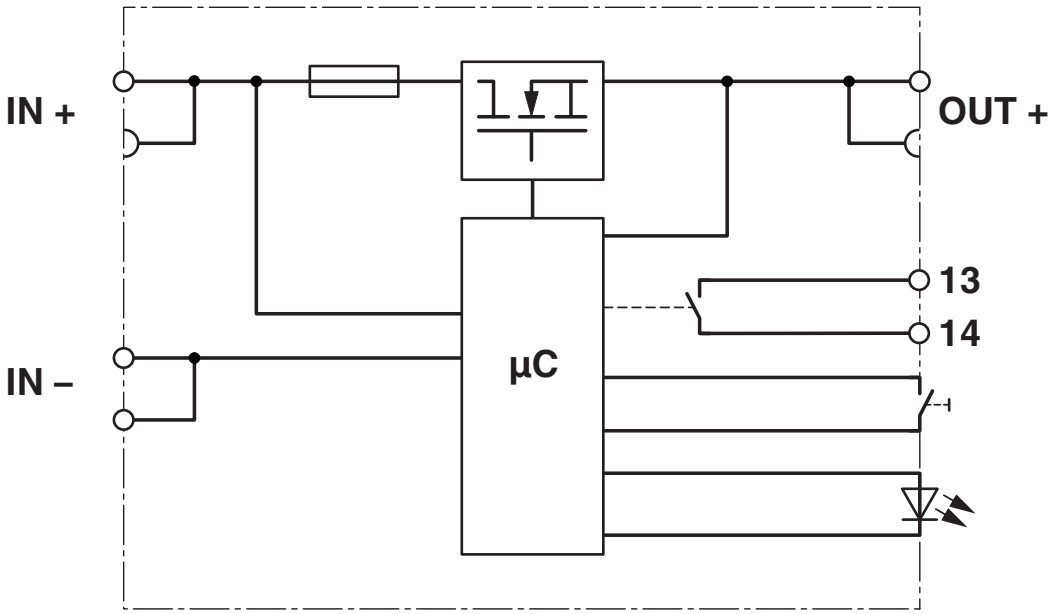
Trigger characteristic in the DC range

Diagram

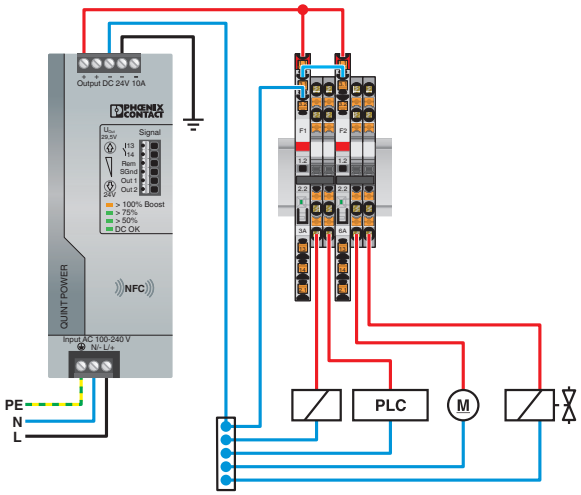


Total current input

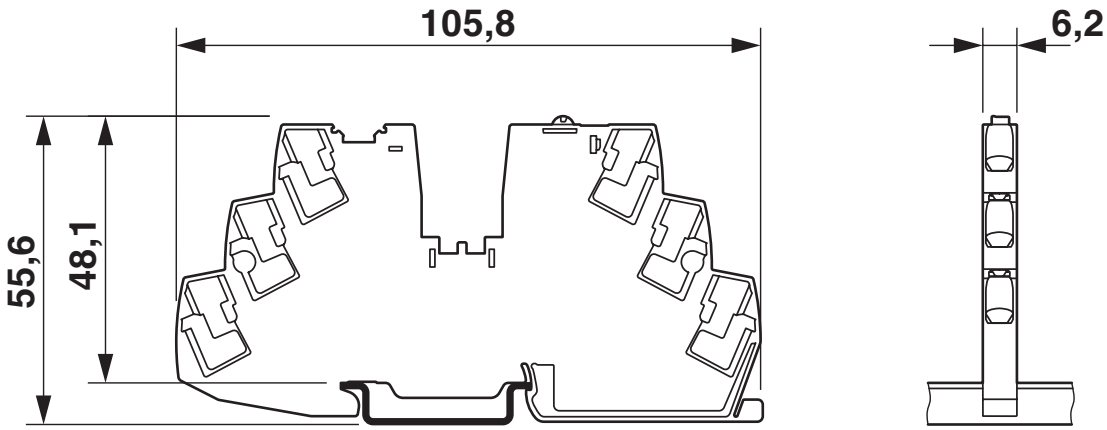
Block diagram



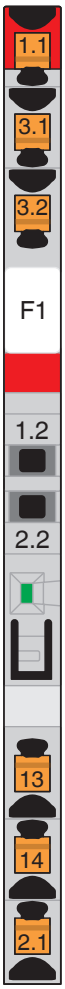
Application drawing



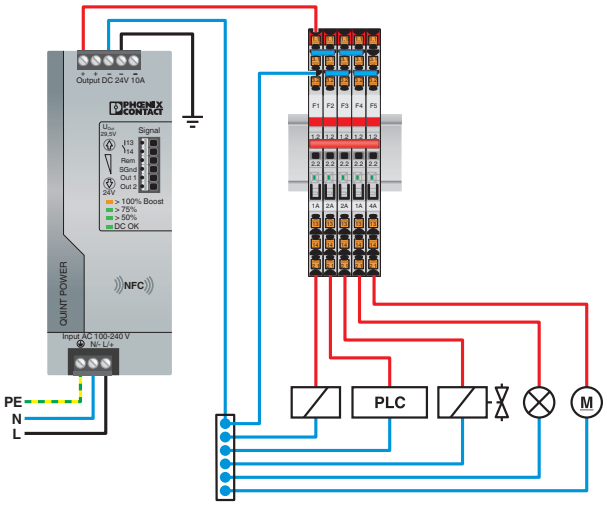
Dimensional drawing



Product drawing



Application drawing



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Type 1 surge protection device - VAL-US-120/40/1+1-FM

2910349

https://www.phoenixcontact.com/us/products/2910349

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Surge protective device, two channel with remote indicator contact for 120 V AC, 2-wire plus ground.

Commercial Data

Item number	2910349
Packing unit	1 pc
Sales Key	C06
Product Key	CL132U
Catalog Page	Page 93 (C-4-2019)
GTIN	4055626444901
Weight per Piece (including packing)	225.2 g
Weight per Piece (excluding packing)	225.2 g
Customs tariff number	85363030
Country of origin	DE

Type 1 surge protection device - VAL-US-120/40/1+1-FM

2910349

https://www.phoenixcontact.com/us/products/2910349

Technical Data

Product properties

IEC test classification	II
	T2
EN type	T2
IEC power supply system	TN-S
	TT
Type	DIN rail module, two-section, divisible
Product type	Surge arrester
Number of positions	2
Surge protection fault message	Optical, remote indicator contact

Insulation characteristics

Overvoltage category	III
Pollution degree	2

Electrical properties

Nominal frequency f_N	50 Hz (60 Hz)

Indicator/remote signaling

Connection name	Remote fault indicator contact
Switching function	Changeover contact
Operating voltage	5 V AC ... 250 V AC
	30 V DC
Operating current	5 mA AC ... 1.5 A AC
	1 A DC

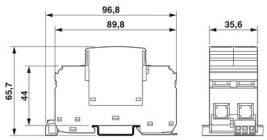
Connection data

Connection method	Screw connection
Screw thread	M5
Tightening torque	4.5 Nm (1.5 mm² ... 16 mm²)
	4.5 Nm (25 mm² ... 35 mm²)
Stripping length	16 mm
Conductor cross section flexible	1.5 mm² ... 25 mm²
Conductor cross section solid	1.5 mm² ... 35 mm²
Conductor cross section AWG	15 ... 2

Remote fault indicator contact

Connection method	Screw connection
Screw thread	M2
Tightening torque	0.25 Nm
Conductor cross section flexible	0.14 mm² ... 1.5 mm²
Conductor cross section solid	0.14 mm² ... 1.5 mm²
Conductor cross section AWG	28 ... 16

Dimensions

Dimensional drawing	
Width	35.6 mm
Height	96.8 mm
Depth	65.7 mm (incl. DIN rail 7.5 mm)
Horizontal pitch	2 Div.

Material specifications

Color	jet black RAL 9005
Flammability rating according to UL 94	V-0
CTI value of material	600
Insulating material	PA 6.6/PBT
Material group	I
Housing material	PA 6.6
	PBT

Protective circuit

Mode of protection	L-N
	L-PE
	N-PE
Direction of action	1L-N & N-GND
Nominal voltage U_N	120 V AC (TN-S)
	120 V AC (TT)
Nominal frequency f_N	50 Hz (60 Hz)
Rated load current I_L	80 A
Residual current I_{PE}	≤ 5 µA
Nominal discharge current I_n (8/20) µs	20 kA
Follow current interrupt rating I_{fi} (N-PE)	100 A (305 V AC)
Short-circuit current rating I_{SCCR}	25 kA
Voltage protection level U_p (L-N)	≤ 0.9 kV
Voltage protection level U_p (L-PE)	≤ 1.6 kV
Voltage protection level U_p (N-PE)	≤ 1.5 kV
Residual voltage U_{res} (L-N)	≤ 0.9 kV (at I_n)
	≤ 0.75 kV (at 10 kA)
	≤ 0.6 kV (at 5 kA)
	≤ 0.55 kV (at 3 kA)
Residual voltage U_{res} (L-PE)	≤ 1.6 kV (at I_n)
	≤ 1.2 kV (at 10 kA)
	≤ 1 kV (at 5 kA)

	≤ 0.9 kV (at 3 kA)
Residual voltage U_{res} (N-PE)	≤ 0.4 kV (at I_n)
	≤ 0.25 kV (at 10 kA)
	≤ 0.15 kV (at 5 kA)
	≤ 0.1 kV (at 3 kA)
TOV behavior at U_T (L-N)	208 V AC (5 s / withstand mode)
	240 V AC (120 min / safe failure mode)
TOV behavior at U_T (N-PE)	1200 V AC (200 ms / withstand mode)
Response time t_A (L-N)	≤ 25 ns
Response time t_A (L-PE)	≤ 100 ns
Response time t_A (N-PE)	≤ 100 ns
Max. backup fuse with V-type through wiring	80 A (gG)
Max. backup fuse with branch wiring	125 A (gG)

Environmental and real-life conditions

Ambient conditions

Degree of protection	IP20 (only when all terminal points are used)
Ambient temperature (operation)	-40 °C ... 80 °C
Ambient temperature (storage/transport)	-40 °C ... 80 °C
Altitude	≤ 2000 m (amsl (above mean sea level))
Permissible humidity (operation)	5 % ... 95 %
Shock (operation)	25g (Half-sine / 11 ms / 3x ±X, ±Y, ±Z)
Vibration (operation)	5g (10 ... 500 Hz / 2.5 h / X, Y, Z)

Approval data

UL specifications

Maximum continuous operating voltage MCOV (L-N)	175 V AC
Maximum continuous operating voltage MCOV (L-G)	175 V AC
Maximum continuous operating voltage MCOV (N-G)	305 V AC
Short-circuit current rating (SCCR)	200 kA
Voltage protection rating VPR (L-N)	700 V
Voltage protection rating VPR (L-G)	1800 V
Voltage protection rating VPR (N-G)	1200 V
UL type	type 1
Nominal discharge current I_n	20 kA
Maximum Surge Current per Phase	40 kA
Mode of protection	L-N
	L-G
	N-G
Nominal voltage	120 V AC
Power distribution system	Single phase
Nominal frequency	50/60 Hz
SPD Type	1

UL indicator/remote signaling

AC operating voltage	125 V AC
AC operating current	1 A AC

UL connection data

Tightening torque	30 lb_f-in.
Conductor cross section AWG	14 ... 2

Standards and regulations

Air clearances and creepage distances

Standards/regulations	EN 60664-1 / EN 61643-11
Standards/specifications	IEC 61643-11
Standards/specifications	EN 61643-11

Mounting

Mounting type	DIN rail: 35 mm

Type 1 surge protection device - VAL-US-120/40/1+1-FM

2910349

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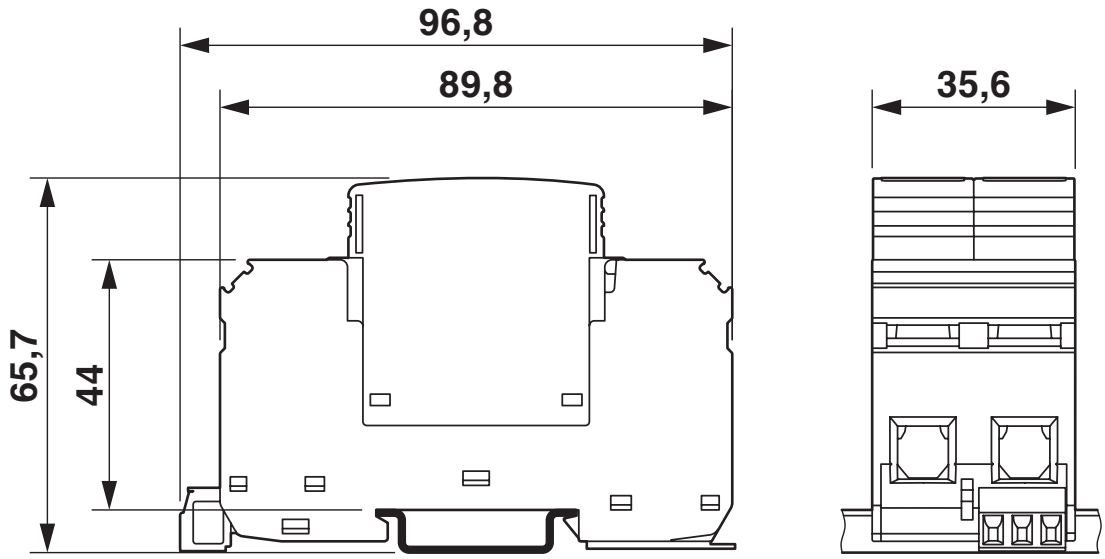
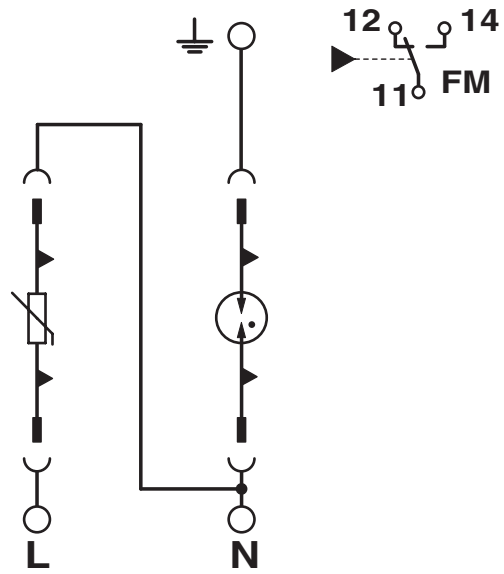
Drawings

Dimensional drawing



Circuit diagram



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End clamp - CLIPFIX 35-5

3022276

https://www.phoenixcontact.com/us/products/3022276

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Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN rail, with marking option, with parking option for FBS...5, FBS...6, KSS 5, KSS 6, width: 5.15 mm, color: gray

Your advantages

- Large-surface marking
- Design width of just 5.2 mm
- Phoenix Contact has engineered its CLIPFIX end brackets to maintain a secure grip on the various DIN rail systems

Commercial Data

Item number	3022276
Packing unit	1 pc
Minimum order quantity	50 pc
Sales Key	B17
Product Key	BE7111
Catalog Page	Page 538 (C-3-2019)
GTIN	4017918194154
Weight per Piece (including packing)	4.836 g
Weight per Piece (excluding packing)	4.65 g
Customs tariff number	39269097
Country of origin	DE

Technical Data

Product properties

Product type	End block

Dimensions

Width	5.15 mm
Height	35.3 mm
Height NS 35/15	44 mm
Height NS 35/7,5	36.5 mm
Length	48.6 mm

Material specifications

Color	gray
Material	PA
Flammability rating according to UL 94	V0
Static insulating material application in cold	-60 °C
Relative insulation material temperature index (Elec., UL 746 B)	65 °C
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Environmental and real-life conditions

Ambient conditions

Ambient temperature (operation)	-60 °C ... 65 °C (max. short-term operating temperature RTI Elec.)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C
Permissible humidity (storage/transport)	30 % ... 70 %

Mounting

Mounting type	NS 35/7,5
	NS 35/15

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End cover - D-ST 4

3030420

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End cover, length: 55.9 mm, width: 2.2 mm, height: 29 mm, color: gray

Commercial Data

Item number	3030420
Packing unit	1 pc
Minimum order quantity	50 pc
Sales Key	B02
Product Key	BE2Z1X
Catalog Page	Page 99 (C-1-2019)
GTIN	4017918188030
Weight per Piece (including packing)	2.169 g
Weight per Piece (excluding packing)	2.135 g
Customs tariff number	85389099
Country of origin	DE

Technical Data

Product properties

Product type	End cover

Ambient conditions

Ambient temperature (operation)	-60 °C ... 105 °C (max. short-term operating temperature RTI Elec.)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C
Permissible humidity (storage/transport)	30 % ... 70 %

Material specifications

Color	gray
Material	PA
Flammability rating according to UL 94	V0
Static insulating material application in cold	-60 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	125 °C
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3
Calorimetric heat release NFPA 130 (ASTM E 1354)	27,5 MJ/kg
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed

Dimensions

Width	2.2 mm
Height	29 mm
Length	55.9 mm

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End cover - D-ST 2,5-QUATTRO - 3030514

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End cover, length: 72.2 mm, width: 2.2 mm, height: 29.1 mm, color: gray

RoHS COMPLETE line

Key Commercial Data

Packing unit	1 pc
Minimum order quantity	50 pc
GTIN	4 017918 187972
GTIN	4017918187972
Weight per Piece (excluding packing)	2.800 g
Custom tariff number	85389099
Country of origin	Germany

Technical data

General

Color	gray
Material	PA
Flammability rating according to UL 94	V0

Dimensions

Width	2.2 mm
Length	72.2 mm
Height	29.1 mm

General

Relative insulation material temperature index (Elec., UL 746 B)	130 °C

End cover - D-ST 2,5-QUATTRO - 3030514

Technical data

General

Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	125 °C
Static insulating material application in cold	-60 °C
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Calorimetric heat release NFPA 130 (ASTM E 1354)	27,5 MJ/kg
Smoke gas toxicity NFPA 130 (SMP 800C)	passed
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Ambient conditions

Operating temperature	-60 °C ... 105 °C (max. short-term operating temperature 130°C)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Permissible humidity (storage/transport)	30 % ... 70 %
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C

Standards and Regulations

Flammability rating according to UL 94	V0

Environmental Product Compliance

China RoHS	Environmentally friendly use period: unlimited = EFUP-e
	No hazardous substances above threshold values

Classifications

eCl@ss

eCl@ss 10.0.1	27141133
eCl@ss 11.0	27141133
eCl@ss 4.0	21011300
eCl@ss 4.1	21011300
eCl@ss 5.0	27141100
eCl@ss 5.1	27141100
eCl@ss 6.0	27141100
eCl@ss 7.0	27141133
eCl@ss 9.0	27141133

End cover - D-ST 2,5-QUATTRO - 3030514

Classifications

ETIM

ETIM 2.0	EC000886
ETIM 3.0	EC000886
ETIM 4.0	EC000886
ETIM 6.0	EC000886
ETIM 7.0	EC000886

UNSPSC

UNSPSC 6.01	30211827
UNSPSC 7.0901	39121424
UNSPSC 11	39121424
UNSPSC 12.01	39121424
UNSPSC 13.2	39121425
UNSPSC 18.0	39121425
UNSPSC 19.0	39121425
UNSPSC 20.0	39121425
UNSPSC 21.0	39121425

Fuse plug - P-FU 5X20 LED 24-5

3209248

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Fuse plug, Suitable for terminal blocks with a width of 5.2 mm and above with TG zone, nom. voltage: 24 V, nominal current: 6.3 A, connection method: Plug-in connection, fuse type: G / 5 x 20, mounting type: Plug-in mounting, color: black

Your advantages

- Large-surface labeling option
- Test contacts on both sides of the fuse
- Versions with bipolar error display
- Can be used for overload/short-circuit protection

Commercial Data

Item number	3209248
Packing unit	1 pc
Minimum order quantity	10 pc
Sales Key	B02
Product Key	BE2Z3X
Catalog Page	Page 414 (C-1-2019)
GTIN	4046356548342
Weight per Piece (including packing)	5.29 g
Weight per Piece (excluding packing)	4.953 g
Customs tariff number	85369095
Country of origin	CN

Technical Data

Notes

General	Suitable for terminal blocks with a width of 5.2 mm and above with TG zone
Notes on operation	Prior to replacing the cartridge fuse, disconnect the fuse connector from the basic terminal block.

Product properties

Product type	Fuse
Pitch	5.2 mm
Potentials	1

Insulation characteristics

Degree of pollution	3

Electrical properties

Fuse	G / 5 x 20
LED voltage range	12 V AC/DC ... 30 V AC/DC
LED current range	0.35 mA ... 0.95 mA

Input data

LED voltage range	12 V AC/DC ... 30 V AC/DC

Connection data

Nominal current	6.3 A (the current is determined by the fuse used)
Maximum load current	6.3 A (the current is determined by the fuse used)
Nominal voltage	24 V (The current is determined by the fuse used, the voltage by the fuse or selected LED display.)

Dimensions

Width	6.2 mm
Height	57.7 mm
Length	25 mm
Pitch	5.2 mm

Material specifications

Color	black
Flammability rating according to UL 94	V0
Insulating material	PA
Static insulating material application in cold	-60 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	130 °C
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3

Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3
Calorimetric heat release NFPA 130 (ASTM E 1354)	28 MJ/kg
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed

Environmental and real-life conditions

Ambient conditions

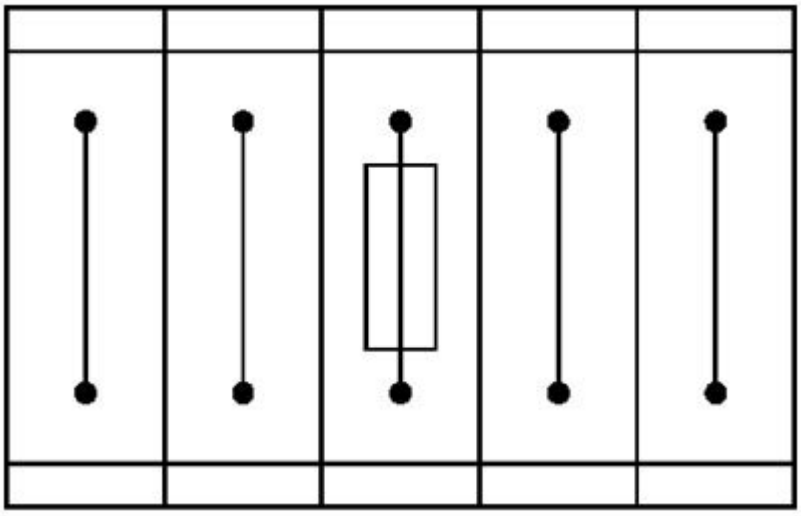
Ambient temperature (operation)	-60 °C ... 105 °C (max. short-term operating temperature RTI Elec.)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C
Permissible humidity (storage/transport)	30 % ... 70 %

Mounting

Mounting type	Plug-in mounting

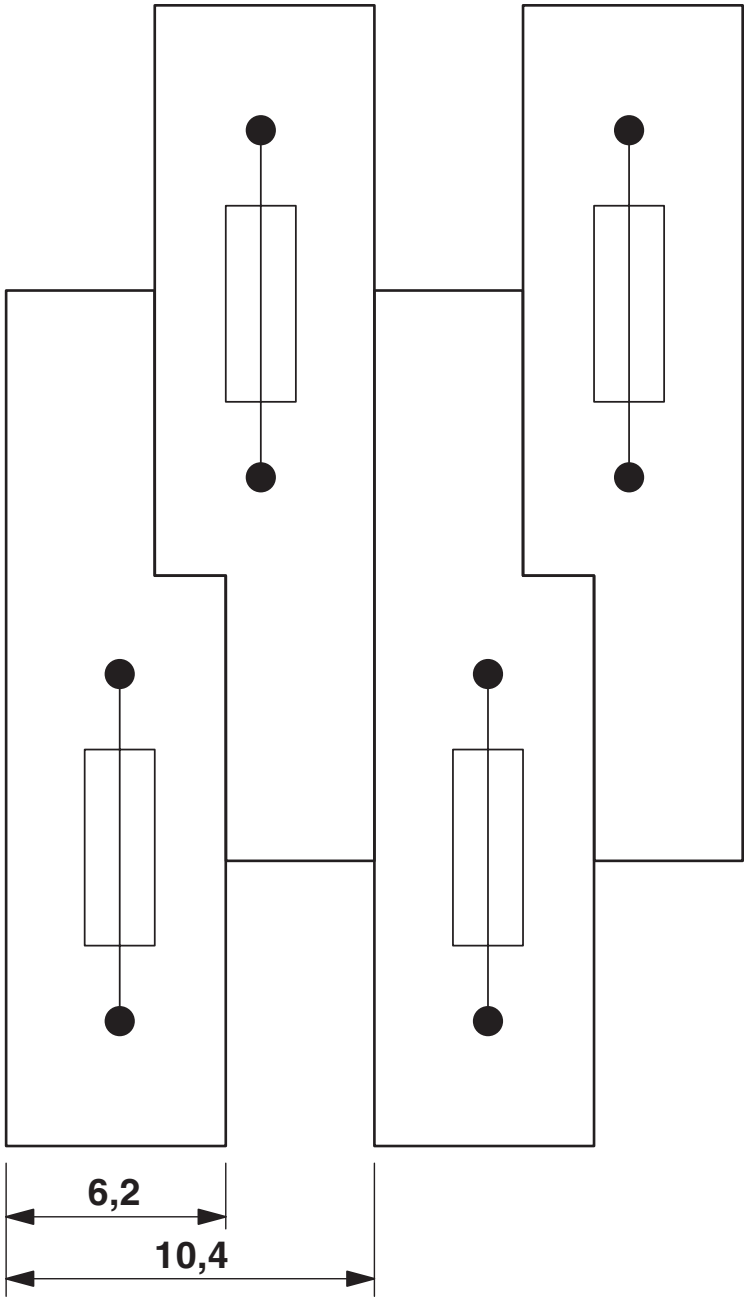
Drawings

Application drawing

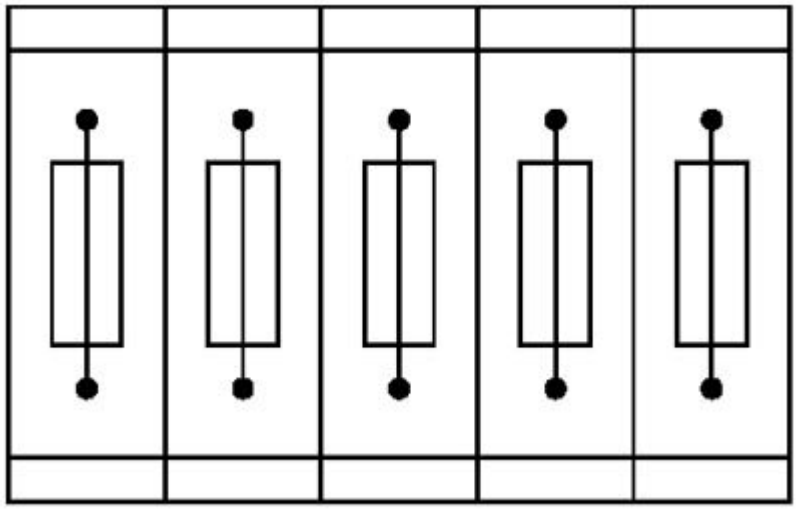


Fuse terminal block in single arrangement,
block consisting of one fuse terminal block and 4 feed-through terminal blocks

Application drawing

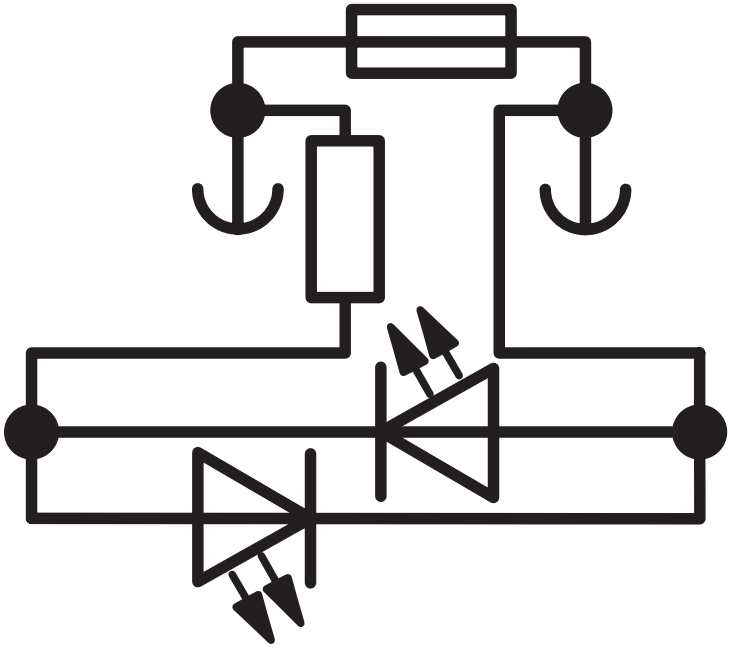


Application drawing



Fuse terminal blocks in interconnected arrangement,
block consisting of 5 fuse terminal blocks

Circuit diagram



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Feed-through terminal block - PT 2,5-QUATTRO - 3209578

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Feed-through terminal block, nom. voltage: 800 V, nominal current: 24 A, connection method: Push-in connection, number of connections: 4, cross section: 0.14 mm² - 4 mm², AWG: 26 - 12, width: 5.2 mm, height: 35.3 mm, color: gray, mounting type: NS 35/7,5, NS 35/15

Your advantages

- In addition to the testing facility in the double function shaft, all terminal blocks provide an additional test connection
- The compact design and front connection enable wiring in a confined space
- The Push-in connection terminal blocks are characterized by the system features of the CLIPLINE complete system and by easy and tool-free wiring of conductors with ferrules or solid conductors
- Tested for railway applications

Key Commercial Data

Packing unit	1 pc
Minimum order quantity	50 pc
GTIN	4 046356 329859
GTIN	4046356329859
Weight per Piece (excluding packing)	10.800 g
Custom tariff number	85369010
Country of origin	Germany

Technical data

General

Number of rows	1
Number of connections	4
Potentials	1
Nominal cross section	2.5 mm²

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Technical data

General

Color	gray
Insulating material	PA
Flammability rating according to UL 94	V0
Area of application	Railway industry
	Machine building
	Plant engineering
	Process industry
Mounting type	NS 35/7,5
Rated surge voltage	8 kV
Degree of pollution	3
Overvoltage category	III
Insulating material group	I
Maximum load current	28 A (with 4 mm² conductor cross section, rigid)
Nominal current I_N	24 A (with 2.5 mm² conductor connection cross section)
Nominal voltage U_N	800 V
Open side panel	Yes
Shock protection test specification	DIN EN 50274 (VDE 0660-514):2002-11
Back of the hand protection	guaranteed
Finger protection	guaranteed
Result of surge voltage test	Test passed
Result of power-frequency withstand voltage test	Test passed
Power frequency withstand voltage setpoint	2 kV
Result of the test for mechanical stability of terminal points (5 x conductor connection)	Test passed
Result of flexion and pull-out test	Test passed
Bending test rotation speed	10 rpm
Bending test turns	135
Bending test conductor cross section/weight	0.14 mm² / 0.2 kg
	2.5 mm² / 0.7 kg
Tensile test result	Test passed
Result of tight fit on support	Test passed
Tight fit on carrier	NS 35
Setpoint	1 N
Result of voltage-drop test	Test passed
Result of temperature-rise test	Test passed
Requirement temperature-rise test	Increase in temperature ≤ 45 K
Short circuit stability result	Test passed

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Technical data

General

Conductor cross section short circuit testing	2.5 mm²
Short-time current	0.3 kA
Conductor cross section short circuit testing	4 mm²
Short-time current	0.48 kA
Result of thermal test	Test passed
Proof of thermal characteristics (needle flame) effective duration	30 s
Result of aging test	Test passed
Oscillation, broadband noise test result	Test passed
Test specification, oscillation, broadband noise	DIN EN 50155 (VDE 0115-200):2018-05
Test spectrum	Service life test category 2, bogie-mounted
Test frequency	f_1 = 5 Hz to f_2 = 250 Hz
ASD level	6.12 (m/s²)²/Hz
Acceleration	3.12g
Test duration per axis	5 h
Test directions	X-, Y- and Z-axis
Shock test result	Test passed
Test specification, shock test	DIN EN 50155 (VDE 0115-200):2018-05
Shock form	Half-sine
Acceleration	5g
Shock duration	30 ms
Number of shocks per direction	3
Test directions	X-, Y- and Z-axis (pos. and neg.)
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	125 °C
Static insulating material application in cold	-60 °C
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Calorimetric heat release NFPA 130 (ASTM E 1354)	27,5 MJ/kg
Smoke gas toxicity NFPA 130 (SMP 800C)	passed
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Dimensions

Width	5.2 mm
End cover width	2.2 mm
Length	72.2 mm

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Technical data

Dimensions

Height	35.3 mm
Height NS 35/7,5	36.8 mm
Height NS 35/15	44.3 mm

Connection data

Connection	1 level
Connection method	Push-in connection
Stripping length	8 mm ... 10 mm
Connection in acc. with standard	IEC 60947-7-1
Conductor cross section solid min.	0.14 mm²
Conductor cross section solid max.	4 mm²
Conductor cross section AWG min.	26
Conductor cross section AWG max.	12
Conductor cross section flexible min.	0.14 mm²
Conductor cross section flexible max.	4 mm²
Min. AWG conductor cross section, flexible	26
Max. AWG conductor cross section, flexible	14
Conductor cross section flexible, with ferrule without plastic sleeve min.	0.14 mm²
Conductor cross section flexible, with ferrule without plastic sleeve max.	2.5 mm²
Conductor cross section flexible, with ferrule with plastic sleeve min.	0.14 mm²
Conductor cross section flexible, with ferrule with plastic sleeve max.	2.5 mm²
Two conductors with the same cross section, flexible, with TWIN ferrules, with plastic sleeve, maximum	0.5 mm²
Connection cross sections directly pluggable	0.34 mm² 4 mm²
Conductor cross section solid min.	0.34 mm²
Conductor cross section solid max.	4 mm²
Conductor cross section flexible, with ferrule without plastic sleeve min.	0.34 mm²
Conductor cross section flexible, with ferrule without plastic sleeve max.	2.5 mm²
Conductor cross section flexible, with ferrule with plastic sleeve min.	0.34 mm²
Conductor cross section flexible, with ferrule with plastic sleeve max.	2.5 mm²
Internal cylindrical gage	A3

Ambient conditions

Operating temperature	-60 °C ... 105 °C (max. short-term operating temperature 130°C)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Permissible humidity (storage/transport)	30 % ... 70 %
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Technical data

Standards and Regulations

Connection in acc. with standard	CSA
	IEC 60947-7-1
Flammability rating according to UL 94	V0

Environmental Product Compliance

China RoHS	Environmentally friendly use period: unlimited = EFUP-e
	No hazardous substances above threshold values

Drawings

Circuit diagram

Classifications

eCl@ss

eCl@ss 10.0.1	27141120
eCl@ss 11.0	27141120
eCl@ss 4.0	27141100
eCl@ss 4.1	27141100
eCl@ss 5.0	27141100
eCl@ss 5.1	27141100
eCl@ss 6.0	27141100
eCl@ss 7.0	27141120
eCl@ss 9.0	27141120

ETIM

ETIM 2.0	EC000897
ETIM 3.0	EC000897
ETIM 4.0	EC000897
ETIM 6.0	EC000897
ETIM 7.0	EC000897

UNSPSC

UNSPSC 6.01	30211811
UNSPSC 7.0901	39121410
UNSPSC 11	39121410
UNSPSC 12.01	39121410

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Classifications

UNSPSC

UNSPSC 13.2	39121410
UNSPSC 18.0	39121410
UNSPSC 19.0	39121410
UNSPSC 20.0	39121410
UNSPSC 21.0	39121410

Approvals

Approvals

Approvals

DNV GL / NK / CSA / BV / LR / NK / ABS / UL Recognized / cUL Recognized / IECEE CB Scheme / EAC / EAC / RS / LR / VDE Zeichengenehmigung / cULus Recognized

Ex Approvals

IECEx / UL Recognized / cUL Recognized / EAC Ex / NEPSI / ATEX / CCC / cULus Recognized

Approval details

DNV GL		https://approvalfinder.dnvgl.com/	TAE00003JE

NK	ClassNK	http://www.classnk.or.jp/hp/en/	14ME0912

CSA		http://www.csagroup.org/services-industries/product-listing/	13631

	B	C
Nominal voltage UN	600 V	600 V
Nominal current IN	20 A	20 A
mm²/AWG/kcmil	26-12	26-12

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Approvals

BV	http://www.veristar.com/portal/veristarinfo/generalinfo/approved/approvedProducts/equipmentAndMaterials	25278/B0 BV

LR	http://www.lr.org/en	12/20038 (E3)

NK	http://www.classnk.or.jp/hp/en/	14ME0913

ABS	http://www.eagle.org/eagleExternalPortalWEB/	16-HG1591536-PDA

UL Recognized — http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm — FILE E 60425

	B	C
Nominal voltage UN	600 V	600 V
Nominal current IN	20 A	20 A
mm²/AWG/kcmil	26-12	26-12

cUL Recognized — http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm — FILE E 60425

	B	C
Nominal voltage UN	600 V	600 V
Nominal current IN	20 A	20 A
mm²/AWG/kcmil	26-12	26-12

IECEE CB Scheme	http://www.iecee.org/	DE1-62953

EAC	RU C-DE.AI30.B.01102

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Approvals

EAC			RU C-DE.BL08.B.00644
RS		http://www.rs-head.spb.ru/en/index.php	17.00013.272
LR		http://www.lr.org/en	14/20056
VDE Zeichengenehmigung		http://www2.vde.com/de/Institut/Online-Service/VDE-gepruefteProdukte/Seiten/Online-Suche.aspx	40032222

Nominal voltage UN	800 V
Nominal current IN	24 A
mm²/AWG/kcmil	0.2-2.5

cULus Recognized	

Accessories

Accessories

Bridge

Wire bridge - FBSW 2-5/250MM - 3030172

Wire bridge, length: 250 mm, width: 5.1 mm, number of positions: 1, color: red/black

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Wire bridge - FBSW 2-5/60MM - 3030170

Wire bridge, length: 60 mm, width: 5.1 mm, number of positions: 1, color: red/black

Wire bridge - FBSW 2-5/110MM - 3030171

Wire bridge, length: 110 mm, width: 5.1 mm, number of positions: 1, color: red/black

Component plug terminal block

Component connector - P-CO 2-5 R47K - 3032447

Component connector, with 47 kOhm resistance for wire-break monitoring, pitch: 5.2 mm, length: 8.9 mm, width: 4.1 mm, height: 34.8 mm, number of positions: 2, color: black

Crimping tool

Crimping pliers - CRIMPFOX CENTRUS 6S - 1213144

Crimping pliers, for uninsulated and insulated ferrules, DIN 46228 Part 1 and 4, from 0.14 mm² … 6 mm², also for TWIN ferrules up to 2 x 4 mm², automatic cross section adjustment, lateral insertion, equipped with fall protection

Crimping pliers - CRIMPFOX CENTRUS 10S - 1213154

Crimping pliers, for uninsulated and insulated ferrules, DIN 46228 Part 1 and 4, from 0.14 mm² ... 10 mm², also for TWIN ferrules up to 2 x 4 mm², automatic cross section adjustment, lateral insertion, equipped with fall protection

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Crimping pliers - CRIMPFOX CENTRUS 6H - 1213146

Crimping pliers, for uninsulated and insulated ferrules, DIN 46228 Part 1 and 4, from 0.14 mm² … 6 mm², also for TWIN ferrules up to 2 x 4 mm², automatic cross section adjustment, lateral insertion, equipped with fall protection

Crimping pliers - CRIMPFOX CENTRUS 10H - 1213156

Crimping pliers, for uninsulated and insulated ferrules, DIN 46228 Part 1 and 4, from 0.14 mm² ... 10 mm², also for TWIN ferrules up to 2 x 4 mm², automatic cross section adjustment, lateral insertion, equipped with fall protection

Crimping pliers - CRIMPFOX 10S - 1212045

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.14 mm² ... 10 mm², unlockable pressure lock, lateral entry

Crimping pliers - CRIMPFOX 6H - 1212046

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.14 mm² ... 6 mm², unlockable pressure lock, lateral entry

Crimping pliers - CRIMPFOX 2,5-M - 1212719

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.25 mm² ... 2.5 mm², lateral entry, trapezoidal crimp

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Crimping pliers - CRIMPFOX 6-M - 1212720

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.25 mm² ... 6.0 mm², lateral entry, trapezoidal crimp

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Crimping pliers - CRIMPFOX 6 - 1212034

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.25 mm² ... 6.0 mm², lateral entry, trapezoidal crimp

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Crimping pliers - CRIMPFOX 6T - 1212037

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.25 mm² ... 6 mm², lateral entry, trapezoidal crimp

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Crimping pliers - CRIMPFOX 6T-F - 1212038

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.25 mm² ... 6 mm², front entry, trapezoidal crimp

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Crimping pliers - CRIMPFOX 6S-F - 1212043

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.5 mm² ... 6 mm², front entry, square crimp

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Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Crimping pliers - CRIMPFOX-M - 1212072

Basic pliers, for accommodating dies for a wide range of type of contacts

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Device circuit breakers

Electronic circuit breaker - PTCB E1 24DC/1-8A NO - 2908262

Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit. Simple potential distribution using components from the CLIPLINE complete terminal block system. With electronic locking of the set nominal currents. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/1-3A NO - 2909909

Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit. Simple potential distribution using components from the CLIPLINE complete terminal block system. With electronic locking of the set nominal currents. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/2A NO - 2909903

Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit. Simple potential distribution using components from the CLIPLINE complete terminal block system. With fixed nominal current. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/1-4A NO - 2908261

Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit. Simple potential distribution using components from the CLIPLINE complete terminal block system. With electronic locking of the set nominal currents. For installation on DIN rails.

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Electronic circuit breaker - PTCB E1 24DC/3A NO - 2909904

Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit. Simple potential distribution using components from the CLIPLINE complete terminal block system. With fixed nominal current. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/4A NO - 2909906

Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit. Simple potential distribution using components from the CLIPLINE complete terminal block system. With fixed nominal current. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/6A NO - 2909908

Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit. Simple potential distribution using components from the CLIPLINE complete terminal block system. With fixed nominal current. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/1A NO - 2909902

Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit. Simple potential distribution using components from the CLIPLINE complete terminal block system. With fixed nominal current. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/8A NO - 2909910

Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit. Simple potential distribution using components from the CLIPLINE complete terminal block system. With fixed nominal current. For installation on DIN rails.

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Electronic circuit breaker - PTCB E1 24DC/1-8A SI-R - 1135752

Single-channel, electronic fuse for the protection of 24 V loads. Simple potential distribution using terminal blocks from the CLIPLINE complete system. With status output, reset input, and electronic interlock. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/2A SI-R - 1135749

Single-channel, electronic fuse for the protection of 24 V loads. Simple potential distribution using terminal blocks from the CLIPLINE complete system. With status output, reset input, and electronic interlock. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/1-4A SI-R - 1135753

Single-channel, electronic fuse for the protection of 24 V loads. Simple potential distribution using terminal blocks from the CLIPLINE complete system. With status output, reset input, and electronic interlock. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/4A SI-R - 1135745

Single-channel, electronic fuse for the protection of 24 V loads. Simple potential distribution using terminal blocks from the CLIPLINE complete system. With status output, reset input, and electronic interlock. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/6A SI-R - 1135740

Single-channel, electronic fuse for the protection of 24 V loads. Simple potential distribution using terminal blocks from the CLIPLINE complete system. With status output, reset input, and electronic interlock. For installation on DIN rails.

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Electronic circuit breaker - PTCB E1 24DC/1A SI-R - 1135751

Single-channel, electronic fuse for the protection of 24 V loads. Simple potential distribution using terminal blocks from the CLIPLINE complete system. With status output, reset input, and electronic interlock. For installation on DIN rails.

Electronic circuit breaker - PTCB E1 24DC/8A SI-R - 1135734

Single-channel, electronic fuse for the protection of 24 V loads. Simple potential distribution using terminal blocks from the CLIPLINE complete system. With status output, reset input, and electronic interlock. For installation on DIN rails.

DIN rail

DIN rail perforated - NS 35/ 7,5 PERF 2000MM - 0801733

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 UNPERF 2000MM - 0801681

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail perforated - NS 35/ 7,5 WH PERF 2000MM - 1204119

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

DIN rail, unperforated - NS 35/ 7,5 WH UNPERF 2000MM - 1204122

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 AL UNPERF 2000MM - 0801704

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Aluminum, uncoated, length: 2000 mm, color: silver

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DIN rail perforated - NS 35/ 7,5 ZN PERF 2000MM - 1206421

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 ZN UNPERF 2000MM - 1206434

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 CU UNPERF 2000MM - 0801762

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Copper, uncoated, length: 2000 mm, color: copper-colored

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Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

End cap - NS 35/ 7,5 CAP - 1206560

DIN rail end piece, for DIN rail NS 35/7.5

DIN rail perforated - NS 35/15 PERF 2000MM - 1201730

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/15 UNPERF 2000MM - 1201714

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail perforated - NS 35/15 WH PERF 2000MM - 0806602

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/15 WH UNPERF 2000MM - 1204135

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

DIN rail, unperforated - NS 35/15 AL UNPERF 2000MM - 1201756

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Aluminum, uncoated, length: 2000 mm, color: silver

DIN rail perforated - NS 35/15 ZN PERF 2000MM - 1206599

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/15 ZN UNPERF 2000MM - 1206586

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/15 CU UNPERF 2000MM - 1201895

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Copper, uncoated, length: 2000 mm, color: copper-colored

End cap - NS 35/15 CAP - 1206573

DIN rail end piece, for DIN rail NS 35/15

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

DIN rail, unperforated - NS 35/15-2,3 UNPERF 2000MM - 1201798

DIN rail, unperforated, Standard profile 2.3 mm, width: 35 mm, height: 15 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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Documentation

Mounting material - PT-IL - 3208090

Operating decal for the push-in Technology

End block

End clamp - CLIPFIX 35 - 3022218

Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN rail, with marking option, width: 9.5 mm, color: gray

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End clamp - CLIPFIX 35-5 - 3022276

Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN rail, with marking option, with parking option for FBS...5, FBS...6, KSS 5, KSS 6, width: 5.15 mm, color: gray

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End clamp - E/NS 35 N - 0800886

End clamp, width: 9.5 mm, color: gray

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

End cover

End cover - D-ST 2,5-QUATTRO - 3030514

End cover, length: 72.2 mm, width: 2.2 mm, height: 29.1 mm, color: gray

End cover - D-ST 2,5-QUATTRO-0,8 OG - 3030513

End cover, length: 72 mm, width: 0.8 mm, height: 29 mm, color: orange

Cover segment - DS-ST 2,5 - 3036602

End cover segments, large segment: 32.25 x 13.83 x 0.9, small segment: 22.65 x 11.65 x 0.9, color: gray

Filler plug

Filler plugs - CEC 2,5 - 3062757

Cover for conductor shaft, 10-pos., for spring cage terminal blocks (ST) and terminal blocks with push-in technology (PT) with a width of 5.2 mm

Insulating sleeve

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Insulating sleeve - MPS-IH WH - 0201663

Insulating sleeve, color: white

Insulating sleeve - MPS-IH RD - 0201676

Insulating sleeve, color: red

Insulating sleeve - MPS-IH BU - 0201689

Insulating sleeve, color: blue

Insulating sleeve - MPS-IH YE - 0201692

Insulating sleeve, color: yellow

Insulating sleeve - MPS-IH GN - 0201702

Insulating sleeve, color: green

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Insulating sleeve - MPS-IH GY - 0201728

Insulating sleeve, color: gray

Insulating sleeve - MPS-IH BK - 0201731

Insulating sleeve, color: black

Insulating sleeve - ISH 2,5/0,2 - 3002843

Insulating sleeve, color: white

Insulating sleeve - ISH 2,5/0,5 - 3002856

Insulating sleeve, color: gray

Insulating sleeve - ISH 2,5/1,0 - 3002869

Insulating sleeve, color: black

Jumper

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Plug-in bridge - FBS 2-5 - 3030161

Plug-in bridge, pitch: 5.2 mm, length: 22.7 mm, width: 9 mm, number of positions: 2, color: red

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Plug-in bridge - FBS 3-5 - 3030174

Plug-in bridge, pitch: 5.2 mm, length: 22.7 mm, width: 14.2 mm, number of positions: 3, color: red

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Plug-in bridge - FBS 4-5 - 3030187

Plug-in bridge, pitch: 5.2 mm, length: 22.7 mm, width: 19.4 mm, number of positions: 4, color: red

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Plug-in bridge - FBS 5-5 - 3030190

Plug-in bridge, pitch: 5.2 mm, length: 23 mm, width: 24.6 mm, number of positions: 5, color: red

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Plug-in bridge - FBS 10-5 - 3030213

Plug-in bridge, pitch: 5.2 mm, length: 22.7 mm, width: 50.6 mm, number of positions: 10, color: red

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Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Plug-in bridge - FBS 20-5 - 3030226

Plug-in bridge, pitch: 5.2 mm, number of positions: 20, color: red

Plug-in bridge - FBS 50-5 - 3038930

Plug-in bridge, pitch: 5.2 mm, number of positions: 50, color: red

Plug-in bridge - FBSR 2-5 - 3033702

Plug-in bridge, pitch: 5.2 mm, number of positions: 2, color: red

Plug-in bridge - FBSR 3-5 - 3001591

Plug-in bridge, pitch: 5.2 mm, number of positions: 3, color: red

Plug-in bridge - FBSR 4-5 - 3001592

Plug-in bridge, pitch: 5.2 mm, number of positions: 4, color: red

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Plug-in bridge - FBSR 5-5 - 3001593

Plug-in bridge, pitch: 5.2 mm, number of positions: 5, color: red

Plug-in bridge - FBSR 10-5 - 3033710

Plug-in bridge, pitch: 5.2 mm, number of positions: 10, color: red

Plug-in bridge - FBS 2-5 BU - 3036877

Plug-in bridge, pitch: 5.2 mm, number of positions: 2, color: blue

Plug-in bridge - FBS 3-5 BU - 3036880

Plug-in bridge, pitch: 5.2 mm, number of positions: 3, color: blue

Plug-in bridge - FBS 4-5 BU - 3036893

Plug-in bridge, pitch: 5.2 mm, number of positions: 4, color: blue

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Plug-in bridge - FBS 5-5 BU - 3036903

Plug-in bridge, pitch: 5.2 mm, number of positions: 5, color: blue

Plug-in bridge - FBS 10-5 BU - 3036916

Plug-in bridge, pitch: 5.2 mm, number of positions: 10, color: blue

Plug-in bridge - FBS 20-5 BU - 3036929

Plug-in bridge, pitch: 5.2 mm, number of positions: 20, color: blue

Plug-in bridge - FBS 50-5 BU - 3032114

Plug-in bridge, pitch: 5.2 mm, number of positions: 50, color: blue

Labeled terminal marker

Zack marker strip - ZB 5 CUS - 0824962

Zack marker strip, can be ordered: Strip, white, labeled according to customer specifications, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 5.15 x 10.5 mm, Number of individual labels: 10

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Zack marker strip - ZB 5,LGS:FORTL.ZAHLEN - 1050017

Zack marker strip, Strip, white, labeled, printed horizontally: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 491 ... 500, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 5.15 x 10.5 mm, Number of individual labels: 10

Zack marker strip - ZB 5,QR:FORTL.ZAHLEN - 1050020

Zack marker strip, white, Printed vertically: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 491 ... 500, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 5.15 x 10.5 mm

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Zack marker strip - ZB 5,LGS:GLEICHE ZAHLEN - 1050033

Zack marker strip, Strip, white, labeled, can be labeled with: CMS-P1-PLOTTER, printed horizontally: Identical numbers 1 or 2, etc. up to 100, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 5.15 x 10.5 mm, Number of individual labels: 10

Zack marker strip - ZB 5,LGS:L1-N,PE - 1050415

Zack marker strip, Strip, white, labeled, horizontal: L1, L2, L3, N, PE, L1, L2, L3, N, PE, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 5.15 x 10.5 mm, Number of individual labels: 10

Marker for terminal blocks - UC-TM 5 CUS - 0824581

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 10.5 x 4.6 mm, Number of individual labels: 96

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Marker for terminal blocks - UCT-TM 5 CUS - 0829595

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 4.6 x 10.5 mm, Number of individual labels: 72

Zack Marker strip, flat - ZBF 5 CUS - 0825025

Zack Marker strip, flat, can be ordered: Strip, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Zack Marker strip, flat - ZBF 5,LGS:FORTL.ZAHLEN - 0808671

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 491 ... 500, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Zack Marker strip, flat - ZBF 5,QR:FORTL.ZAHLEN - 0808697

Zack Marker strip, flat, Strip, white, labeled, Printed vertically: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 91 ... 100, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Zack Marker strip, flat - ZBF 5,LGS:GERADE ZAHLEN - 0810821

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: consecutive numbers 2 ... 20, 22 ... 40, etc. up to 82 ... 100, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Zack Marker strip, flat - ZBF 5,LGS:UNGERADE ZAHLEN - 0810863

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: Odd numbers 1 - 19, 21 - 39, etc. up to 81 - 99, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Marker for terminal blocks - UC-TMF 5 CUS - 0824638

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 5.2 mm, lettering field size: 4.6 x 5.1 mm, Number of individual labels: 96

Marker for terminal blocks - UCT-TMF 5 CUS - 0829658

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 5.2 mm, lettering field size: 4.4 x 4.7 mm, Number of individual labels: 72

Marker carriers

Marker carriers - STP 5-2-ZB - 3037643

Double marker carrier, snaps onto the spring-cage terminal blocks ST 2.5..., labeled with ZB 5 or ZBF 5

Group marker label for terminal marking - GBS-ZB/26X6 - 0809298

Group marking label, snaps onto terminal center for screw, spring-cage and quick connection terminal blocks, labeled with ESL 26x6 mm or EST 25x6 mm, in the foot part with Zack marker strip, length: 29 mm

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Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Partition plate

Partition plate - ATP-ST QUATTRO - 3030815

Partition plate, length: 90.9 mm, width: 2 mm, height: 45 mm, color: gray

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Spacer plate - DP PS-5 - 3036725

Spacer plate, length: 22.4 mm, width: 5.2 mm, height: 29 mm, number of positions: 1, color: red

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Planning and marking software

Software - PROJECT COMPLETE - 1050453

Intuitive planning and marking software for configuring terminal strips and for professional marking of marking materials for terminal blocks, conductors, cables, devices, and systems. The software is available for download

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Reducing bridge

Reducing bridge - RB ST (2,5/4)-1,5 - 3038943

Reducing bridge, pitch: 7.1 mm, length: 22.7 mm, width: 10.4 mm, number of positions: 2, color: red

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Screwdriver tools

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Screwdriver - SZF 1-0,6X3,5 - 1204517

Actuation tool, for ST terminal blocks, also suitable for use as a bladed screwdriver, size: 0.6 x 3.5 x 100 mm, 2-component grip, with non-slip grip

Actuation tool - ST-BW - 1207608

Actuation tool, for all 2.5 mm² - 4.0 mm² spring-cages

Terminal marking

Group marker label for terminal marking - GBS 5-25X12 - 0810588

Group marker label, snaps onto terminal center for screw, spring-cage and quick connection terminal blocks, labeled with a 25 x 12 mm label or manually with the B-STIFT, in the foot part with ZB 5

Zack marker strip - ZB 5 :UNBEDRUCKT - 1050004

Zack marker strip, Strip, white, unlabeled, can be labeled with: PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 5.1 x 10.5 mm, Number of individual labels: 10

Marker for terminal blocks - UC-TM 5 - 0818108

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 10.5 x 4.6 mm, Number of individual labels: 96

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Marker for terminal blocks - UCT-TM 5 - 0828734

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: TOPMARK NEO, TOPMARK LASER, BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, THERMOMARK PRIME, THERMOMARK CARD 2.0, THERMOMARK CARD, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm, lettering field size: 4.6 x 10.5 mm, Number of individual labels: 72

Zack Marker strip, flat - ZBF 5:UNBEDRUCKT - 0808642

Zack Marker strip, flat, Strip, white, unlabeled, can be labeled with: PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.1 x 5.2 mm, Number of individual labels: 10

Marker for terminal blocks - UC-TMF 5 - 0818153

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into flat marker groove, for terminal block width: 5.2 mm, lettering field size: 4.6 x 5.1 mm, Number of individual labels: 96

Marker for terminal blocks - UCT-TMF 5 - 0828744

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: TOPMARK NEO, TOPMARK LASER, BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, THERMOMARK PRIME, THERMOMARK CARD 2.0, THERMOMARK CARD, mounting type: snap into flat marker groove, for terminal block width: 5.2 mm, lettering field size: 4.4 x 4.7 mm, Number of individual labels: 72

Test plug terminal block

Test plugs - MPS-MT - 0201744

Test plugs, with solder connection up to 1 mm² conductor cross section, color: gray

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Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Test plugs - PS-5 - 3030983

Test plugs, Modular test plug, color: red

Test plugs - PS-5/2,3MM RD - 3038723

Test plugs, color: red

Test socket

Test adapter - PAI-4-FIX-5/6 BU - 3035975

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

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Test adapter - PAI-4-FIX-5/6 OG - 3035974

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

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Test adapter - PAI-4-FIX-5/6 YE - 3035977

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

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Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Test adapter - PAI-4-FIX-5/6 RD - 3035976

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 GN - 3035978

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 BK - 3035980

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 GY - 3035982

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 VT - 3035979

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Feed-through terminal block - PT 2,5-QUATTRO - 3209578

Accessories

Test adapter - PAI-4-FIX-5/6 BN - 3035981

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 WH - 3035983

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Warning label printed

Warning label - WS PT 2,5 - 1029026

Warning label, yellow/black, labeled: Lightning flash, mounting type: plug in, for terminal block width: 5.2 mm

Warning label - WS-DIO PT 2,5 - 1029037

Warning label, yellow/black, labeled: Diode, mounting type: plug in, for terminal block width: 5.2 mm

Ground modular terminal block - PT 2,5-QUATTRO-PE

3209594

https://www.phoenixcontact.com/us/products/3209594

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Ground modular terminal block, number of connections: 4, connection method: Push-in connection, Rated cross section: 2.5 mm^2, cross section: 0.14 mm^2 - 4 mm^2, mounting type: NS 35/7,5, NS 35/15, color: green-yellow

Your advantages

- In addition to the testing facility in the double function shaft, all terminal blocks provide an additional test connection
- The compact design and front connection enable wiring in a confined space
- The Push-in connection terminal blocks are characterized by the system features of the CLIPLINE complete system and by easy and tool-free wiring of conductors with ferrules or solid conductors
- Tested for railway applications

Commercial Data

Item number	3209594
Packing unit	1 pc
Minimum order quantity	50 pc
Sales Key	B02
Product Key	BE2223
Catalog Page	Page 71 (C-1-2019)
GTIN	4046356329842
Weight per Piece (including packing)	13.456 g
Weight per Piece (excluding packing)	12.775 g
Customs tariff number	85369010
Country of origin	DE

Technical Data

Product properties

Product type	Ground terminal block
Area of application	Railway industry
	Machine building
	Plant engineering
	Process industry
Number of connections	4
Number of rows	1

Insulation characteristics

Overvoltage category	III
Degree of pollution	3

Electrical properties

Rated surge voltage	8 kV
Maximum power dissipation for nominal condition	0.77 W

Connection data

Grounding foot	Yes
Number of connections per level	4
Nominal cross section	2.5 mm²
Note	Please observe the current carrying capacity of the DIN rails.
Stripping length	8 mm ... 10 mm
Internal cylindrical gage	A3
Connection in acc. with standard	IEC 60947-7-2
Conductor cross section solid	0.14 mm² ... 4 mm²
Cross section AWG	26 ... 12 (converted acc. to IEC)
Conductor cross section flexible	0.14 mm² ... 4 mm²
Conductor cross section, flexible [AWG]	26 ... 12 (converted acc. to IEC)
Flexible conductor cross section flexible (ferrule, w/o plastic sleeve)	0.14 mm² ... 2.5 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	0.14 mm² ... 2.5 mm²
Maximum load current	with 4 mm² conductor cross section, rigid
Nominal cross section	2.5 mm²
Cross section AWG	26 ... 12 (converted acc. to IEC)

Connection cross sections directly pluggable

Conductor cross section solid	0.34 mm² ... 4 mm²
Flexible conductor cross section flexible (ferrule, w/o plastic sleeve)	0.5 mm² ... 2.5 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	0.34 mm² ... 2.5 mm²

Ex data

Rated data (ATEX/IECEx)

ATEX certificate	PTB 09 ATEX 1111 U
IEC Ex certificate	IECEx PTB 10.0021 U
Identification	☐ II 2 G Ex eb IIC Gb
Operating temperature range	-60 °C ... 110 °C
Ex-certified accessories	3030514 D-ST 2,5-QUATTRO
	1204517 SZF 1-0,6X3,5
	3022276 CLIPFIX 35-5
	3022218 CLIPFIX 35
output	(Permanent)

Ex connection data General

Nominal cross section	2.5 mm²
Rated cross section AWG	14
Connection capacity rigid	0.14 mm² ... 4 mm²
Connection capacity AWG	26 ... 12
Connection capacity flexible	0.14 mm² ... 2.5 mm²
Connection capacity AWG	26 ... 14

Dimensions

Width	5.2 mm
End cover width	2.2 mm
Height	35.3 mm
Height NS 35/15	44.3 mm
Height NS 35/7,5	36.8 mm
Height	1.437 "
Length	72.2 mm

Material specifications

Color	green-yellow
Flammability rating according to UL 94	V0
Insulating material group	I
Insulating material	PA
Static insulating material application in cold	-60 °C
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed

Mechanical properties

Mechanical data

Open side panel	Yes

Environmental and real-life conditions

Oscillation/broadband noise

Specification	DIN EN 50155 (VDE 0115-200):2008-03
Spectrum	Service life test category 2, bogie-mounted
Frequency	f_1 = 5 Hz to f_2 = 250 Hz
ASD level	6.12 (m/s²)²/Hz
Acceleration	3.12g
Test duration per axis	5 h
Test directions	X-, Y- and Z-axis
Result	Test passed

Shocks

Specification	DIN EN 50155 (VDE 0115-200):2008-03
Pulse shape	Half-sine
Acceleration	30g
Shock duration	18 ms
Number of shocks per direction	3
Test directions	X-, Y- and Z-axis (pos. and neg.)
Result	Test passed

Ambient conditions

Ambient temperature (operation)	-60 °C ... 105 °C (max. short-term operating temperature RTI Elec.)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C
Permissible humidity (storage/transport)	30 % ... 70 %

Standards and regulations

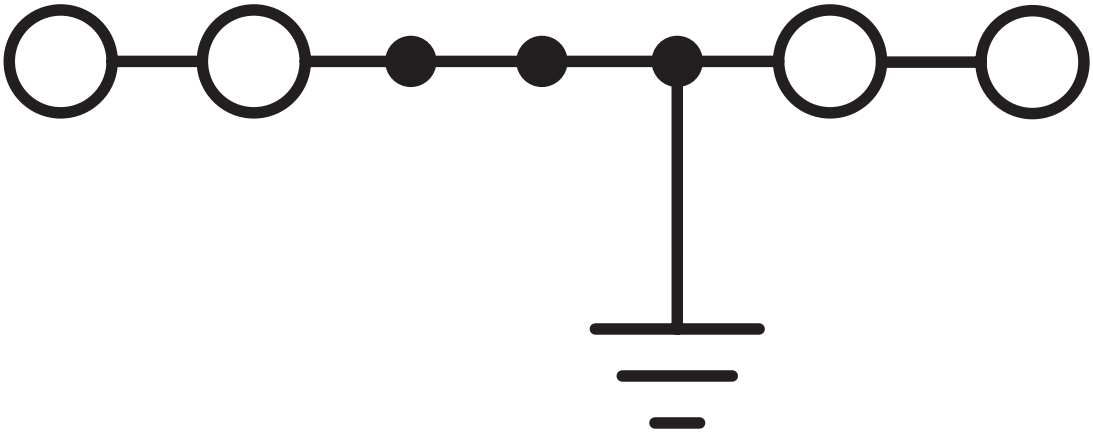
Connection in acc. with standard	IEC 60947-7-2

Mounting

Mounting type	NS 35/7,5
	NS 35/15

Drawings

Circuit diagram



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Middletown, PA 17057, United States
(+717) 944-1300
info@phoenixcon.com

Installation ground terminal block - PTB 2,5-PE/L/TG

3210539

https://www.phoenixcontact.com/us/products/3210539

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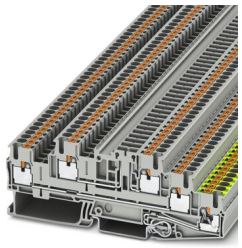


Installation ground terminal block, Current and voltage are determined by the plug used., nom. voltage: 400 V, nominal current: 22 A, Push-in connection, Rated cross section: 2.5 mm^2, cross section: 0.14 mm^2 - 4 mm^2, Push-in connection, Rated cross section: 2.5 mm^2, cross section: 0.14 mm^2 - 4 mm^2, mounting type: NS 35/7,5, NS 35/15, color: gray

Your advantages

- Double function shafts on all levels

Commercial Data

Item number	3210539
Packing unit	1 pc
Minimum order quantity	50 pc
Sales Key	B02
Product Key	BE2232
Catalog Page	Page 95 (C-1-2019)
GTIN	4046356693769
Weight per Piece (including packing)	21.396 g
Weight per Piece (excluding packing)	21.396 g
Customs tariff number	85369010
Country of origin	PL

Technical Data

Notes

General	Current and voltage are determined by the plug used.

Product properties

Product type	Ground terminal block
Number of connections	5
Number of rows	3
Potentials	2

Insulation characteristics

Overvoltage category	III
Degree of pollution	3

Electrical properties

Rated surge voltage	4 kV
Maximum power dissipation for nominal condition	0.77 W

Connection data

Grounding foot	Yes
Number of connections per level	2
Nominal cross section	2.5 mm²

Level 1+2

Note	Please observe the current carrying capacity of the DIN rails.
Stripping length	8 mm ... 10 mm
Internal cylindrical gage	A3
Conductor cross section solid	0.14 mm² ... 4 mm²
Cross section AWG	26 ... 12 (converted acc. to IEC)
Conductor cross section flexible	0.14 mm² ... 4 mm²
Conductor cross section, flexible [AWG]	26 ... 12 (converted acc. to IEC)
Flexible conductor cross section flexible (ferrule, w/o plastic sleeve)	0.14 mm² ... 2.5 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	0.14 mm² ... 2.5 mm²
2 conductors with the same cross section, flexible, with TWIN ferrule with plastic sleeve	0.5 mm²
Nominal current	22 A (with a 2.5 mm² conductor cross section)
Maximum load current	24 A (with 4 mm² conductor cross section)
	28 A (with 4 mm² conductor cross section and 3-pos. terminal block)
Nominal voltage	400 V (phase conductor/phase conductor)
	250 V (phase conductor/PE)
Nominal cross section	2.5 mm²

Level 3

Stripping length	8 mm ... 10 mm
Conductor cross section solid	0.14 mm² ... 4 mm²
Cross section AWG	26 ... 12 (converted acc. to IEC)
Conductor cross section flexible	0.14 mm² ... 4 mm²
Conductor cross section, flexible [AWG]	26 ... 12 (converted acc. to IEC)
Flexible conductor cross section flexible (ferrule, w/o plastic sleeve)	0.14 mm² ... 2.5 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	0.14 mm² ... 2.5 mm²
2 conductors with the same cross section, flexible, with TWIN ferrule with plastic sleeve	0.5 mm²
Nominal current	16 A (with a 2.5 mm² conductor cross section)
Maximum load current	16 A (with 4 mm² conductor cross section)
	16 A (with 1.5 mm² conductor cross section and 3-pos. terminal block base)
Nominal voltage	250 V
Nominal cross section	2.5 mm²

Level 1+2 Connection cross sections directly pluggable

Conductor cross section solid	0.34 mm² ... 4 mm²
Flexible conductor cross section flexible (ferrule, w/o plastic sleeve)	0.34 mm² ... 2.5 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	0.34 mm² ... 2.5 mm²

Level 3 Connection cross sections directly pluggable

Conductor cross section solid	0.34 mm² ... 4 mm²
Flexible conductor cross section flexible (ferrule, w/o plastic sleeve)	0.34 mm² ... 2.5 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	0.34 mm² ... 2.5 mm²

Dimensions

Width	5.2 mm
End cover width	2.2 mm
Height NS 35/15	49.8 mm
Height NS 35/7,5	42.3 mm
Length	118 mm

Material specifications

Color	gray
Flammability rating according to UL 94	V0
Insulating material group	I
Insulating material	PA
Static insulating material application in cold	-60 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	130 °C
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3

Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3
Calorimetric heat release NFPA 130 (ASTM E 1354)	28 MJ/kg
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed

Electrical tests

Surge voltage test

Test voltage setpoint	7.3 kV
Result	Test passed

Temperature-rise test

Requirement temperature-rise test	Increase in temperature ≤ 45 K
Result	Test passed
Short-time withstand current 2.5 mm²	0.3 kA
	0.18 kA
Result	Test passed

Power-frequency withstand voltage

Test voltage setpoint	1.89 kV
Result	Test passed

Mechanical properties

Mechanical data

Open side panel	Yes

Mechanical tests

Mechanical strength

Result	Test passed

Attachment on the carrier

DIN rail/fixing support	NS 35
Test force setpoint	1 N
Result	Test passed

Test for conductor damage and slackening

Rotation speed	10 rpm
Revolutions	135
Conductor cross section/weight	0.14 mm² / 0.2 kg
	2.5 mm² / 0.7 kg
	4 mm² / 0.9 kg
Result	Test passed

Environmental and real-life conditions

Aging

Temperature cycles	192
Result	Test passed

Needle-flame test

Time of exposure	30 s
Result	Test passed

Oscillation/broadband noise

Specification	DIN EN 50155 (VDE 0115-200):2008-03
Spectrum	Service life test category 2, bogie-mounted
Frequency	f_1 = 5 Hz to f_2 = 250 Hz
ASD level	6.12 (m/s²)²/Hz
Acceleration	3.12g
Test duration per axis	5 h
Test directions	X-, Y- and Z-axis
Result	Test passed

Shocks

Specification	DIN EN 50155 (VDE 0115-200):2008-03
Pulse shape	Half-sine
Acceleration	30g
Shock duration	18 ms
Number of shocks per direction	3
Test directions	X-, Y- and Z-axis (pos. and neg.)
Result	Test passed

Ambient conditions

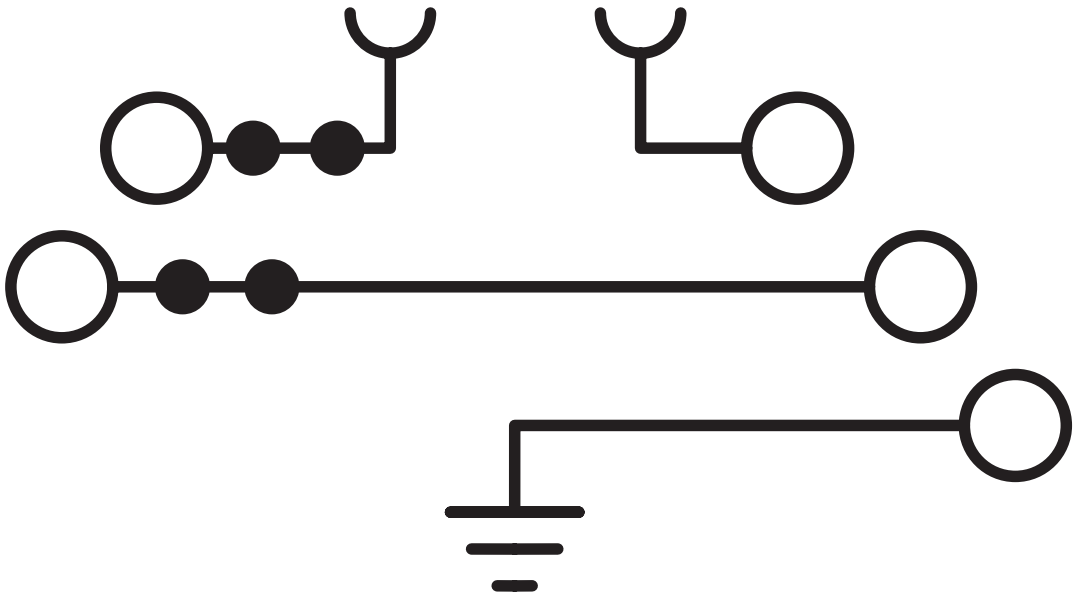
Ambient temperature (operation)	-60 °C ... 105 °C (max. short-term operating temperature RTI Elec.)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Ambient temperature (assembly)	-5 °C ... 70 °C
Permissible humidity (storage/transport)	30 % ... 70 %

Mounting

Mounting type	NS 35/7,5
	NS 35/15

Drawings

Circuit diagram



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Double-level terminal block - PTTB 2,5 - 3210567

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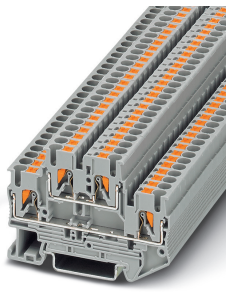


Double-level terminal block, connection method: Push-in connection, cross section: 0.14 mm² - 4 mm², AWG: 26 - 12, width: 5.2 mm, color: gray, mounting type: NS 35/7,5, NS 35/15

Your advantages

- The Push-in connection terminal blocks are characterized by the system features of the CLIPLINE complete system and by easy and tool-free wiring of conductors with ferrules or solid conductors
- The compact design and front connection enable wiring in a confined space
- In addition to the testing facility in the double function shaft, all terminal blocks provide an additional test connection
- Tested for railway applications

Key Commercial Data

Packing unit	1 pc
GTIN	4 046356 418980
GTIN	4046356418980
Weight per Piece (excluding packing)	11.200 g
Custom tariff number	85369010
Country of origin	China

Technical data

General

Number of rows	2
Number of connections	4
Nominal cross section	2.5 mm²
Color	gray
Insulating material	PA

Double-level terminal block - PTTB 2,5 - 3210567

Technical data

General

Flammability rating according to UL 94	V0
Area of application	Railway industry
Rated surge voltage	6 kV
Degree of pollution	3
Overvoltage category	III
Insulating material group	I
Connection in acc. with standard	IEC 60947-7-1
Nominal current I_N	22 A (with 2.5 mm² conductor connection cross section)
Maximum load current	26 A (with 4 mm² conductor cross section, rigid)
Nominal voltage U_N	500 V
Open side panel	Yes
Shock protection test specification	DIN EN 50274 (VDE 0660-514):2002-11
Back of the hand protection	guaranteed
Finger protection	guaranteed
Result of surge voltage test	Test passed
Surge voltage test setpoint	7.3 kV
Result of power-frequency withstand voltage test	Test passed
Power frequency withstand voltage setpoint	1.89 kV
Checking the mechanical stability of terminal points (5 x conductor connection)	Test passed
Result of flexion and pull-out test	Test passed
Bending test rotation speed	10 rpm
Bending test turns	135
Bending test conductor cross section/weight	0.14 mm² / 0.2 kg
	2.5 mm² / 0.7 kg
	4 mm² / 0.9 kg
Tensile test result	Test passed
Result of tight fit on support	Test passed
Tight fit on carrier	NS 35
Setpoint	1 N
Result of voltage-drop test	Test passed
Result of temperature-rise test	Test passed
Short circuit stability result	Test passed
Conductor cross section short circuit testing	2.5 mm²
Short-time current	0.3 kA
Conductor cross section short circuit testing	4 mm²
Short-time current	0.48 kA

Double-level terminal block - PTTB 2,5 - 3210567

Technical data

General

Result of aging test	Test passed
Ageing test for screwless modular terminal block temperature cycles	192
Result of thermal test	Test passed
Proof of thermal characteristics (needle flame) effective duration	30 s
Oscillation, broadband noise test result	Test passed
Test specification, oscillation, broadband noise	DIN EN 50155 (VDE 0115-200):2008-03
Test spectrum	Service life test category 2, bogie-mounted
Test frequency	f_1 = 5 Hz to f_2 = 250 Hz
ASD level	6.12 $(m/s^2)^2/Hz$
Acceleration	3.12g
Test duration per axis	5 h
Test directions	X-, Y- and Z-axis
Shock test result	Test passed
Test specification, shock test	DIN EN 50155 (VDE 0115-200):2008-03
Shock form	Half-sine
Acceleration	30g
Shock duration	18 ms
Number of shocks per direction	3
Test directions	X-, Y- and Z-axis (pos. and neg.)
Relative insulation material temperature index (Elec.; UL 746 B)	130 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	130 °C
Static insulating material application in cold	-60 °C
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed
Calorimetric heat release NFPA 130 (ASTM E 1354)	28 MJ/kg
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Dimensions

Width	5.2 mm
End cover width	2.2 mm
Length	68 mm
Height	45.8 mm
Height NS 35/7,5	47.5 mm
Height NS 35/15	55 mm

Double-level terminal block - PTTB 2,5 - 3210567

Technical data

Connection data

Connection method	Push-in connection
Conductor cross section solid min.	0.14 mm²
Conductor cross section solid max.	4 mm²
Conductor cross section flexible min.	0.14 mm²
Conductor cross section flexible max.	4 mm²
Conductor cross section AWG min.	26
Conductor cross section AWG max.	12
Conductor cross section flexible, with ferrule without plastic sleeve min.	0.14 mm²
Conductor cross section flexible, with ferrule without plastic sleeve max.	2.5 mm²
Conductor cross section flexible, with ferrule with plastic sleeve min.	0.14 mm²
Conductor cross section flexible, with ferrule with plastic sleeve max.	2.5 mm²
Two conductors with the same cross section, flexible, with TWIN ferrules, with plastic sleeve, maximum	0.5 mm²
Stripping length	8 mm ... 10 mm
Internal cylindrical gage	A4

Standards and Regulations

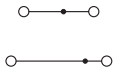
Connection in acc. with standard	CSA
	IEC 60947-7-1
Flammability rating according to UL 94	V0

Environmental Product Compliance

China RoHS	Environmentally friendly use period: unlimited = EFUP-e
	No hazardous substances above threshold values

Drawings

Circuit diagram



Classifications

eCl@ss

eCl@ss 10.0.1	27141120
eCl@ss 11.0	27141120
eCl@ss 4.0	27141100
eCl@ss 4.1	27141100
eCl@ss 5.0	27141100

Double-level terminal block - PTTB 2,5 - 3210567

Classifications

eCl@ss

eCl@ss 5.1	27141100
eCl@ss 6.0	27141100
eCl@ss 7.0	27141120
eCl@ss 9.0	27141120

ETIM

ETIM 2.0	EC000897
ETIM 3.0	EC000897
ETIM 4.0	EC000897
ETIM 6.0	EC000897
ETIM 7.0	EC000897

UNSPSC

UNSPSC 6.01	30211811
UNSPSC 7.0901	39121410
UNSPSC 11	39121410
UNSPSC 12.01	39121410
UNSPSC 13.2	39121410
UNSPSC 18.0	39121410
UNSPSC 19.0	39121410
UNSPSC 20.0	39121410
UNSPSC 21.0	39121410

Approvals

Approvals

Approvals

DNV GL / NK / CSA / BV / LR / NK / ABS / UL Recognized / cUL Recognized / IECEE CB Scheme / EAC / RS / EAC / LR / VDE Zeichengenehmigung / cULus Recognized

Ex Approvals

IECEx / EAC Ex / NEPSI / ATEX / CCC

Approval details

Double-level terminal block - PTTB 2,5 - 3210567

Approvals

DNV GL	https://approvalfinder.dnvgl.com/	TAE00003JE

NK	http://www.classnk.or.jp/hp/en/	14ME0912

CSA	http://www.csagroup.org/services-industries/product-listing/	13631

	B	C	D
Nominal voltage UN	300 V	300 V	600 V
Nominal current IN	20 A	20 A	5 A
mm²/AWG/kcmil	26-12	26-12	26-12

BV	http://www.veristar.com/portal/veristarinfo/generalinfo/approved/approvedProducts/equipmentAndMaterials	25278/B0 BV

LR	http://www.lr.org/en	12/20038 (E3)

NK	http://www.classnk.or.jp/hp/en/	14ME0913

ABS	http://www.eagle.org/eagleExternalPortalWEB/	16-HG1591536-PDA

UL Recognized	http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 60425

	B	C	D
Nominal voltage UN	300 V	300 V	600 V
Nominal current IN	20 A	20 A	5 A
mm²/AWG/kcmil	26-12	26-12	26-12

Double-level terminal block - PTTB 2,5 - 3210567

Approvals

cUL Recognized		http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm	FILE E 60425

	B	C	D
Nominal voltage UN	300 V	300 V	600 V
Nominal current IN	20 A	20 A	5 A
mm²/AWG/kcmil	26-12	26-12	26-12

IECEE CB Scheme		http://www.iecee.org/	DE1-62953
EAC			RU C-DE.AI30.B.01102
RS		http://www.rs-head.spb.ru/en/index.php	17.00013.272
EAC			RU C-DE.BL08.B.00644
LR		http://www.lr.org/en	14/20056
VDE Zeichengenehmigung		http://www2.vde.com/de/Institut/Online-Service/VDE-gepruefteProdukte/Seiten/Online-Suche.aspx	40032222

Nominal voltage UN	500 V
Nominal current IN	22 A
mm²/AWG/kcmil	0.2-2.5

Double-level terminal block - PTTB 2,5 - 3210567

Approvals

cULus Recognized

Accessories

Accessories

Bridge

Wire bridge - FBSW 2-5/250MM - 3030172

Wire bridge, length: 250 mm, width: 5.1 mm, number of positions: 1, color: red/black

Wire bridge - FBSW 2-5/60MM - 3030170

Wire bridge, length: 60 mm, width: 5.1 mm, number of positions: 1, color: red/black

Wire bridge - FBSW 2-5/110MM - 3030171

Wire bridge, length: 110 mm, width: 5.1 mm, number of positions: 1, color: red/black

Wire bridge - FBSW 2-5/250MM - 3030172

Wire bridge, length: 250 mm, width: 5.1 mm, number of positions: 1, color: red/black

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Wire bridge - FBSW 2-5/60MM - 3030170

Wire bridge, length: 60 mm, width: 5.1 mm, number of positions: 1, color: red/black

Wire bridge - FBSW 2-5/110MM - 3030171

Wire bridge, length: 110 mm, width: 5.1 mm, number of positions: 1, color: red/black

Component plug terminal block

Component connector - P-CO 2-5 R47K - 3032447

Component connector, with 47 kOhm resistance for wire-break monitoring, pitch: 5.2 mm, length: 8.9 mm, width: 4.1 mm, height: 34.8 mm, number of positions: 2, color: black

Crimping tool

Crimping pliers - CRIMPFOX CENTRUS 6S - 1213144

Crimping pliers, for uninsulated and insulated ferrules, DIN 46228 Part 1 and 4, from 0.14 mm² … 6 mm², also for TWIN ferrules up to 2 x 4 mm², automatic cross section adjustment, lateral insertion, equipped with fall protection

Crimping pliers - CRIMPFOX CENTRUS 10S - 1213154

Crimping pliers, for uninsulated and insulated ferrules, DIN 46228 Part 1 and 4, from 0.14 mm² ... 10 mm², also for TWIN ferrules up to 2 x 4 mm², automatic cross section adjustment, lateral insertion, equipped with fall protection

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Crimping pliers - CRIMPFOX CENTRUS 6H - 1213146

Crimping pliers, for uninsulated and insulated ferrules, DIN 46228 Part 1 and 4, from 0.14 mm² … 6 mm², also for TWIN ferrules up to 2 x 4 mm², automatic cross section adjustment, lateral insertion, equipped with fall protection

Crimping pliers - CRIMPFOX CENTRUS 10H - 1213156

Crimping pliers, for uninsulated and insulated ferrules, DIN 46228 Part 1 and 4, from 0.14 mm² ... 10 mm², also for TWIN ferrules up to 2 x 4 mm², automatic cross section adjustment, lateral insertion, equipped with fall protection

Crimping pliers - CRIMPFOX 10S - 1212045

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.14 mm² ... 10 mm², unlockable pressure lock, lateral entry

Crimping pliers - CRIMPFOX 6H - 1212046

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.14 mm² ... 6 mm², unlockable pressure lock, lateral entry

Crimping pliers - CRIMPFOX 2,5-M - 1212719

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.25 mm² ... 2.5 mm², lateral entry, trapezoidal crimp

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Crimping pliers - CRIMPFOX 6-M - 1212720

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.25 mm² ... 6.0 mm², lateral entry, trapezoidal crimp

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Crimping pliers - CRIMPFOX 6 - 1212034

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.25 mm² ... 6.0 mm², lateral entry, trapezoidal crimp

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Crimping pliers - CRIMPFOX 6T - 1212037

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.25 mm² ... 6 mm², lateral entry, trapezoidal crimp

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Crimping pliers - CRIMPFOX 6T-F - 1212038

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.25 mm² ... 6 mm², front entry, trapezoidal crimp

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Crimping pliers - CRIMPFOX 6S-F - 1212043

Crimping pliers, for ferrules without insulating collar according to DIN 46228 Part 1 and ferrules with insulating collar according to DIN 46228 Part 4, 0.5 mm² ... 6 mm², front entry, square crimp

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Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Crimping pliers - CRIMPFOX-M - 1212072

Basic pliers, for accommodating dies for a wide range of type of contacts

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DIN rail

DIN rail perforated - NS 35/ 7,5 PERF 2000MM - 0801733

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 UNPERF 2000MM - 0801681

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail perforated - NS 35/ 7,5 WH PERF 2000MM - 1204119

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/ 7,5 WH UNPERF 2000MM - 1204122

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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Double-level terminal block - PTTB 2,5 - 3210567

Accessories

DIN rail, unperforated - NS 35/ 7,5 AL UNPERF 2000MM - 0801704

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Aluminum, uncoated, length: 2000 mm, color: silver

DIN rail perforated - NS 35/ 7,5 ZN PERF 2000MM - 1206421

DIN rail perforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/ 7,5 ZN UNPERF 2000MM - 1206434

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/ 7,5 CU UNPERF 2000MM - 0801762

DIN rail, unperforated, Standard profile, width: 35 mm, height: 7.5 mm, acc. to EN 60715, material: Copper, uncoated, length: 2000 mm, color: copper-colored

End cap - NS 35/ 7,5 CAP - 1206560

DIN rail end piece, for DIN rail NS 35/7.5

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

DIN rail perforated - NS 35/15 PERF 2000MM - 1201730

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/15 UNPERF 2000MM - 1201714

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

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DIN rail perforated - NS 35/15 WH PERF 2000MM - 0806602

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/15 WH UNPERF 2000MM - 1204135

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: silver

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DIN rail, unperforated - NS 35/15 AL UNPERF 2000MM - 1201756

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Aluminum, uncoated, length: 2000 mm, color: silver

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Double-level terminal block - PTTB 2,5 - 3210567

Accessories

DIN rail perforated - NS 35/15 ZN PERF 2000MM - 1206599

DIN rail perforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/15 ZN UNPERF 2000MM - 1206586

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/15 CU UNPERF 2000MM - 1201895

DIN rail, unperforated, Standard profile, width: 35 mm, height: 15 mm, similar to EN 60715, material: Copper, uncoated, length: 2000 mm, color: copper-colored

End cap - NS 35/15 CAP - 1206573

DIN rail end piece, for DIN rail NS 35/15

DIN rail, unperforated - NS 35/15-2,3 UNPERF 2000MM - 1201798

DIN rail, unperforated, Standard profile 2.3 mm, width: 35 mm, height: 15 mm, acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

Documentation

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Mounting material - PT-IL - 3208090

Operating decal for the push-in Technology

End block

End clamp - CLIPFIX 35 - 3022218

Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN rail, with marking option, width: 9.5 mm, color: gray

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End clamp - CLIPFIX 35-5 - 3022276

Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN rail, with marking option, with parking option for FBS...5, FBS...6, KSS 5, KSS 6, width: 5.15 mm, color: gray

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End clamp - E/NS 35 N - 0800886

End clamp, width: 9.5 mm, color: gray

End cover

End cover - D-PTTB 2,5 - 3211634

End cover, length: 68 mm, width: 2.2 mm, height: 39.6 mm, color: gray

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Filler plug

Filler plugs - CEC 2,5 - 3062757

Cover for conductor shaft, 10-pos., for spring cage terminal blocks (ST) and terminal blocks with push-in technology (PT) with a width of 5.2 mm

Front adapter

Front adapters - VIP-PA-PWR/20XOE/ 2,0M/S7 - 2904725

VIP power cabling, universal front adapter for connection to all popular 20-pos. SIMATIC S7-300 I/O modules, via 20 individual wires in rope structure, not assembled (field connection, e.g., via 20 modular terminal blocks), cable length: 2 m

Front adapters - VIP-PA-PWR/40XOE/ 2,0M/S7 - 2904732

VIP power cabling, universal front adapter for connection to all popular 40-pos. SIMATIC S7-300 I/O modules, via 40 individual wires in rope structure, not assembled (field connection, e.g., via 40 modular terminal blocks), cable length: 2 m

Insulating sleeve

Insulating sleeve - MPS-IH WH - 0201663

Insulating sleeve, color: white

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Insulating sleeve - MPS-IH RD - 0201676

Insulating sleeve, color: red

Insulating sleeve - MPS-IH BU - 0201689

Insulating sleeve, color: blue

Insulating sleeve - MPS-IH YE - 0201692

Insulating sleeve, color: yellow

Insulating sleeve - MPS-IH GN - 0201702

Insulating sleeve, color: green

Insulating sleeve - MPS-IH GY - 0201728

Insulating sleeve, color: gray

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Insulating sleeve - MPS-IH BK - 0201731

Insulating sleeve, color: black

Insulating sleeve - ISH 2,5/0,2 - 3002843

Insulating sleeve, color: white

Insulating sleeve - ISH 2,5/0,5 - 3002856

Insulating sleeve, color: gray

Insulating sleeve - ISH 2,5/1,0 - 3002869

Insulating sleeve, color: black

Jumper

Plug-in bridge - FBS 2-5 - 3030161

Plug-in bridge, pitch: 5.2 mm, length: 22.7 mm, width: 9 mm, number of positions: 2, color: red

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Plug-in bridge - FBS 3-5 - 3030174

Plug-in bridge, pitch: 5.2 mm, length: 22.7 mm, width: 14.2 mm, number of positions: 3, color: red

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Plug-in bridge - FBS 4-5 - 3030187

Plug-in bridge, pitch: 5.2 mm, length: 22.7 mm, width: 19.4 mm, number of positions: 4, color: red

---

Plug-in bridge - FBS 5-5 - 3030190

Plug-in bridge, pitch: 5.2 mm, length: 23 mm, width: 24.6 mm, number of positions: 5, color: red

---

Plug-in bridge - FBS 10-5 - 3030213

Plug-in bridge, pitch: 5.2 mm, length: 22.7 mm, width: 50.6 mm, number of positions: 10, color: red

---

Plug-in bridge - FBS 20-5 - 3030226

Plug-in bridge, pitch: 5.2 mm, number of positions: 20, color: red

---

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Plug-in bridge - FBS 50-5 - 3038930

Plug-in bridge, pitch: 5.2 mm, number of positions: 50, color: red

Plug-in bridge - FBSR 2-5 - 3033702

Plug-in bridge, pitch: 5.2 mm, number of positions: 2, color: red

Plug-in bridge - FBSR 3-5 - 3001591

Plug-in bridge, pitch: 5.2 mm, number of positions: 3, color: red

Plug-in bridge - FBSR 4-5 - 3001592

Plug-in bridge, pitch: 5.2 mm, number of positions: 4, color: red

Plug-in bridge - FBSR 5-5 - 3001593

Plug-in bridge, pitch: 5.2 mm, number of positions: 5, color: red

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Plug-in bridge - FBSR 10-5 - 3033710

Plug-in bridge, pitch: 5.2 mm, number of positions: 10, color: red

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Plug-in bridge - FBS 2-5 BU - 3036877

Plug-in bridge, pitch: 5.2 mm, number of positions: 2, color: blue

---

Plug-in bridge - FBS 3-5 BU - 3036880

Plug-in bridge, pitch: 5.2 mm, number of positions: 3, color: blue

---

Plug-in bridge - FBS 4-5 BU - 3036893

Plug-in bridge, pitch: 5.2 mm, number of positions: 4, color: blue

---

Plug-in bridge - FBS 5-5 BU - 3036903

Plug-in bridge, pitch: 5.2 mm, number of positions: 5, color: blue

---

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Plug-in bridge - FBS 10-5 BU - 3036916

Plug-in bridge, pitch: 5.2 mm, number of positions: 10, color: blue

Plug-in bridge - FBS 20-5 BU - 3036929

Plug-in bridge, pitch: 5.2 mm, number of positions: 20, color: blue

Plug-in bridge - FBS 50-5 BU - 3032114

Plug-in bridge, pitch: 5.2 mm, number of positions: 50, color: blue

Labeled terminal marker

Zack Marker strip, flat - ZBF 5 CUS - 0825025

Zack Marker strip, flat, can be ordered: Strip, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Zack Marker strip, flat - ZBF 5,LGS:FORTL.ZAHLEN - 0808671

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 491 ... 500, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Zack Marker strip, flat - ZBF 5,QR:FORTL.ZAHLEN - 0808697

Zack Marker strip, flat, Strip, white, labeled, Printed vertically: consecutive numbers 1 ... 10, 11 ... 20, etc. up to 91 ... 100, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Zack Marker strip, flat - ZBF 5,LGS:GERADE ZAHLEN - 0810821

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: consecutive numbers 2 ... 20, 22 ... 40, etc. up to 82 ... 100, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Zack Marker strip, flat - ZBF 5,LGS:UNGERADE ZAHLEN - 0810863

Zack Marker strip, flat, Strip, white, labeled, printed horizontally: Odd numbers 1 - 19, 21 - 39, etc. up to 81 - 99, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.15 x 5.15 mm, Number of individual labels: 10

Marker for terminal blocks - UC-TMF 5 CUS - 0824638

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 5.2 mm, lettering field size: 4.6 x 5.1 mm, Number of individual labels: 96

Marker for terminal blocks - UCT-TMF 5 CUS - 0829658

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into flat marker groove, for terminal block width: 5.2 mm, lettering field size: 4.4 x 4.7 mm, Number of individual labels: 72

Marker carriers

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Marker carriers - STP 5-2 - 0800967

Double marker carrier, snaps onto the double-level spring-cage terminal block STTB 2,5, STTB 4, PTTB 2,5, PTTB 4 can be marked with UC-TM 5, ZB 5 or UC-TMF 5, ZBF 5

Marker carriers - STP 5-2/S - 0800970

Double marker carrier, snaps onto the double-level spring-cage terminal block ZFKK 1,5, with MSTBV or ICV pick-off

Partition plate

Partition plate - ATP-STTB 4 - 3030747

Partition plate, length: 88.7 mm, width: 2 mm, height: 53 mm, color: gray

Spacer plate - DP PS-5 - 3036725

Spacer plate, length: 22.4 mm, width: 5.2 mm, height: 29 mm, number of positions: 1, color: red

Planning and marking software

Software - PROJECT COMPLETE - 1050453

Intuitive planning and marking software for configuring terminal strips and for professional marking of marking materials for terminal blocks, conductors, cables, devices, and systems. The software is available for download

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Screwdriver tools

Screwdriver - SZF 1-0,6X3,5 - 1204517

Actuation tool, for ST terminal blocks, also suitable for use as a bladed screwdriver, size: 0.6 x 3.5 x 100 mm, 2-component grip, with non-slip grip

Actuation tool - ST-BW - 1207608

Actuation tool, for all 2.5 mm² - 4.0 mm² spring-cages

Terminal marking

Zack Marker strip, flat - ZBF 5:UNBEDRUCKT - 0808642

Zack Marker strip, flat, Strip, white, unlabeled, can be labeled with: PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into flat marker groove, for terminal block width: 5 mm, lettering field size: 5.1 x 5.2 mm, Number of individual labels: 10

Marker for terminal blocks - UC-TMF 5 - 0818153

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into flat marker groove, for terminal block width: 5.2 mm, lettering field size: 4.6 x 5.1 mm, Number of individual labels: 96

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Marker for terminal blocks - UCT-TMF 5 - 0828744

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: TOPMARK NEO, TOPMARK LASER, BLUEMARK ID COLOR, BLUEMARK ID, BLUEMARK CLED, THERMOMARK PRIME, THERMOMARK CARD 2.0, THERMOMARK CARD, mounting type: snap into flat marker groove, for terminal block width: 5.2 mm, lettering field size: 4.4 x 4.7 mm, Number of individual labels: 72

Test plug terminal block

Reducing plug - RPS - 0201647

Reducing plug, color: gray

Test plugs - MPS-MT - 0201744

Test plugs, with solder connection up to 1 mm² conductor cross section, color: gray

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Test plugs - PS-5 - 3030983

Test plugs, Modular test plug, color: red

Test plugs - PS-5/2,3MM RD - 3038723

Test plugs, color: red

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Test socket

Test adapter - PAI-4-FIX-5/6 BU - 3035975

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 OG - 3035974

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 YE - 3035977

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 RD - 3035976

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 GN - 3035978

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Test adapter - PAI-4-FIX-5/6 BK - 3035980

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 GY - 3035982

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 VT - 3035979

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 BN - 3035981

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 WH - 3035983

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Vertical bridge

Double-level terminal block - PTTB 2,5 - 3210567

Accessories

Potential bridge - FBS-PV - 3032185

Vertical potential bridge, to connect the upper and lower level

---

Warning label printed

Warning label - WS PT 2,5 - 1029026

Warning label, yellow/black, labeled: Lightning flash, mounting type: plug in, for terminal block width: 5.2 mm

---

Warning label - WS-DIO PT 2,5 - 1029037

Warning label, yellow/black, labeled: Diode, mounting type: plug in, for terminal block width: 5.2 mm

---

End cover - D-PTTB 2,5 - 3211634

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End cover, length: 68 mm, width: 2.2 mm, height: 39.6 mm, color: gray

RoHS COMPLETE line

Key Commercial Data

Packing unit	1 pc
Minimum order quantity	50 pc
GTIN	4 046356 428378
GTIN	4046356428378
Weight per Piece (excluding packing)	3.250 g
Custom tariff number	85389099
Country of origin	Germany

Technical data

General

Color	gray
Material	PA
Flammability rating according to UL 94	V0

Dimensions

Width	2.2 mm
End cover width	2.2 mm
Length	68 mm
Height	39.6 mm
Height NS 35/7,5	47.5 mm

End cover - D-PTTB 2,5 - 3211634

Technical data

Dimensions

Height NS 35/15	55 mm

General

Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	130 °C
Static insulating material application in cold	-60 °C
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Calorimetric heat release NFPA 130 (ASTM E 1354)	28 MJ/kg
Smoke gas toxicity NFPA 130 (SMP 800C)	passed
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3

Ambient conditions

Operating temperature	-60 °C ... 105 °C (max. short-term operating temperature 130°C)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Permissible humidity (storage/transport)	30 % ... 70 %
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C

Standards and Regulations

Flammability rating according to UL 94	V0

Environmental Product Compliance

China RoHS	Environmentally friendly use period: unlimited = EFUP-e
	No hazardous substances above threshold values

Classifications

eCl@ss

eCl@ss 10.0.1	27141133
eCl@ss 11.0	27141133
eCl@ss 4.0	21011300
eCl@ss 4.1	21011300
eCl@ss 5.0	27141100
eCl@ss 5.1	27141100
eCl@ss 6.0	27141100

End cover - D-PTTB 2,5 - 3211634

Classifications

eCl@ss

eCl@ss 7.0	27141133
eCl@ss 9.0	27141133

ETIM

ETIM 2.0	EC000886
ETIM 3.0	EC000886
ETIM 4.0	EC000886
ETIM 6.0	EC000886
ETIM 7.0	EC000886

UNSPSC

UNSPSC 6.01	30211827
UNSPSC 7.0901	39121424
UNSPSC 11	39121424
UNSPSC 12.01	39121424
UNSPSC 13.2	39121425
UNSPSC 18.0	39121425
UNSPSC 19.0	39121425
UNSPSC 20.0	39121425
UNSPSC 21.0	39121425

Feed-through terminal block - PT 6

3211813

https://www.phoenixcontact.com/us/products/3211813

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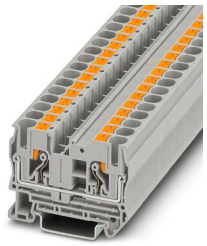


Feed-through terminal block, nom. voltage: 1000 V, nominal current: 41 A, connection method: Push-in connection, Rated cross section: 6 mm^2, cross section: 0.5 mm^2 - 10 mm^2, mounting type: NS 35/7,5, NS 35/15, color: gray

Your advantages

- In addition to the testing facility in the double function shaft, all terminal blocks provide an additional test connection
- The Push-in connection terminal blocks are characterized by the system features of the CLIPLINE complete system and by easy and tool-free wiring of conductors with ferrules or solid conductors
- The compact design and front connection enable wiring in a confined space
- Tested for railway applications

Commercial Data

Item number	3211813
Packing unit	1 pc
Minimum order quantity	50 pc
Sales Key	B02
Product Key	BE2211
Catalog Page	Page 111 (C-1-2019)
GTIN	4046356494656
Weight per Piece (including packing)	14.98 g
Weight per Piece (excluding packing)	13.98 g
Customs tariff number	85369010
Country of origin	CN

Technical Data

Product properties

Product type	Feed-through terminal block
Number of positions	1
Area of application	Railway industry
	Machine building
	Plant engineering
Number of connections	2
Number of rows	1
Potentials	1

Insulation characteristics

Overvoltage category	III
Degree of pollution	3

Electrical properties

Rated surge voltage	8 kV
Maximum power dissipation for nominal condition	1.31 W

Connection data

Number of connections per level	2
Nominal cross section	6 mm²
Stripping length	10 mm ... 12 mm
Internal cylindrical gage	A5
Connection in acc. with standard	IEC 60947-7-1
Conductor cross section solid	0.5 mm² ... 10 mm²
Cross section AWG	20 ... 8 (converted acc. to IEC)
Conductor cross section flexible	0.5 mm² ... 10 mm²
Conductor cross section, flexible [AWG]	20 ... 8 (converted acc. to IEC)
Flexible conductor cross section flexible (ferrule, w/o plastic sleeve)	0.5 mm² ... 6 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	0.5 mm² ... 6 mm²
2 conductors with the same cross section, flexible, with TWIN ferrule with plastic sleeve	0.5 mm² ... 1.5 mm² When using TWIN ferrules, we recommend a minimum ferrule length of 13 mm.
Nominal current	41 A
Maximum load current	52 A (with 10 mm² conductor cross section, rigid)
Nominal voltage	1000 V
Nominal cross section	6 mm²

Connection cross sections directly pluggable

Conductor cross section solid	1 mm² ... 10 mm²
Flexible conductor cross section flexible (ferrule, w/o plastic sleeve)	1 mm² ... 6 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	1 mm² ... 6 mm²

Ex data

Rated data (ATEX/IECEx)

ATEX certificate	SEV 13 ATEX 0159 U
IEC Ex certificate	IECEx SEV 13.0005 U
Identification	☐ II 2 GD Ex eb IIC Gb
Operating temperature range	-60 °C ... 110 °C
Ex-certified accessories	3212044 D-PT 6
	3024481 ATP-ST 6
	1204520 SZF 2-0,8X4,0
	3022276 CLIPFIX 35-5
	3022218 CLIPFIX 35
List of bridges	Plug-in bridge / FBS 2-8 / 3030284
	Plug-in bridge / FBS 3-8 / 3030297
	Plug-in bridge / FBS 4-8 / 3030307
	Plug-in bridge / FBS 5-8 / 3030310
	Plug-in bridge / FBS 6-8 / 3032470
	Plug-in bridge / FBS 10-8 / 3030323
Bridge data	35 A / 6 mm²
Ex temperature increase	40 K (36.5 A / 6 mm²)
Rated voltage	550 V
for bridging with bridge	550 V
- At bridging between non-adjacent terminal blocks	275 V
- At bridging between non-adjacent terminal blocks via PE terminal block	275 V
- At cut-to-length bridging	220 V
- At cut-to-length bridging with cover	275 V
- At cut-to-length bridging with partition plate	550 V
Rated insulation voltage	500 V
output	(Permanent)

Ex level General

Rated current	36.5 A
Maximum load current	46 A
Contact resistance	0.48 mΩ

Ex connection data General

Nominal cross section	6 mm²
Rated cross section AWG	10
Connection capacity rigid	0.5 mm² ... 10 mm²
Connection capacity AWG	20 ... 8
Connection capacity flexible	0.5 mm² ... 6 mm²
Connection capacity AWG	20 ... 10

Dimensions

Width	8.2 mm
End cover width	2.2 mm
Height	42.2 mm
Height NS 35/15	51 mm
Height NS 35/7,5	43.5 mm
Length	57.7 mm

Material specifications

Color	gray
Flammability rating according to UL 94	V0
Insulating material group	I
Insulating material	PA
Static insulating material application in cold	-60 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	125 °C
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3
Calorimetric heat release NFPA 130 (ASTM E 1354)	27,5 MJ/kg
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed

Electrical tests

Surge voltage test

Test voltage setpoint	9.8 kV
Result	Test passed

Temperature-rise test

Requirement temperature-rise test	Increase in temperature ≤ 45 K
Result	Test passed
Short-time withstand current 6 mm²	0.72 kA
Result	Test passed

Power-frequency withstand voltage

Test voltage setpoint	2.2 kV
Result	Test passed

Mechanical properties

Mechanical data

Open side panel	Yes

Mechanical tests

Mechanical strength

Result	Test passed

Attachment on the carrier

DIN rail/fixing support	NS 35
Test force setpoint	5 N
Result	Test passed

Test for conductor damage and slackening

Rotation speed	10 rpm
Revolutions	135
Conductor cross section/weight	0.5 mm² / 0.3 kg
	6 mm² / 1.4 kg
	10 mm² / 2 kg
Result	Test passed

Environmental and real-life conditions

Aging

Temperature cycles	192
	192
Result	Test passed
	Test passed

Needle-flame test

Time of exposure	30 s
Result	Test passed

Oscillation/broadband noise

Specification	DIN EN 50155 (VDE 0115-200):2018-05
Spectrum	Service life test category 2, bogie-mounted
Frequency	f_1 = 5 Hz to f_2 = 250 Hz
ASD level	6.12 (m/s²)²/Hz
Acceleration	3.12g
Test duration per axis	5 h
Test directions	X-, Y- and Z-axis
Result	Test passed

Shocks

Specification	DIN EN 50155 (VDE 0115-200):2018-05
Pulse shape	Half-sine
Acceleration	30g
Shock duration	18 ms
Number of shocks per direction	3
Test directions	X-, Y- and Z-axis (pos. and neg.)
Result	Test passed

Ambient conditions

Ambient temperature (operation)	-60 °C ... 105 °C (max. short-term operating temperature RTI Elec.)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C
Permissible humidity (storage/transport)	30 % ... 70 %

Standards and regulations

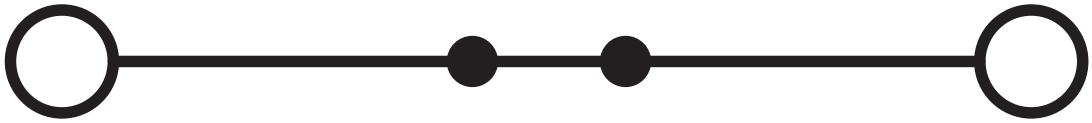
Connection in acc. with standard	IEC 60947-7-1

Mounting

Mounting type	NS 35/7,5
	NS 35/15

Drawings

Circuit diagram



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Middletown, PA 17057, United States
(+717) 944-1300
info@phoenixcon.com

Disconnect terminal block - PT 4-TG

3211922

https://www.phoenixcontact.com/us/products/3211922

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Disconnect terminal block, Current and voltage are determined by the plug used., nom. voltage: 500 V, nominal current: 20 A, connection method: Push-in connection, Rated cross section: 4 mm^2, cross section: 0.2 mm^2 - 6 mm^2, mounting: NS 35/7,5, NS 35/15, color: gray

Your advantages

- The compact design and front connection enable wiring in a confined space
- In addition to the testing facility in the double function shaft, all terminal blocks provide an additional test connection
- The Push-in connection terminal blocks are characterized by the system features of the CLIPLINE complete system and by easy and tool-free wiring of conductors with ferrules or solid conductors
- Tested for railway applications

Commercial Data

Item number	3211922
Packing unit	1 pc
Minimum order quantity	50 pc
Sales Key	B02
Product Key	BE2232
Catalog Page	Page 103 (C-1-2019)
GTIN	4046356482561
Weight per Piece (including packing)	8.448 g
Weight per Piece (excluding packing)	8.43 g
Customs tariff number	85369010
Country of origin	PL

Technical Data

Notes

General	Current and voltage are determined by the plug used.

Product properties

Product type	Disconnect terminal block
Area of application	Railway industry
	Machine building
	Plant engineering
Number of connections	2
Number of rows	1
Potentials	1

Insulation characteristics

Overvoltage category	III
Degree of pollution	3

Electrical properties

Rated surge voltage	6 kV
Maximum power dissipation for nominal condition	1.02 W

Connection data

Number of connections per level	2
Nominal cross section	4 mm²
Stripping length	10 mm ... 12 mm
Internal cylindrical gage	A4
Connection in acc. with standard	IEC 60947-7-1
Conductor cross section solid	0.2 mm² ... 6 mm²
Cross section AWG	24 ... 10 (converted acc. to IEC)
Conductor cross section flexible	0.2 mm² ... 6 mm²
Conductor cross section, flexible [AWG]	24 ... 10 (converted acc. to IEC)
Flexible conductor cross section flexible (ferrule, w/o plastic sleeve)	0.25 mm² ... 4 mm²
Flexible conductor cross section (ferrule with plastic sleeve)	0.25 mm² ... 4 mm²
2 conductors with the same cross section, flexible, with TWIN ferrule with plastic sleeve	0.5 mm² ... 1 mm²
Nominal current	20 A
Maximum load current	20 A (with 6 mm² conductor cross section, rigid)
Nominal voltage	500 V (Current and voltage are determined by the plug used.)
Nominal cross section	4 mm²

Connection cross sections directly pluggable

Conductor cross section solid	0.5 mm² ... 6 mm²
Flexible conductor cross section flexible (ferrule, w/o plastic	0.5 mm² ... 4 mm²

sleeve)	
Flexible conductor cross section (ferrule with plastic sleeve)	0.5 mm² ... 4 mm²

Dimensions

Width	6.2 mm
End cover width	2.2 mm
Height NS 35/15	44 mm
Height NS 35/7,5	36.5 mm
Height	1.437 "
Length	56 mm

Material specifications

Color	gray
Flammability rating according to UL 94	V0
Insulating material group	I
Insulating material	PA
Static insulating material application in cold	-60 °C
Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21))	125 °C
Relative insulation material temperature index (Elec., UL 746 B)	130 °C
Fire protection for rail vehicles (DIN EN 45545-2) R22	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R23	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R24	HL 1 - HL 3
Fire protection for rail vehicles (DIN EN 45545-2) R26	HL 1 - HL 3
Calorimetric heat release NFPA 130 (ASTM E 1354)	27,5 MJ/kg
Surface flammability NFPA 130 (ASTM E 162)	passed
Specific optical density of smoke NFPA 130 (ASTM E 662)	passed
Smoke gas toxicity NFPA 130 (SMP 800C)	passed

Electrical tests

Surge voltage test

Test voltage setpoint	7.3 kV
Result	Test passed

Temperature-rise test

Requirement temperature-rise test	Increase in temperature ≤ 45 K
Result	Test passed
Short-time withstand current 2.5 mm²	0.3 kA
Result	Test passed

Power-frequency withstand voltage

Test voltage setpoint	1.89 kV
Result	Test passed

Mechanical properties

Mechanical data

Open side panel	Yes

Mechanical tests

Mechanical strength

Result	Test passed

Attachment on the carrier

DIN rail/fixing support	NS 35
Test force setpoint	1 N
Result	Test passed

Test for conductor damage and slackening

Rotation speed	10 rpm
Revolutions	135
Conductor cross section/weight	0.2 mm² / 0.2 kg
	4 mm² / 0.9 kg
	6 mm² / 1.4 kg
Result	Test passed

Environmental and real-life conditions

Aging

Temperature cycles	192
Result	Test passed

Needle-flame test

Time of exposure	30 s
Result	Test passed

Oscillation/broadband noise

Specification	DIN EN 50155 (VDE 0115-200):2018-05
Spectrum	Service life test category 2, bogie-mounted
Frequency	f_1 = 5 Hz to f_2 = 250 Hz
ASD level	6.12 (m/s²)²/Hz
Acceleration	3.12g
Test duration per axis	5 h
Test directions	X-, Y- and Z-axis
Result	Test passed

Shocks

Specification	DIN EN 50155 (VDE 0115-200):2018-05
Pulse shape	Half-sine
Acceleration	30g
Shock duration	18 ms
Number of shocks per direction	3

Test directions	X-, Y- and Z-axis (pos. and neg.)
Result	Test passed

Ambient conditions

Ambient temperature (operation)	-60 °C ... 105 °C (max. short-term operating temperature RTI Elec.)
Ambient temperature (storage/transport)	-25 °C ... 60 °C (for a short time, not exceeding 24 h, -60 °C to +70 °C)
Ambient temperature (assembly)	-5 °C ... 70 °C
Ambient temperature (actuation)	-5 °C ... 70 °C
Permissible humidity (storage/transport)	30 % ... 70 %

Standards and regulations

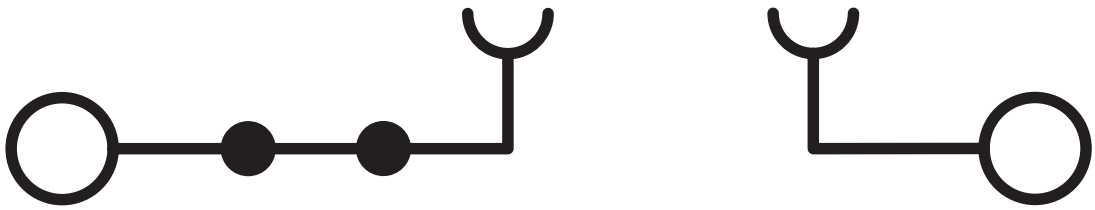
Connection in acc. with standard	IEC 60947-7-1

Mounting

Mounting type	NS 35/7,5
	NS 35/15

Drawings

Circuit diagram



Phoenix Contact USA
586 Fulling Mill Road
Middletown, PA 17057, United States
(+717) 944-1300
info@phoenixcon.com

POWER PS SONIC
TRUSTED BATTERY SOLUTIONS

PS SERIES

General Purpose | Emergency Lighting | Medical | Fire & Security

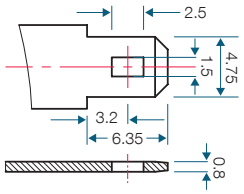
PS-1250

12V 5.0 AH @ 20-hr.
12V 4.6 AH @ 10-hr.

Rechargeable Sealed Lead Acid Battery
PS – General Purpose Series

TERMINALS: (mm)

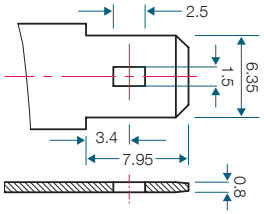
F1: Quick disconnect tabs, 0.187" x 0.032" – Mate with AMP. INC. FASTON "187" series



Torque – Not Applicable

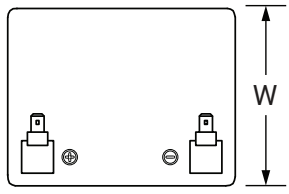
OR

F2: Quick disconnect tabs, 0.250" x 0.032" – Mate with AMP. INC FASTON "250" series



Torque – Not Applicable

DIMENSIONS: inch (mm)

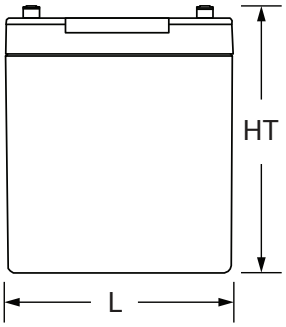


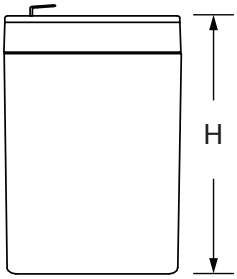
L: 3.54 (90)
W: 2.76 (70)
H: 3.98 (101)
HT: 4.21 (107)

Tolerances for L, W, and HT are +/- 0.04 in. (+/- 1mm)

Tolerances for H dimensions are + 0.08 (+ 2mm) and

-0.04 in. (- 1mm) All data subject to change without notice.





FEATURES

- Absorbent Glass Mat (AGM) technology for superior performance
- Valve regulated, maintenance free spill proof construction
- Power/volume ratio yielding excellent energy density
- Rugged vibration and impact resistant ABS case and cover
- Gas recombination technology
- 5 year design life

APPROVALS

- Approved for transport by air. D.O.T., I.A.T.A., F.A.A. and C.A.B. certified
- U.L. recognized
- ISO9001:2015 – Quality management systems

PERFORMANCE SPECIFICATIONS

Nominal Voltage	12 volts (6 cells)
Nominal Capacity	
20-hr. (0.250A, 10.5V)	5.00 AH
10-hr. (0.465A, 10.5V)	4.65 AH
5-hr. (0.850A, 10.5V)	4.25 AH
1-hr. (2.96A, 9.6V)	2.96 AH
Approximate Weight	3.06 lbs. (1.39 kg)
Internal Resistance (approx.)	48.0 miliohms
Max Short-Duration Discharge Current (5 Sec.)	75.0 amperes
Shelf Life	
PS series batteries may be stored for up to 6 months at 25 C(77 F) and then a freshening charge is required. For higher temperatures the time interval will be shorter.	
Operating Temperature Range	
Charge	5°F (-15°C) to 122°F (50°C)
Discharge	-4°F (-20°C) to 140°F (60°C)
Case	ABS Plastic
Power Sonic Chargers	PSC-121000ACX

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power-sonic.com

Rev04: 03/22

POWER PS SONIC
TRUSTED BATTERY SOLUTIONS

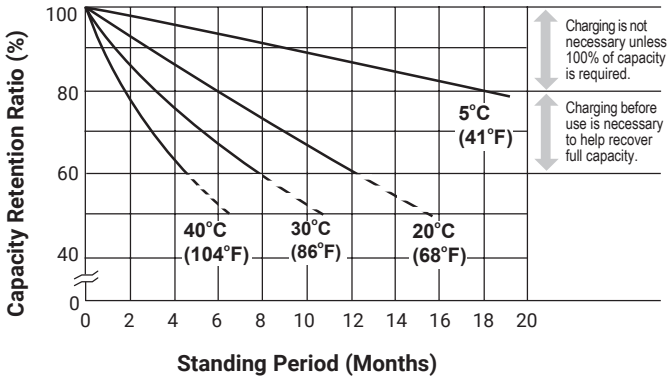
PS SERIES

PS-1250

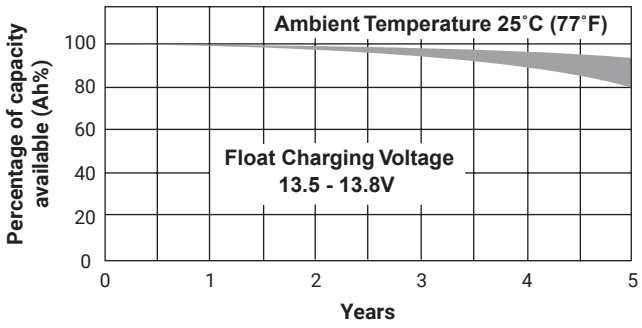
12V 5.0 AH @ 20-hr.
12V 4.6 AH @ 10-hr.

Rechargeable Sealed Lead Acid Battery
PS – General Purpose Series

SHELF LIFE & STORAGE



LIFE CHARACTERISTICS IN STAND-BY USE



CHARGING

Cycle Applications: Apply constant voltage charge at 14.4V – 15.0V at 25°C (77°F) Initial charging current should be set at less than 0.25C Amps. Switch to float charge to avoid overcharging.

"Float" or "Stand-By" Service: Apply constant voltage charge at 13.5V – 13.8V at 25°C (77°F) Initial charging current should be set at less than 0.25C Amps. When held at this voltage, the battery will seek its own current level and maintain itself in a fully charged condition.

Temperature Compensation: Charging Voltage for both Cyclic and Standby applications should be regulated in relation to ambient temperature. As temperature rises charging voltage should be reduced to prevent overcharge and increased as temperature falls to avoid undercharge.

For further charging information including temperature compensation factors, see Power Sonic Technical Manual/ Power Sonic Charger specifications.

APPLICATIONS

- General purpose
- Emergency lighting
- Medical
- Fire and security

CHARGERS

Power Sonic offers a wide range of chargers suitable for batteries with a variety of capacities.

Please refer to our website for more information on our switch mode and transformer type chargers.

Please contact our technical department for advice if you have difficulty in locating a suitable charger.

FURTHER INFORMATION

Please refer to our website **www.power-sonic.com** for a complete range of useful downloads, such as product catalogs, material safety data sheets (MSDS), ISO certification, etc.

GLOBAL HEADQUARTERS
(USA AND INTERNATIONAL EXCLUDING EMEA)
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Reno, Nevada 89439
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T: +1 775 824 6500
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T NL: + 31 33 7410 700
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T FR: + 33 344 32 18 17
E: salesEMEA@power-sonic.com

Saginaw Control and Engineering
95 Midland Road Saginaw, MI 48638-5770
(800) 234-6871 - Fax: (989) 799-4524
SCE@SaginawControl.com

SCE-36EL3612SSLPPL

Product Specifications:

Part Number: SCE-36EL3612SSLPPL
Description: S.S. LPPL Enclosure
Height: 36.00"
Width: 36.00"
Depth: 12.00"
Price Code: S9
List Price: $2,402.44
Catalog Page: 270
Est. Ship Weight: 122.50 lbs

Construction
- 0.075 In. stainless steel Type 304.
- Seams continuously welded and ground smooth.
- Flange trough collar around all sides of door opening.
- Collar studs 3/8-16 provided for mounting optional panels.
- Mounting holes in back of the enclosure for wall mounting.
- Mounting hardware, sealing washers and hole plugs included.
- Stainless steel concealed hinges.
- Removable and interchangeable doors.
- Black zinc die cast keylocking/padlocking handles.
- 3-point latching mechanism.
- Removable print pocket.
- Pour in place oil & water resistant gasket
- Ground stud on door and body.

Application
Designed to house electrical and electronic controls, instrumentation and components in indoor or outdoor locations. For outdoor application a drip shield and drain vent is recommended.

For details about the design, performance expectations, applications and design suggestions - See Design Considerations www.saginawcontrol.com/instman/considerations.pdf

Finish
#4 Brushed finish on all exterior surfaces. Optional sub-panels are powder coated white.

Industry Standards - (IS6)
- NEMA Type 3R, 4, 4X, 12 and Type 13
- UL Listed Type 3R, 4, 4X and 12
- CSA Type 4, 4X and 12
- IEC 60529
- IP 66

Notes
Special Instructions apply for IS3, IS4 and IS6 to maintain the environmental rating of Type 3R for these parts. Instructions are located on the enclosure door. Drip shield is required on IS3, drip shield is recommended on IS4 and IS6. Drain holes are required on all.

Optional Accessories
SCE-36P36 Subpanel, Bent
SCE-36P36GALV Subpanel, Bent Galvanized
SCE-BVK Breather Vent
SCE-DF36EL36LP Panel, Dead Front (Wall Mount)
SCE-DS36SS Shield, S.S. Drip
SCE-ELFM36HSS S.S. EL Flush Mount Frame
SCE-ELFM36WSS S.S. EL Flush Mount Frame
SCE-ELMFK4 Foot Kit, EL Mounting (4pc.)
SCE-ELSP3 KIT, Swing-Out Panel (20 High & Up)
SCE-RD36EL36SSLPPL Door, Replacement

Similar Part Numbers
SCE-24EL2410SSLPPLS.S. LPPL Enclosure
SCE-30EL2412SSLPPLS.S. LPPL Enclosure
SCE-30EL3012SSLPPLS.S. LPPL Enclosure
SCE-36EL2412SSLPPLS.S. LPPL Enclosure
SCE-36EL3012SSLPPLS.S. LPPL Enclosure
SCE-42EL3612SSLPPLS.S. LPPL Enclosure
SCE-48EL3612SSLPPLS.S. LPPL Enclosure
SCE-48EL3616SSLPPLS.S. LPPL Enclosure

Installation Information
- Sealing Washer Specifications
- Dead Front Wall Mount With 3 Point Latching Hardware
- EL Flush Mount Frame
- Dead Front Wall Mount Installation Instructions
- Swing Panel ELSP3 for Encl. Height > 16
- Drip Shield Kit Assembly

Saginaw Control and Engineering
95 Midland Road Saginaw, MI 48638-5770
(800) 234-6871 - Fax: (989) 799-4524
SCE@SaginawControl.com

SCE-36P36GALV

Product Specifications:

Part Number: SCE-36P36GALV
Description: Subpanel, Bent Galvanized
Height: 33.00"
Width: 33.00"
Depth: 0.88"
Price Code: P3
List Price: $145.65
Catalog Page: 444
Est. Ship Weight: 35.00 lbs

Application
Subpanels are constructed from galvanized or galvannealed steel for direct bonding of electrical components. Size determines steel thickness.

Industry Standards - (IS17)
- NEMA Not Applicable
- UL Not Applicable
- CSA N/A

Similar Part Numbers
SCE-24P24GALVSubpanel, Bent Galvanized
SCE-30P24GALVSubpanel, Bent Galvanized
SCE-30P30GALVSubpanel, Bent Galvanized
SCE-36P24GALVSubpanel, Bent Galvanized
SCE-36P30GALVSubpanel, Bent Galvanized
SCE-40P24GALVSubpanel, Bent Galvanized
SCE-42P24GALVSubpanel, Bent Galvanized
SCE-42P30GALVSubpanel, Bent Galvanized
SCE-42P36GALVSubpanel, Bent Galvanized
SCE-42P42GALVSubpanel, Bent Galvanized

Installation Information
- Galvanized Subpanel Details & Grounding
- Sub-Plate SCE-72P72GALV in SCE-7272**ULP all depths

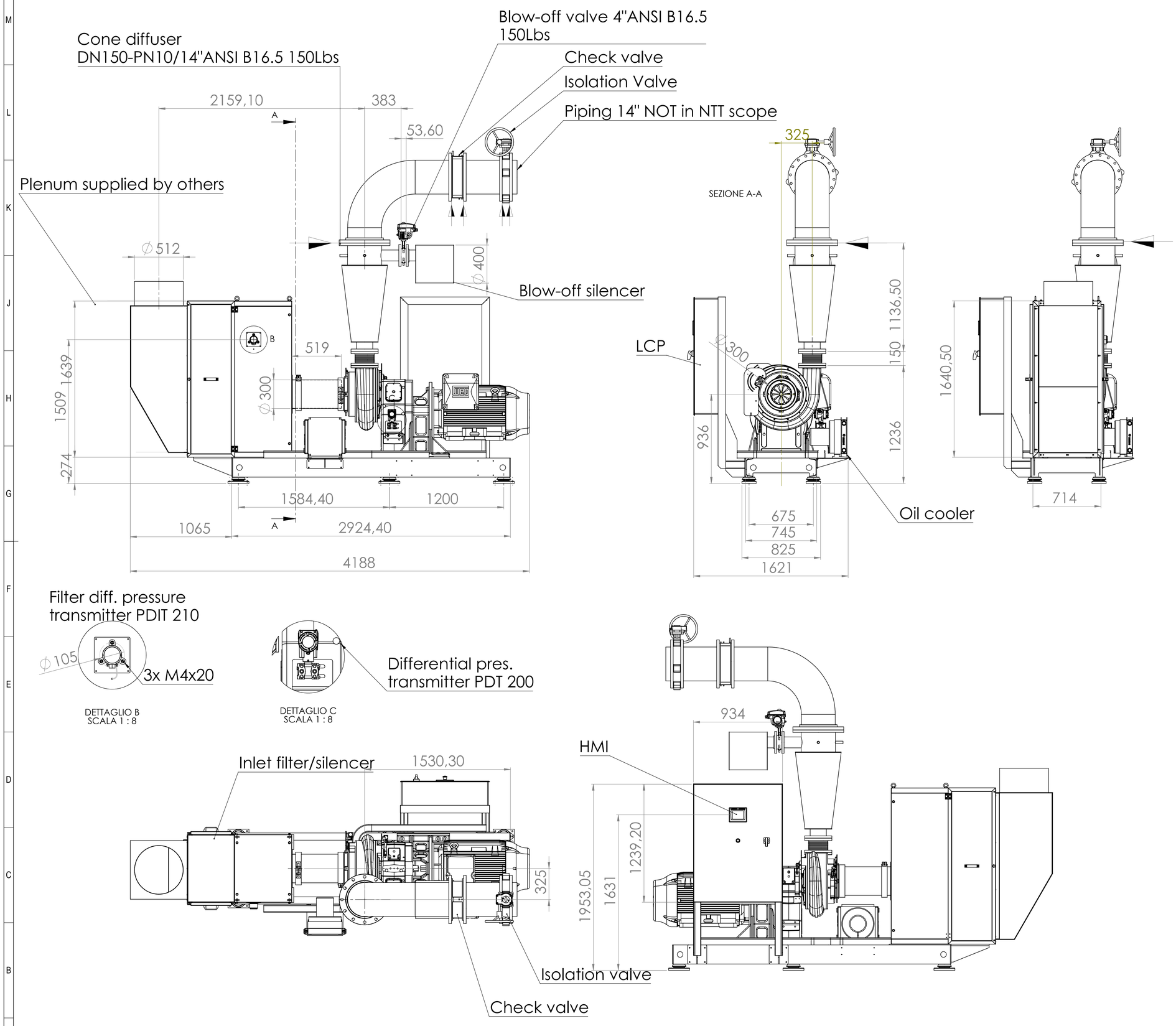
LED LIGHTS

Features

- Available with motion sensor or on/off switch
- Motion sensor version detects the motion of the enclosure door being opened and automatically turns light on
- Combined AC & DC voltage range allows the universal use with a single model
- Daisy chain cables allows the user to connect up to 16 lights with AC voltage and up to 8 lights with DC voltage
- Includes both magnets and screw mount clip for mounting to all types of surfaces with no need for additional mounting accessories
- Long light service life of 60,000 hours

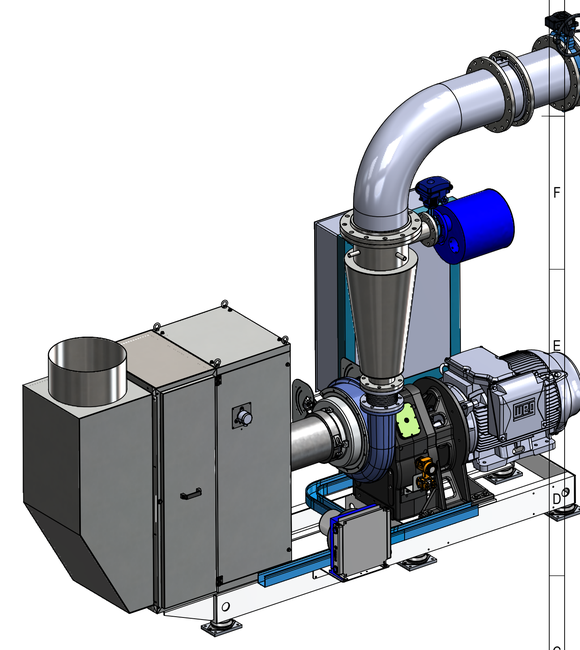
CATALOG NUMBERS	OPERATING VOLTAGE	ACTIVATION METHOD	LIGHT INTENSITY	LAMP TYPE	SUPPLIED MOUNTING METHOD	DIMENSIONS (HXWXD)
SL24265VMS	24-265V AC/DC, 50/60 Hz	Motion Sensor	400	LED, 120 degree angle	Magnet and Screw Mount	14.07x1.26x1.40 (357x32x36)
SL24265V0OS	24-265V AC/DC, 50/60 Hz	On/Off Switch	400	LED, 120 degree angle	Magnet and Screw Mount	14.07x1.26x1.23 (357x32x31)

CATALOG NUMBERS	PRODUCT DESCRIPTION	VOLTAGE AC	FREQUENCY	CURRENT RATING	VOLTAGE DC	RATED CURRENCY	DIMENSIONS (HXWXD)
CSLF	Connector, Strip Light, Female	—	—	—	—	—	—
CSLM	Connector, Strip Light, Male	—	—	—	—	—	—
PCSLW118	Cable, Power, Strip Light, Female 1 End, 118"	—	—	—	—	—	—
DCCSLW19	Cable, Daisy Chain, Strip Light, Male/Female, 19"	—	—	—	—	—	—
DCCSLW39	Cable, Daisy Chain, Strip Light, Male/Female, 39"	—	—	—	—	—	—
CDS138	Cable, Strip Light to Door Switch, Female, 138"	—	—	—	—	—	—
DSPP	Door Switch, End Limit, Plain Plunger	24 - 400V	50/60 Hz	10 - 1.8 A	24 - 250V	28 - 0.27 A	2.80x1.19x1.18 (71x30x30)
DSRP	Door Switch, End Limit, Roller Plunger	24 - 400V	50/60 Hz	10 - 1.8 A	24 - 250V	28 - 0.27 A	3.30x1.19x1.18 (84x30x30
DSPPRB	Door Switch, End Limit, Plain Plunger w Release Button	24 - 400V	50/60 Hz	10 - 1.8 A	24 - 250V	28 - 0.27 A	3.56x1.19x1.53 (90x30x39)
SDLS	Slide, Door Limit Switch	—	—	—	—	—	2.56x1.57x0.45 (65x40x11)



NOTES:

1. Discharge cone, Blow off valve & Bov silencer have to be supported by existing discharge pipes at customer care.
2. On outlet flange of discharge cone silencer allowable forces has to be limited to keep lower than:
   - max. axial travel - 10mm / + 5 mm &
   - max. transversal travel ± 1.5 mm

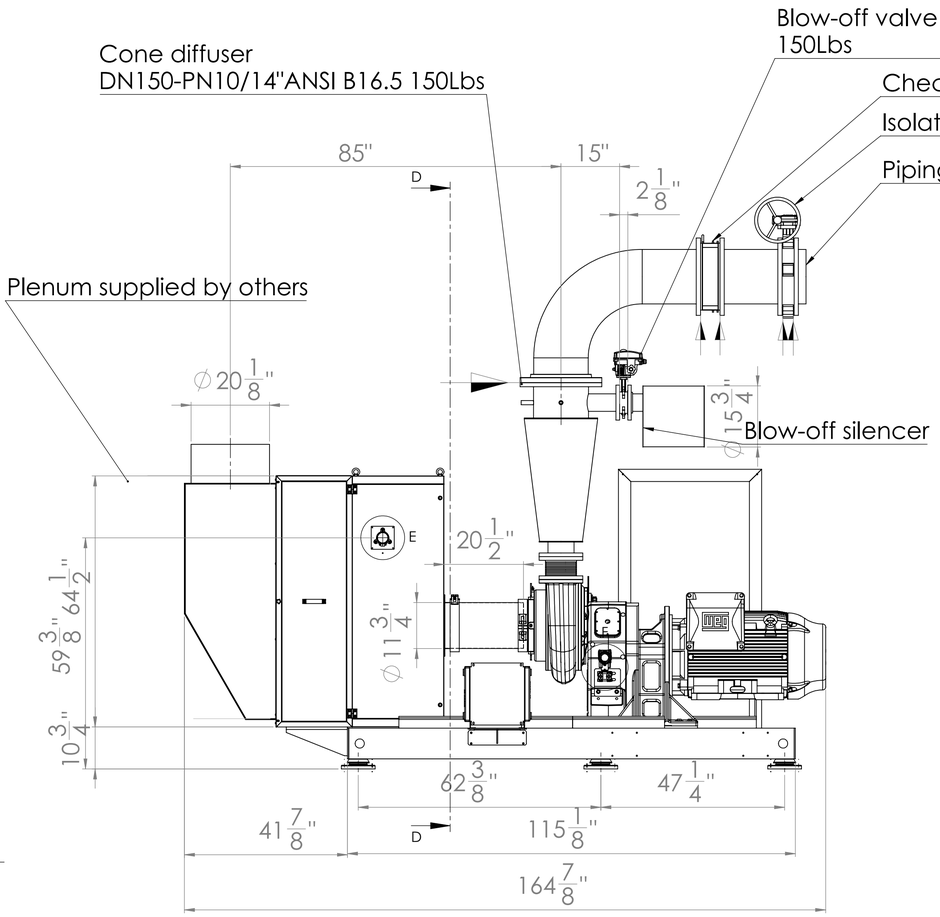


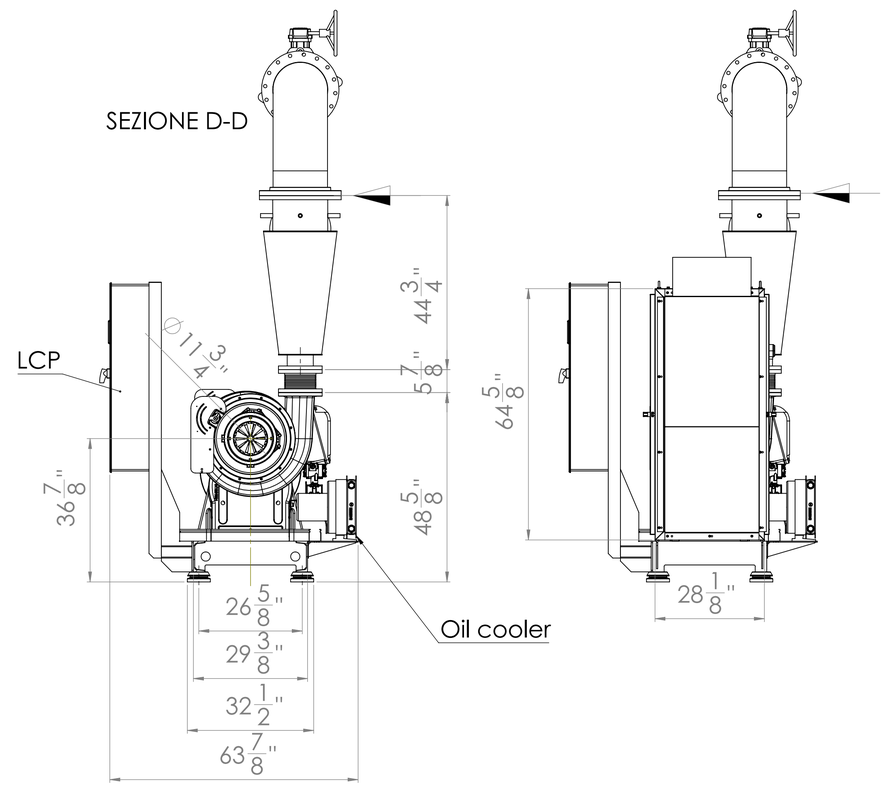
Rev.	Description	Date	Revisioned by	Approved by
02	LCP updated,instruments and cable raceway updated	08/12/2022	S. Schiaffino	S. Schiaffino
01	FIRST ISSUED	30/09/2022	S. Schiaffino	S. Schiaffino

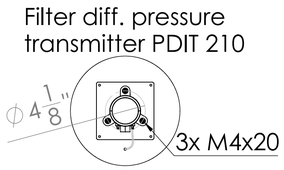
Revisioni

Dimensioni indicate in mm / Dimension in millimeters
Massa [Kg] / Mass [Kg]
Limiti di fornitura / Battery limits — Altri / By Others — Punto di Sollevamento / Lifting point
Data Approv. / Approval Date: 30/09/2022 — Approvato da / Approved by: S. Schiaffino
Data / Date: 28/09/2022 — Disegnato da / Drawn by: S. Schiaffino
Note Disegno / Drawing Note
Commessa / Job Number: 22-0989
Scala del foglio / Sheet Scale: 1:20
Formato / Format: A1
Foglio / Sheet: 1/2
Stato / Document Status: UNDER REVISION
Descrizione / Description: GAD TAUNTON
Tolleranza / Tolerance: UNI-EN 22768 m-K
Codice / Code: 22-0989 - 041
Rev.: 02

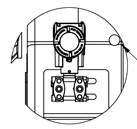
NexTurbo TECHNOLOGIES



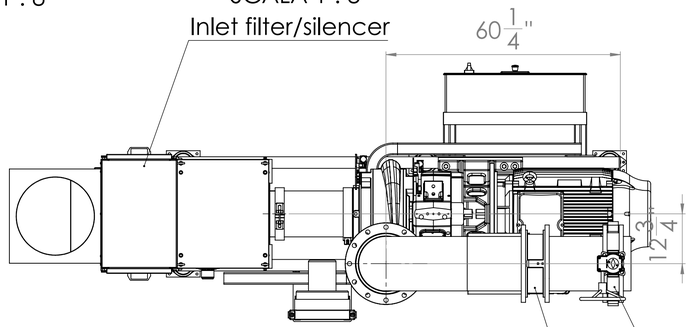


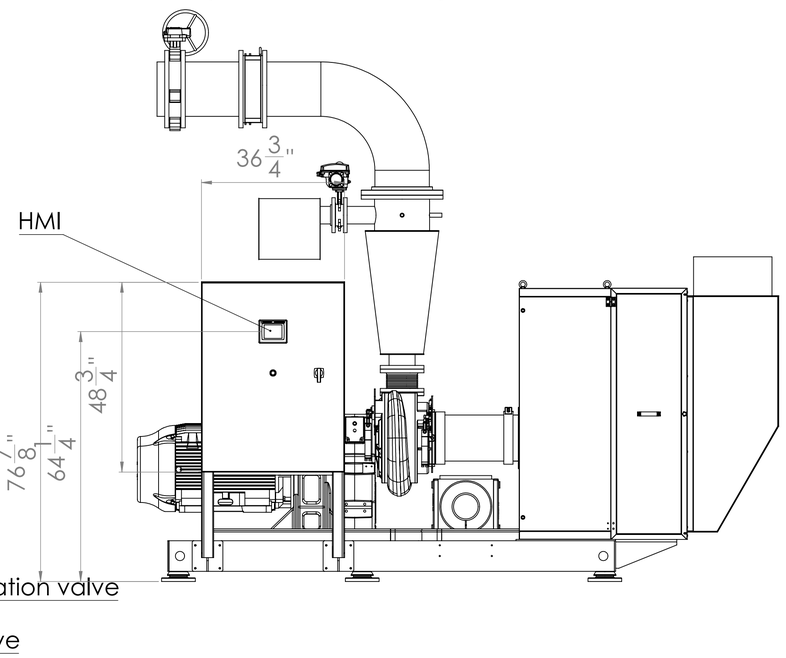


DETTAGLIO E
SCALA 1 : 8



DETTAGLIO F
SCALA 1 : 8





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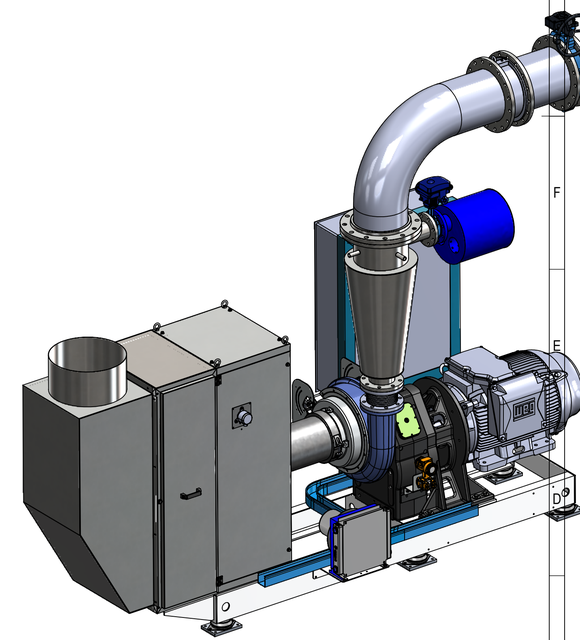

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Revisioni

Dimensioni indicate in Inces
Dimension in Inches

Massa [Kg]
Mass [Kg]

Limiti di fornitura / Battery limits — Altri / By Others — Punto di Sollevamento / Lifting point

Data Approv. / Approval Data: 30/09/2022
Approvato da / Approved by: S. Schiaffino
Note Disegno / Drawing Note:

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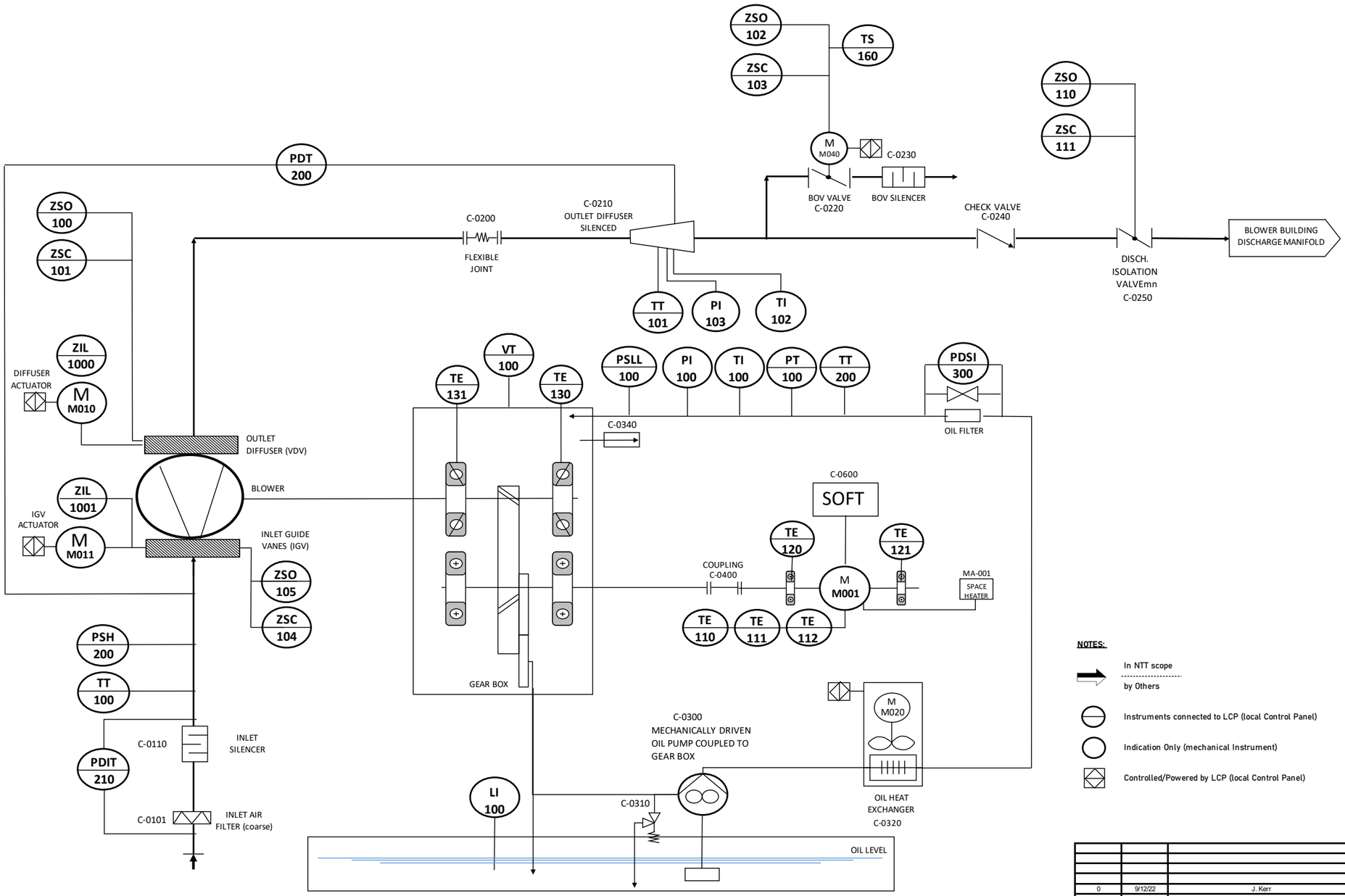
Rev.: 02

NexTurbo TECNOLOGIES



Tag No.	Description
ELECTRICAL INSTRUMENTS	
ZSO-102	Limit switch BOV: open
ZSC-103	Limit switch BOV: close
TS-160	BOV Overload switch
ZSO-110	Limit switch Isolation valve- open
ZSC-111	Limit switch Isolation valve- close
TS-170	Isolation Valve Overload switch
PDSI-300	Oil filter diff. Pressure switch Indicator
TT-101	Discharge temperature transmitter
PDT-200	Diff. Pressure across compressor
TE-120	PT100 in motor bearing
TE-121	PT100 in motor bearing
TE-110	PT100 in motor winding
TE-111	PT100 in motor winding
TE-112	PT100 in motor winding
ZSO-100	VDV limit switch -open
ZSC-101	VDV limit switch -close
ZIL-1000	VDV actuator switch
ZSO-105	IGV limit switch -open
ZSC-104	IGV limit position
ZIL-1001	IGV actuator switch
PDIT-210	Diff pressure across inlet filter
TE-130	PT100 bearing high speed shaft motor end
TE-131	PT100 bearing high speed shaft kompressor end
VT-100	Vibration accelerometer
PSH-200	Surge detector
PSLL-100	Low Low lube oil pressure
PT-100	Lube oil pressure tranmsitter
TT-100	Air inlet temperature
TT-200	Lube oil temperature transmitter

MECH. INSTRUMENTS	
PI-103	Discharge air manometer
TI-102	Discharge air thermometer
LI-100	Lubrication oil level indicator
PI-100	Lubrication oil manometer (downstream oil filter)
TI-100	Lubrication oil thermometer (downstream oil filter)

CONSUMERS	
M-040	BOV motor
M-020	Oil cooler motor
M-001	Main drive motor
MA-001	Motor Space heater
M-010	VDV Actuator
M-011	IGV Actuator

COMPONENTS	
C-0220	BOV
C-0230	BOV silencer (modular)
C-0210	Cone diffuser
C-0200	Flexible Compensator
C-0240	Checkvalve
C-0250	Isolation valve
C-0330	Oil filter
C-0320	Oil cooler
C-0350	Thermostatic 3-way-valve
C-0340	Oil Demister GTB
C-0600	Motor control - SOFT STARTER
C-0400	Motor/Compressor coupling (B5)
C-0101	Inlet Coarse filter (EU2)
C-0110	Inlet silencer
C-0300	Mechanical driven oil pump
C-0310	Lubrication oil safety relief valve

NOTES:

In NTT scope

by Others

Instruments connected to LCP (local Control Panel)

Indication Only (mechanical Instrument)

Controlled/Powered by LCP (local Control Panel)

REV	DATE	APPROVAL
0	9/12/22	J. Kerr

NEXT TURBO TECHNOLOGIES
Via San Francesco 62, 21020 Inarzo (VA) Italy

Doc No.:	Taunton (GTB-T20XY)
Doc Title:	P&I DIAGRAM
Created by:	Portal program
http://www.next-turbo.com	
Format	A3
Scale	NONE
Project :	Taunton
Project No.:	22.0989
Country:	USA

Drawings	Aeration Blower Local Control Panel - CP-6101, CP6201, CP-6301, CP-6401
Project	Wastewater Treatment Facility Phase 2 Improvements
Job Number	22.0989
Created	09/29/22
Modified	11/01/23

Customer	Veolia Water North America - Northeast,LLC
Street	825 West Water Street
City	Taunton
State	MA
Zip Code	02780
Installation Site	Taunton Wastewater Treatment Facility
Contact	8
Phone	9
E-mail	10

NEXT TURBO AMERICAS, LLC
824 Woodswether Rd., East
KANSAS CITY, MO 64105
PHONE: 816-588-6054

PROJECT: Wastewater Treatment Facility Phase 2 Improvements	PAGE TITLE: Cover Page	DRAWN	09/29/22	MODIFIED	11/01/23	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
		NTA		TAW & ARG		22.0989		002	001

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NEXT TURBO AMERICAS, LLC
824 Woodswether Rd., East
KANSAS CITY, MO 64105
PHONE: 816-588-6054

PROJECT:
Wastewater Treatment Facility Phase 2 Improvements

PAGE TITLE:
Table Of Contents

DRAWN	09/29/22	MODIFIED	11/01/23	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
	NTA		TAW & ARG	22.0989		003	002

SYMBOL LIBRARY

Terminal Connection

Interruption Point

Circuit Breaker

Coil

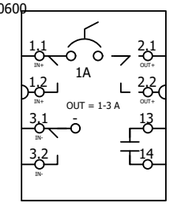
N.O Contacts

N.O Pushbutton

Cable Definition

Male/Female Pin

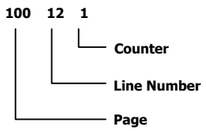
ECB10600



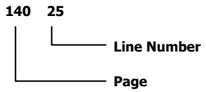
Electronic Breaker

LEGEND KEY

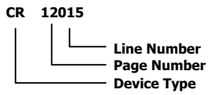
Wire Numbering



Device Cross-Referencing

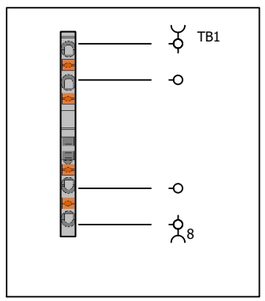


Device Tag Numbering

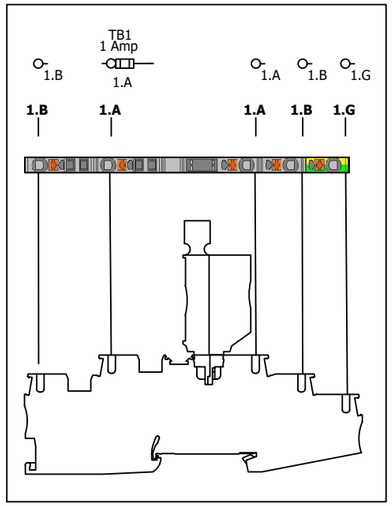


Field Wired Device

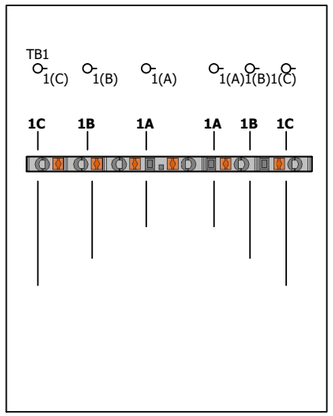
Typical Wiring of a Quatro Terminal Block



Typical Wiring of a Installation Ground Terminal Block



Typical Wiring of a 3 Level Terminal Block



NEXT TURBO AMERICAS, LLC 824 Woodswether Rd., East KANSAS CITY, MO 64105 PHONE: 816-588-6054	PROJECT: Wastewater Treatment Facility Phase 2 Improvements	PAGE TITLE: Legend Key	DRAWN	09/29/22 TTI	MODIFIED	11/07/22 JRH	JOB NUMBER: 22.0989	LOCATION:	NEXT PAGE: 010	PAGE: 003

Parts List

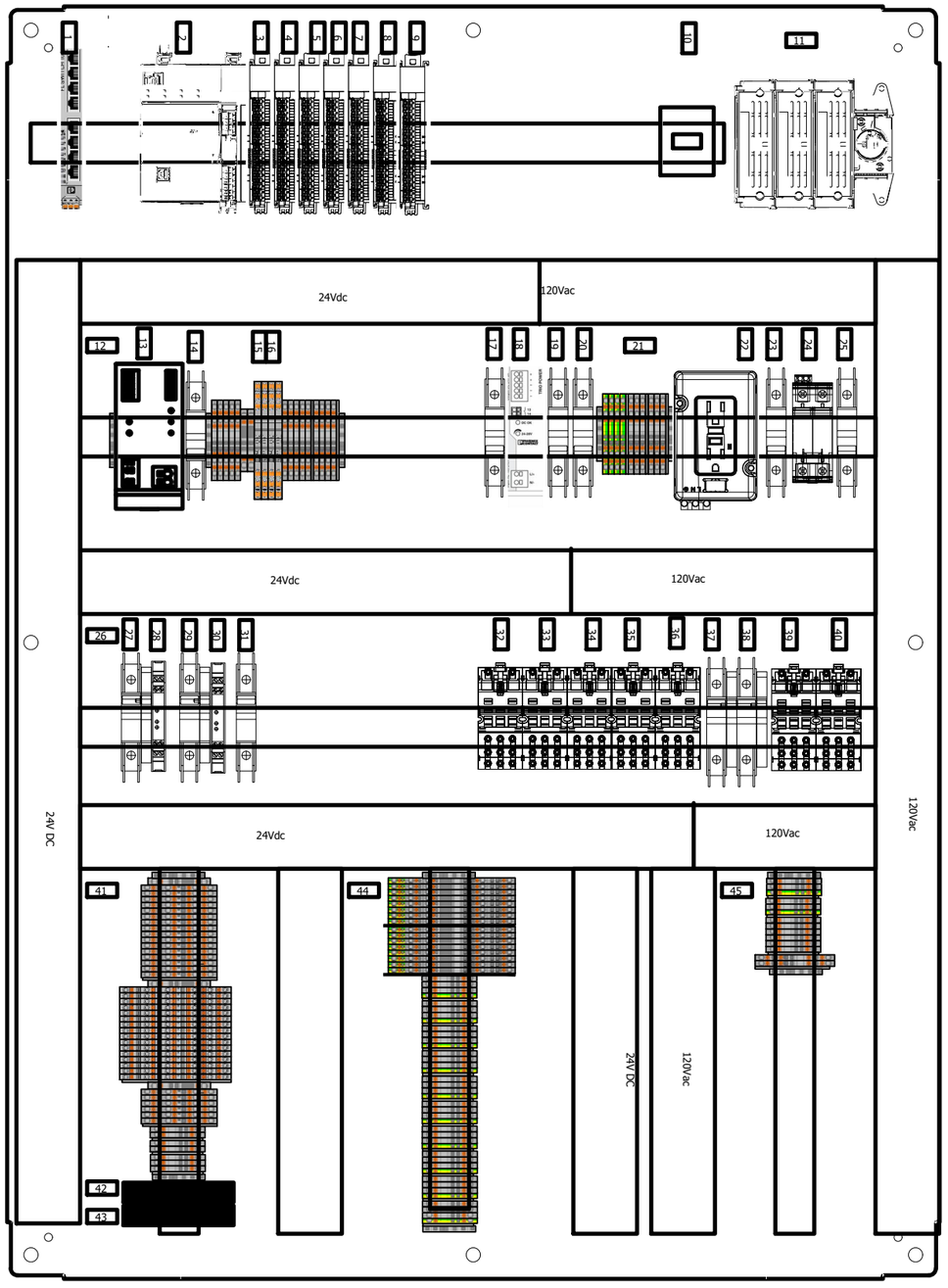
Device Tag	Description	Qty	Order Number	Manufacturer	Mark Of Conformity	Certificate Number
BAS11500	Control Tower Stack Light, 24V AC/DC Full Voltage, Black Housing, Single Circuit Piezo	1	855E-B24SA3	Allen-Bradley	cULus Listed	E14840
BAS11500	Control Tower Stack Light, 24V AC/DC Full Voltage, Amber Steady LED (socket mount)	1	855E-24TL5	Allen-Bradley	cULus Listed	E14840
BAS11500	Control Tower Stack Light Mounting Base, Vertical Mount, Black Housing, No Cap	1	855E-BVM	Allen-Bradley	cULus Listed	E14840
BAT10700A	Battery,Rechargeable,Rectangular,Lead Acid,12VDC,5Ah,Quick Disconnect: 0.25,SLA	1	PS-1250-F2	Power Sonic	UL	MH20845
BAT10700B	Battery,Rechargeable,Rectangular,Lead Acid,12VDC,5Ah,Quick Disconnect: 0.25,SLA	1	PS-1250-F2	Power Sonic	UL	MH20845
CB10000	Thermomagnetic device circuit breaker, Number of positions: 1, Width: 17.6 mm, Mounting type: DIN rail: 35 mm, Color: gray 20 Amp	1	2907640	Phoenix Contact	cUL,cULus	E320373
CB10211	Thermomagnetic device circuit breaker, Number of positions: 1, Width: 17.6 mm, Mounting type: DIN rail: 35 mm, Color: gray 3 Amp	1	2907560	Phoenix Contact	cUL,UL	E320373
CB10304	thermomagnetic Device Circuit Breaker - TMC 81D 10A-2907634	1	2907634	Phoenix Contact	cUL, UL	E320373
CB10304	Thermomagnetic device circuit breaker, Number of positions: 1, Width: 9 mm, Mounting type: Snaps On To Side of Circuit Breaker,Color: gray	1	2908219	Phoenix Contact	cUL,UL	E478429
CB10405	thermomagnetic Device Circuit Breaker - TMC 81D 10A-2907634	1	2907634	Phoenix Contact	cUL, UL	E320373
CB10405	Thermomagnetic device circuit breaker, Number of positions: 1, Width: 9 mm, Mounting type: Snaps On To Side of Circuit Breaker,Color: gray	1	2908219	Phoenix Contact	cUL,UL	E478429
CB10700	Thermomagnetic device circuit breaker, Number of positions: 1, Width: 17.6 mm, Mounting type: DIN rail: 35 mm, Color: gray 6 Amp	1	2907563	Phoenix Contact	cUL,UL	E320373
CB10708	Thermomagnetic device circuit breaker, Number of positions: 1, Width: 17.6 mm, Mounting type: DIN rail: 35 mm, Color: gray 5 Amp	1	2907562	Phoenix Contact	cUL,UL	E320373
CB10800	Thermomagnetic device circuit breaker, Number of positions: 1, Width: 17.6 mm, Mounting type: DIN rail: 35 mm, Color: gray 3 Amp	1	2907560	Phoenix Contact	cUL,UL	E320373
CB10808	Thermomagnetic device circuit breaker, Number of positions: 1, Width: 17.6 mm, Mounting type: DIN rail: 35 mm, Color: gray 5 Amp	1	2907562	Phoenix Contact	cUL,UL	E320373
CB10905	Thermomagnetic device circuit breaker, Number of positions: 1, Width: 17.6 mm, Mounting type: DIN rail: 35 mm, Color: gray 3 Amp	1	2907628	Phoenix Contact	cUL,UL	E320373
CB10905	Thermomagnetic device circuit breaker, Number of positions: 1, Width: 9 mm, Mounting type: Snaps On To Side of Circuit Breaker,Color: gray	1	2908219	Phoenix Contact	cUL,UL	E478429
CB10919	Thermomagnetic device circuit breaker, Number of positions: 1, Width: 17.6 mm, Mounting type: DIN rail: 35 mm, Color: gray 3 Amp	1	2907628	Phoenix Contact	cUL,UL	E320373
CB10919	Thermomagnetic device circuit breaker, Number of positions: 1, Width: 9 mm, Mounting type: Snaps On To Side of Circuit Breaker,Color: gray	1	2908219	Phoenix Contact	cUL,UL	E478429
CB10935	Thermomagnetic device circuit breaker, Number of positions: 1, Width: 17.6 mm, Mounting type: DIN rail: 35 mm, Color: gray 1 Amp	1	2907558	Phoenix Contact	cULus,UL	E320373
CR10508	700-HB General Purpose Square Relay, 10 Amp Standard Contact, 3PDT, 120V 50/60Hz	1	700-HB33A1-3-4	Allen-Bradley	cULus,UL	E3125
CR10508	700-H General Purpose Accessories, 11-Blade Base Socket, Screw Terminals, Guarded Touch Safe Terminal Construction	1	700-HN153	Allen-Bradley	cULus,UL	E3125
CR10511	700-HB General Purpose Square Relay, 10 Amp Standard Contact, 3PDT, 120V 50/60Hz	1	700-HB33A1-3-4	Allen-Bradley	cULus,UL	E3125
CR10511	700-H General Purpose Accessories, 11-Blade Base Socket, Screw Terminals, Guarded Touch Safe Terminal Construction	1	700-HN153	Allen-Bradley	cULus,UL	E3125
CR11506	700-HB General Purpose Square Relay, 10 Amp Standard Contact, 3PDT, 24V	1	700-HB33Z24-3-4	Allen-Bradley	cULus,UL	E3125
CR11506	700-H General Purpose Accessories, 11-Blade Base Socket, Screw Terminals, Guarded Touch Safe Terminal Construction	1	700-HN153	Allen-Bradley	cULus,UL	E3125
CR11508	700-HB General Purpose Square Relay, 10 Amp Standard Contact, 3PDT, 24V	1	700-HB33Z24-3-4	Allen-Bradley	cULus,UL	E3125
CR11508	700-H General Purpose Accessories, 11-Blade Base Socket, Screw Terminals, Guarded Touch Safe Terminal Construction	1	700-HN153	Allen-Bradley	cULus,UL	E3125
CR11510	700-HB General Purpose Square Relay, 10 Amp Standard Contact, 3PDT, 24V	1	700-HB33Z24-3-4	Allen-Bradley	cULus,UL	E3125
CR11510	700-H General Purpose Accessories, 11-Blade Base Socket, Screw Terminals, Guarded Touch Safe Terminal Construction	1	700-HN153	Allen-Bradley	cULus,UL	E3125
CR11512	700-HB General Purpose Square Relay, 10 Amp Standard Contact, 3PDT, 24V	1	700-HB33Z24-3-4	Allen-Bradley	cULus,UL	E3125
CR11512	700-H General Purpose Accessories, 11-Blade Base Socket, Screw Terminals, Guarded Touch Safe Terminal Construction	1	700-HN153	Allen-Bradley	cULus,UL	E3125
DSC10000	194R NextGen Disconnect Switch, Open, Non-Fused, 30 A, 3 Pole	1	194R-N30-1753	Allen-Bradley	UL	UL 98, 508
DSC10000	NFPA 79 internal operating handle with shaft, 12 in	1	194R-N1	Allen-Bradley	Non Critical	Non Critical
DSC10000	Red/Yellow Padlockable handle, standard	1	194R-PY	Allen-Bradley	Non Critical	Non Critical
ECB11000	Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit.	1	2909909	Phoenix Contact	CE, cULus	E123528
ECB11100	Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit.	1	2909909	Phoenix Contact	CE, cULus	E123528
ECB11200	Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit.	1	2909909	Phoenix Contact	CE, cULus	E123528

Parts List

Device Tag	Description	Qty	Order Number	Manufacturer	Mark Of Conformity	Certificate Number
ECB11210	Electronic device circuit breaker - PTCB E1 24DC/1-8A	1	2908262	Phoenix Contact	CE, cULus	E123528
ECR10607	700-HB General Purpose Square Relay, 10 Amp Standard Contact, 3PDT, 24V	1	700-HB33Z24-3-4	Allen-Bradley	cULus,UL	E3125
ECR10607	700-H General Purpose Accessories, 11-Blade Base Socket, Screw Terminals, Guarded Touch Safe Terminal Construction	1	700-HN153	Allen-Bradley	cULus,UL	E3125
EPB10605	Rockwell Automation 800T-FXJ6A4 Non-Illuminated Push-Pull Switch, 30.5 mm, 2NC Contact Configuration, Jumbo Mushroom Head/Push/Pull Operator, Red	1	800T-FX6JA4	Allen-Bradley	UL	E14840
EPB10605	800T Legend Plate, Standard Push-To-Stop/Pull-To-Start	1	800T-X618Y	Allen-Bradley	Non Critical	Non Critical
HM11504	Kubler Hour Meter. 8 Digit Display, 24Vdc	1	AH5724VDC	Kubler	UL	E128604
LIO11300	5069 Compact I/O 16 Channel 24V DC Sink Input Module	1	5069-IB16	Allen-Bradley	CE, cULus	E322657
LIO11300	5069 Compact I/O 18 pins Spring type terminal block kit in a pack of 5pcs	1	5069-RTB18-SPRING	Allen-Bradley	CE, cULus	E334470
LIO11400	5069 Compact I/O 16 Channel 24V DC Sink Input Module	1	5069-IB16	Allen-Bradley	CE, cULus	E322657
LIO11400	5069 Compact I/O 18 pins Spring type terminal block kit in a pack of 5pcs	1	5069-RTB18-SPRING	Allen-Bradley	CE, cULus	E334470
LIO11500	5069 Compact I/O 16 Channel 24V DC Source Output Module	1	5069-OB16	Allen-Bradley	CE, cULus	E322657
LIO11500	5069 Compact I/O 18 pins Spring type terminal block kit in a pack of 5pcs	1	5069-RTB18-SPRING	Allen-Bradley	CE, cULus	E334470
LIO11600	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module	1	5069-IF8	Allen-Bradley	cUL,UL	E65584
LIO11600	5069 Compact I/O 18 pins Spring type terminal block kit in a pack of 5pcs	1	5069-RTB18-SPRING	Allen-Bradley	CE, cULus	E334470
LIO11700	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module	1	5069-IF8	Allen-Bradley	cUL,UL	E65584
LIO11700	5069 Compact I/O 18 pins Spring type terminal block kit in a pack of 5pcs	1	5069-RTB18-SPRING	Allen-Bradley	CE, cULus	E334470
LIO11800	5069 Compact I/O 4 Channel Universal Voltage/Current/RTD/TC Analog Input Module	1	5069-IY4	Allen-Bradley	CE, cULus	E322657
LIO11800	5069 Compact I/O 14 pins Spring type terminal block with embedded CJC thermistors kit in a pack of 5 pcs	1	5069-RTB14CJC-SPRING	Allen-Bradley	CE, cULus	E334470
LIO11900	5069 Compact I/O 4 Channel Universal Voltage/Current/RTD/TC Analog Input Module	1	5069-IY4	Allen-Bradley	CE, cULus	E322657
LIO11900	5069 Compact I/O 14 pins Spring type terminal block with embedded CJC thermistors kit in a pack of 5 pcs	1	5069-RTB14CJC-SPRING	Allen-Bradley	CE, cULus	E334470
LT10935	Wiegmann LED Strip Light, 24-265V AC/DC, Motion Sensor, Magnet and Screw Mount, 14" Long	1	SL24265VMS	Wiegmann	cULus Listed	
LT10935	Wiegmann LED Strip Femail Connector	1	CSLF	Wiegmann	cULus Listed	
NSW11000	Narrow Ethernet switch, eight RJ45 ports with 10/100 Mbps on all ports, automatic data transmission speed detection, autocrossing function, and QoS	1	1085256	Phoenix Contact	cUL,UL	E140403
OIT11100	PanelView 5310, 9 in. Wide Display , Touch screen, Wide aspect ration Color, 24V DC, Single Ethernet port	1	2713P-T9WD1	Allen-Bradley	CE, cULus	E113724
PLC11200	CompactLogix 5380 Controller, 1 MB, 8 I/Os, 24 nodes, Standard	1	5069-L310ER	Allen-Bradley	cUL,UL	NRAQ.E65584
PLC11200	5069 Compact I/O Power terminal RTB kit for both 4 and 6 pin Screw type	1	5069-RTB64-SPRING	Allen-Bradley	CE, cULus	E334470
PNL050	Enclosure, Stainless Steel 304, NEMA 4X, 48"H x 36"W x 12"D	1	48EL3612SSLPPL	Saginaw	cUL,UL	E69392
PNL050	Saginaw 48 X 36 Galvinized Back Panel	1	SCE-48P36GALV	Saginaw	cUL,UL	E69392
PNL050	Foot Kit, EL Mounting (4pc.),	1	ELMFK4	Saginaw	Non Critical	Non Critical
PWS10800	Primary-switched TRIO POWER power supply with push-in connection for DIN rail mounting, input: 1-phase, output: 24 V DC/5 A	1	2903148	Phoenix Contact	cUL,UL	E123528
REC10211	1492 DIN Rail Receptacle, 15 Amp, Gound Fault Current Interrupt	1	1492-REC15G	Allen-Bradley	UL, c-UL-us	E54866
SSR10905	Electronic reversing load relay, for controlling DC motors, with LED display and protective circuit, output: 10 - 30 V DC/6 A with a switch-over time of 80 ms	1	2982090	Phoenix Contact	UL	E228652
SSR10919	Electronic reversing load relay, for controlling DC motors, with LED display and protective circuit, output: 10 - 30 V DC/6 A with a switch-over time of 80 ms	1	2982090	Phoenix Contact	UL	E228652
SUP10200	Phoenix Contact Type 2 Surge Protection Device, 120 Vac, 2-wire Plus Ground	1	2910349	Phoenix Contact	cUL,UL	E330181
TB1	Disconnect terminal block, nom. voltage: 400 V, nominal current: 20 A, connection method: Push-in connection.	2	3211922	Phoenix Contact	cULus	E60425
TB1	End cover, Length: 56 mm, Width: 2.2 mm, Height: 36.5 mm, Color: gray	2	3030420	Phoenix Contact	Non Critical	Non Critical
TB1	Fuse plug, Nominal current: 6.3 A, Width: 5.2 mm, Fuse type: G / 5 x 20, Fuse type: Glass, Mounting type: Plug-in mounting, Color: black	2	3209248	Phoenix Contact	UL, CSA, CE	E60425
TB1	PT 2,5-QUATTRO, Feed-through terminal block, Connection method: Push-in connection, Cross section: 0.14 mm² - 4 mm², AWG: 26 - 12, Width: 5.2 mm, Color: gray	16	3209578	Phoenix Contact	UL, CSA, CE	E60425

Parts List

Device Tag	Description	Qty	Order Number	Manufacturer	Mark Of Conformity	Certificate Number
TB1	End clamp, Width: 5.15 mm, Height: 35 mm, Length: 48.5 mm, Color: gray	2	3022276	Phoenix Contact	Non Critical	Non Critical
TB1	End cover, Length: 72 mm, Width: 2.2 mm, Height: 36.5 mm, Color: gray	6	3030514	Phoenix Contact	Non Critical	Non Critical
TB2	Feed-through terminal block, Connection method: Push-in connection, Cross section: 0.5 mm² - 10 mm², AWG: 20 - 8, Width: 8.2 mm, Height: 42.2 mm, Color: gray, Mounting type: NS 35/7,5, NS 35/15	3	3211813	Phoenix Contact	cULus,UL	E192998
TB2	PT 2,5-QUATTRO, Feed-through terminal block, Connection method: Push-in connection, Cross section: 0.14 mm² - 4 mm², AWG: 26 - 12, Width: 5.2 mm, Color: gray	6	3209578	Phoenix Contact	UL, CSA, CE	E60425
TB2	End clamp, Width: 5.15 mm, Height: 35 mm, Length: 48.5 mm, Color: gray	2	3022276	Phoenix Contact	Non Critical	Non Critical
TB2	PT 2,5-QUATTRO-PE, Ground modular terminal block, Connection method: Push-in connection, Cross section: 0.14 mm² - 4 mm², AWG: 26 - 12, Width: 5.2 mm, Height: 35.3 mm, Color: green-yellow	4	3209594	Phoenix Contact	UL, CSA, CE	E60425
TB2	End cover, Length: 72 mm, Width: 2.2 mm, Height: 36.5 mm, Color: gray	3	3030514	Phoenix Contact	Non Critical	Non Critical
TB4	Disconnect terminal block, nom. voltage: 400 V, nominal current: 20 A, connection method: Push-in connection.	3	3211922	Phoenix Contact	cULus	E60425
TB4	End cover, Length: 56 mm, Width: 2.2 mm, Height: 36.5 mm, Color: gray	3	3030420	Phoenix Contact	Non Critical	Non Critical
TB4	Fuse plug, Nominal current: 6.3 A, Width: 5.2 mm, Fuse type: G / 5 x 20, Fuse type: Glass, Mounting type: Plug-in mounting, Color: black	3	3209248	Phoenix Contact	UL, CSA, CE	E60425
TB4	End clamp, Width: 5.15 mm, Height: 35 mm, Length: 48.5 mm, Color: gray	1	3022276	Phoenix Contact	Non Critical	Non Critical
TB4	Double-level terminal block, Cross section: 0.14 mm² - 4 mm², AWG: 26 - 12, Connection type: Push-in connection, Width: 5.2 mm, Color: gray, Mounting type: NS 35/7,5, NS 35/15	22	3210567	Phoenix Contact	cULus	E60425
TB4	End cover, Length: 68 mm, Width: 2.2 mm, Color: gray	1	3211634	Phoenix Contact	Non Critical	Non Critical
TB4	Multi-level terminal block, Cross section: 0.14 mm² - 4 mm², AWG: 26 - 12, Connection type: Push-in connection, Width: 5.2 mm, Color: gray, Mounting type: NS 35/7,5, NS 35/15	12	3210499	Phoenix Contact	cULus	E60425
TB4	End cover, Length: 102.2 mm, Width: 2.2 mm, Height: 50.2 mm, Color: gray	1	3211647	Phoenix Contact	Non Critical	Non Critical
TB4	Feed-through terminal block, Connection method: Push-in connection, Cross section: 0.5 mm² - 10 mm², AWG: 20 - 8, Width: 8.2 mm, Height: 42.2 mm, Color: gray, Mounting type: NS 35/7,5, NS 35/15	6	3211813	Phoenix Contact	cULus,UL	E192998
TB4	End cover, Length: 48.6 mm, Width: 2.2 mm, Height: 29.1 mm, Color: gray	2	3030417	Phoenix Contact	Non Critical	Non Critical
TB5	Installation ground terminal block, Push-in connection, Cross section: 0.14 mm² - 4 mm², AWG: 26 - 12, Width: 5.2 mm, Color: gray, Mounting type: NS 35/7,5, NS 35/15	16	3210539	Phoenix Contact	UL, CSA, CE	E60425
TB5	Fuse plug, Nominal current: 6.3 A, Width: 5.2 mm, Fuse type: G / 5 x 20, Fuse type: Glass, Mounting type: Plug-in mounting, Color: black	16	3209248	Phoenix Contact	UL, CSA, CE	E60425
TB5	500 mA 5 x 20 Glass Type Mini Fuse	16	GMA-500-R	Bussman	UL, CSA	E19180
TB5	Feed-through terminal block, Connection method: Push-in connection, Cross section: 0.5 mm² - 10 mm², AWG: 20 - 8, Width: 8.2 mm, Height: 42.2 mm, Color: gray, Mounting type: NS 35/7,5, NS 35/15	30	3211813	Phoenix Contact	cULus,UL	E192998
TB5	PT 2,5-PE, Ground modular terminal block, Connection method: Push-in connection, Cross section: 0.14 mm² - 4 mm², AWG: 26 - 12, Width: 5.2 mm, Color: green-yellow	10	3209536	Phoenix Contact	UL, CSA, CE	E60425
TB5	End cover, Length: 48.6 mm, Width: 2.2 mm, Height: 29.1 mm, Color: gray	10	3030417	Phoenix Contact	Non Critical	Non Critical
TB5	End clamp, Width: 5.15 mm, Height: 35 mm, Length: 48.5 mm, Color: gray	2	3022276	Phoenix Contact	Non Critical	Non Critical
TB6	Feed-through terminal block, Connection method: Push-in connection, Cross section: 0.5 mm² - 10 mm², AWG: 20 - 8, Width: 8.2 mm, Height: 42.2 mm, Color: gray, Mounting type: NS 35/7,5, NS 35/15	11	3211813	Phoenix Contact	cULus,UL	E192998
TB6	End clamp, Width: 5.15 mm, Height: 35 mm, Length: 48.5 mm, Color: gray	3	3022276	Phoenix Contact	Non Critical	Non Critical
TB6	PT 2,5-PE, Ground modular terminal block, Connection method: Push-in connection, Cross section: 0.14 mm² - 4 mm², AWG: 26 - 12, Width: 5.2 mm, Color: green-yellow	2	3209536	Phoenix Contact	UL, CSA, CE	E60425
TB6	End cover, Length: 48.6 mm, Width: 2.2 mm, Height: 29.1 mm, Color: gray	3	3030417	Phoenix Contact	Non Critical	Non Critical
TB6	PT 2,5-QUATTRO, Feed-through terminal block, Connection method: Push-in connection, Cross section: 0.14 mm² - 4 mm², AWG: 26 - 12, Width: 5.2 mm, Color: gray	2	3209578	Phoenix Contact	UL, CSA, CE	E60425
TB6	End cover, Length: 72 mm, Width: 2.2 mm, Height: 36.5 mm, Color: gray	1	3030514	Phoenix Contact	Non Critical	Non Critical
UPS10700	Uninterruptible power supply with integrated power supply unit. For lead AGM energy storage with 1.3 Ah to 12 Ah nominal capacity. Input: 1-phase, output: 24 V DC/5 A. Push-in connection technology	1	2907160	Phoenix Contact	UL	E123528



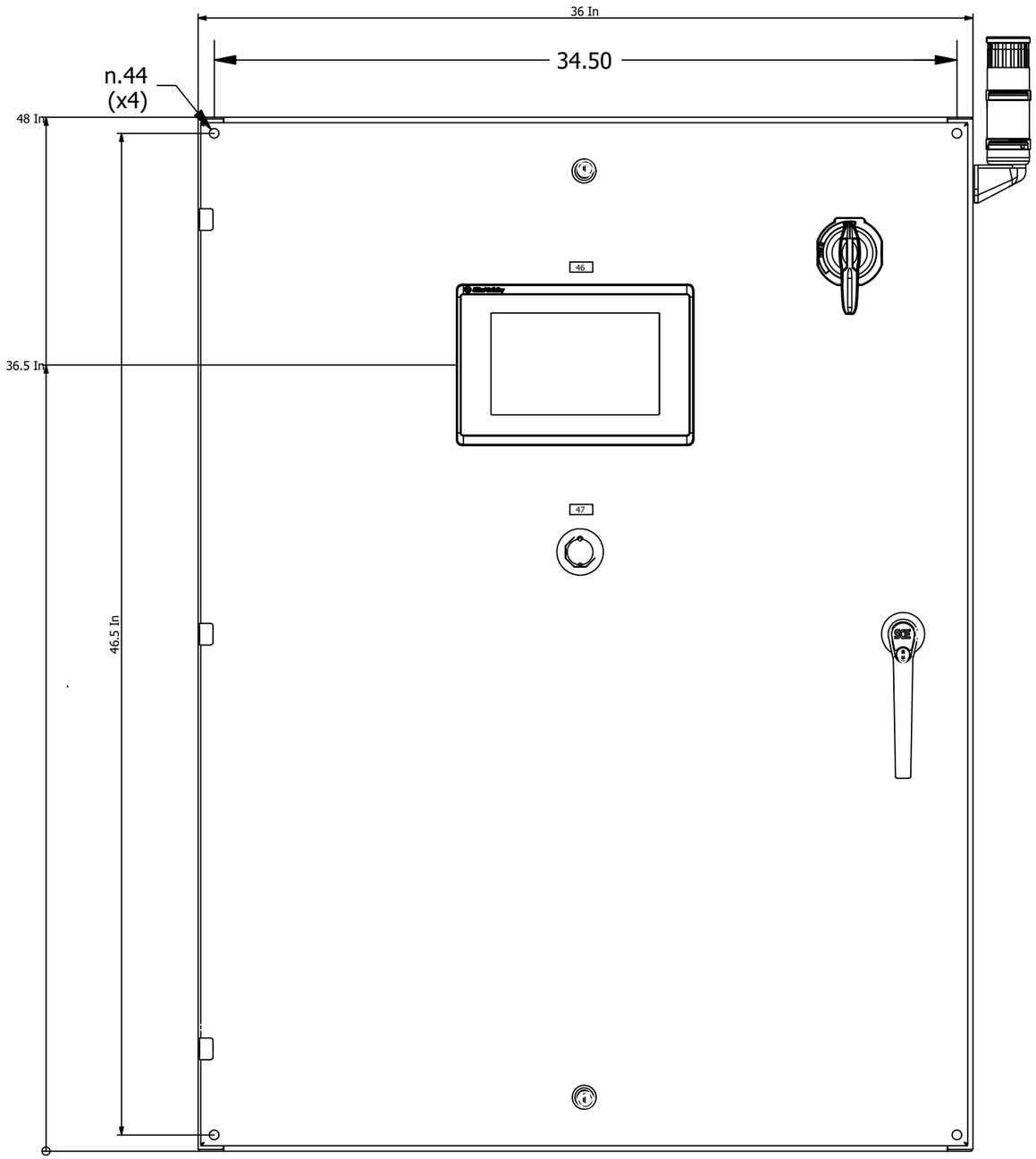
Label #	Device Tag	Description
1	NSW11000	Network Switch
2	PLC11200	PLC Proccessor
3	LIO11300	DC Input Module
4	LIO11400	DC Input Module
5	LIO11500	DC Output Module
6	LIO11600	Analog Input Module
7	LIO11700	Analog Input Module
8	LIO11800	Analog Input Module
9	LIO11900	Analog Input Module
10	HM11504	Hour Meter
11	DSC10000	Incoming Power Disconnect Switch
12	TB1	Terminal Block 1
13	UPS 10711	24VDC UPS
14	CB10708	Control Power Secondary Braker
15	ECB11100 ECB11000	OIT11100 Power Breaker NSW11000 Power Breaker
16	ECB11200 ECB11210	PLC11200 SA Power Breaker PLC11200 MOD Power Breaker
17	CB10808	Field Power Secondary Breaker
18	PWS10800	Field Power Supply
19	CB10700	Control Power Primary Breaker
20	CB10800	Field Power Primary Breaker
21	TB2	Terminal Block 2
22	REC10211	120VAC Outlet
23	CB10211	REC10211 Breaker
24	SUP10200	Surge Protector
25	CB10200	120VAC Incoming Breaker
26	TB3	Terminal Block 3
27	CB10905	Diffusser Actuator Power Breaker
28	SSR10905	Diffuser Actuator Load Relay
29	CB10919	Inlet Guide Vane Actuator Power Breaker
30	SSR10919	Inlet Guide Vane Actuator Load Relay
31	CB10935	Panel Light Breaker
32	CR11506	Blower Run Command Relay
33	CR11508	Blow Off Valve Close Relay
34	CR11514	Blow Off Valve Open Relay
35	CR11516	Oil Cooler Fan Relay
36	ECR10607	Estop Relay
37	CB10306	Blow Off Valve Power Breaker
38	CB10405	Oil Cooler Fan Power Breaker
39	CR10508	Blower Run Confirmation Relay
40	CR10511	Blower Alarm Relay
41	TB4	Terminal Block 4
42	ZIL10910	Diffusser Actuator Feedback
43	ZIL10923	Inlet Guide Vane Actuator Feedback
44	TB5	Terminal Block 5
45	TB6	Terminal Block 6
46	OIT11100	Panel View
47	EPB10605	E-Stop
48	BAS11500	Stack Light

NEXT TURBO AMERICAS, LLC
507 OAK ST.
KANSAS CITY, MO 64106
PHONE: 816-588-6054

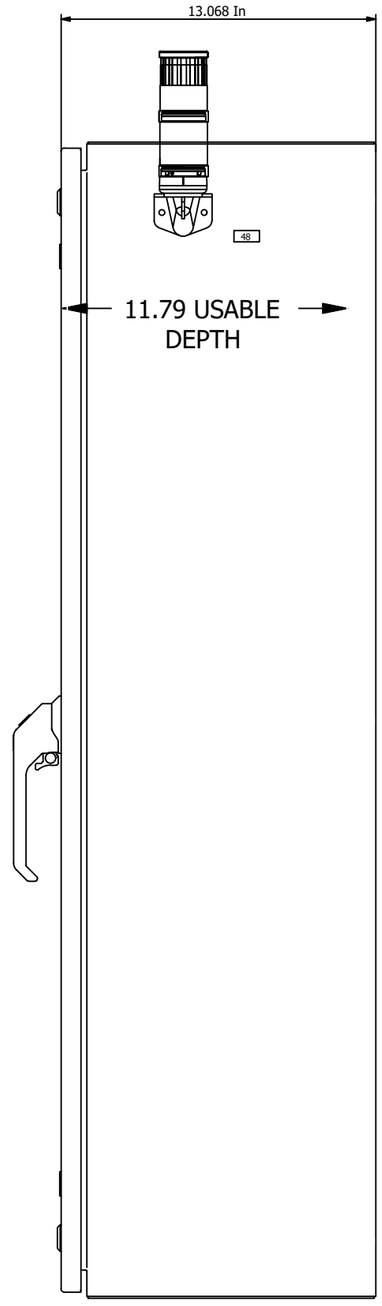
PROJECT:
Wastewater Treatment Facility Phase 2 Improvements

PAGE TITLE:
Back Panel Layout

DRAWN	09/29/22	MODIFIED	11/11/22	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
	TTI		JRH	22.0989	CP-6101	051	050



FRONT VIEW



RIGHT SIDE VIEW

NEXT TURBO AMERICAS, LLC
824 Woodswether Rd., East
KANSAS CITY, MO 64105
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PROJECT:	PAGE TITLE:	DRAWN	09/29/22	MODIFIED	11/14/22	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
Wastewater Treatment Facility Phase 2 Improvements	Enclosure Layout		TTI		JRH	22.0989	LOCAL	052	051

TB4			
Voltage:	24VDC		
Term. #	Description	Wire #	Page
8U	Blow Off Valve Closed Feedback	103071	103/113
8L	Blow Off Valve Closed Feedback	113021	103/113
9U	Blow Off Valve Open Feedback	103101	103/113
9L	Blow Off Valve Open Feedback	113021	103/113
10U	Blow Off Valve Monitor Relay	103131	103/113
10L	Blow Off Valve Monitor Relay	113021	103/113
11U	Blow Off Valve In Remote Relay	103161	103/113
11L	Blow Off Valve In Remote Relay	113021	103/113
13U	Discharge Valve Closed	113241	113
13L	Discharge Valve Closed	113021	113
14U	Discharge Valve Open	113261	113
14L	Discharge Valve Open	113021	113
16U	Diffuser Actuator Closed	113301	113
16L	Diffuser Actuator Closed	113021	113
17U	Diffuser Actuator Open	113321	113
17L	Diffuser Actuator Open	113021	113
20A	Inlet Guide Vane Actuator Closed	114041	114
20B	Inlet Guide Vane Actuator Closed	114021	114
21A	Inlet Guide Vane Actuator Open	114061	114
21B	Inlet Guide Vane Actuator Open	114021	114
23A	Low Oil Pressure Switch	114102	114
23B	Low Oil Pressure Switch	114021	114
23C	Low Oil Pressure Switch	C24	114
24A	Surge Detector Switch	114121	114
24B	Surge Detector Switch	114021	114
24C	Surge Detector Switch	C24	114
25A	Oil Filter Differential Switch	114141	114
25B	Oil Filter Differential Switch	114021	114
25C	Oil Filter Differential Switch	C24	114
42	Diffusser Actuator Power	109052	109
43	Diffusser Actuator Power	109071	109
44	Inlet Guide Vane Actuator Power	109212	109
45	Inlet Guide Vane Actuator Power	109231	109
46	Blow Off Valve +24Vdc	103121	103
47	Blow Off Valve Open	103131	103
48	Blow Off Valve Close	103141	103

TB5			
Voltage:	4-20mA Analog Inputs		
Term. #	Description	Wire #	Page
1A	Blower Motor Amps	105131	105/116
1B	Blower Motor Amps	1H24	105/116
1G	Blower Motor Amps	PE	116
2A	Diffuser Actuator Position	109122	109/116
2B	Diffuser Actuator Position	109132	109/116
2G	Diffuser Actuator Position	PE	116
3A	Inlet Guide Actuator Position	109312	109/116
3B	Inlet Guide Actuator Position	109322	109/116
3G	Inlet Guide Actuator Position	PE	116
4A	Air Filter Differential Pressure	116141	116
4B	Air Filter Differential Pressure	1H24	116
4G	Air Filter Differential Pressure	PE	116
5A	Inlet/Outlet Differential Pressure	116181	116
5B	Inlet/Outlet Differential Pressure	1H24	116
5G	Inlet/Outlet Differential Pressure	PE	116
6A	Inlet Air Temp	116221	116
6B	Inlet Air Temp	1H24	116
6G	Inlet Air Temp	PE	116
7A	Oil Pressure Transmitter	116261	116
7B	Oil Pressure Transmitter	1H24	116
7G	Oil Pressure Transmitter	PE	116
8A	Oil Temp Transmitter	116301	116
8B	Oil Temp Transmitter	1H24	116
8G	Oil Temp Transmitter	PE	116
9A	Gearbox Vibration Transmitter	117021	117
9B	Gearbox Vibration Transmitter	1H24	117
9G	Gearbox Vibration Transmitter	PE	117
10A	Discharge Air Temp Transmitter	117061	117
10B	Discharge Air Temp Transmitter	1H24	117
10G	Discharge Air Temp Transmitter	PE	117
17	Main Motor Winding "U" RTD	118061	118
18	Main Motor Winding "U" RTD	118081	118
19	Main Motor Winding "U" RTD	118101	118
20	Main Motor Winding "U" RTD	PE	118
21	Main Motor Winding "V" RTD	118121	118
22	Main Motor Winding "V" RTD	118141	118
23	Main Motor Winding "V" RTD	118161	118
24	Main Motor Winding "V" RTD	PE	118

TB5			
Voltage:	4-20mA Analog Inputs		
Term. #	Description	Wire #	Page
25	Main Motor Winding "W" RTD	118181	118
26	Main Motor Winding "W" RTD	118201	118
27	Main Motor Winding "W" RTD	118221	118
28	Main Motor Winding "W" RTD	PE	118
29	Main Motor Bearing "DE" RTD	118281	118
30	Main Motor Bearing "DE" RTD	118301	118
31	Main Motor Bearing "DE" RTD	118321	118
32	Main Motor Bearing "DE" RTD	PE	118
33	Main Motor Bearing "NDE" RTD	119061	119
34	Main Motor Bearing "NDE" RTD	119081	119
35	Main Motor Bearing "NDE" RTD	119101	119
36	Main Motor Bearing "NDE" RTD	PE	119
37	Gearbox Shaft Bearing "DE" RTD	119121	119
38	Gearbox Shaft Bearing "DE" RTD	119141	119
39	Gearbox Shaft Bearing "DE" RTD	119161	119
40	Gearbox Shaft Bearing "DE" RTD	PE	119
41	Gearbox Shaft Bearing "NDE" RTD	119181	119
42	Gearbox Shaft Bearing "NDE" RTD	119201	119
43	Gearbox Shaft Bearing "NDE" RTD	119221	119
44	Gearbox Shaft Bearing "NDE" RTD	PE	119
49	Diffusser Actuator Pot	109121	109
50	Diffusser Actuator Pot	109131	109
51	Diffusser Actuator Pot	109141	109
52	Diffusser Actuator Pot	PE	109
53	Inlet Guide Vane Actuator Pot	109281	109
54	Inlet Guide Vane Actuator Pot	109291	109
55	Inlet Guide Vane Actuator Pot	109301	109
55	Inlet Guide Vane Actuator Pot	PE	109

TB6			
Voltage:	120VAC		
Term. #	Description	Wire #	Page
1	Blower Off Valve (L)	103061	103
2	Blower Off Valve (N)	N120	103
3	Blower Off Valve (PE)	PE	103
4	Oil Cooler Fan (L)	104052	104
5	Oil Cooler Fan (N)	N120	104
6	Oil Cooler Fan (PE)	PE	104
7	Blower Run Command	106053	105
8	Blower Run Command	105091	105
9	Blower Run Comfirmation	106141	105
10	Blower Run Comfirmation	105081	105
11	Blower Alarm	106141	105
12	Blower Alarm	105111	105

NEXT TURBO AMERICAS, LLC
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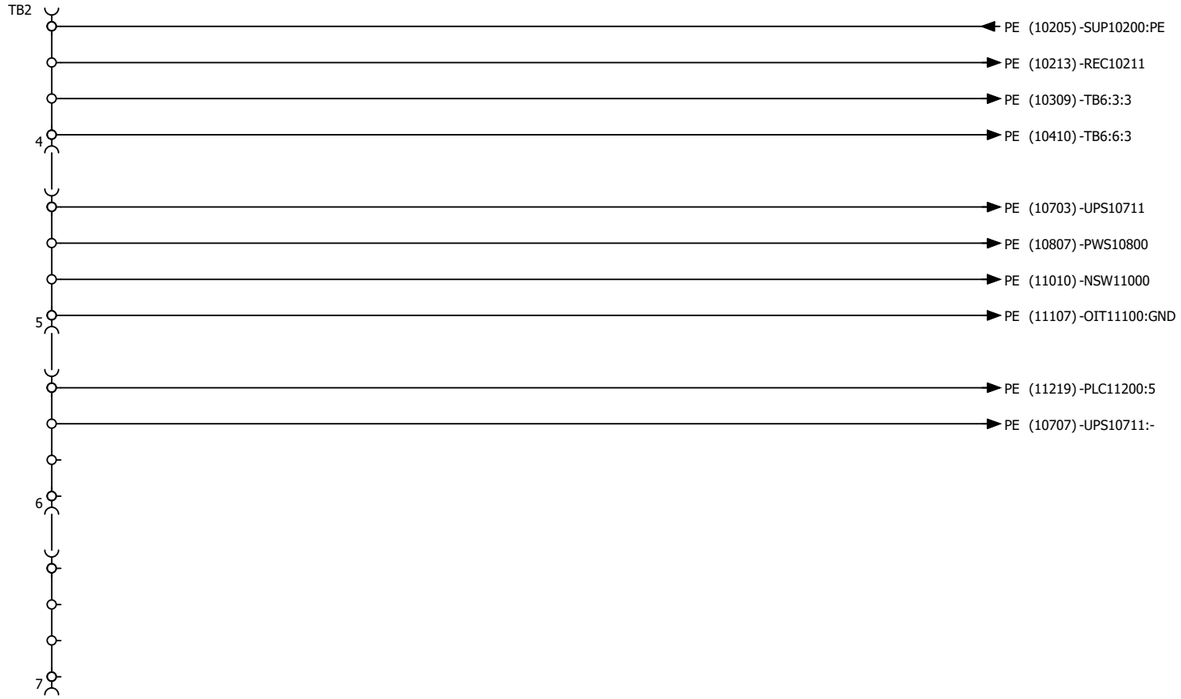
PROJECT:	PAGE TITLE:	DRAWN	09/29/22	MODIFIED	06/01/23	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
Wastewater Treatment Facility Phase 2 Improvements	120V AC Incoming Power Distribution		TTI		JRH	22.0989	LOCAL	101	100



NEXT TURBO AMERICAS, LLC 824 Woodswether Rd., East KANSAS CITY, MO 64105 PHONE: 816-588-6054	PROJECT: Wastewater Treatment Facility Phase 2 Improvements	PAGE TITLE: PE Ground Distribution	DRAWN	09/29/22	MODIFIED	06/01/23	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
				TTI		JRH	22.0989	LOCAL	102	101

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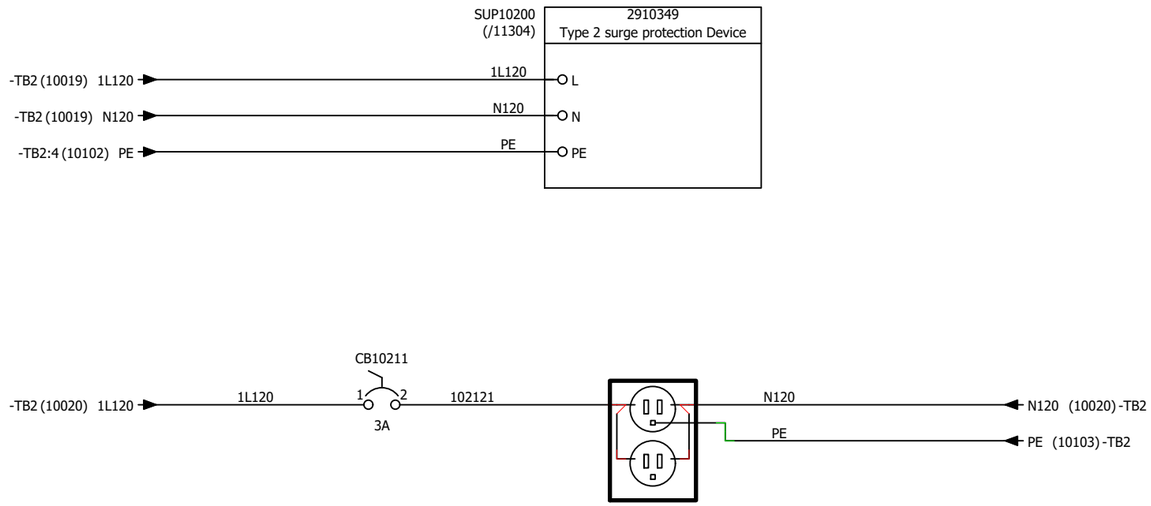
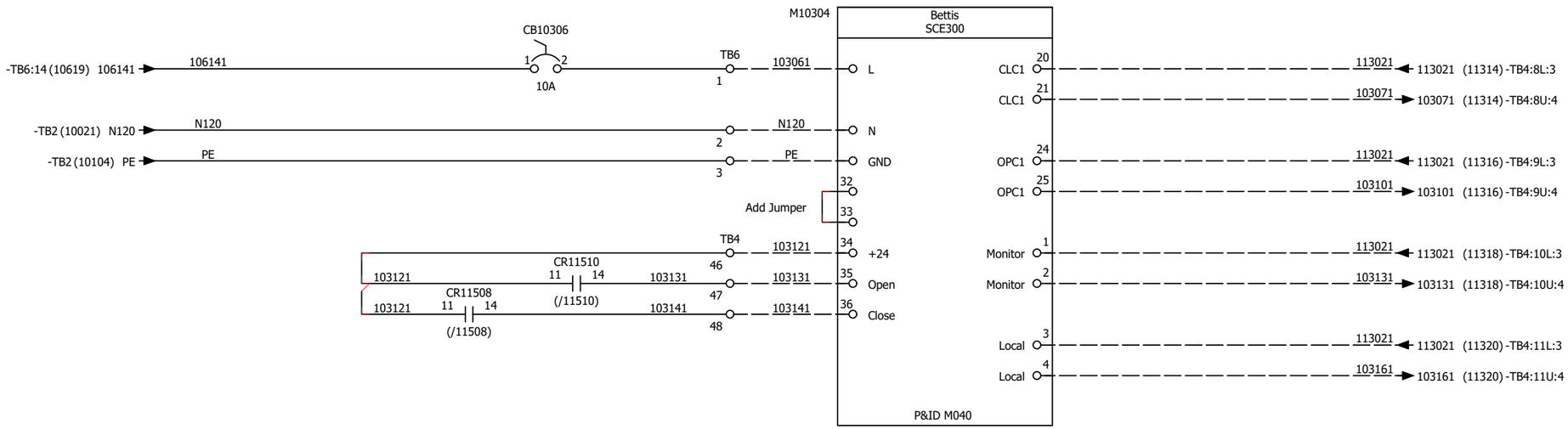


NEXT TURBO AMERICAS, LLC 824 Woodswether Rd., East KANSAS CITY, MO 64105 PHONE: 816-588-6054	PROJECT: Wastewater Treatment Facility Phase 2 Improvements	PAGE TITLE: Surge Suppresor/Recepticle	DRAWN	09/29/22 TTI	MODIFIED	05/15/23 JRH	JOB NUMBER: 22.0989	LOCATION: LOCAL	NEXT PAGE: 103	PAGE: 102



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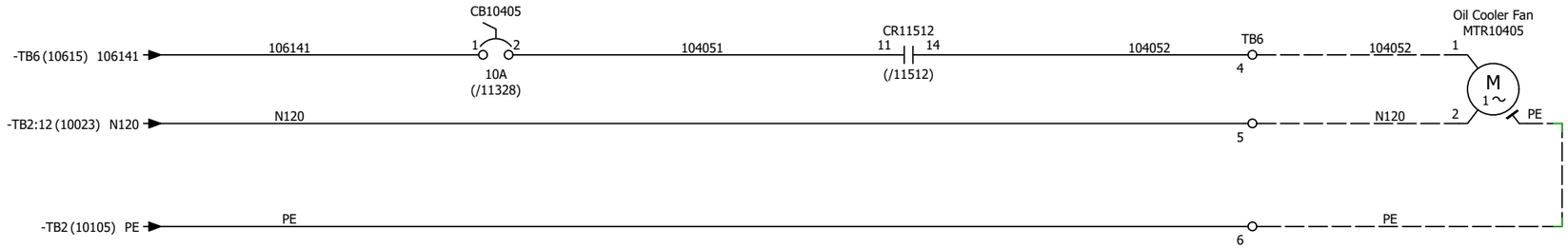
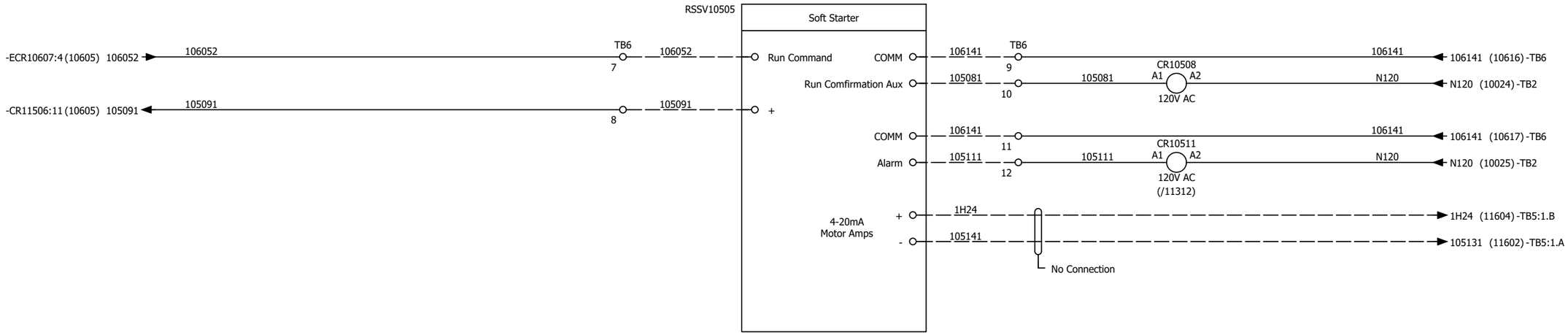
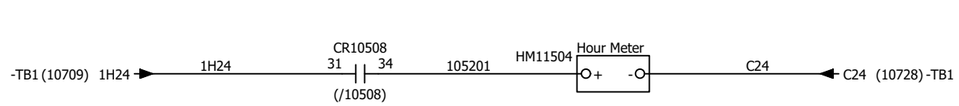
PROJECT:	PAGE TITLE:	DRAWN	09/29/22	MODIFIED	06/01/23	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
Wastewater Treatment Facility Phase 2 Improvements	120V AC Blow Off Valve		TTI		JRH	22.0989	LOCAL	104	103



NEXT TURBO AMERICAS, LLC 824 Woodswether Rd., East KANSAS CITY, MO 64105 PHONE: 816-588-6054	PROJECT: Wastewater Treatment Facility Phase 2 Improvements	PAGE TITLE: 120V AC Oil Cooler Fan	DRAWN	09/29/22	MODIFIED	05/15/23	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
				TTI		JRH	22.0989	LOCAL	105	104





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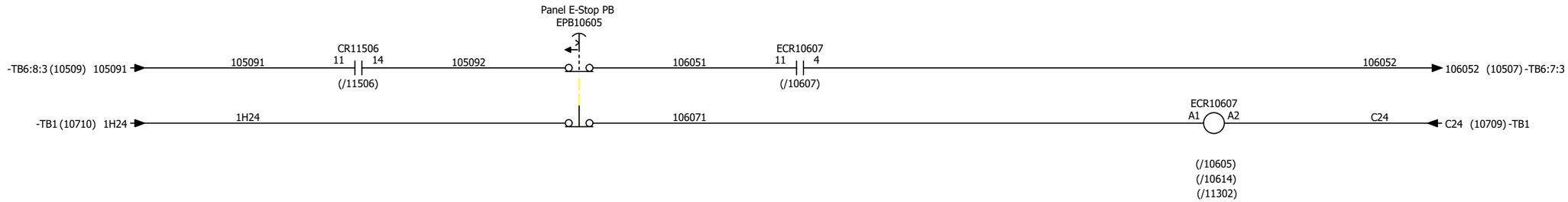
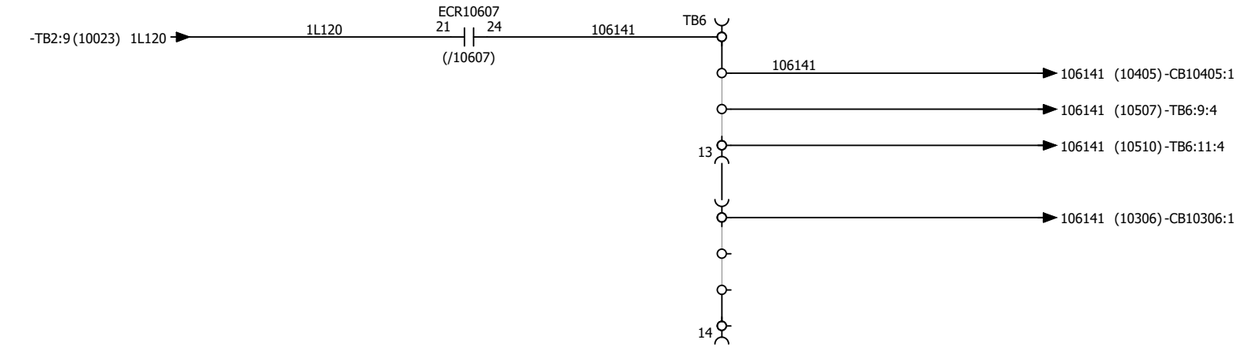
PROJECT:
Wastewater Treatment Facility Phase 2 Improvements

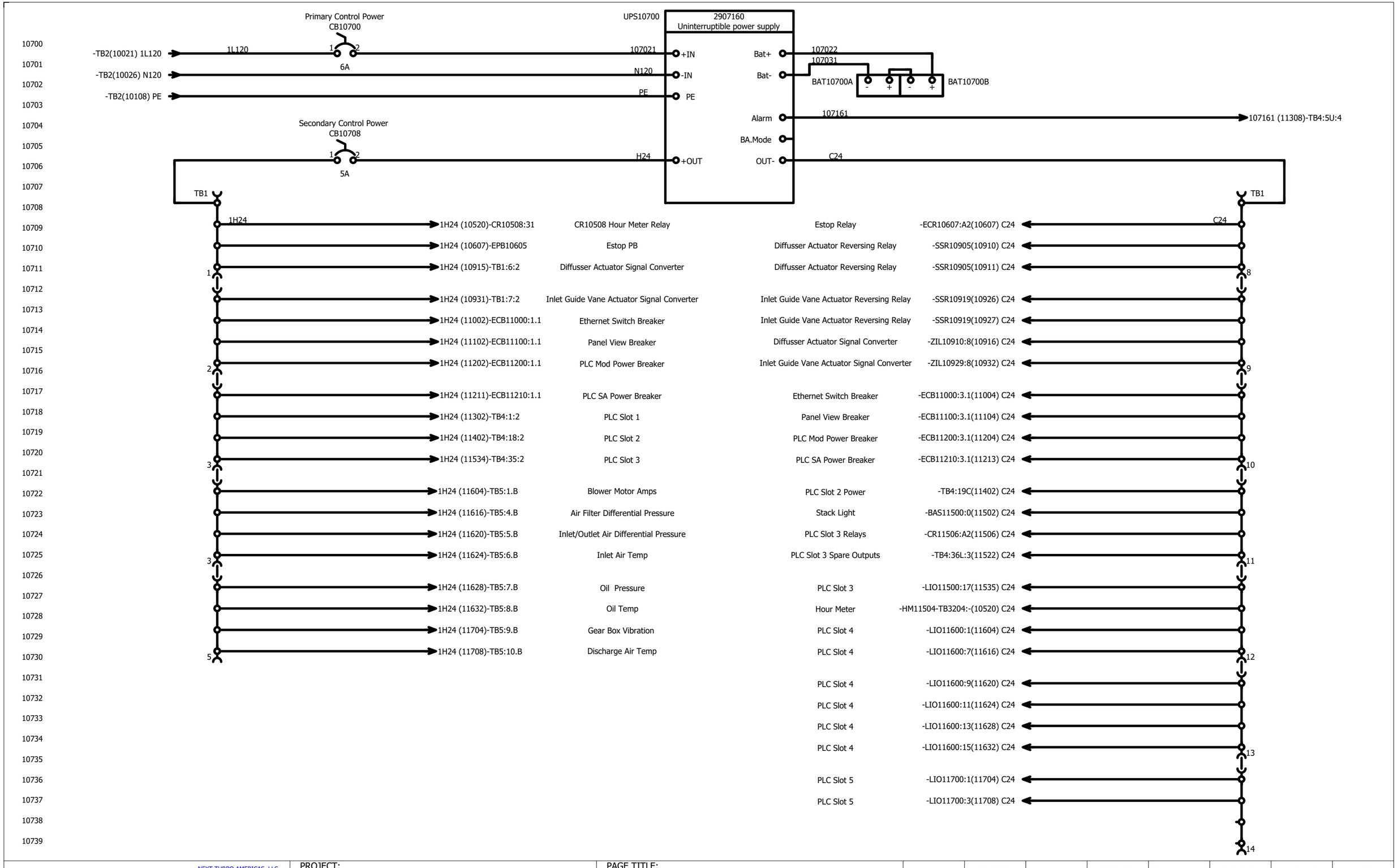
PAGE TITLE:
120V Blower Control

DRAWN	09/29/22	MODIFIED	11/14/22	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
	TTI		JRH	22.0989	LOCAL	106	105





NEXT TURBO AMERICAS, LLC 824 Woodswether Rd., East KANSAS CITY, MO 64105 PHONE: 816-588-6054	PROJECT: Wastewater Treatment Facility Phase 2 Improvements	PAGE TITLE: Safety Circuit	DRAWN	09/29/22 TTI	MODIFIED	06/01/23 JRH	JOB NUMBER: 22.0989	LOCATION: LOCAL	NEXT PAGE: 107	PAGE: 106



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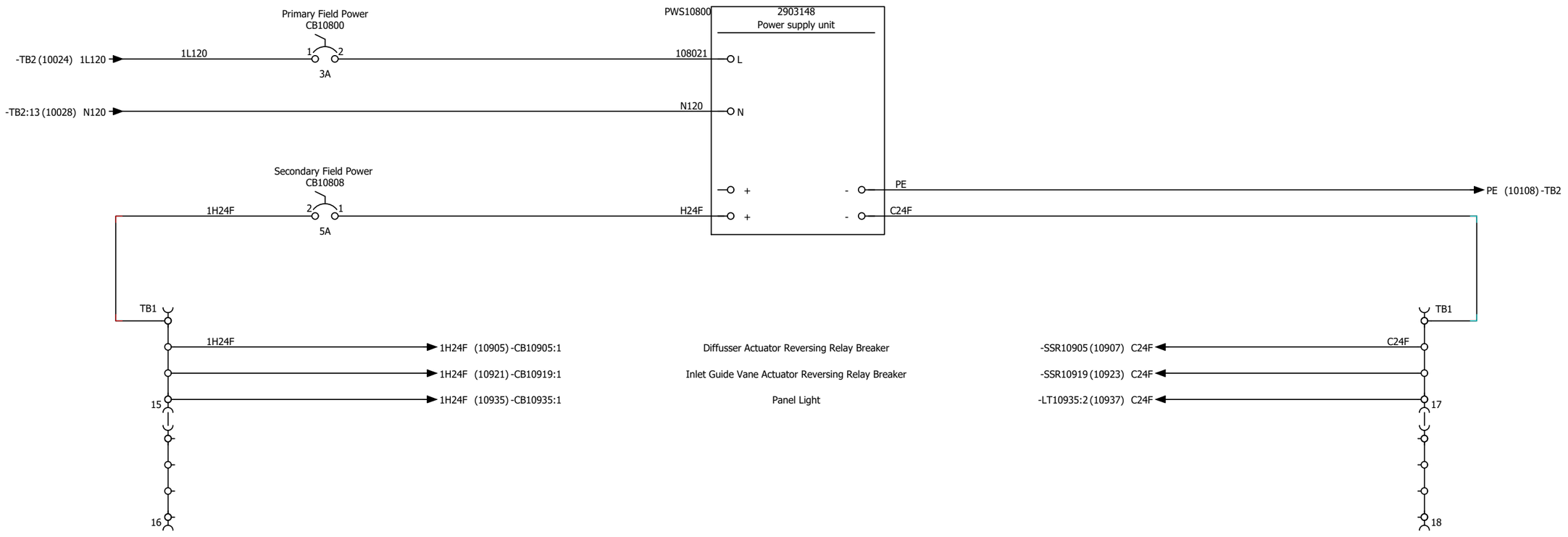
PROJECT:
Wastewater Treatment Facility Phase 2 Improvements

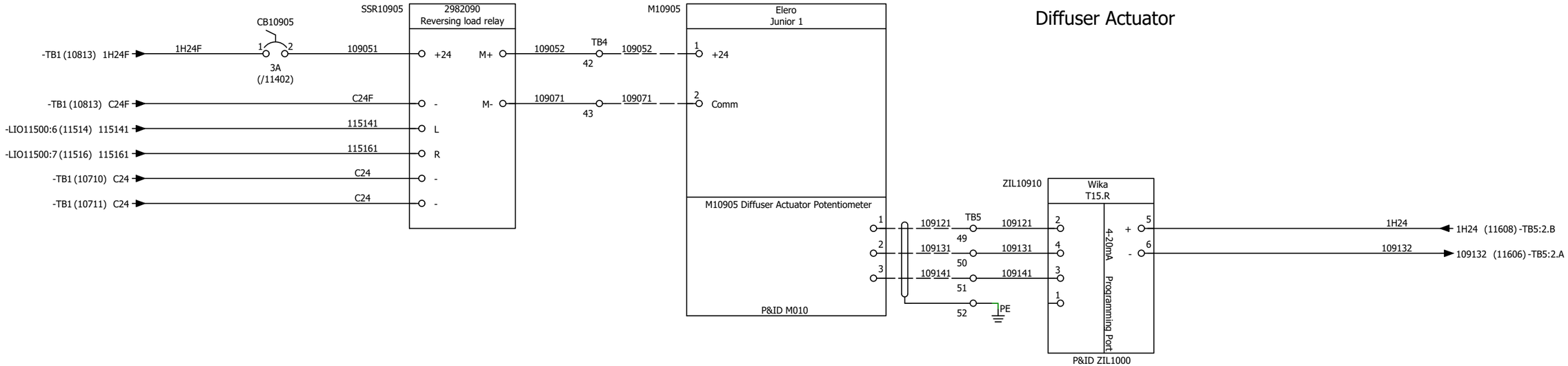
PAGE TITLE:
24V DC UPS/Control Power Distribution

DRAWN	09/29/22	MODIFIED	06/01/23	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
	TTI		JRH	22.0989	LOCAL	108	107

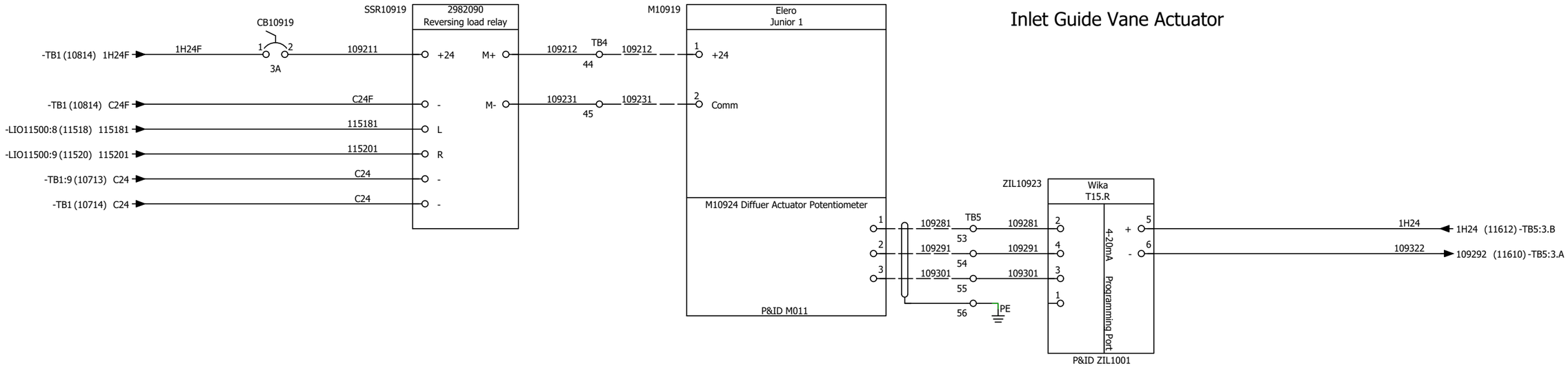


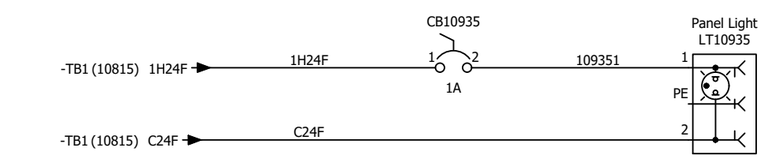
NEXT TURBO AMERICAS, LLC 824 Woodswether Rd., East KANSAS CITY, MO 64105 PHONE: 816-588-6054	PROJECT: Wastewater Treatment Facility Phase 2 Improvements	PAGE TITLE: 24V DC Field Power Distribution	DRAWN	09/29/22	MODIFIED	05/15/23	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
				TTI		JRH	22.0989	LOCAL	109	108

Diffuser Actuator

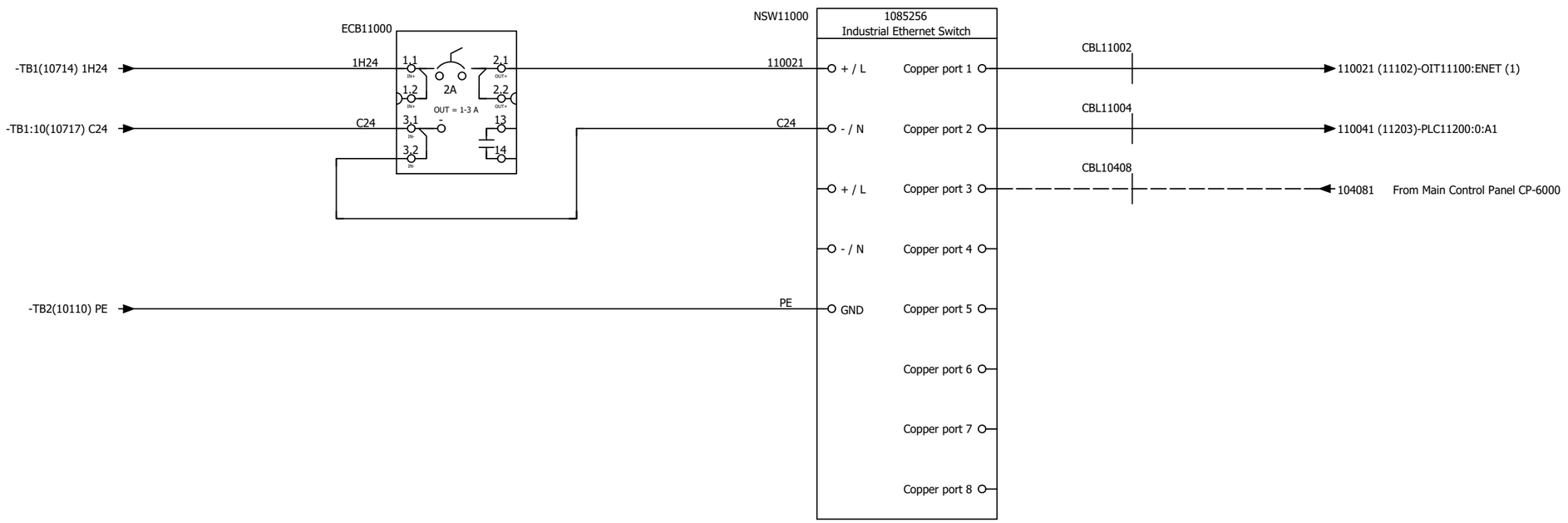


Inlet Guide Vane Actuator

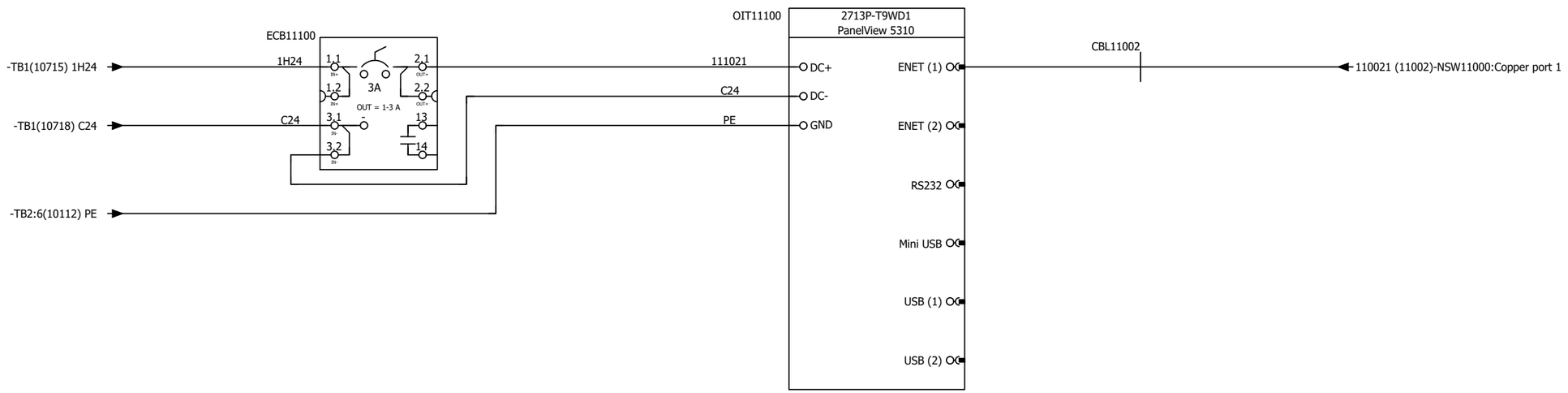




NEXT TURBO AMERICAS, LLC 824 Woodswether Rd., East KANSAS CITY, MO 64105 PHONE: 816-588-6054	PROJECT: Wastewater Treatment Facility Phase 2 Improvements	PAGE TITLE: 24V DC Actuators/Panel Light	DRAWN	09/29/22	MODIFIED	06/01/23	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
				TTI		JRH	22.0989	LOCAL	110	109



NEXT TURBO AMERICAS, LLC 824 Woodswether Rd., East KANSAS CITY, MO 64105 PHONE: 816-588-6054	PROJECT: Wastewater Treatment Facility Phase 2 Improvements	PAGE TITLE: Ethernet Network Switch	DRAWN	09/29/22 TTI	MODIFIED	11/14/22 JRH	JOB NUMBER: 22.0989	LOCATION: LOCAL	NEXT PAGE: 111	PAGE: 110



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NEXT TURBO AMERICAS, LLC
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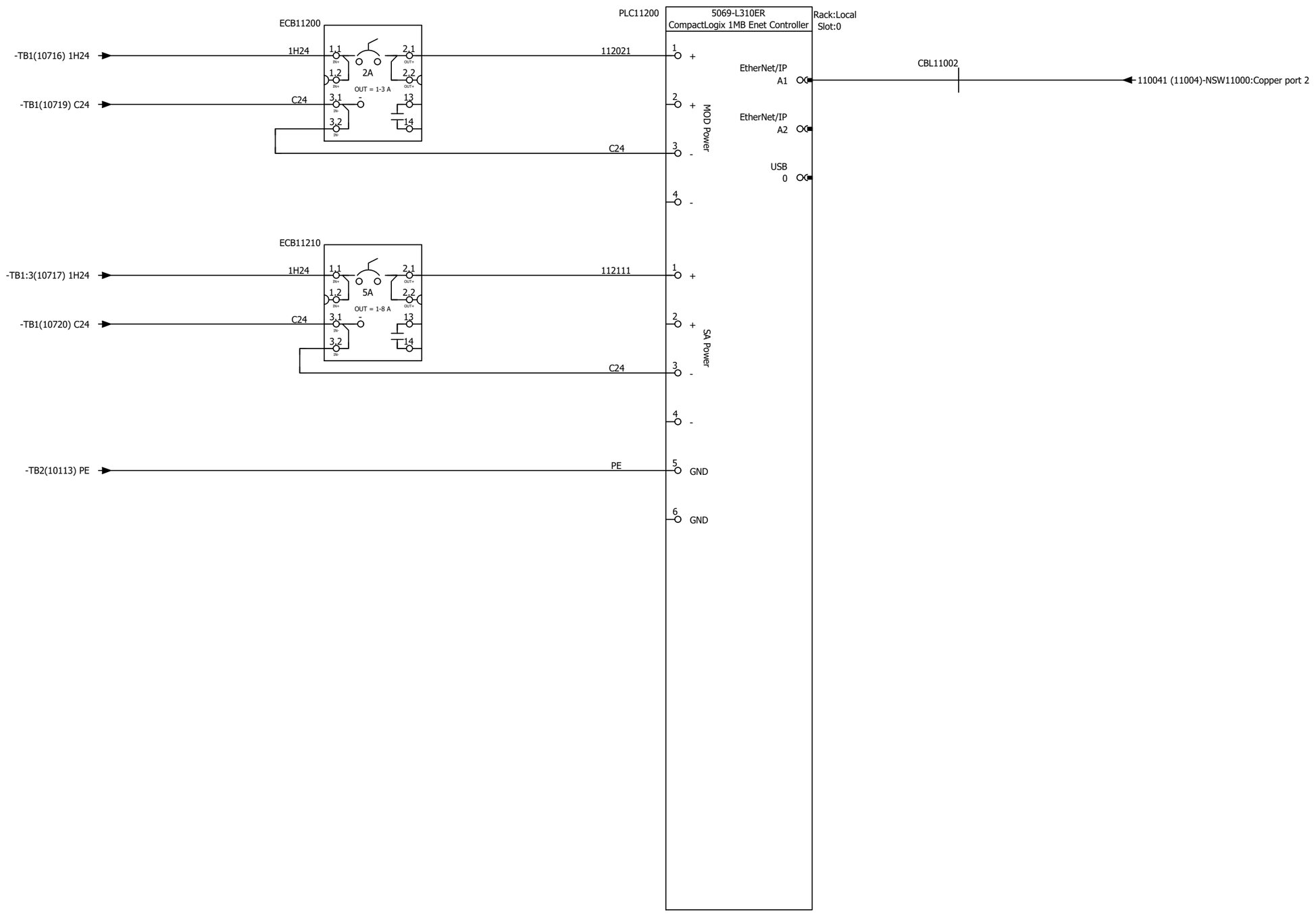
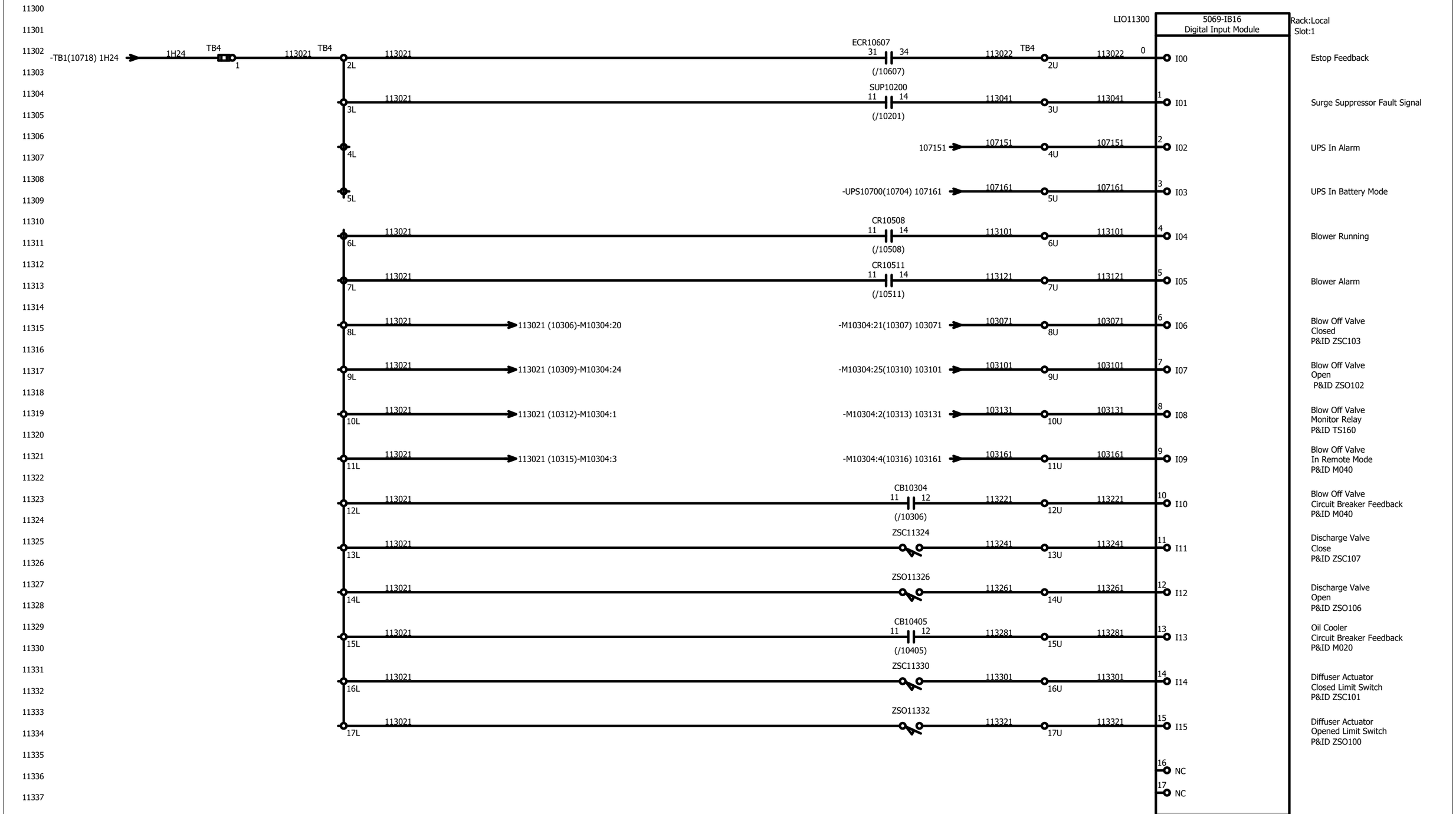
PROJECT:	PAGE TITLE:	DRAWN	09/29/22	MODIFIED	11/14/22	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
Wastewater Treatment Facility Phase 2 Improvements	Operator Interface Terminal		TTI		JRH	22.0989	LOCAL	112	111



NextTurbo NEXT TURBO AMERICAS, LLC 824 Woodswether Rd., East KANSAS CITY, MO 64105 PHONE: 816-588-6054	PROJECT: Wastewater Treatment Facility Phase 2 Improvements	PAGE TITLE: PLC Rack: Local Slot: 0 CompactLogix Processor	DRAWN	09/29/22 TTI	MODIFIED	11/14/22 JRH	JOB NUMBER: 22.0989	LOCATION: LOCAL	NEXT PAGE: 113	PAGE: 112



NEXT TURBO AMERICAS, LLC
824 Woodswether Rd., East
KANSAS CITY, MO 64105
PHONE: 816-588-6054

PROJECT: Wastewater Treatment Facility Phase 2 Improvements

PAGE TITLE: PLC Rack: Local Slot:1 Input Module

DRAWN	09/29/22	MODIFIED	06/01/23	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
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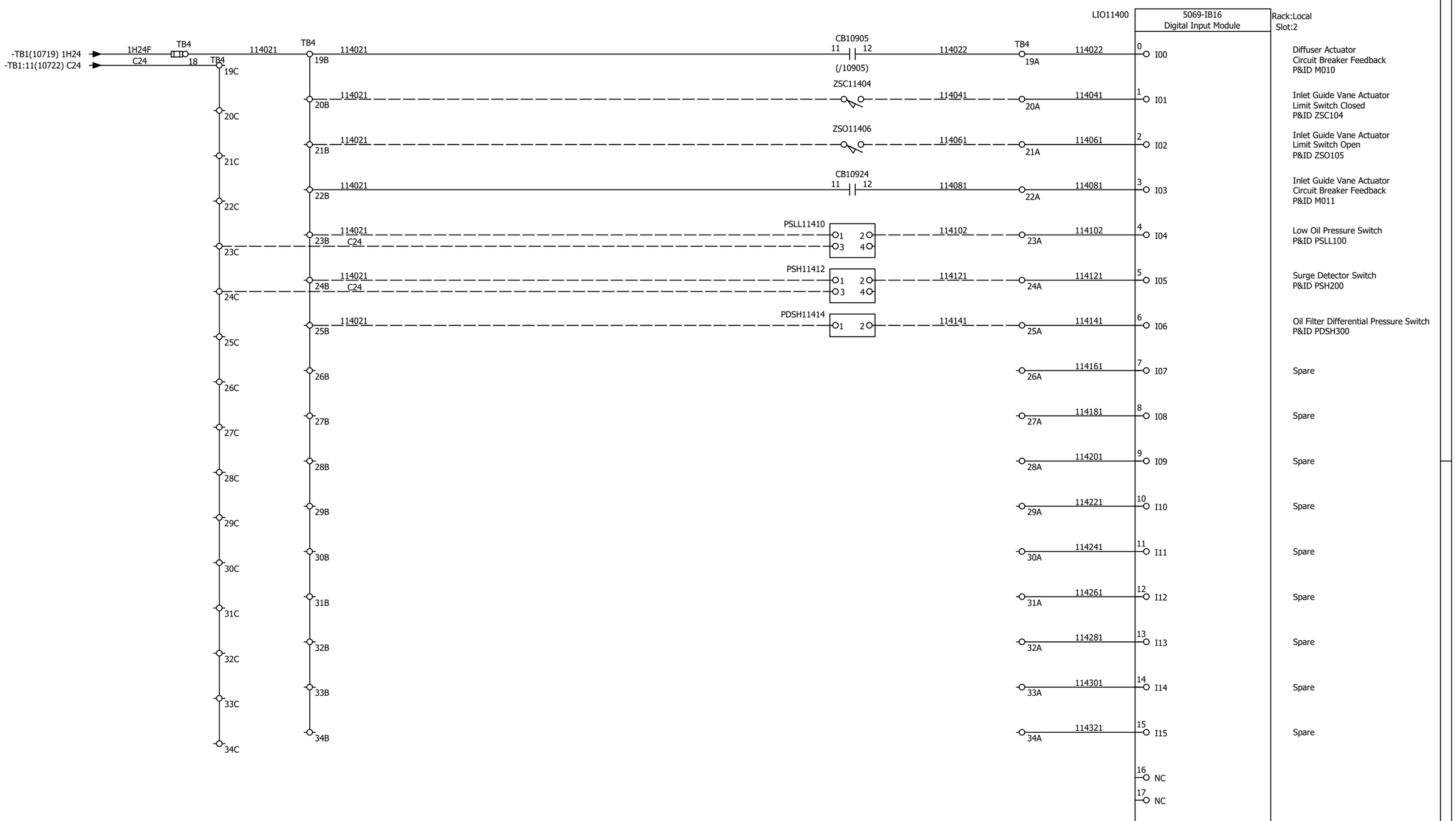


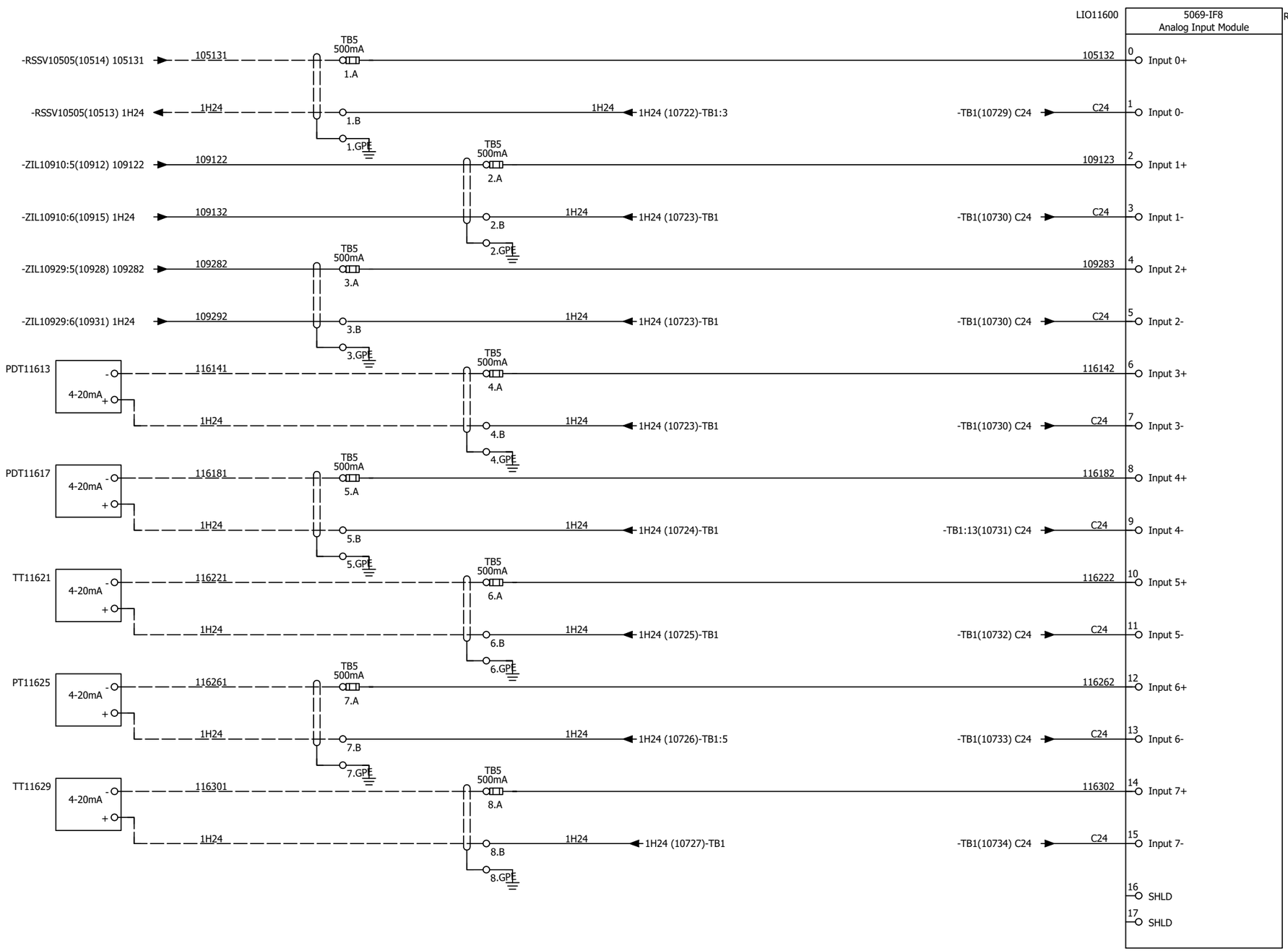
NEXT TURBO AMERICAS, LLC 824 Woodswether Rd., East KANSAS CITY, MO 64105 PHONE: 816-588-6054	PROJECT: Wastewater Treatment Facility Phase 2 Improvements	PAGE TITLE: PLC Rack: Local Slot:2 Input Module	DRAWN	09/29/22 TTI	MODIFIED	11/14/22 JRH	JOB NUMBER: 22.0989	LOCATION: LOCAL	NEXT PAGE: 115	PAGE: 114

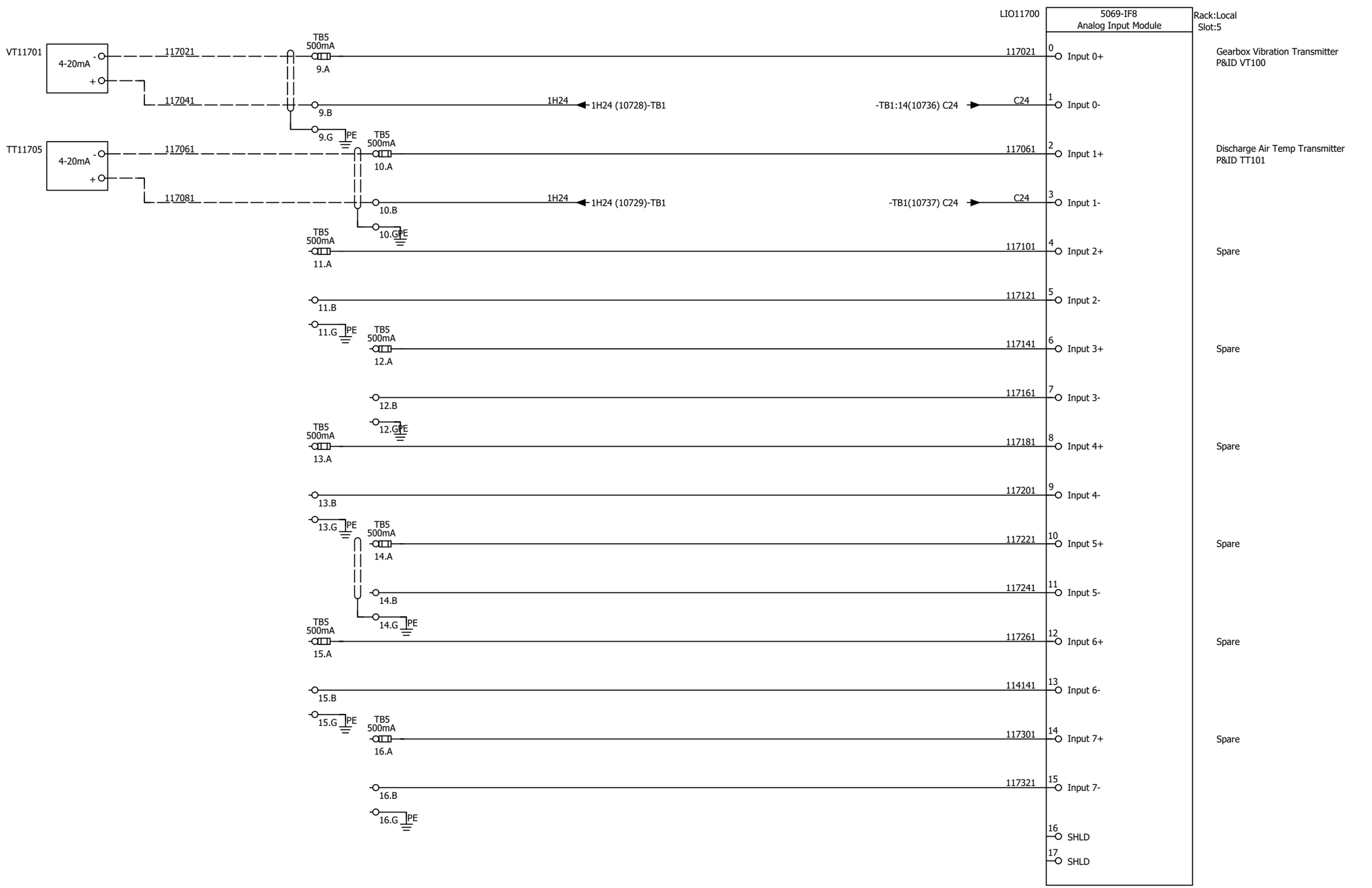
LIO11500 — 5069-OB16 Digital Output Module — Rack:Local Slot:3

BAS11500 — Stack Light (Red Light, Horn)

11502	Blower Alarm Light	O00 (0)	115021	BAS11500 Red Light 1 → 0 → C24 → C24 (10723)-TB1
11504	Blower Alarm Horn	O01 (1)	115041	BAS11500 Horn 2
11506	Blower Run Comamand	O02 (2)	115061	CR11506 A1/A2 (/10605) → C24 → C24 (10724)-TB1
11508	Blow Off Valve Close Valve Relay P&ID M040	O03 (3)	115081	CR11508 A1/A2 (/10314) → C24
11510	Blow Off Valve Open Valve Relay P&ID M040	O04 (4)	115101	CR11510 A1/A2 (/10313) → C24
11512	Start Oil Cooler Relay P&ID M020	O05 (5)	115121	CR11512 A1/A2 (/10405) → C24
11514	Diffuser Actuator Close Actuator Relay P&ID M010	O06 (6)	115141	115141 (10908)-SSR10905
11516	Diffuser Actuator Open Actuator Relay P&ID M010	O07 (7)	115161	115161 (10909)-SSR10905
11518	Inlet Guide Vane Actuator Close Actuator Relay P&ID M011	O08 (8)	115181	115181 (10924)-SSR10919
11520	Inlet Guide Vane Actuator Open Actuator Relay P&ID M011	O09 (9)	115201	115201 (10925)-SSR10919
11522	Spare	O10 (10)	115221	TB4 36U — TB4 36L → C24 → C24 (10725)-TB1
11524	Spare	O11 (11)	115241	37U — 37L
11526	Spare	O12 (12)	115261	38U — 38L
11528	Spare	O13 (13)	115281	39U — 39L
11530	Spare	O14 (14)	115301	40U — 40L
11532	Spare	O15 (15)	115321	41U — 41L
11534		LA+ (16)	115341	TB4 35 → 1H24 → 1H24 (10720)-TB1
11535		LA- (17)	C24	C24 (10727)-TB1:12

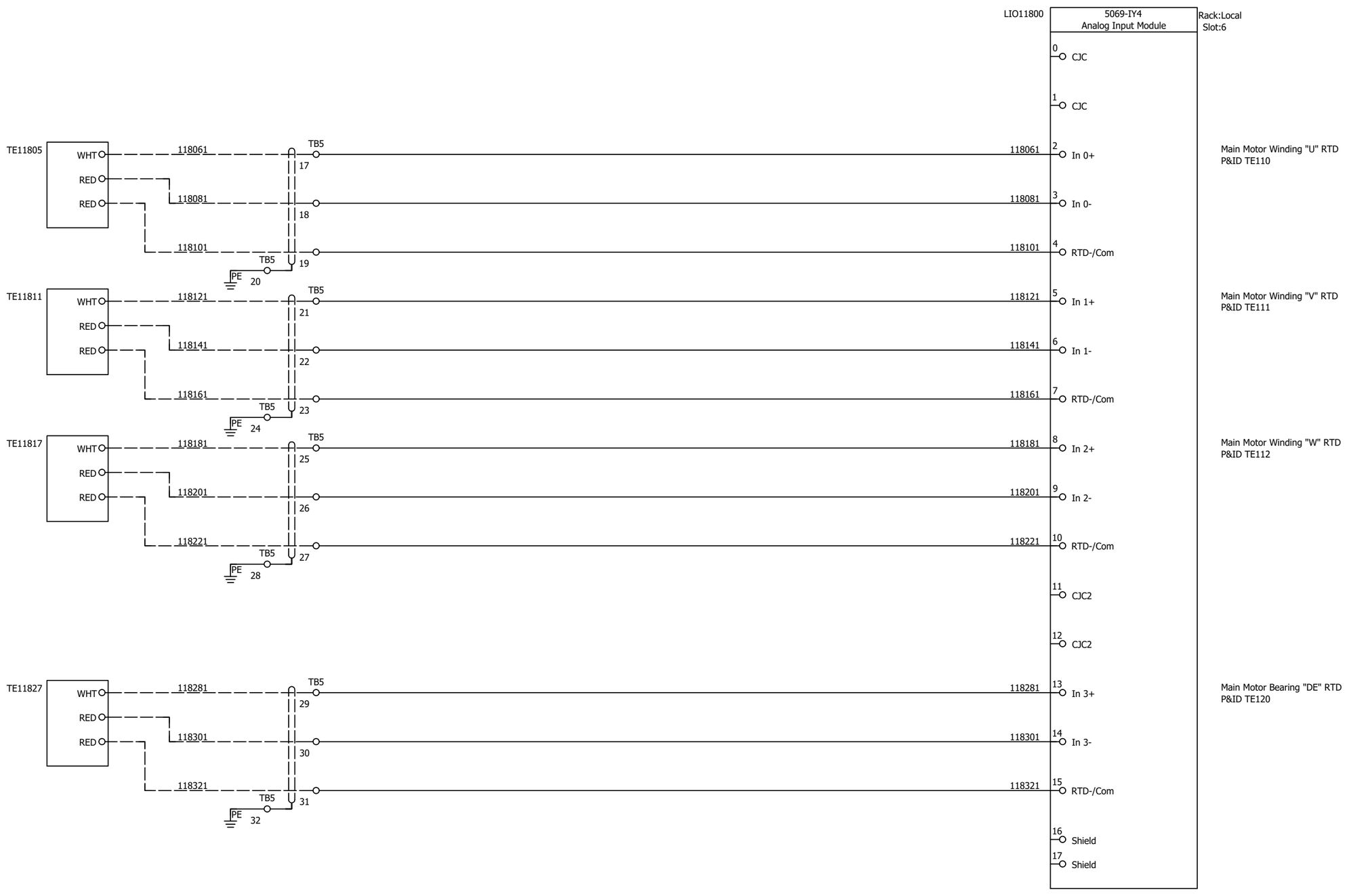
NextTurbo	NEXT TURBO AMERICAS, LLC 824 Woodswether Rd., East KANSAS CITY, MO 64105 PHONE: 816-588-6054	PROJECT: Wastewater Treatment Facility Phase 2 Improvements	PAGE TITLE: PLC Rack: Local Slot:3 Output Module	DRAWN	09/29/22 TTI	MODIFIED	11/14/22 JRH	JOB NUMBER: 22.0989	LOCATION: LOCAL	NEXT PAGE: 116	PAGE: 115


LIO11600
5069-IF8
Analog Input Module
Rack:Local
Slot:4
-RSSV10505(10514) 105131
105131
TB5
500mA
1.A
105132
0
Input 0+
Blower Motor Amps
-RSSV10505(10513) 1H24
1H24
1.B
1H24
1H24 (10722)-TB1:3
-TB1(10729) C24
C24
1
Input 0-
1.GPE
-ZIL10910:5(10912) 109122
109122
TB5
500mA
2.A
109123
2
Input 1+
Diffuser Actuator
Position Feedback
P&ID ZIL1000
-ZIL10910:6(10915) 1H24
109132
2.B
1H24
1H24 (10723)-TB1
-TB1(10730) C24
C24
3
Input 1-
2.GPE
-ZIL10929:5(10928) 109282
109282
TB5
500mA
3.A
109283
4
Input 2+
Inlet Guide Vane Actuator
Position Feedback
P&ID ZIL1001
-ZIL10929:6(10931) 1H24
109292
3.B
1H24
1H24 (10723)-TB1
-TB1(10730) C24
C24
5
Input 2-
3.GPE
PDT11613
4-20mA
-
+
116141
TB5
500mA
4.A
116142
6
Input 3+
Air Filter
Differential Pressure Transmitter
P&ID PDT210
1H24
1H24
1H24 (10723)-TB1
-TB1(10730) C24
C24
7
Input 3-
4.B
4.GPE
PDT11617
4-20mA
-
+
116181
TB5
500mA
5.A
116182
8
Input 4+
Inlet/Outlet Air
Differential Pressure Transmitter
P&ID PDT200
1H24
1H24
1H24 (10724)-TB1
-TB1:13(10731) C24
C24
9
Input 4-
5.B
5.GPE
TT11621
4-20mA
-
+
116221
TB5
500mA
6.A
116222
10
Input 5+
Inlet Air Temp Transmitter
P&ID TT100
1H24
1H24
1H24 (10725)-TB1
-TB1(10732) C24
C24
11
Input 5-
6.B
6.GPE
PT11625
4-20mA
-
+
116261
TB5
500mA
7.A
116262
12
Input 6+
Oil Pressure Transmitter
P&ID PT100
1H24
1H24
1H24 (10726)-TB1:5
-TB1(10733) C24
C24
13
Input 6-
7.B
7.GPE
TT11629
4-20mA
-
+
116301
TB5
500mA
8.A
116302
14
Input 7+
Oil Temp Transmitter
P&ID TT200
1H24
1H24
1H24 (10727)-TB1
-TB1(10734) C24
C24
15
Input 7-
8.B
8.GPE
16
SHLD
17
SHLD

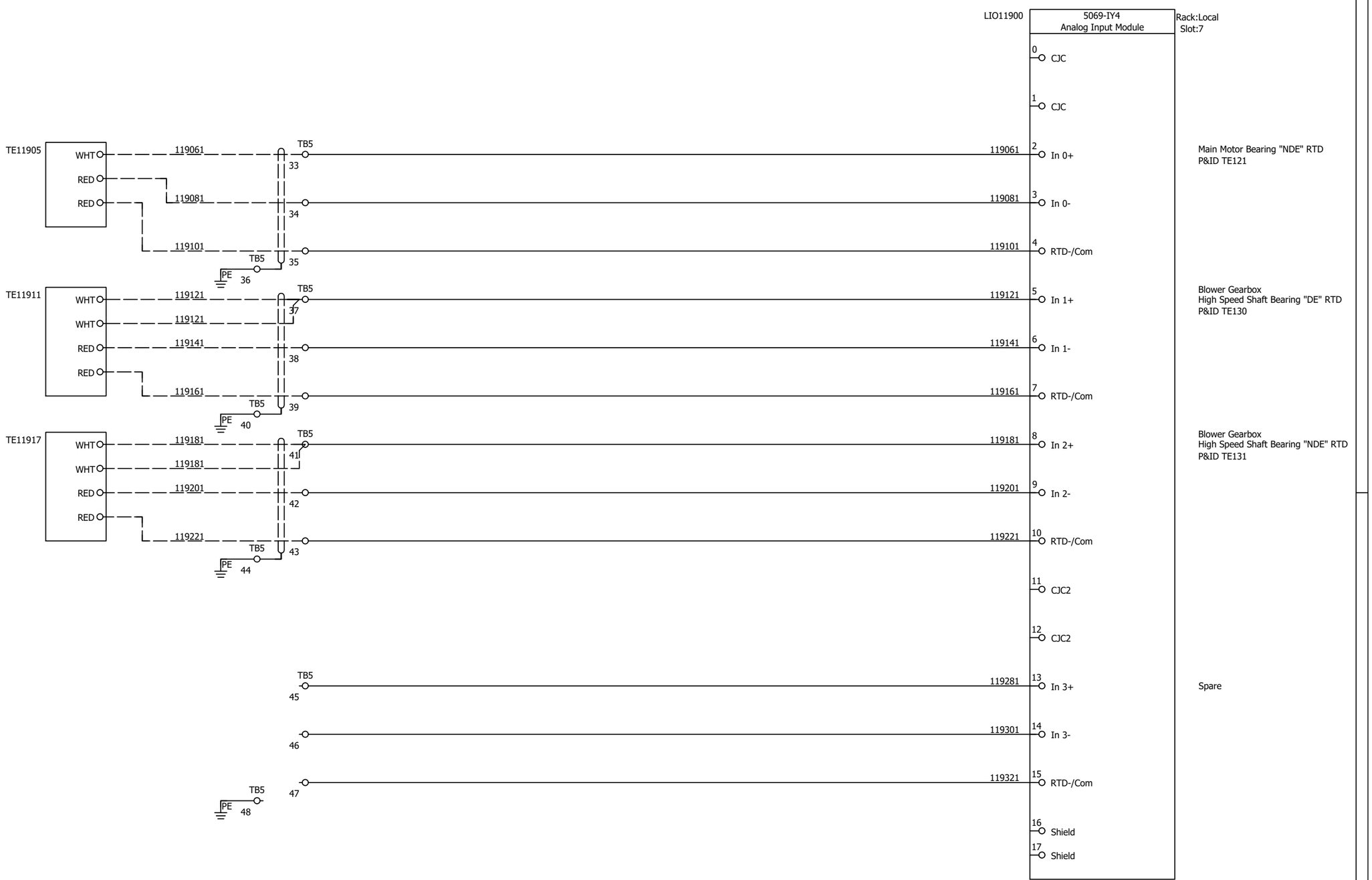


NEXT TURBO AMERICAS, LLC
824 Woodswether Rd., East
KANSAS CITY, MO 64105
PHONE: 816-588-6054

PROJECT:	PAGE TITLE:	DRAWN	09/29/22	MODIFIED	11/14/22	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
Wastewater Treatment Facility Phase 2 Improvements	PLC Rack: Local Slot:5 Analog Input Module		TTI		JRH	22.0989	LOCAL	118	117



NEXT TURBO AMERICAS, LLC 824 Woodswether Rd., East KANSAS CITY, MO 64105 PHONE: 816-588-6054	PROJECT: Wastewater Treatment Facility Phase 2 Improvements	PAGE TITLE: PLC Rack: Local Slot:6 Analog Input Module	DRAWN	09/29/22 TTI	MODIFIED	11/14/22 JRH	JOB NUMBER: 22.0989	LOCATION: LOCAL	NEXT PAGE: 119	PAGE: 118



NextTurbo NEXT TURBO AMERICAS, LLC 824 Woodswether Rd., East KANSAS CITY, MO 64105 PHONE: 816-588-6054	PROJECT: Wastewater Treatment Facility Phase 2 Improvements	PAGE TITLE: PLC Rack: Local Slot:7 Analog Input Module	DRAWN	09/29/22 TTI	MODIFIED	11/14/22 JRH	JOB NUMBER: 22.0989	LOCATION: LOCAL	NEXT PAGE:	PAGE: 119

Next Turbo Americas
Kansas City, Missouri

Document No.:	**NTA-11-003**
Title:	**Local Control Panel Functional Description**
Revision:	**0**
Date:	**November 11, 2022**
Project No.:	**22.0989**
Project Name:	**Taunton, MA**

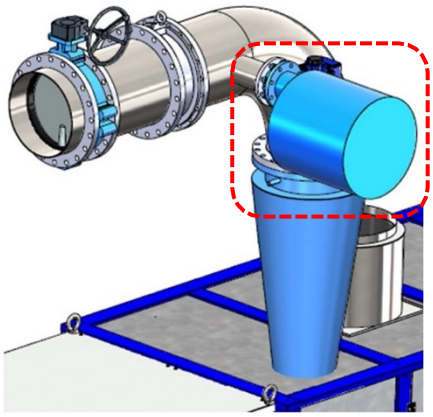
TABLE OF CONTENTS

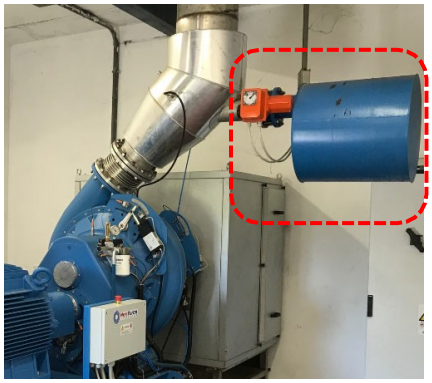
1. INTRODUCTION OF A SINGLE STAGE CENTRIFUGAL BLOWER

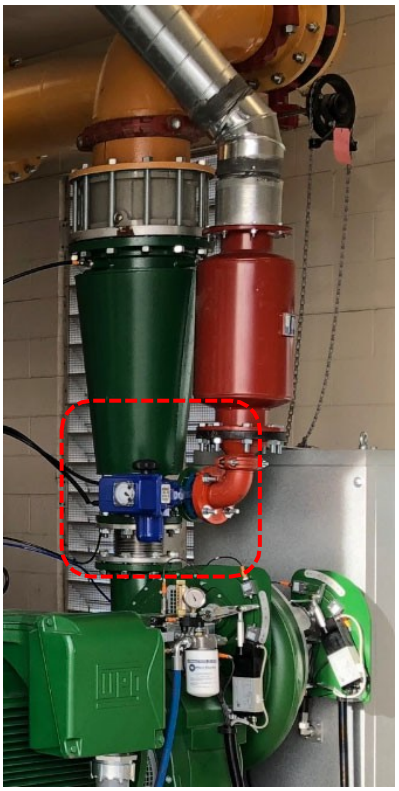
The single-stage, geared turbo-compressor (blower) design has decades of success when applied in wastewater treatment plants.

A single-stage turbo-compressor is a centrifugal machine where a gas is compressed by imparting velocity on the ingested gas by means of a single impeller. The impeller increases the velocity energy of the gas and the diffuser volute increases the static gas pressure energy by decreasing its velocity. This process is governed by the principles of fluidmechanics and thermodynamics.

In contrast to volumetric blowers (positive displacement type or screw type), the centrifugal blowers cannot start against pressure. Therefore, during start-up of the blower and motor, the compressed air must be released to a low pressure point at atmospheric pressure. The air is vented to atmosphere by a blow-off valve that it is located either on the blower discharge cone diffuser or on the pipe which connects the cone diffuser to the outlet check valve. During the initial blower start-up, the blow-off valve is fully open.







Centrifugal compressors are subject to a sequenced start-up procedure which is programmed into the Local Control Panel (LCP). The LCP is an integral part of the blower scope of supply. The blower manufacture must program the LCP to allow the blower to conduct a proper and safe start-up as well as a smooth and safe shut-down. The LCP is also responsible for continuously monitoring the operational data of the blower while running to stop it safely in the event of an alarm or trip.

2. GENERAL

Refer to the following documents:

- P&I Diagram: Document # NTA-08-001
- Parts List: Document # NTA-09-001
- Master Control Panel Functional Description: Document # NTA-11-008

Blower Control System:

The blower LCP requires external commands to control air flow output. There are only three control commands sent to the blower LCP: 1) Run signal [1 = blower on, 0 = blower off], 2) Increase Air, and 3) Decrease Air. The commands are sent from a Master Control Panel (provided by Next Turbo or a third party), or the commands are sent from the plant's SCADA network or DCS. The LCP is controlled the same regardless of the master panel controlling it. For the purposes of this document, the panel controlling the LCPs will be referred to as the Blower Control System (MCP).

Blower Skid Control Components:

1. Local control panel (LCP) mounted on the blower skid (supplied by NEXT TURBO).
2. Electric motor (item M001 on the P&I diagram).
3. MCC with soft starter
4. Auxiliaries:
    - Diffuser vane actuator (item M-010 on the P&ID)
    - Inlet guide vanes actuator (item M-011 on the P&ID)
    - Oil cooler (item C-0320 on the P&ID)
    - Blow-off valve (item C-0220 on the P&ID)
    - Discharge valve (Item C-0250 on the P&ID)(1)
    - Oil Heater (item MA-005 on P&ID)(1)
    - Exhaust fan (item C-0700 on the P&ID) (1)
5. Motor Space Heater (item MA-001 on P&ID) (1) is controlled by the soft starter. When the motor is off, the space heater is turned on.
6. Blower skid mounted instruments wired to the LCP.

Blower Settings:

- Main motor soft starter ramp time should be programmed to 15 seconds or less. Please consult with Next Turbo if a different ramp time is desired.
- Calibration of IGV & Discharge Diffuser Vanes is done during the factory blower test. Positioning and scaling are pre-set via the HMI. Values are shown on a specific document made after the test. "See mechanical run test certificate"
- The blow off valve closing time is set during the factory blower test at the factory. Positioning and timing are pre-set via the HMI. The pre-set values can be changed in the HMI.
- Alarm & trip set-points for all instruments, accessories and main motor are set during the factory blower test. Values are shown on the Parts List document # NTA-09-001. The pre-set values should only be adjusted by a Next Turbo representative.

(1) Not included on all blower configurations

3. OPERATING PHILOSOPHY PRINCIPLES

The operating philosophy is based on the following main criteria:

- The blowers can be started & stopped manually from the Local Control Panel HMI or remotely by the MCP.
- The auxiliaries (diffuser vane actuator M-010, inlet guide vanes actuator M-011, oil cooler C-0320, blow-off valve C-0220, discharge valve C-0250, oil heater MA-005, exhaust fan C-07000) are automatically activated/controlled by the Local Control Panel. The motor space heater MA-001 is controlled by the MCC with soft starter.
- If the discharge valve is not electrically operated and controlled by the LCP, the valve must be fully open prior to starting the blower.
- The MCC with soft starter is controlled by the LCP. The run command from the LCP to the soft starter must be a hardwired discrete signal. The E-stop button on the LCP is wired in series with the run command. With this configuration, the main motor will immediately stop when the E-stop is engaged. The feedback signals from the soft starter to the LCP can either be hardwired discrete signals or they can be sent via network communication.

4. LOCAL CONTROL PANEL COMPONENTS

The local control panel contains the following:

- PLC programmable logical controller, programmed for the blower control.
- Touch panel (HMI door mounted) for manual control and monitoring of blower status.
- All electrical equipment for the control of the auxiliaries.
- Electrical connections for control of the MCC with soft starter.
- Emergency stop push button (door mounted).

5. OPERATIONAL MODES

SERVICE MODE

The service mode allows the operator to control (start/stop, open/close) all the auxiliary equipment without the possibility of starting the main motor. This mode is to be utilized for testing and/or maintenance purposes.

OPERATING MODE

This is the normal operational mode where the blower is started and stopped and its airflow is locally (manual mode) regulated or remotely (auto mode) regulated according to the process demand.

- **LOCAL/MANUAL**
  The blower is manually started and stopped by the field operator via LCP HMI push buttons. The airflow is manually adjusted using the increase/decrease diffuser push buttons on the LCP HMI.

- **REMOTE/AUTO**
  The blower is remotely started and stopped by the MCP and its airflow is automatically regulated.

6. PRE-START SETTINGS (Start conditions)

The LCP automatically sets each auxiliary to its pre-start state after the blower has been stopped and no alarm conditions are active. The following conditions must be met to start the blower. If any of these conditions are not met, a status message on the HMI will indicate the blower is "Not Ready to Start" and a secondary status message is displayed indicating which condition has not been met. If the following conditions are met, the HMI will set the main status to "Blower Ready to Start."

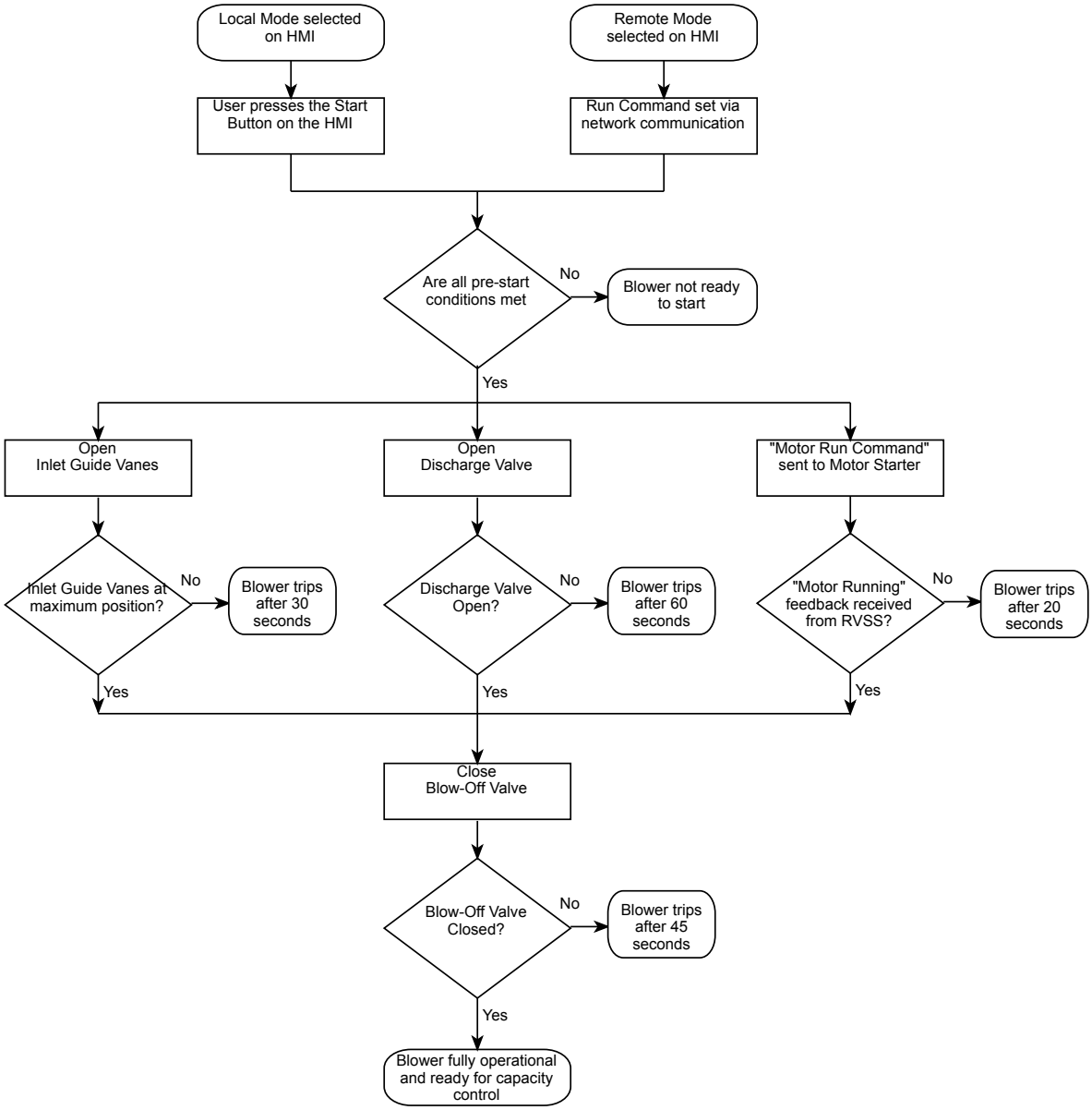
1. Diffuser vanes actuator (item M-010 on the P&ID)
    a. Actuator in minimum position (limit switch ZSC-101 on the P&ID).
2. Inlet guide vanes actuator (item M-011 on the P&ID)
    a. Actuator in minimum position (limit switch ZSC-104 on the P&ID).
3. Blow-off valve (valve tag # C-0220 on the P&ID)
    a. Valve is fully open (limit switch ZSO-102 on the P&ID).
    b. Actuator Monitor Relay engaged
4. Discharge valve (valve tag # C-0250 on the P&ID)
    a. Valve is fully closed (limit switch ZSC-111 on the P&ID).
    b. Actuator Monitor Relay engaged
5. Motor Starter is idle and ready to start.
6. No alarm or trip conditions are active.
7. All auxiliary circuit breakers are in the set/engaged position.
8. Maximum number of starts in a one-hour time frame has not been reached.
    a. To avoid overheating the main motor or motor starter, the LCP counts the number of starts performed by the main motor. The main motor is allowed to start a maximum of four (4) times in a one-hour time frame. If the maximum starts per hour is reached, the LCP will not allow the main motor to start until the "one hour timer" (since the first start) has expired. A dedicated pop-up alarm on the HMI informs the field operator. The LCP will communicate to the MCP the maximum starts per hour has been reached.

7. START SEQUENCE

The start sequence of the blower is initiated by either an operator acting on the HMI or from a run command received from the MCP. Through-out the start sequence, the LCP is monitoring all alarms and trip conditions. If a trip condition occurs, the blower will be stopped.

The mechanical oil pump is activated by the bull gear and therefore operates as long as the motor is rotating. If the oil pressure transmitter and/or pressure switch detect “low oil pressure”, an alarm is shown on the HMI. In the case of “low-low oil pressure”, the unit stops immediately (see critical stop section 11).

The oil cooler is started by the LCP when the oil temperature transmitter is above 60°C [140F]. When the oil temperature drops below 55°C [131F] the oil cooler fan is switched off by the LCP.



START SEQUENCE STATUS INFORMATION

When the blower start sequence is initiated, the main status on the HMI will say “Blower Starting”. The secondary status will then display the following information depending on the current step of the start sequence:

- Opening Discharge Valve
- Waiting for Motor Starter Feedback
- Motor ramping to Full Speed
- Opening IGV
- Closing Blow Off Valve

8. CAPACITY CONTROL

The airflow of the blower is regulated via discharge variable diffuser vanes. The airflow turn-down of the blower is between 40/45% to 100% where 100% is the maximum design capacity of the blower. The variable diffusers vanes are integrally mounted inside the blower and are aerodynamic shape to obtain the highest blower efficiency over the entire regulating range. When the blower has completed the start sequence, the diffuser vanes will be at minimum position (0% open) and the blower will be outputting minimum airflow which is 40% to 45% (depending on design) of blower design capacity.

The diffusers vanes are positioned by an electric actuator equipped with limit switches and internal position feedback. The actuator is powered by the local control panel which is constantly monitoring the diffuser vane position. Adjusting the position of the diffuser vanes linearly adjusts the airflow output of the blower.

	Local Mode	Remote Mode
Control By	*Plant Operator*	MCP
Actions	Commands issued via push buttons on the LCP HMI	Commands issued via network commands
Description	The airflow output will increase when the operator presses the Diffuser Vane “Increase” button. The diffuser will keep opening as long as the operator presses the button. If the diffuser is fully open (maximum position), the limit switch is engaged and the “Maximum” LED is turned on. The airflow output will decrease when the operator presses the Diffuser Vane “Decrease” button. The diffuser will keep closing as long as the operator presses the button. If the diffuser is fully closed (minimum position), the limit switch is engaged and the “Minimum” LED is turned on.	The airflow output of the blower is automatically controlled by the MCP in accordance with a given set-point. The airflow output will increase when the “Increase” command is sent. If the diffuser is fully open (maximum position), the limit switch is engaged and the “Maximum” LED is turned on. The airflow output will decrease when the “Decrease” command is sent. If the diffuser is fully closed (minimum position), the limit switch is engaged and the “Minimum” LED is turned on.

To avoid an excessive load on the main motor, the LCP is constantly monitoring the motor current consumption. If the main motor Full Load Amps (FLA) current is reached before the diffuser is at its maximum opening position, the LCP will not allow the diffuser to open any further. If the main motor FLA current is exceeded, the LCP will force the diffuser to close. This function restricts the motor from being overloaded.

If the main motor FLA current is reached and the VDV is not 100% open, the LCP informs the MCP (via network) that the blower will not allow air flow to be increased and the next blower should be remotely started if the process requires more air. This situation can occur if there is high inlet air temperature and the blower is operating at, or slightly above, the design pressure.

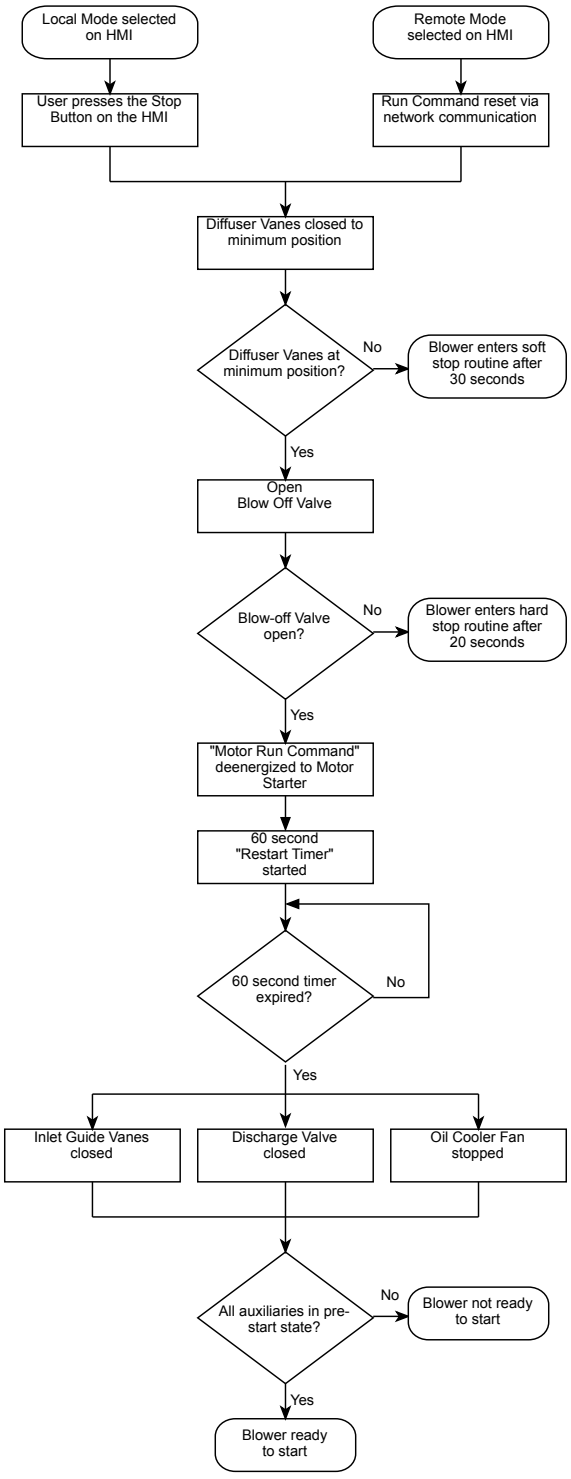
Blower Efficiency – Two Point Control

The inlet guide vanes (IGV) maximize the blower efficiency by pre-rotating the air into the impeller. The pre-rotation angle is computed from the 2-point control algorithm built into the PLC of the LCP. This algorithm constantly measures the inlet air temperature, the differential pressure across the blower and

the discharge diffuser position. The optimal position of the IGV is constantly calculated and automatically positioned by the LCP.

9. NORMAL STOP SEQUENCE

The stop sequence of the blower is initiated by either an operator acting on the HMI or from the MCP removing the run command signal. During the stop sequence, the LCP is monitoring all alarms and trip conditions. If a trip condition occurs, the blower will be stopped and jump to the Soft Stop sequence or the Hard Stop sequence, depending on the severity of the trip.



STOP SEQUENCE STATUS INFORMATION

When the blower stop sequence is initiated, the main status will say “Blower Stopping.” The secondary status will then display the following information depending on the current step of the stop sequence:

- Closing Diffuser vanes
- Opening Blow-off valve
- Closing Inlet guide vanes
- Closing Discharge Valve
- Waiting for motor ramp down timer to expire

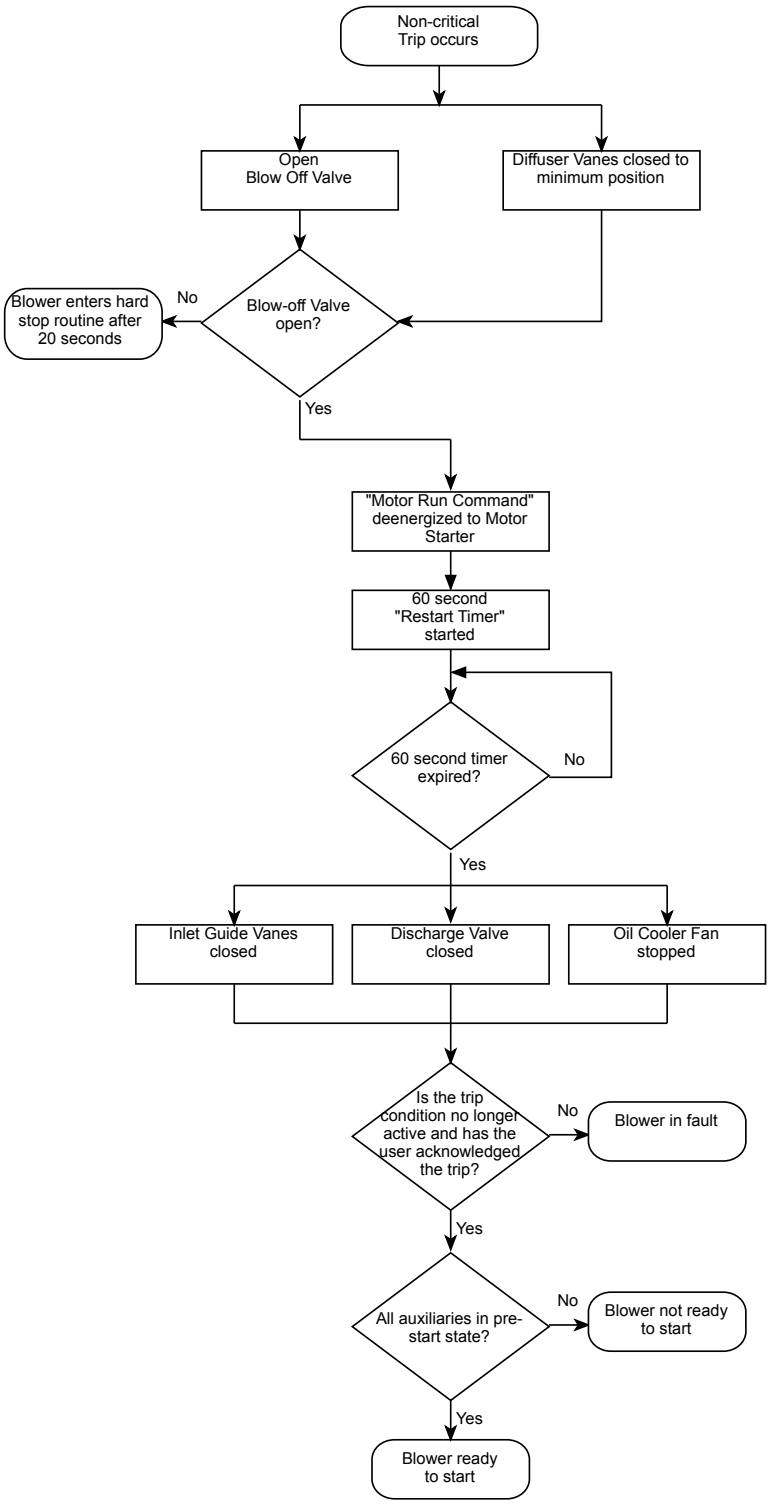
Once the normal stop sequence is complete and all pre-start permissives are met, the main status will say “Blower Ready to Start.”

10. NON-CRITICAL STOP SEQUENCE (Soft Stop)

The soft stop sequence stops the blower in a shorter time frame than the normal stop sequence (section 9). The soft stop procedure is activated when one of the following trips is detected:

- Inlet air recirculation (high-high inlet air temperature) (TT-100)
- High-high outlet air temperature (TT-101)
- High-high oil temperature (TT-200)
- High-high temperature high-speed shaft D.E. bearing (TE-130)
- High-high temperature high-speed shaft N.D.E. bearing (TE-131)
- High-high temperature slow-speed shaft D.E. bearing (TE-132)
- High-high temperature slow-speed shaft N.D.E. bearing (TE-133)
- Main motor high-high winding temperature (TE-110/TE-111/TE-112)
- Main motor high-high temperature D.E. bearing (TE-120)
- Main motor high-high temperature N.D.E. bearing (TE-121)
- Blow off valve failure to close during startup (C-0220)
- Blow off valve full-close limit switch not engaged during blower operation (C-0220)
- Diffuser vanes failure to reach minimum position during shutdown (M-010)
- Diffuser vanes failure to reach maximum position during diagnostic check (M-010)
- Diffuser vanes circuit breaker overload (M-010)
- Inlet guide vanes failure to reach maximum position during startup (M-011)
- Inlet guide vanes failure to reach minimum position during shutdown (M-011)
- Inlet guide vanes circuit breaker overload (M-011)
- Discharge valve failure to open during startup (C-0250)
- Discharge valve failure to close during shutdown (C-0250)
- Discharge valve full-open limit switch not engaged during blower operation (C-0250)
- Oil cooler circuit breaker overload (C-0320)
- Low oil tank temperature (TT-300)
- Sensor Faults – TT-100, PT-100, TT-200, TT-300, VT-100, TE-130, TE-131, TE-132, TE-133, TE-110, TE-111, TE-112, TE-120, TE-121, VT-120, VT-121, Motor Current, VDV Position Sensor, IGV Position Sensor

Note: The functionality of certain sensors can be disabled via the HMI on the LCP utilizing a special login. This function is useful in case a non-critical instrument stops working. The functionality of that instrument can be bypassed. Consult Next Turbo or your local approved service company for more information and the list of instruments that are allowed to be disabled.



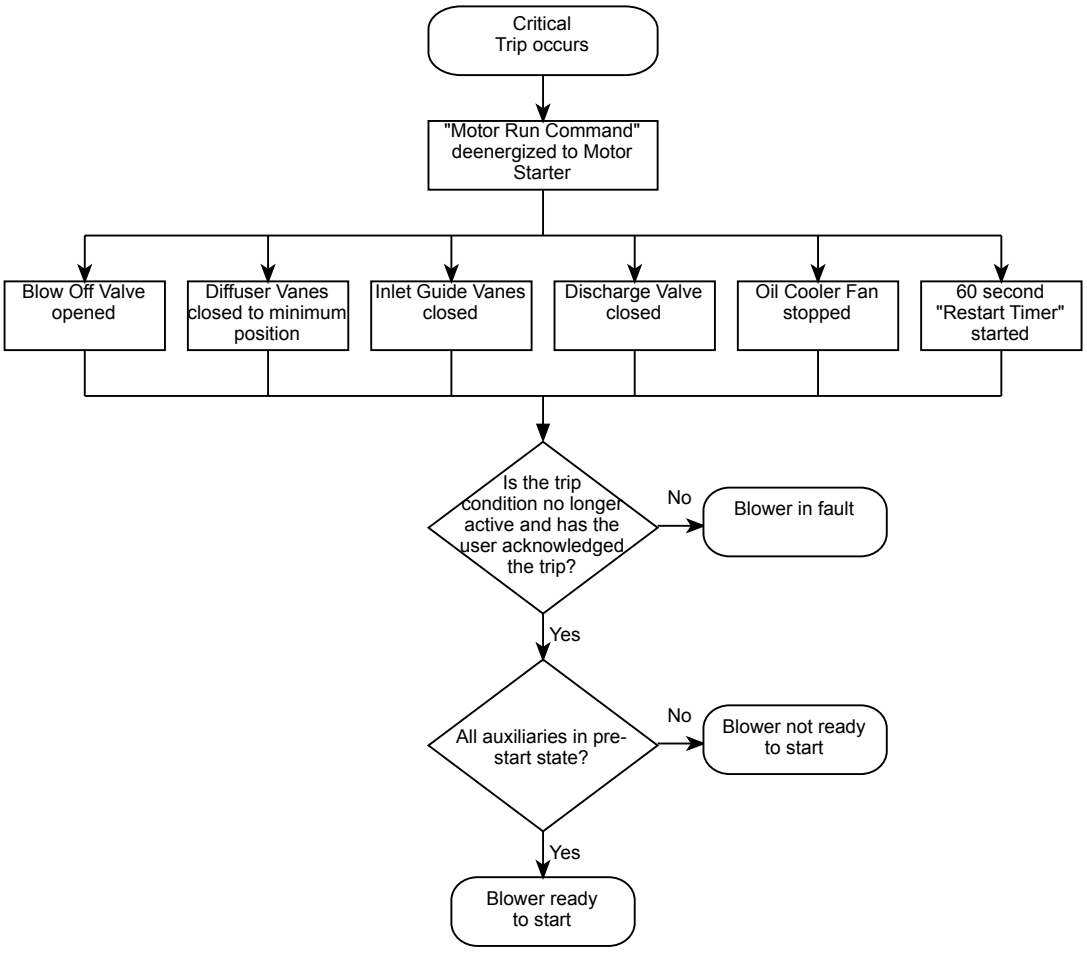
The blow-off valve stroke time is 15 seconds or less. When commanded to open, if the blow-off valve is not fully open after 20 seconds, the LCP will immediately de-energize the “Motor Run Command” to the MCC.

The blower cannot restart until the trip condition is no longer active and the operator acknowledges and resets the trip locally on the HMI of the LCP.

11. CRITICAL STOP SEQUENCE (Hard Stop)

In order to protect the blower, the critical stop procedure stops the main motor immediately without waiting for the blow-off valve to open. The critical stop procedure is activated when one of the following trips is detected:

- Low-low oil pressure (PT-100)
- Low-low oil pressure (PSLL-100)
- High-high oil pressure (PT-100)
- Surge (PSH-200)
- High-high gear vibration (VT-100)
- High-high vibration motor D.E. bearing (VT-120)
- High-high vibration motor D.E. bearing (VT-121)
- Motor Starter Feedback (main motor running) not received during start-up
- Motor Starter Feedback (main motor running) missing while blower in operation
- Motor Starter Fault
- Blow off valve failure to open during shutdown (C-0220)
- Emergency Stop Button Activated
- Loss of Main Supply Power



The blower cannot restart until the trip condition is no longer active and the operator acknowledges and resets the trip locally on the HMI of the LCP.

12. EMERGENCY STOP

NOTE: The emergency stop should only be used if there is risk of personal injury or property damage.

The emergency stop is activated when an operator presses the emergency stop (E-stop) button on the LCP door (or on the blower skid if applicable). The E-stop is wired in series with the hardwired signal permissive contact "Motor Run Command" from the LCP to the motor starter. Activating the E-stop removes the "Motor Run Command" to the motor starter which immediately de-energizes the main motor.

When the E-stop is activated, power is automatically removed from all 120VAC auxiliaries (oil cooler, blow-off valve, etc). The auxiliaries will remain in their current position.

It is highly recommended to loop additional emergency stop push buttons together with the blower emergency stop circuit. This increases the safety of the equipment and plant personel. Refer to the Local Control Panel drawings for wire terminal locations used to connect additional emergency stop buttons.

As soon as the emergency stop is reset (by operator), the LCP will set all auxiliaries to their pre-start conditions. The blower cannot restart until the operator acknowledges and resets the trip locally on the HMI of the LCP.

BLOWER FAULT STATUS INFORMATION

When the blower is in a fault state, a popup will be displayed indicating the trip(s) that caused the blower to stop. The main status will say "Blower Fault." The secondary status will display one the following status's:

- If the Trip has not been acknowledged or reset: "Acknowledge and Reset Trip Status"
- If the Trip has been acknowledged but not reset: "Reset Trip Status on Alarms Page"

13. ALARM SIGNALS

Alarm signals are intended to inform the operator of a problem or undesirable condition within the blower. Alarms do not stop the blower. While alarms do not stop the blower, some alarms will restrict the blower from starting. The following alarms, if active, will not allow the blower to start:

- Low Oil Level Switch (LSL-050)
- Max number of starts exceeded in a one-hour time frame
- BOV Monitor Relay Trip
- BOV Circuit Breaker Overload
- Isolation Valve Monitor Relay Trip
- Isolation Valve Circuit Breaker Overload
- Low Oil Tank Temperature
- Main Power Failure, on UPS backup power
- Rotation Sensor detected motor shaft rotation while blower off
- Sensor Fault –TT-101, PDT-200

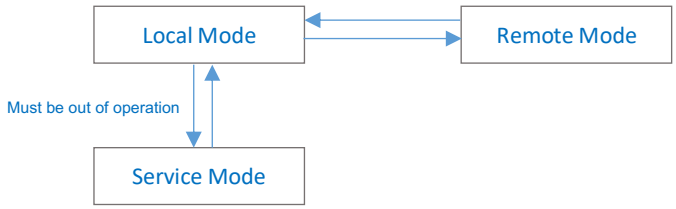
The following alarms do not restrict the blower from starting:

- Electrical Surge Suppressor Failure in LCP
- Loss of Network Communication with MCP
- Low oil pressure (PT-100)
- High oil temperature (TT-200)
- High inlet air temperature (TT-100)
- High gear vibration (VT-100)
- High temperature main motor D.E. bearing (TE-120)
- High temperature main motor N.D.E. bearing (TE-121)
- High temperature high-speed shaft D.E. bearing (TE-130)
- High temperature high-speed shaft N.D.E. bearing (TE-131)
- High temperature slow-speed shaft D.E. bearing (TE-132)
- High temperature slow-speed shaft N.D.E. bearing (TE-133)
- High pressure across oil filter (dirty filter) (PDSI-300)
- High temperature main motor windings (TE-110/TE-111/TE-112)
- High Motor Vibration (VT-120, VT-121)
- High Motor Current (97% of FLA)
- High-High Motor Current (100% of FLA)
- High pressure across inlet air filter (dirty filter) (PDIT-210, PDIT-211)
- Oil Heater Circuit Breaker Overload (MA-005)
- UPS Fault
- Sound Enclosure Fan Circuit Breaker Overload
- High Sound Enclosure Temperature (TT-110)
- High discharge air temperature (TT-101)
- Sensor Fault –PDT-210, PDT-211, TT-110

14. OPERATING THE BLOWER USING THE LOCAL HMI

14.1 Blower LOCAL/AUTO/SERVICE Modes

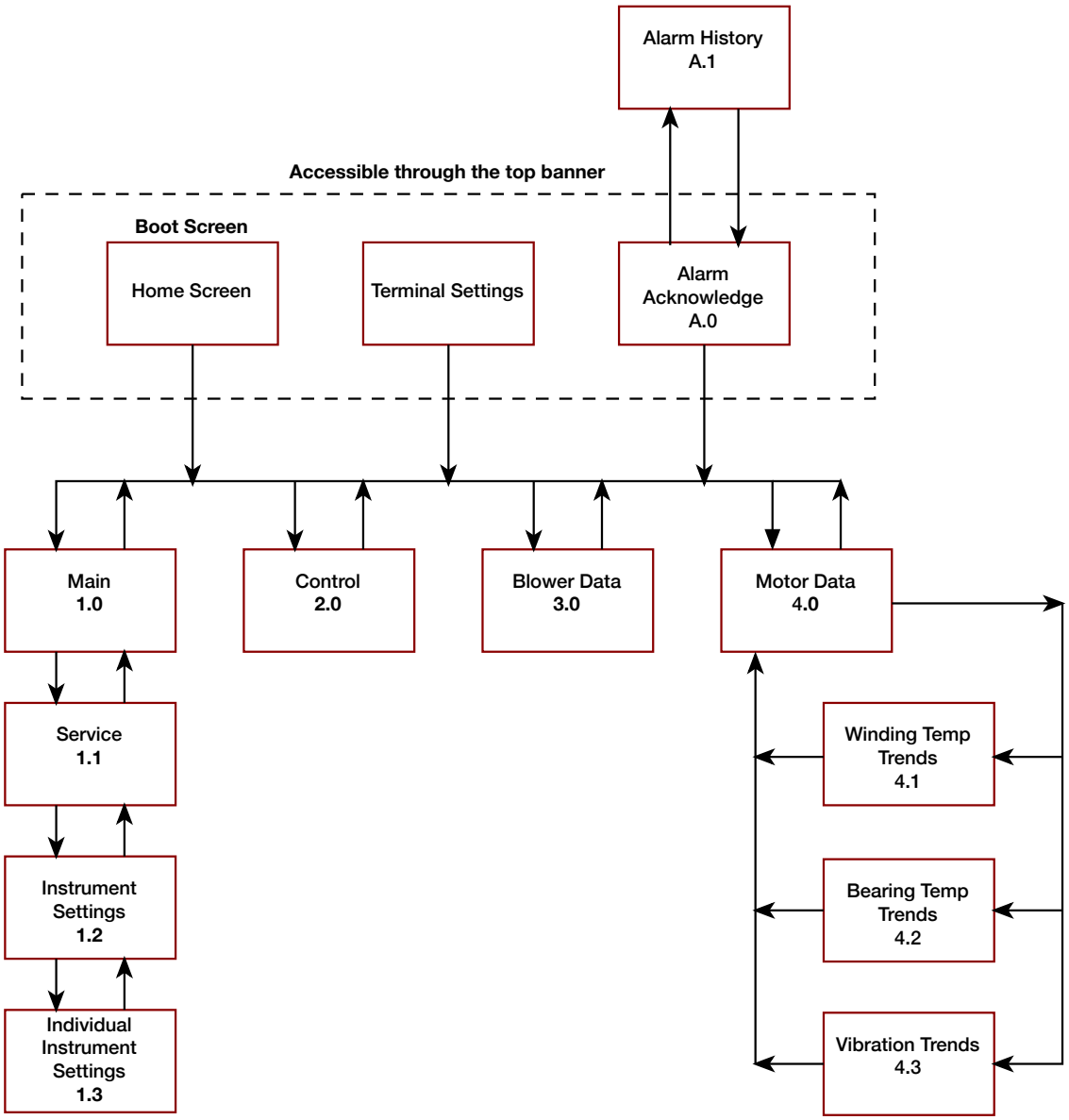
Access to the Modes:



Description of the Modes:

	Local Mode	Remote Mode	Service Mode
User	*Plant Operator*	*Plant Operator*	*Maintenance Personnel*
Description	In Local Mode the turbo blower can only be started and stopped locally on the HMI. After the blower start sequence has been completed, the blower capacity can be increased and decreased locally on the HMI.	In Remote (Auto) Mode the turbo blower can only be started and stopped remotely or by the MCP. After the blower start sequence has been completed, the blower capacity will be increased and decreased remotely by the MCP according to the selected set point and the actual airflow to the process.	In Service Mode the turbo blower can neither be started locally nor remotely for security purposes. For maintenance purposes the auxiliary components can be operated independently of each other and independent from the operation of the blower.
User Actions	▪ Acknowledge alarms and trips. ▪ Start/stop the blower. Open/Close the diffuser and therefore adjust capacity	▪ Acknowledge alarms & trips	▪ Acknowledge alarm & trips ▪ Open/close diffuser ▪ Open/close IGV ▪ Open/close blow-off valve ▪ Open/close isolation valve ▪ Start/stop Oil cooler ▪ Start/stop enclosure ventilation fan(s) [when installed]

14.2 HMI Screen Navigation



14.3 Screen Explanation

14.3.1 Home (Boot Screen)

1	Log On Button	Opens the Logon popup screen and allows the user the log on to the HMI. See logon screen explanation in section 14.3.2.
2	Bottom Banner	Displays the navigation buttons for the most commonly used screens.

14.3.2 Logon Popup

1	User Name Input	Tap on this input to type in the user name.
2	Password Input	Tap on this input to type in the password.
3	Log on Button	Tap this button to log on after a valid user name and corresponding password have been entered.
4	Logged on Display	Displays the user name that is currently logged in.
5	Log off Button	Tap this button to log off.

HMI Logins and Passwords

Type	User Name	Password
Supervisor	supervisor	nttspa
Operator	plant	ntt

14.3.3 Top Banner

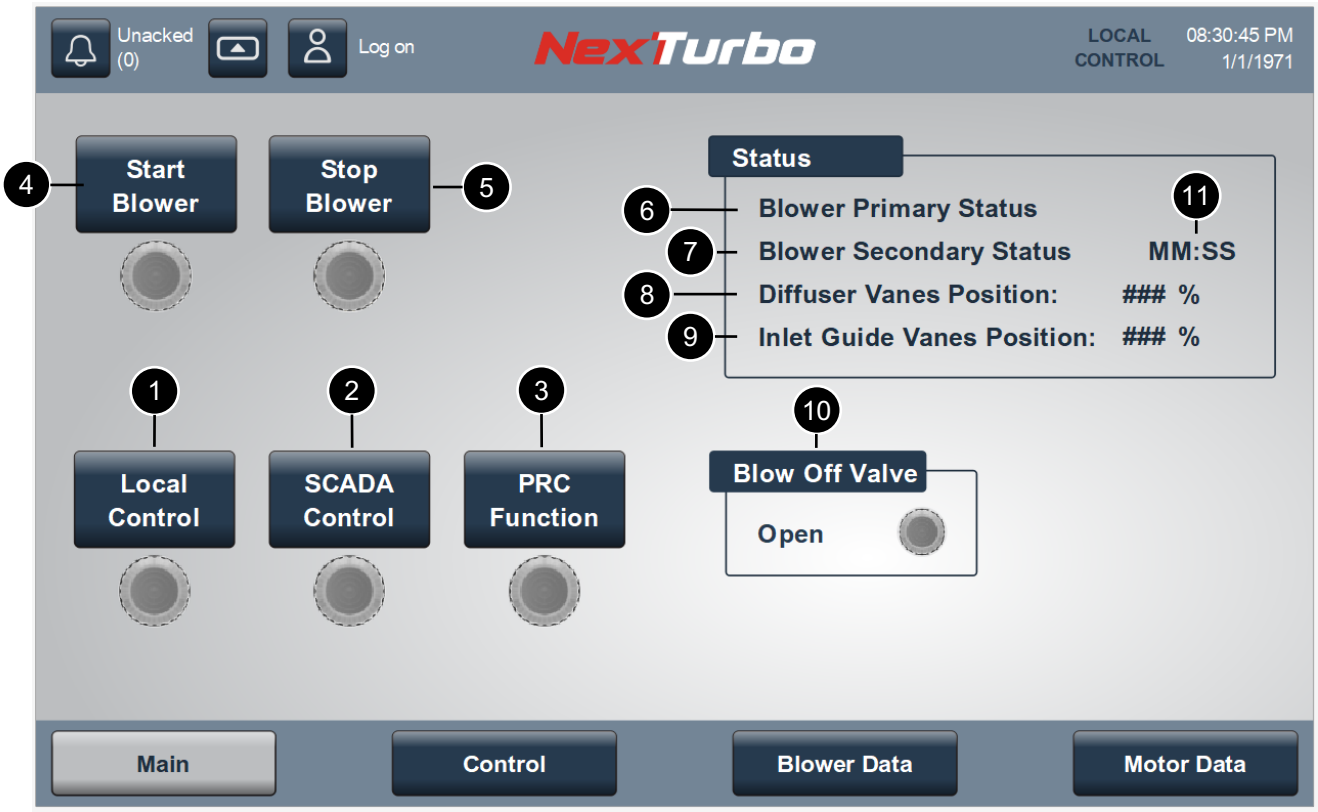
1	Alarm Acknowledgement screen	Opens the Alarm Summary screen when pressed. The indicator turns on red and flashes when there are active alarms that are unacknowledged. When all active alarms are acknowledged the indicator turns solid red. The indicator returns to the default gray icon when all alarms return to normal.
2	Unacknowledged Alarms Count	Indicates the number of unacknowledged alarms and trips.
3	Menu Button	Opens a drop-down menu to allow the user to navigate to either the Home Screen or the Terminal Settings Page
4	Log on Button	Opens the Logon popup screen. Allows the user to Log off. Will display the current logon type (admin [Administrator], plant [Operator], supervisor [Supervisor]).
5	Network Status	Will display a caution indicator or error indicator if there is an issue with network communication. Caution will appear if the network is functioning but has an issue that requires attention. Error will appear if the network is not functioning, i.e. an ethernet cable is disconnected or there is a duplicate IP address.
6	Controller Status	Will display an error, caution or unknown indicator if there is an issue with the controller. Error will appear if the controller is disconnected, powered down, or not configured. Caution will appear if the controller is not in run mode or the tag data is not synchronized with the HMI. Unknown indicator will appear if no controller is visible to the HMI.
7	SCADA/MCP Communication Status	This icon is invisible if communication is active between the LCP and the MCP or SCADA. This icon will be displayed if communication has been lost between the LCP and SCADA. If Next Turbo is supplying a Master Control Panel, the icon will display MCP rather than SCADA.
8	Local/Remote Status	See Main Screen 1.0. Displays “Local Control” if Local mode is selected. Displays “SCADA Control” if Remote mode is selected.
9	Time	The current time and date of the HMI

14.3.4 Bottom Banner

1	Main Button	Opens the Main screen
2	Control Button	Opens the Control screen
3	Blower Data Button	Opens the Blower Data screen
4	Motor Data Button	Opens the Motor Data screen

Note: The button of the current screen will be gray to indicate that screen is active.

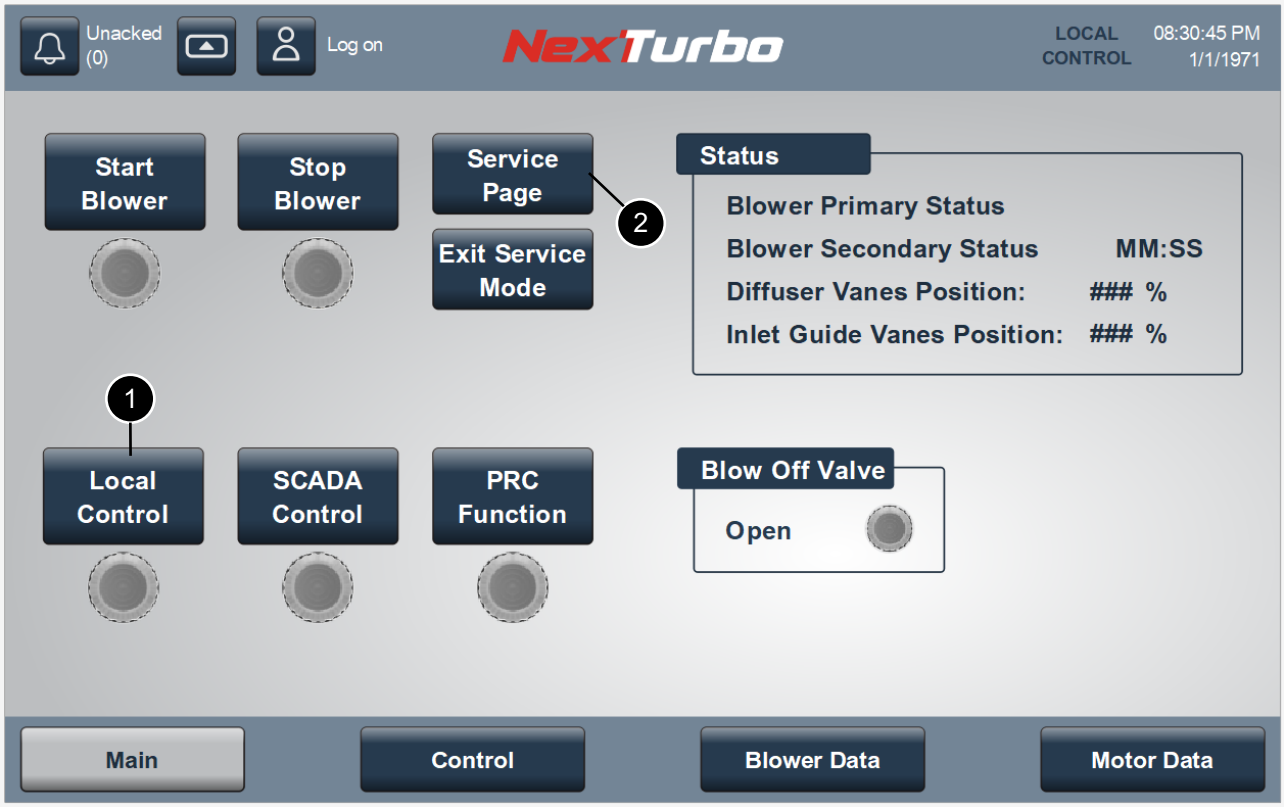
14.3.5 Main (1.0)



1	Local Mode Button	Sets the blower in local control. An operator can control the blower from the HMI. The light will turn on when selected.
2	SCADA Mode Button	Sets the blower in automatic control. SCADA or a master control panel controls the blower remotely. The light will turn on when selected.
3	PRC Function Button	Enables the Pre-Rotation Control function. This engages the inlet guide vane control. The IGV is automatically positioned to obtain the best possible efficiency. The light will turn on when PRC is on. When PRC is not active, the inlet guide vane is set to 100% open.
4	Start Button	Starts the blower if in local mode. When the start button is pressed, the light will flash until the blower has finished its start-up routine and the blow-off valve is closed. When in remote mode, this button is inactive and is grayed out.
5	Stop Button	Stops the blower if in local mode. When the stop button is pressed, the light will flash until the blower is completely stopped and ready to be restarted. When in remote mode, this button is inactive and is grayed out.
6	Blower Primary Status	Displays the current state of the blower. The blower can be in one of the following states: 1. Blower Ready to Start 2. Starting 3. Running 4. Stopping 5. Stopped – Not Ready to Start 6. Stopped – In Alarm

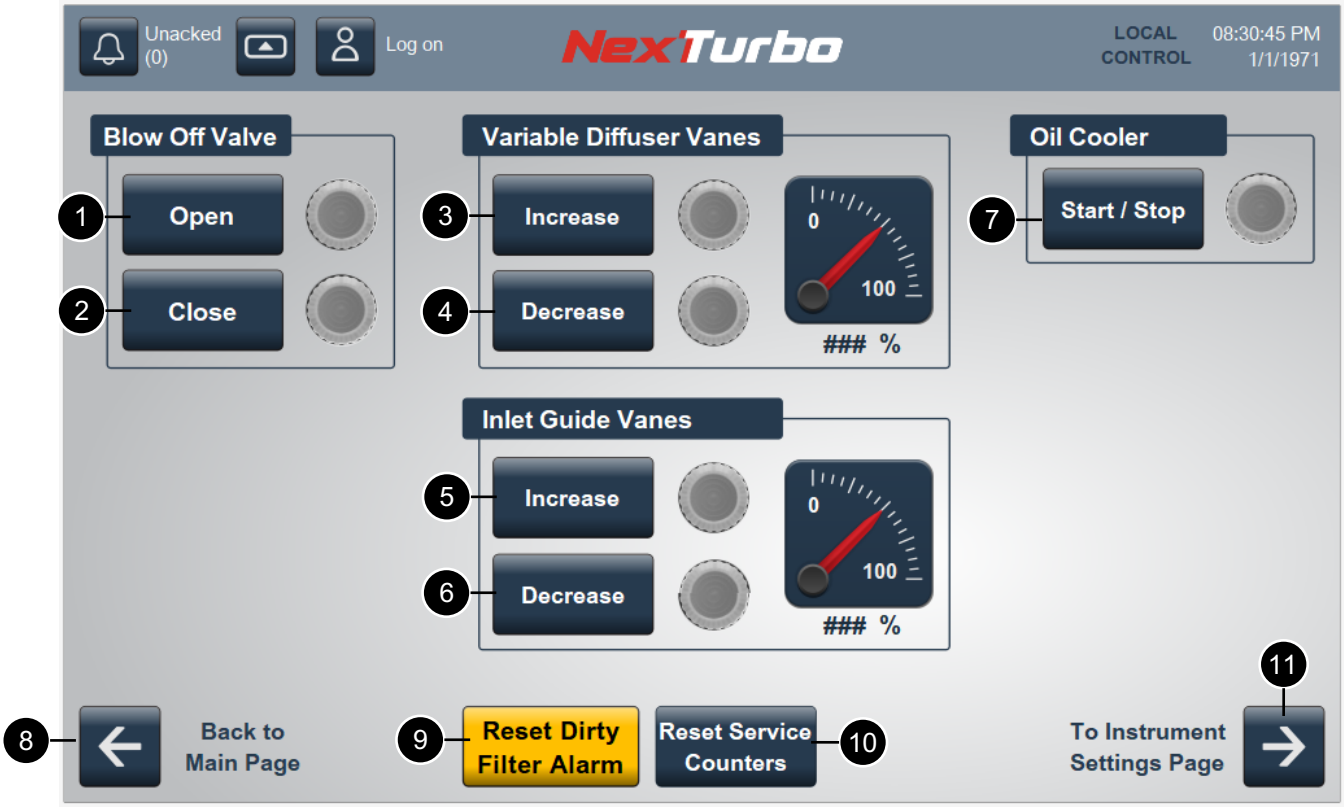
7	Blower Secondary Status	Displays a subset of the Blower Primary Status. Blower in the “Ready” or “Running” State, displays: 1. Comm Failure at “time stamp” 2. Unacknowledged Trips 3. Unacknowledged Alarms Blower in the “Starting” State, displays: 1. Opening isolation valve 2. Waiting for Motor Starter Feedback 3. Motor ramping up to speed 4. Opening Inlet Guide Vanes 5. Closing blow off valve Blower in “Stopping” State, displays: 1. Closing diffuser vanes 2. Opening blow off valve 3. Waiting for motor ramp down timer to expire Blower State “Stopped – Not Ready to Start”, displays: 1. Reached Maximum # of Starts – “time until next start allowed” 2. Closing Isolation Valve 3. VDV not in Pre-start State 4. IGV not in Pre-start State 5. Blow Off Valve not in Pre-start State 6. Isolation Valve not in Pre-start State 7. Alarm Active – See alarms page Blower in “Fault” State, displays: 1. Motor Starter Feedback Still Present 2. Acknowledge and Reset Trip Status 3. Reset Trip Status on Alarms Page.
8	Diffuser Vane Status	Displays the current state of the diffuser vanes. The diffuser vanes can be in one of the following states: 1. At Maximum 2. At Minimum 3. Position: “###%” 4. Position Sensor Fault 5. Failed to Close 6. Circuit Breaker Trip
9	Inlet Guide Vane Status	Displays the current state of the inlet guide vanes. The IGV can be in one of the following states: 1. At Maximum 2. At Minimum 3. Position: “###%” 4. Position Sensor Fault 5. Failed to Close 6. Failed to Open 7. Circuit Breaker Trip
10	Blow-off Valve Status	If the blow-off valve is full open, the open light will turn white. If the blow-off valve is fully closed, the closed light will turn white. If neither light is on, the blow-off valve is at an intermediate position.
11	Count Down Timer Status	• If the blower has started and stopped four times in a one hour time frame, the blower is not allowed to start again until it has been more than an hour since the first start. This timer will appear displaying the minutes and seconds left before another restart is allowed. • If the blower has been stopped, there is a 60 second delay before the blower is allowed to start again. This timer will appear displaying the seconds left before another restart is allowed. • If the network communication between the LCP and the MCP has failed, the time stamp of the communication failure will be displayed here.

14.3.6 Main (1.0) – Entering Service Mode



1	Local Mode Button	If this button is pushed and held for 5 seconds, the "Service Mode" button will appear. The blower is now in service mode. When in service mode, both local mode and remote mode lights are off and the blower is not allowed to start. To exit service mode, navigate to any screen other than the Service screen. Note: The user must be logged in as Operator or Supervisor to access Service Mode.
2	Service Mode Button	Navigates to the Service Screen

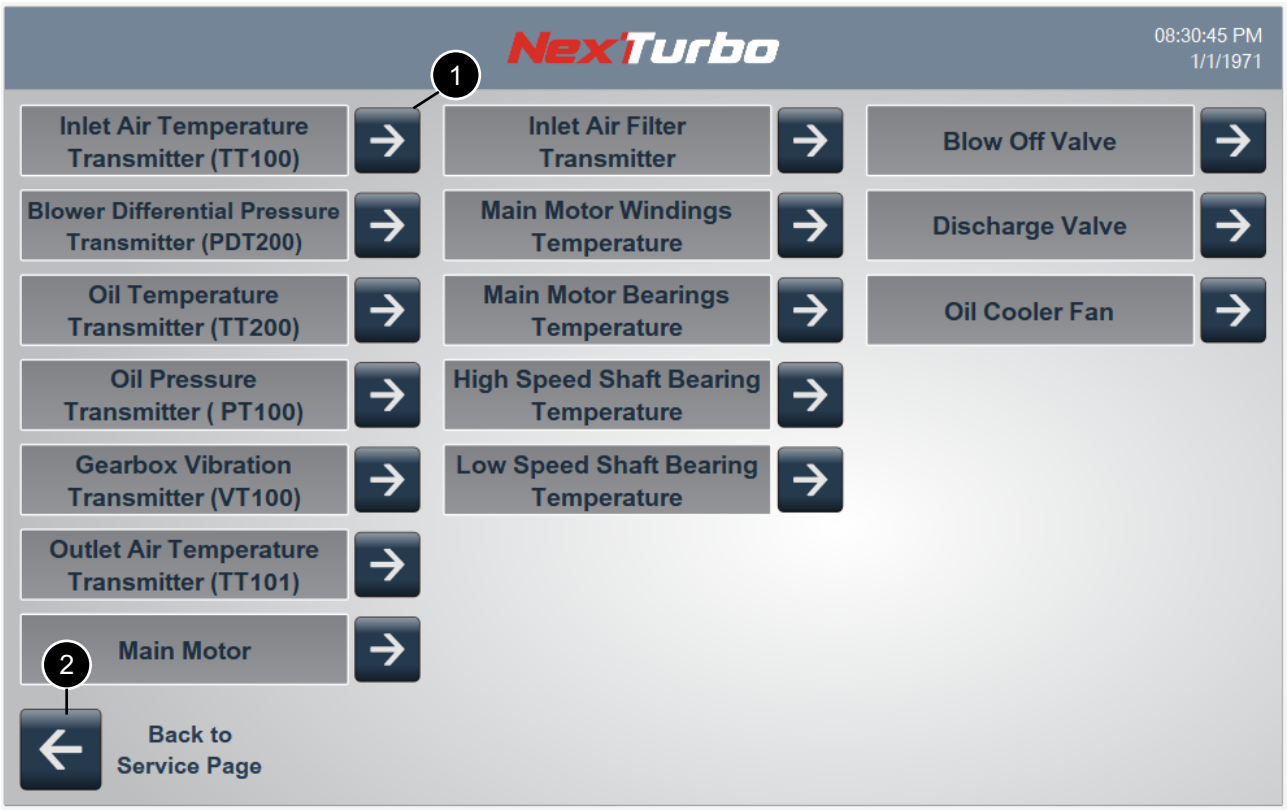
14.3.7 Blower Service (1.1)



1	Open Blow Off Valve Button	Moves the valve towards the open position when pressed. The light will turn on white when the valve is at maximum position.
2	Close Blow Off Valve Button	Moves the valve towards the closed position when pressed. The light will turn on white when the valve is at minimum position.
3	Increase VDV Button	Moves the actuator towards the maximum position when pressed. The light will turn on white when the actuator is at maximum position.
4	Decrease VDV Button	Moves the actuator towards the minimum position when pressed. The light will turn on white when the actuator is at minimum position.
5	Decrease IGV Button	Moves the actuator towards the minimum position when pressed. The light will turn on white when the actuator is at minimum position.
6	Increase IGV Button	Moves the actuator towards the maximum position when pressed. The light will turn on white when the actuator is at maximum position.
7	Start/Stop Oil Cooler Button	Starts and Stops the oil cooler fan. The light will turn on red when the fan is on.
8	Previous Screen Button	Navigates to the Blower Main screen (screen No. 1.0)
9	Reset Dirty Filter Alarm Button	If the inlet air filter(s) or oil filter are dirty and need cleaned/replaced, this button will visible. When an operator replaces or cleans the filters, they should come to this page and press this button.
10	Reset Service Counters	This button will reset the runtime since last service and number of starts since last service counters seen on the Control Screen (screen No. 2.0).

11	Next Screen Button	Navigates to the Instrument Settings screen (screen No. 1.2). This button is only visible if the user is logged in as Supervisor.

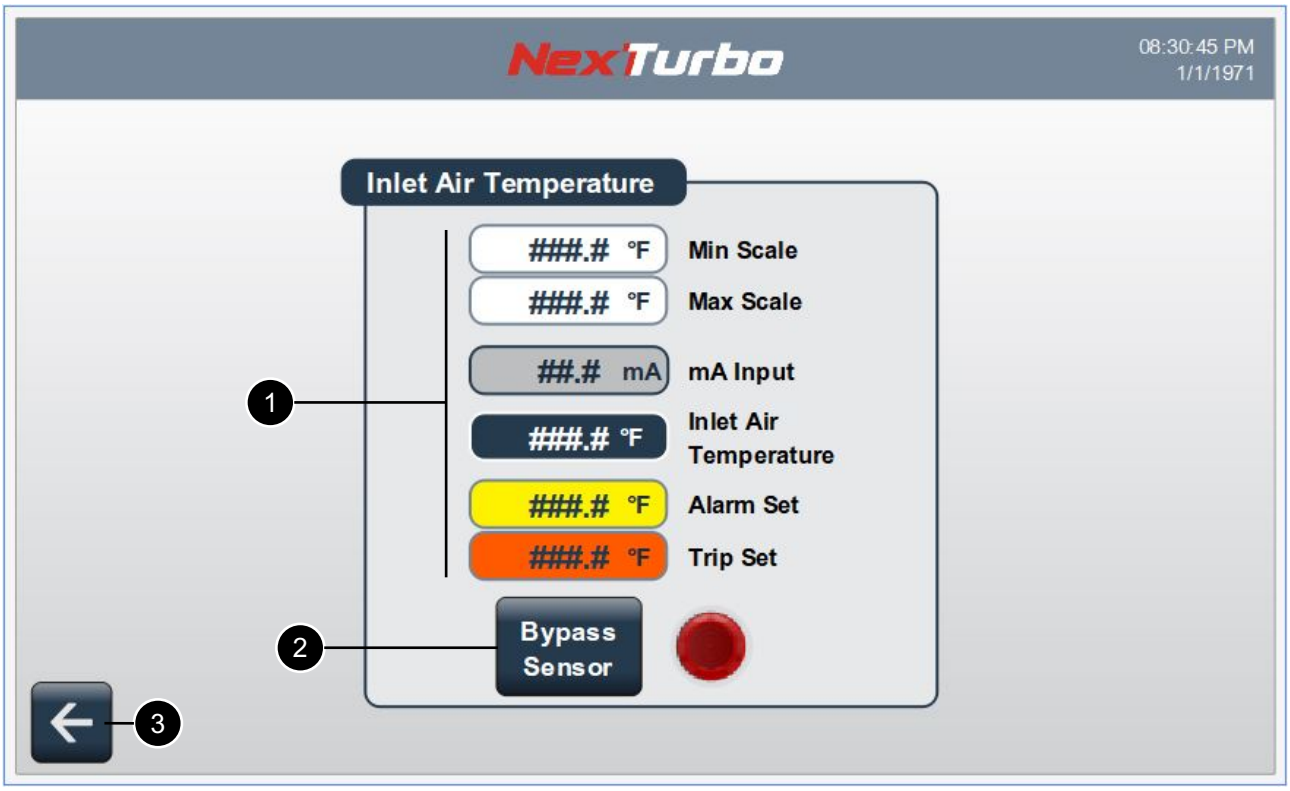
14.3.8 Instrument Settings (1.2)



NOTE: Only the 'Supervisor' login is allowed to access this screen.

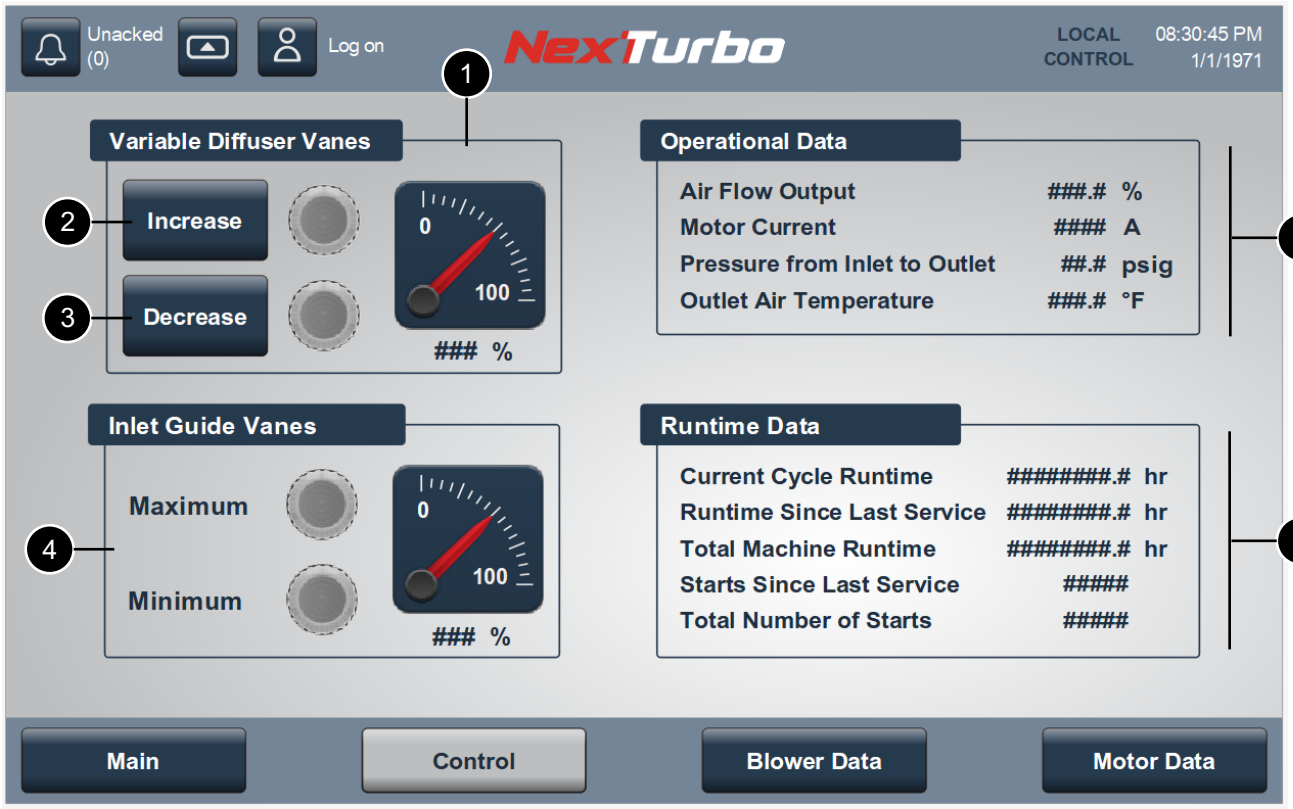
1	Instrument Setting Button	Navigates to the individual instrument settings screen.
2	Previous Screen Button	Navigates to the Blower Service screen. (screen 1.1)

14.3.9 Example of Individual Instrument Settings – Inlet Air Temperature Transmitter (1.3)



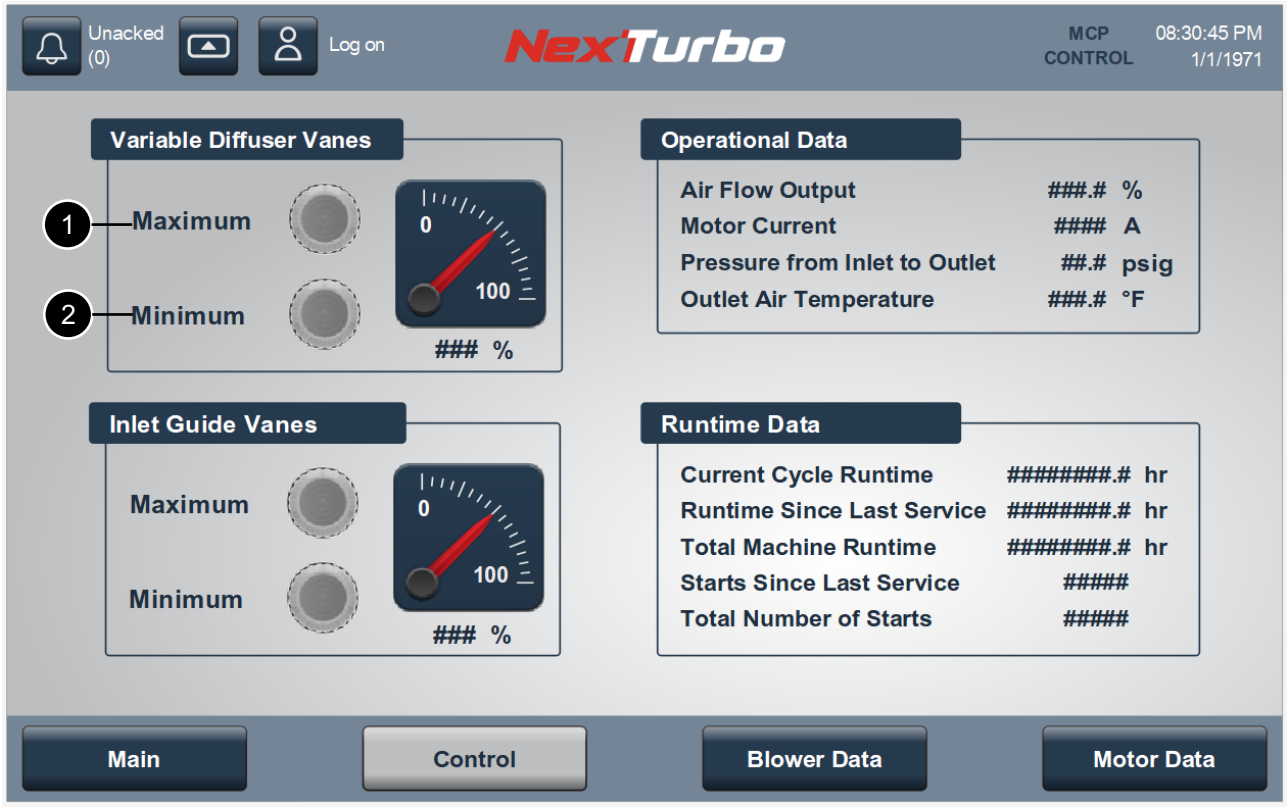
1	Instrument Settings	These values are read only. They are determined at the factory and are set at levels to protect the blower from catastrophic failure. They can only be adjusted by an authorized Next Turbo representative.
2	Bypass Sensor Button	Disables this instruments trip from stopping the blower. The light will turn on red if the instrument trip is disabled.
3	Previous Screen Button	Navigates to the Instrument Settings screen (screen 1.2)

14.3.10 Control (2.0) – Blower in Local Mode



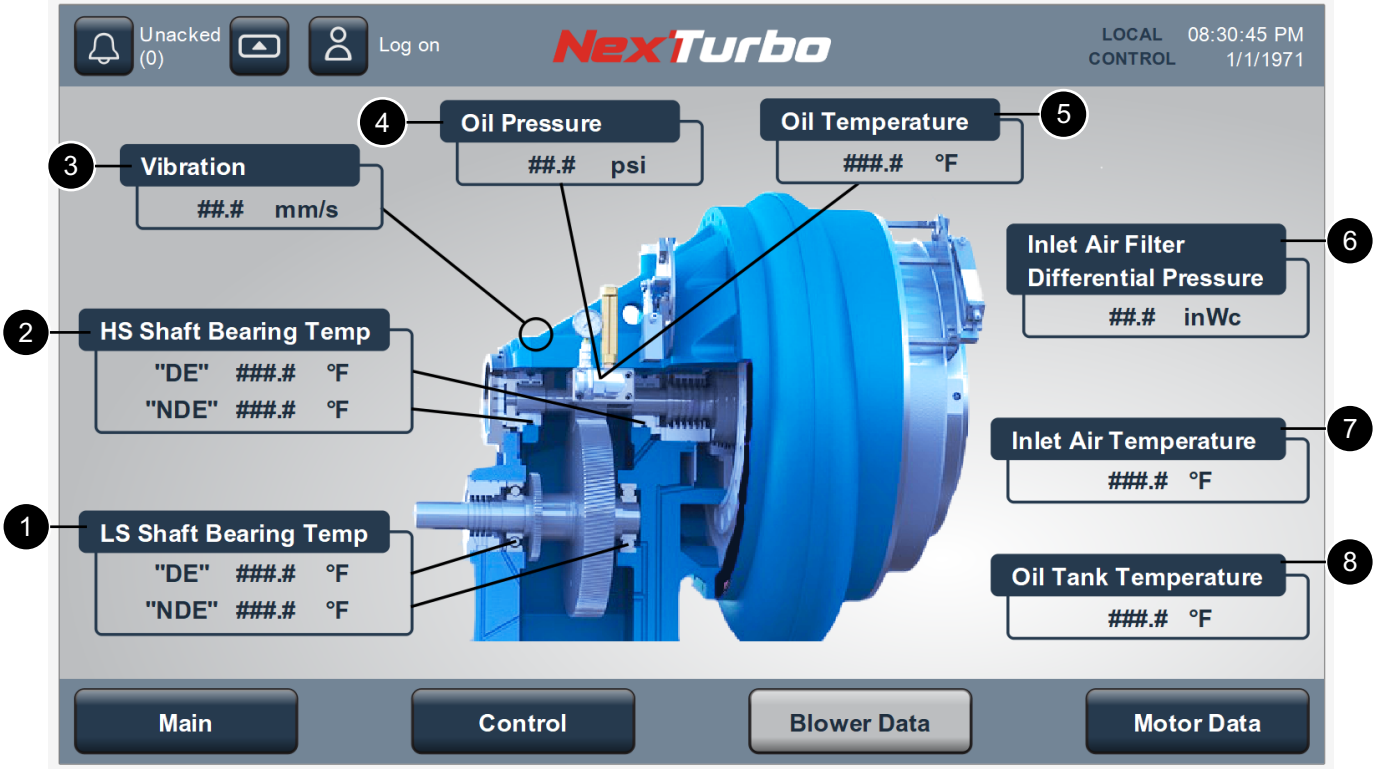
1	VDV Position Display	Displays the position of the variable diffuser vanes. The position is displayed as a percentage between 0 and 100%. The maximum light will turn on white when the diffuser vanes are at the maximum position. The minimum light will turn on white when the diffuser vanes are at the minimum position. NOTE: Diffuser vanes at zero (0%) means the blower output is 40-45% (project dependent) of the rated flow. Diffuser vanes at 100% means blower output is 100%
2	Increase VDV Button	Moves the diffuser vanes in the open direction. When the button is released the VDV will stop. NOTE: This button will only be visible when Local Mode is selected
3	Decrease VDV Button	Moves the diffuser vanes in the closed direction. When the button is released the VDV will stop. NOTE: This button will only be visible when Local Mode is selected
4	IGV Position Display	Displays the position of the inlet guide vanes. The position is displayed as a percentage between 0 and 100%. The maximum light will turn on white when the inlet guide vanes are at the maximum position. The minimum light will turn on white when the inlet guide vanes are at the minimum position.
5	Operational Data	Displays the current measurement values of the listed process variables. The Noise Enclosure Temperature measurement is only available on blowers that include a sound enclosure.
6	Runtime Counters	Displays the runtime for the current cycle runtime, runtime since last service, and the total runtime of the blower.

14.3.11 Control (2.0) – Blower in Remote Mode



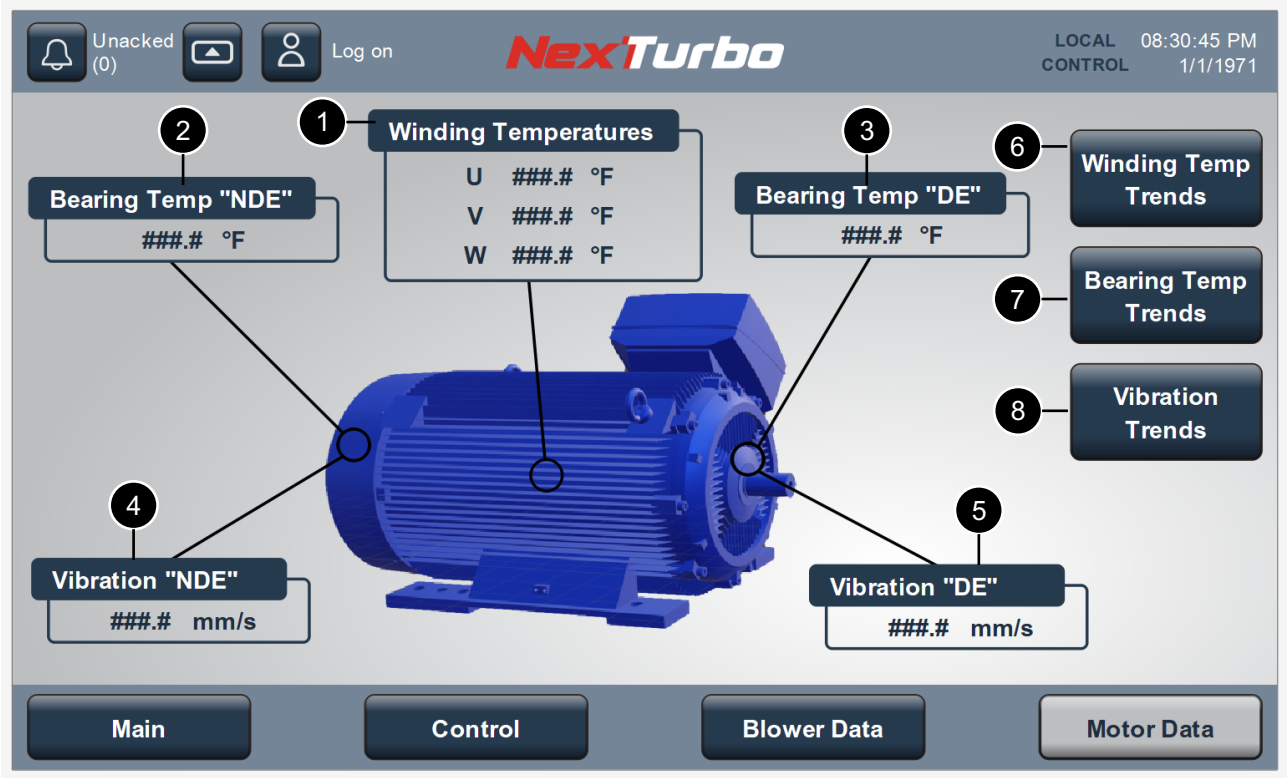
1	Increase VDV Button	When the blower is in remote mode, SCADA controls the blower and therefore the increase and decrease diffuser button are not available.
2	Decrease VDV Button	

14.3.12 Blower Data (3.0)



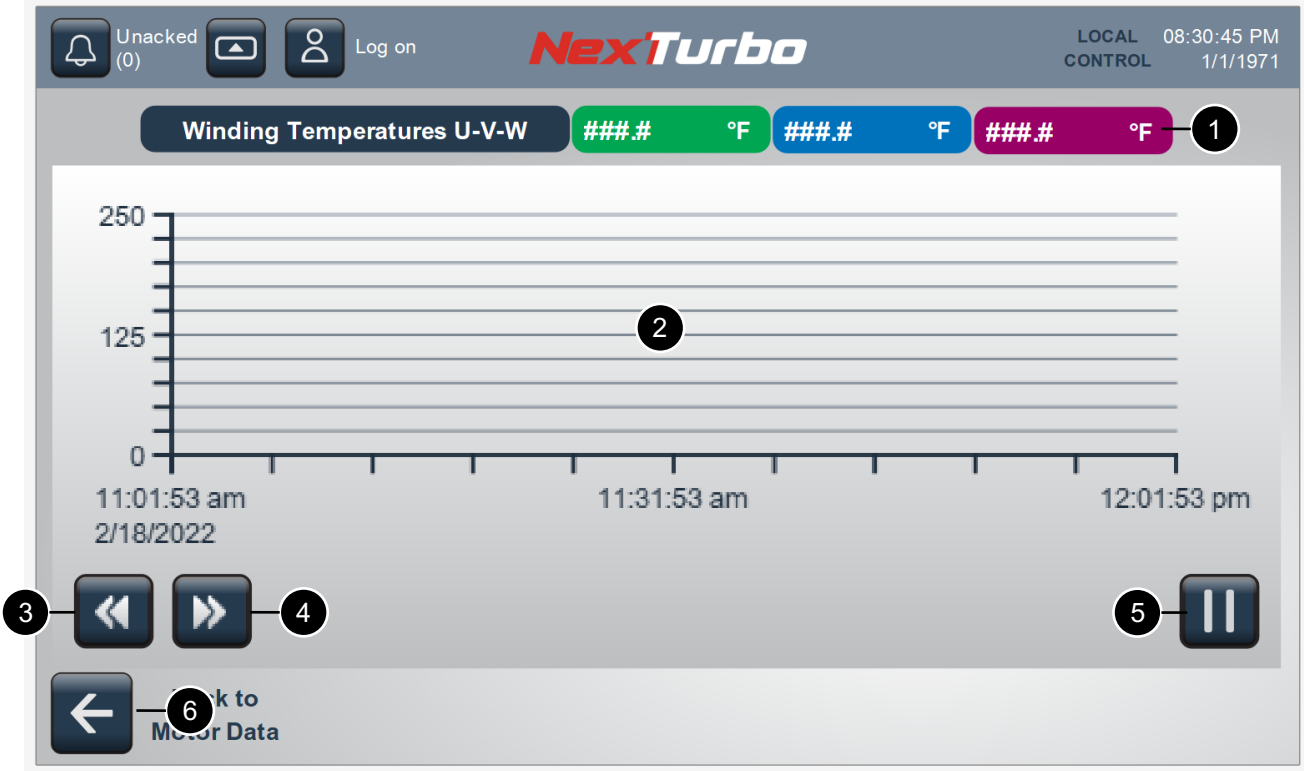
1	LS Shaft Bearing Temp	Gearbox low speed shaft bearing temperature measurements. Only available on blowers that include RTDs on the low-speed shaft.
2	HS Shaft Bearing Temp	Gearbox high speed shaft bearing temperature measurements. Only available on blowers that include RTDs on the high-speed shaft.
3	Vibration	Gearbox vibration transmitter measured in millimeters per second.
4	Oil Pressure	Oil pressure measured at the inlet to the gearbox.
5	Oil Temperature	Oil temperature measured at the inlet to the gearbox.
6	Inlet Air Filter Differential Pressure	Measures the pressure drop across the inlet air filter(s). It allows the blower to detect when an inlet air filter is dirty and needs replaced.
7	Inlet Air Temperature	Temperature of the air entering the blower.
8	Oil Tank Temperature	Temperature of the oil in the oil tank. Only available on blower that require a oil heater.

14.3.13 Motor Data (4.0)



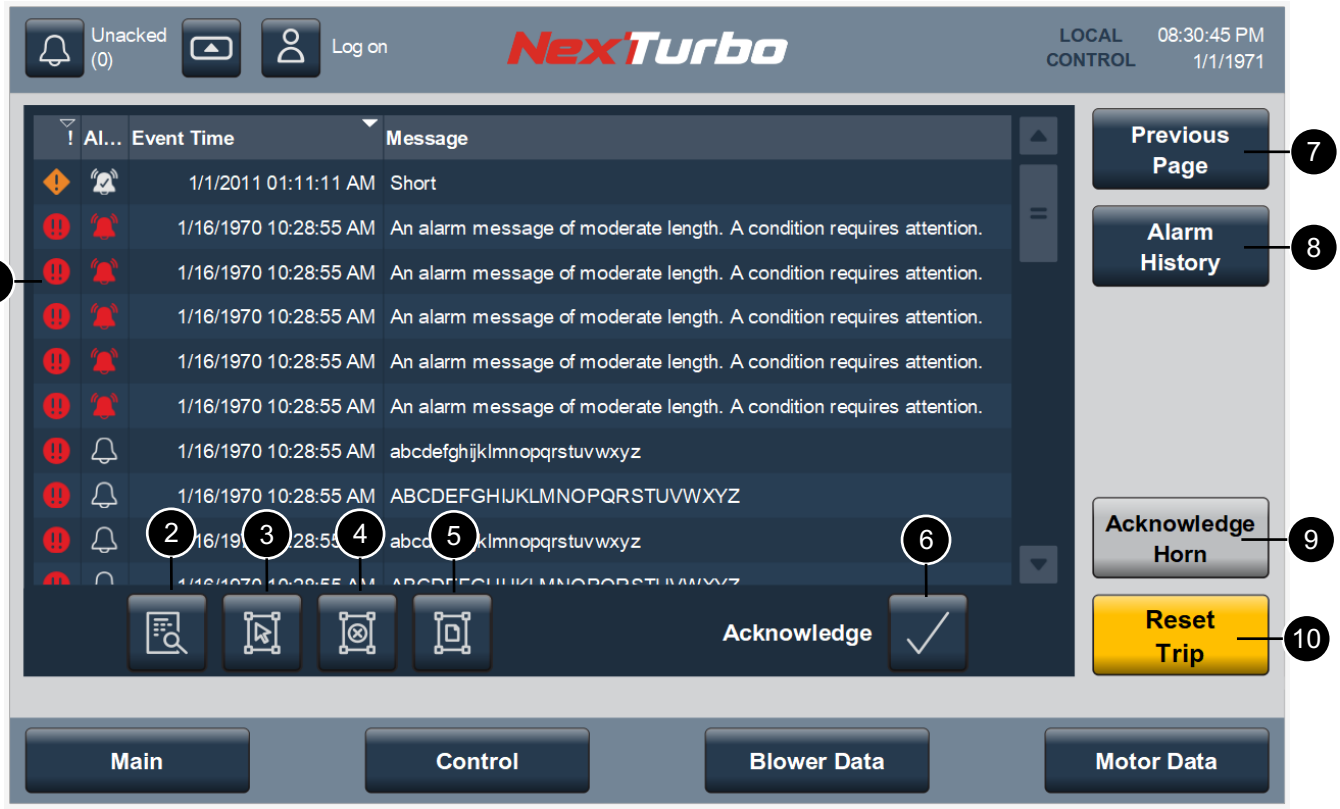
1	Winding Temperatures	Displays the temperature measurement of each motor winding.
2	Bearing Temp “NDE”	Displays the temperature measurement of the “Non-Drive End” motor bearing. Only available on blowers that include motor bearing RTDs.
3	Bearing Temp “DE”	Displays the temperature measurement of the “Drive End” motor bearing. Only available on blowers that include motor bearing RTDs.
4	Vibration “NDE”	Displays the vibration measurement on the “Non-Drive End” motor bearing. Only available on blowers that include motor vibration transmitters.
5	Vibration “DE”	Displays the vibration measurement on the “Drive End” motor bearing. Only available on blowers that include motor vibration transmitters
6	Winding Temp Trends Button	Navigates to the Winding Temperature Trends screen (screen 4.1).
7	Bearing Temp Trends Button	Navigates to the Bearing Temperature Trends screen (screen 4.2). Only available on blowers that include motor bearing RTDs.
8	Vibration Trends Button	Navigates to the Vibration Trends screen (screen 4.3). Only available on blowers that include motor vibration transmitters

14.3.14 Motor Trend (4.1)



1	Winding Temperature Measurements	Displays the current temperature of each motor winding.
2	Temperature Trend Graph	Displays the winding temperature in graphical format over the selected time frame. The color of the trend line of each winding corresponds to the color of the Winding Temperature Display.
3	Pan Backward Button	Displays previous data one-half time space at a time. This button appears only when there is data collected prior to the data displayed in the current time span.
4	Pan Forward Button	Displays more recent data one-half time span at a time. This button appears only when there is data collected after the data displayed in the current time span.
5	Resume Button	Updates data after the trend chart is paused. Pause  replaces Resume  when the trend chart is scrolling. When a trend chart is paused, the trend chart is static at the time the trend chart was paused and data is not updated. Data is collected in the background.
6	Previous Screen Button	Navigates back to the Motor Data screen (screen 4.0).

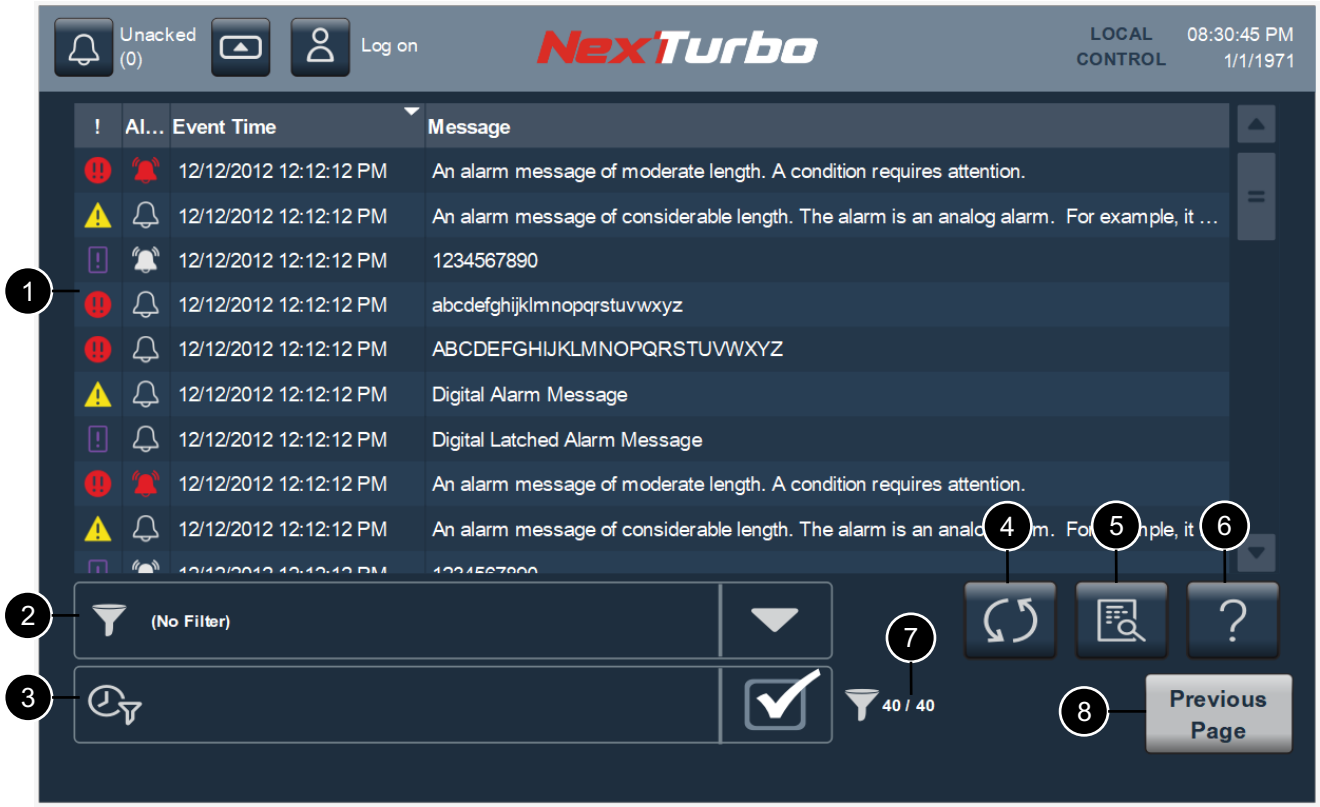
14.3.15 Alarm Acknowledge (A.0)



1	Alarm Table	The list of "In Alarm" and/or Unacknowledged alarms. Each row contains a single alarm condition.
	Priority	• Low  • Medium  • High  • Urgent 
	Alarm State	• Normal, Unacknowledged  and Urgent  • In Alarm, Acknowledged  and Urgent  • In Alarm, Unacknowledged  and Urgent 
	Event Time	The time the alarm condition or sub-condition changed to the currently displayed state
	Message	The message assigned to the alarm
2	Details Pane	Shows the details of the last selected alarm. If no alarm is selected, the Details pane is empty.
3	Select All Button	Selects all alarms in the Alarm Table, including those not displayed on the current page of alarms.
4	Deselect All Button	Deselects all alarms in the Alarm Table, including those not displayed on the current page of alarms.
5	Select Page Button	Selects all the alarms displayed on the current page of alarms.

6	Acknowledge Button	Indicates that you are aware of the alarm. This button changes the state of the alarm from unacknowledged to acknowledged. An alarm must be selected from the list in order for it to be acknowledged.
7	Previous Page Button	Navigates back to the previous screen.
8	Alarm History Button	Navigates to the Alarm History Page (screen A.1)
9	Acknowledge Horn Button	Silences the Horn. This button is only visible when the horn is active.
10	Reset Trip Button	Clears the trip in the PLC. This button will flash when the trip(s) have been acknowledged but not cleared. This button is only visible when a trip has occurred.

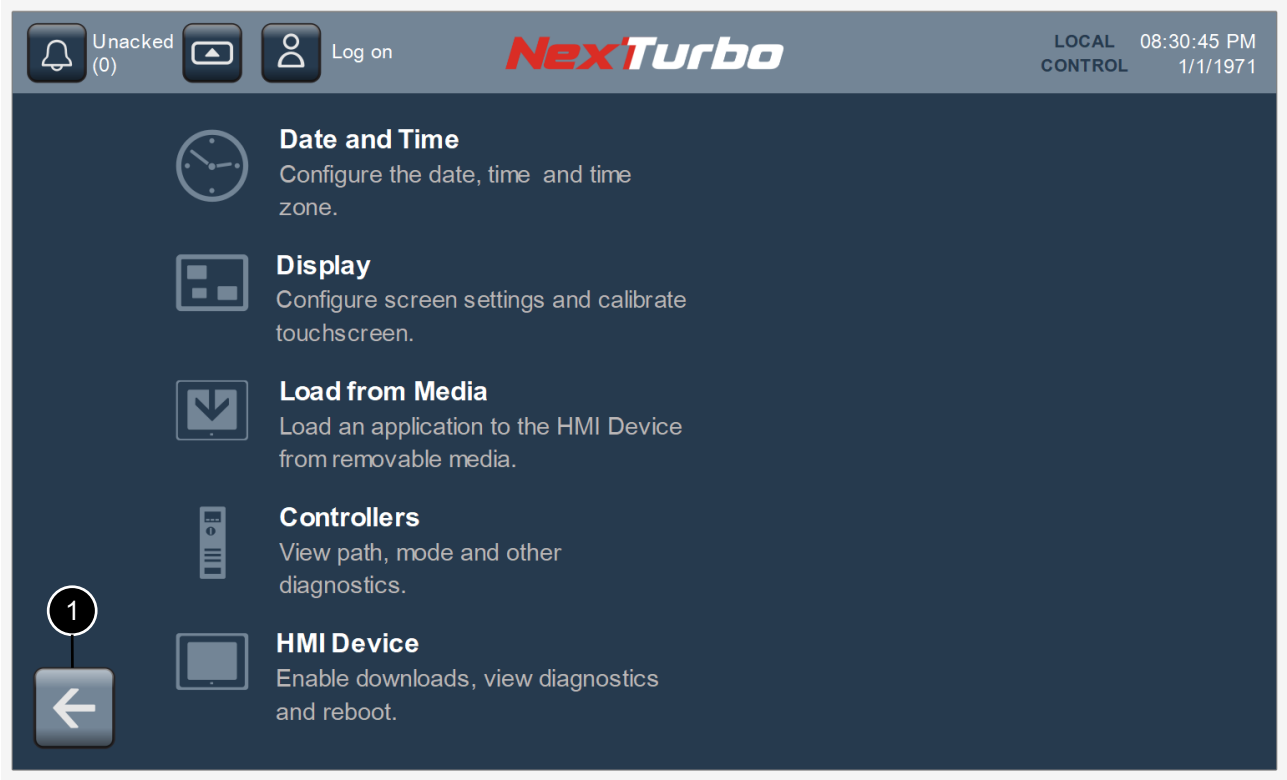
14.3.16 Alarm History (A.1)



1	Alarm Table	The list of “In Alarm” and/or Unacknowledged alarms. Each row contains a single alarm condition.
	! (Priority)	• Low • Medium • High • Urgent
	Alarm State	• Normal, Acknowledged • Normal, Unacknowledged and Urgent • In Alarm, Acknowledged and Urgent • In Alarm, Unacknowledged and Urgent
	Condition Type	Trip or Alarm. A “trip” stops the blower. An “alarm” warns of an undesirable condition and can inhibit the blower from starting.
	Message	The message assigned to the event
2	Filter List	Select a filter in the HMI device to list only the alarm state change records containing the filter value for the indicated column. For example, if the filter exists, select the filter Priority:High to show only those alarm state changes with a high priority.
3	Date Filter	Select the box and enter a date and time to list only the alarm state change records that occurred between the chosen date and time and the present. Select the checkbox on the right side to activate the filter.

4	Refresh Button	Loads the latest alarm state changes from the alarm history. The operator has to refresh the table to see the latest changes. The operator can also exit and enter the Alarm History screen again to refresh.
5	Details Button	Hides or shows the Details pane, which contains the details of the last selected alarm state change record. The Details pane appears on the bottom half of large alarm tables and replaces the list of alarms in medium alarm tables. If no record is selected, the Details pane is empty.
6	Help Button	Opens the Help popup. This popup displays a legend of icons and the task each button on an alarm table performs
7	Number of Records	Number of filtered records and total number of records.
8	Previous Page Button	Navigates to the previous page.

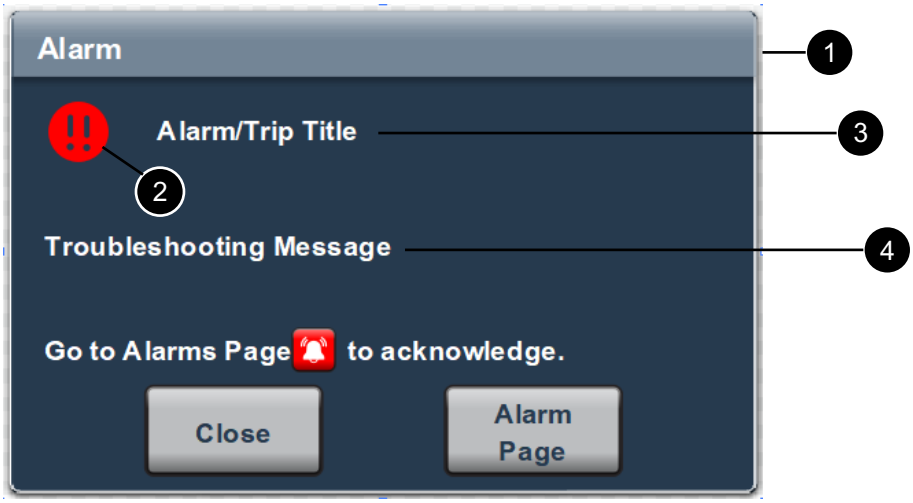
14.3.17 Settings



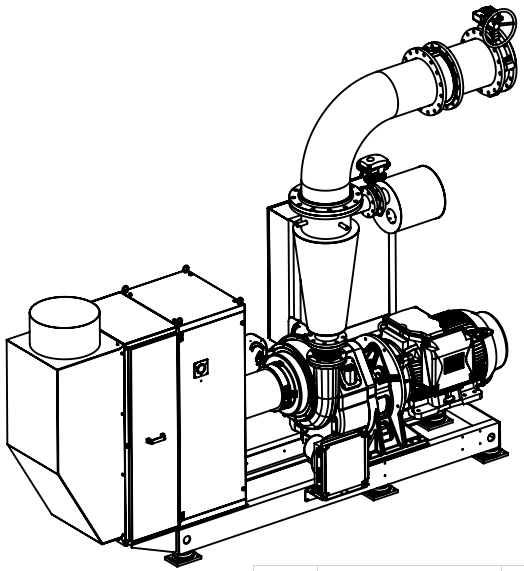
1	Previous Screen Button	Navigates back to the previous screen.

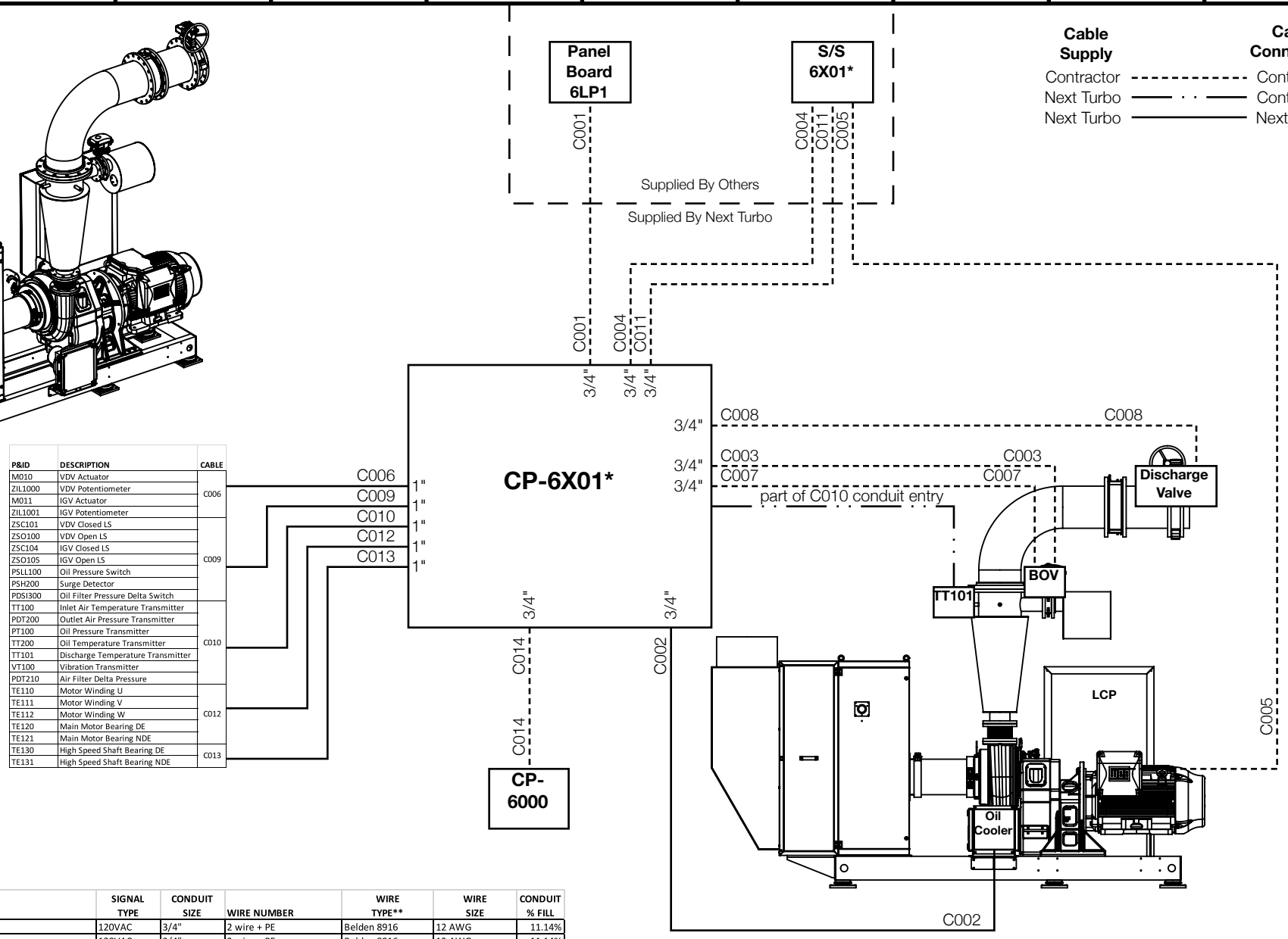
NOTE: This page should not need to be accessed. The only pages the user has full access to are “Display”, “Date and Time”, “Load From Media”. All other pages are Read Only.

14.3.18 Popup Screens



1	Alarm/Trip Popup	If an alarm or Trips occurs, this popup will appear displaying the current Alarm Condition. The top banner of the popup will include the Alarm/Trip Code
2	Severity Icon	The icon will be one of these icons. Informative Alarm, requires user interaction Trip, non-critical stop occurred, requires user interaction Trip, critical stop occurred, requires user interaction
3	Alarm/Trip Title	Title of the Alarm or Trip
4	Troubleshooting Message	Explanation to operator on how to proceed





P&ID	DESCRIPTION	CABLE
M010	VDV Actuator	C006
ZIL1000	VDV Potentiometer	
M011	IGV Actuator	
ZIL1001	IGV Potentiometer	
ZSC101	VDV Closed LS	C009
ZSO100	VDV Open LS	
ZSC104	IGV Closed LS	
ZSO105	IGV Open LS	
PSLL100	Oil Pressure Switch	
PSH200	Surge Detector	
PDSI300	Oil Filter Pressure Delta Switch	
TT100	Inlet Air Temperature Transmitter	C010
PDT200	Outlet Air Pressure Transmitter	
PT100	Oil Pressure Transmitter	
TT200	Oil Temperature Transmitter	
TT101	Discharge Temperature Transmitter	
VT100	Vibration Transmitter	
PDT210	Air Filter Delta Pressure	
TE110	Motor Winding U	C012
TE111	Motor Winding V	
TE112	Motor Winding W	
TE120	Main Motor Bearing DE	
TE121	Main Motor Bearing NDE	
TE130	High Speed Shaft Bearing DE	C013
TE131	High Speed Shaft Bearing NDE	

TAG	DESCRIPTION	SIGNAL TYPE	CONDUIT SIZE	WIRE NUMBER	WIRE TYPE**	WIRE SIZE	CONDUIT % FILL
C001	Main Supply	120VAC	3/4"	2 wire + PE	Belden 8916	12 AWG	11.14%
C002	Oil Cooler Fan	120VAC	3/4"	2 wire + PE	Belden 8916	12 AWG	11.14%
C003	Blow Off Valve Power	120VAC	3/4"	2 wire + PE	Belden 8916	12 AWG	11.14%
C004	MCC Control Signals	120VAC	3/4"	6 wire	Belden 8917	16 AWG	13.50%
C005	Motor Space Heater	120VAC	3/4"	2 wire + PE	Belden 8916	12 AWG	11.14%
C006	Vane Actuator Power and Potentiometer	24VDC	1"	4 wire / Qty (2) TS 3C	Belden 8917 / 8771	16 AWG/22 AWG	16.75%
C007	Blow Off Valve Controls	24VDC	3/4"	11 wire	Belden 8917	16 AWG	24.75%
C008	Discharge Valve Controls	24VDC	3/4"	4 wire	Belden 8917	16 AWG	9.00%
C009	Blower Digital Instruments	24VDC	1"	Qty (7)	Phoenix 1096027	22 AWG	22.59%
C010	Analog Instruments	Analog	1"	Qty (7) TSP	Phoenix 1095892	22 AWG	25.84%
C011	MCC Motor Current	Analog	3/4"	Qty (1) TSP	Belden 8760	18 AWG	7.33%
C012	Motor Winding/Bearing Temps & Vibration	RTD	1"	Qty (5) TS3C	Belden 8771	22 AWG	18.27%
C013	Gearbox Bearing Temperatures	RTD	1"	Qty (2) TSP	Phoenix 1095892	22 AWG	7.38%
C014	Network Cable to MCP	Network	3/4"	CAT6	Belden 7883A	24 AWG	8.50%

** = or Equivalent

*NOTE: Drawing Typical for CP-6101, CP-6201, CP-6301, and CP-6401 and S/S-6101, S/S-6201, S/S-6301, and S/S-6401

NexTurbo

Title	Cable Layout
Document No.	NTA-12-001
Project	Taunton, MA
Project No.	22.0989
Revision	0

POINT to POINT DIAGRAM - EXTERNAL DEVICES

BLOWER LOCAL CONTROL PANEL				CABLE	EXTERNAL LOCATION			
TERMINAL #		WIRE #			WIRE #	PIN #	TERMINAL	NOTES
TB2	1 o	L1		C001 Main Supply	L1	o	6LP1	
	2 o	L2			L2	o		
	3 o	PE			PE	o		
TB6	1 o	103061		C003 BOV Motor		o L1	Blow-Off Valve	
	2 o	N120				o L2		
	3 o	PE				o GND		
	4 o	104052		C002[1] Oil Cooler Motor		o L	Oil Cooler Fan	
	5 o	N120				o N		
	6 o	PE				o GND		
	7 o	106052		C004 MCC Digital Signals		o (Run CMD) TBD	S/S 6x01[2]	
	8 o	105091				o (Run CMD) TBD		
	9 o	106141				o (Run FDBK) TBD		
	10 o	105081				o (Run FDBK) TBD		
	11 o	106141				o (Fault) TBD		
	12 o	105111				o (Fault) TBD		
S/S 6x01[2]	TBD o	L		C005 Motor Space Heater		o H1	Motor	
	TBD o	N				o H2		
	TBD o	GND				o PE		

NOTE (1) = Pre-wired by NTT
NOTE (2) = Typical for tag #'s S/S-6101, S/S-6201, S/S-6301, and S/S-6401

Revision	Date	Sign	Approved		Point to Point Diagram	Project # 22.0989	Page 1 of 6
2	1/2/24	TW	JT	NexTurbo	Drawing # NTA-12-002	Taunton, MA	

POINT to POINT DIAGRAM - EXTERNAL DEVICES

BLOWER LOCAL CONTROL PANEL				CABLE	EXTERNAL LOCATION			
TERMINAL #		WIRE #			WIRE #	PIN #	TERMINAL	NOTES
TB4	42 o	109052		C006[1] VDV/IGV Power & Potentiometers	Blue	o 1	VDV Actuator	
	43 o	109071			Brown	o 2		
	44 o	109212			Blue	o 1	IGV Actuator	
	45 o	109231			Brown	o 2		
TB5	49 o	109121			1	o 1	VDV Potentiometer	
	50 o	109131			2	o 2		
	51 o	109141			3	o 3		
	52 o	PE				o NC		
	53 o	109281			1	o 1	IGV Potentiometer	
	54 o	109291			2	o 2		
	55 o	109301			3	o 3		
	56 o	PE				o NC		
TB4	46 o	103121		C007 BOV Control Signals		o 34	BOV	Jumper pin 32 and 33
	47 o	103131				o 35		
	48 o	103141				o 36		
	8U o	103071				o 21		
	8L o	113021				o 20		
	9U o	103101				o 25		
	9L o	113021				o 24		
	10U o	103131				o 2		
	10L o	113021				o 1		
	11U o	103161				o 4		
	11L o	113021				o 3		
TB4	13U o	113241		C008 Discharge Valve Control Signals		o	Discharge Valve	
	13L o	113021				o		
	14U o	113261				o		
	14L o	113021				o		

NOTE (1) = Pre-wired by NTT

Revision	Date	Sign	Approved		Point to Point Diagram	Project # 22.0989	Page 2 of 6
2	1/2/24	TW	JT	NexTurbo	Drawing # NTA-12-002	Taunton, MA	

POINT to POINT DIAGRAM - EXTERNAL DEVICES

BLOWER LOCAL CONTROL PANEL					EXTERNAL LOCATION			
TERMINAL #		WIRE #	CABLE		WIRE #	PIN #	TERMINAL	NOTES
TB4	16U o	113301	C009[1] Digital Signals		Brown o	1	ZSC101	
	16L o	113021			White o	2	VDV LS Closed	
	17U o	113321			Brown o	1	ZSO100	
	17L o	113021			White o	2	VDV LS Open	
	20A o	114041			Brown o	1	ZSC104	
	20B o	114021			White o	2	IGV LS Closed	
	21A o	114061			Brown o	1	ZSO105	
	21B o	114021			White o	2	IGV LS Open	
	23A o	114102			White o	2	PSLL100	
	23B o	114021			Brown o	1	Oil Pressure	
	23C o	C24			Blue o	3	Switch	
	24A o	114121			White o	2	PSH200	
	24B o	114021			Brown o	1	Surge Detector	
	24C o	C24			Blue o	3		
	25A o	114141			Brown/White o	1	PDSH300	
	25B o	114021			Blue/Black o	2	Oil Filter DP	

NOTE (1) = Pre-wired by NTT

POINT to POINT DIAGRAM - EXTERNAL DEVICES

BLOWER LOCAL CONTROL PANEL			CABLE	EXTERNAL LOCATION			
TERMINAL #		WIRE #		WIRE #	PIN #	TERMINAL	NOTES
TB5	4A o	116141	C010[1] Analog Signals	White	o VDC	PDT210	
	4B o	1H24		Brown	o COM		
	4G o	PE			o NC		
	5A o	116181		White	o +	PDT200	
	5B o	1H24		Brown	o -		
	5G o	PE			o NC		
	6A o	116221		Blue	o 1	TT100	
	6B o	1H24		Brown	o 3		
	6G o	PE			o NC		
	7A o	116261		Blue	o 1	PT100	
	7B o	1H24		Brown	o 3		
	7G o	PE			o NC		
	8A o	116301		Blue	o 1	TT200	
	8B o	1H24		Brown	o 3		
	8G o	PE			o NC		
	9A o	117021		White	o 1	VT100	
	9B o	1H24		Brown	o 2		
	9G o	PE			o NC		
	10A o	117061		Blue	o 1	TT101	
	10B o	1H24		Brown	o 3		
	10G o	PE			o NC		

NOTE (1) = Pre-wired by NTT

POINT to POINT DIAGRAM - EXTERNAL DEVICES

BLOWER LOCAL CONTROL PANEL				CABLE	EXTERNAL LOCATION			
TERMINAL #		WIRE #			WIRE #	PIN #	TERMINAL	NOTES
TB5	1A o	105131		C011 Motor Current		(-) o TBD	S/S 6x01[2]	Do not connect the cable shield to GND in the Device
	1B o	1H24				(+) o TBD		
	1G o	PE				o NC		
TB5	37 o	119121		C013[1] Gearbox Bearing Temperatures		o 1	TE130	
		119121				o 2		
	38 o	119141				o 3		
	39 o	119161				o 4		
	40 o	PE				o NC		
	41 o	119181				o 1	TE131	
		119181				o 2		
	42 o	119201				o 3		
	43 o	119221				o 4		
	44 o	PE				o NC		

NOTE (1) = Pre-wired by NTT
NOTE (2) = Typical for tag #'s S/S-6101, S/S-6201, S/S-6301, and S/S-6401

POINT to POINT DIAGRAM - EXTERNAL DEVICES

BLOWER LOCAL CONTROL PANEL			CABLE	EXTERNAL LOCATION			
TERMINAL #		WIRE #		WIRE #	PIN #	TERMINAL	NOTES
TB5	17 o	118061	C012[1] Motor Winding & Bearing Temps and Motor Vibration	Red	o C1	TE110	Do not connect the cable shield to GND in the Device
	18 o	118081		White	o T1		
	19 o	118101		White	o T1		
	20 o	PE			o NC		
	21 o	118121		Red	o C1	TE111	Do not connect the cable shield to GND in the Device
	22 o	118141		White	o T1		
	23 o	118161		White	o T1		
	24 o	PE			o NC		
	25 o	118181		Red	o C1	TE112	Do not connect the cable shield to GND in the Device
	26 o	118201		White	o T1		
	27 o	118221		White	o T1		
	28 o	PE			o NC		
	29 o	118281		Red	o C1	TE120	Do not connect the cable shield to GND in the Device
	30 o	118301		White	o T1		
	31 o	118321		White	o T1		
	32 o	PE			o NC		
	33 o	119061		Red	o C1	TE121	Do not connect the cable shield to GND in the Device
	34 o	119081		White	o T1		
	35 o	119101		White	o T1		
	36 o	PE			o NC		
CP-6x01[2]	o		C014 CAT6		o	CP-6000	
	o				o		
	o				o		
	o				o		

NOTE (1) = Pre-wired by NTT
NOTE (2) = Typical for tag #'s CP-6101, CP-6201, CP-6301, and CP-6401

Revision	Date	Sign	Approved		Point to Point Diagram	Project # 22.0989	Page 6 of 6
2	1/2/24	TW	JT	NexTurbo	Drawing # NTA-12-002	Taunton, MA	

Drawings	Aeration Main Control Panel - CP-6000
Project	Wastewater Treatment Facility Phase 2 Improvements
Job Number	22.0989
Created	10/19/22
Modified	02/08/23

Customer	Veolia Water North America - Northeast. LLC
Street	825 West Water Street
City	Taunton
State	MA
Zip Code	02780
Installation Site	Tauton Wastewater Treatment Facility

NEXT TURBO AMERICAS, LLC
824 Woodswether Rd, East
KANSAS CITY, MO 64105
PHONE: 816-588-6054

PROJECT:	PAGE TITLE:	DRAWN	10/19/22	MODIFIED	02/08/23	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
Wastewater Treatment Facility Phase 2 Improvements	Cover Sheet		TTI		JRH	22.0989		002	001

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NEXT TURBO AMERICAS, LLC
824 Woodswether Rd, East
KANSAS CITY, MO 64105
PHONE: 816-588-6054

PROJECT:
Wastewater Treatment Facility Phase 2 Improvements

PAGE TITLE:
Table Of Contents

DRAWN	10/19/22	MODIFIED	02/08/23	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
	TTI		JRH	22.0989		003	002

SYMBOL LIBRARY

Terminal Connection

Interruption Point

Circuit Breaker

Coil

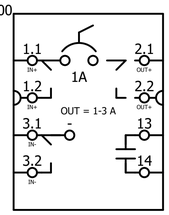
N.O Contacts

N.O Pushbutton

Cable Definition

Male/Female Pin

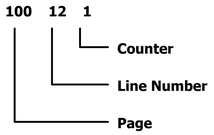
CB10600



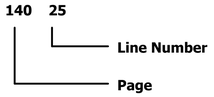
Electronic Breaker

LEGEND KEY

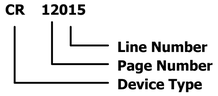
Wire Numbering



Device Cross-Referencing

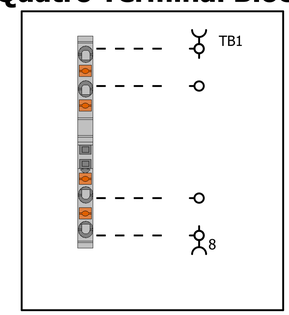


Device Tag Numbering

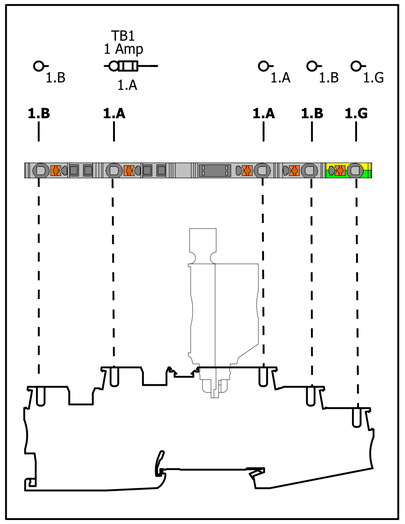


Field Wired Device

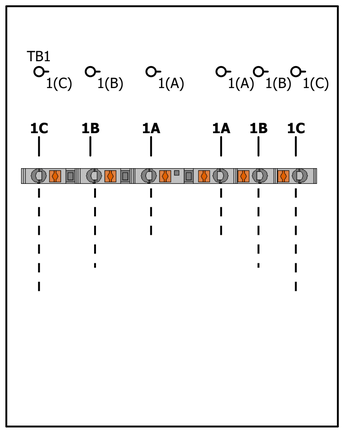
Typical Wiring of a Quatro Terminal Block



Typical Wiring of a Installation Ground Terminal Block



Typical Wiring of a 3 Level Terminal Block



NEXT TURBO AMERICAS, LLC
824 Woodswether Rd, East
KANSAS CITY, MO 64105
PHONE: 816-588-6054

PROJECT:	PAGE TITLE:	DRAWN	10/19/22	MODIFIED	02/08/23	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
Wastewater Treatment Facility Phase 2 Improvements	Legend Key		TTI		JRH	22.0989		010	003

Parts List

Device Tag	Description	Qty	Order Number	Manufacturer	Mark Of Conformity	Certificate Number
BAT10800A	Battery,Rechargeable,Rectangular,Lead Acid,12VDC,5Ah,Quick Disconnect: 0.25,SLA	1	PS-1250-F2	Power Sonic	UL	MH20845
BAT10800B	Battery,Rechargeable,Rectangular,Lead Acid,12VDC,5Ah,Quick Disconnect: 0.25,SLA	1	PS-1250-F2	Power Sonic	UL	MH20845
CB10000	Thermomagnetic device circuit breaker, Number of positions: 1, Width: 17.6 mm, Mounting type: DIN rail: 35 mm, Color: gray 20 Amp	1	2907640	Phoenix Contact	cUL,cULus	E320373
CB10211	Thermomagnetic device circuit breaker, Number of positions: 1, Width: 17.6 mm, Mounting type: DIN rail: 35 mm, Color: gray 3 Amp	1	2907560	Phoenix Contact	cUL,UL	E320373
CB10300	Thermomagnetic device circuit breaker, Number of positions: 1, Width: 17.6 mm, Mounting type: DIN rail: 35 mm, Color: gray 3 Amp	1	2907560	Phoenix Contact	cUL,UL	E320373
CB10307	Thermomagnetic device circuit breaker, Number of positions: 1, Width: 17.6 mm, Mounting type: DIN rail: 35 mm, Color: gray 5 Amp	1	2907562	Phoenix Contact	cUL,UL	E320373
CB10528	Thermomagnetic device circuit breaker, Number of positions: 1, Width: 17.6 mm, Mounting type: DIN rail: 35 mm, Color: gray 1 Amp	1	2907558	Phoenix Contact	cULus,UL	E320373
CB10710	Electronic device circuit breaker - PTCB E1 24DC/1-8A	1	2908262	Phoenix Contact	CE, cULus	E123528
DSC10000	194R NextGen Disconnect Switch, Open, Non-Fused, 30 A, 3 Pole	1	194R-N30-1753	Allen-Bradley	UL	UL 98, 508
DSC10000	NFPA 79 internal operating handle with shaft, 12 in	1	194R-N1	Allen-Bradley	Non Critical	Non Critical
DSC10000	Red/Yellow Padlockable handle, standard	1	194R-PY	Allen-Bradley	Non Critical	Non Critical
ECB10400	Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit.	1	2909909	Phoenix Contact	CE, cULus	E123528
ECB10500	Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit.	1	2909909	Phoenix Contact	CE, cULus	E123528
ECB10600	Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit.	1	2909909	Phoenix Contact	CE, cULus	E123528
ECB10700	Single-channel electronic circuit breaker for protecting 24 V DC loads against overload and short circuit.	1	2909909	Phoenix Contact	CE, cULus	E123528
LIO10800	5069 Compact I/O 16 Channel 24V DC Sink Input Module	1	5069-IB16	Allen-Bradley	CE, cULus	E322657
LIO10800	5069 Compact I/O 18 pins Spring type terminal block kit in a pack of 5pcs	1	5069-RTB18-SPRING	Allen-Bradley	CE, cULus	E334470
LIO10900	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module	1	5069-IF8	Allen-Bradley	cUL,UL	E65584
LIO10900	5069 Compact I/O 18 pins Spring type terminal block kit in a pack of 5pcs	1	5069-RTB18-SPRING	Allen-Bradley	CE, cULus	E334470
LIO11000	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module	1	5069-IF8	Allen-Bradley	cUL,UL	E65584
LIO11000	5069 Compact I/O 18 pins Spring type terminal block kit in a pack of 5pcs	1	5069-RTB18-SPRING	Allen-Bradley	CE, cULus	E334470
LIO11100	5069 Compact I/O 8 Channel Voltage/Current Analog Input Module	1	5069-IF8	Allen-Bradley	cUL,UL	E65584
LIO11100	5069 Compact I/O 18 pins Spring type terminal block kit in a pack of 5pcs	1	5069-RTB18-SPRING	Allen-Bradley	CE, cULus	E334470
LIO11200	5069 Compact I/O 8 Channel Voltage/Current Analog Output Module	1	5069-OF8	Allen-Bradley	CE,cULus	E65584
LIO11200	5069 Compact I/O 18 pins Spring type terminal block kit in a pack of 5pcs	1	5069-RTB18-SPRING	Allen-Bradley	CE, cULus	E334470
LIO11300	5069 Compact I/O 8 Channel Voltage/Current Analog Output Module	1	5069-OF8	Allen-Bradley	CE,cULus	E65584
LIO11300	5069 Compact I/O 18 pins Spring type terminal block kit in a pack of 5pcs	1	5069-RTB18-SPRING	Allen-Bradley	CE, cULus	E334470
LT10528	Wiegmann LED Strip Light, 24-265V AC/DC, Motion Sensor, Magnet and Screw Mount, 14" Long	1	SL24265VMS	Wiegmann	cULus Listed	
LT10528	Wiegmann LED Strip Femail Connector	1	CSLF	Wiegmann	cULus Listed	
NSW10400	Narrow Ethernet switch, eight RJ45 ports with 10/100 Mbps on all ports, automatic data transmission speed detection, autocrossing function, and QoS	1	1085256	Phoenix Contact	cUL,UL	E140403
OIT10600	PanelView 5310,12.1 in. Wide Display , Touch screen,Wide aspect ratio Color, 24V DC, Single Ethernet port	1	2713P-T12WD1	Allen-Bradley	cUL,UL	E65584
PLC10700	CompactLogix 5380 Controller, 1 MB, 8 I/Os, 24 nodes, Standard	1	5069-L310ER	Allen-Bradley	cUL,UL	E65584
PLC10700	5069 Compact I/O Power terminal RTB kit for both 4 and 6 pin Screw type	1	5069-RTB64-SPRING	Allen-Bradley	CE, cULus	E334470
PNL050	Enclosure, Stainless Steel Type 304, NEMA 4X, 36"H x 36"W x 12"D	1	36EL3612SSLPPL	Saginaw	cUL,UL	E69392
PNL050	Saginaw 36 X 36 Galvinized Back Panel	1	SCE-36P36GALV	Saginaw	cUL,UL	E69392
REC10211	1492 DIN Rail Receptacle, 15 Amp,	1	1492-REC15	Allen-Bradley	UL, c-UL-us	E54866
SUP10200	Phoenix Contact Type 2 Surge Protection Device, 120 Vac, 2-wire Plus Ground	1	2910349	Phoenix Contact	cUL,UL	E330181
TB1	PT 2,5-QUATTRO, Feed-through terminal block, Connection method: Push-in connection, Cross section: 0.14 mm² - 4 mm², AWG: 26 - 12, Width: 5.2 mm, Color: gray	8	3209578	Phoenix Contact	UL, CSA, CE	E60425

NextTurbo
NEXT TURBO AMERICAS, LLC
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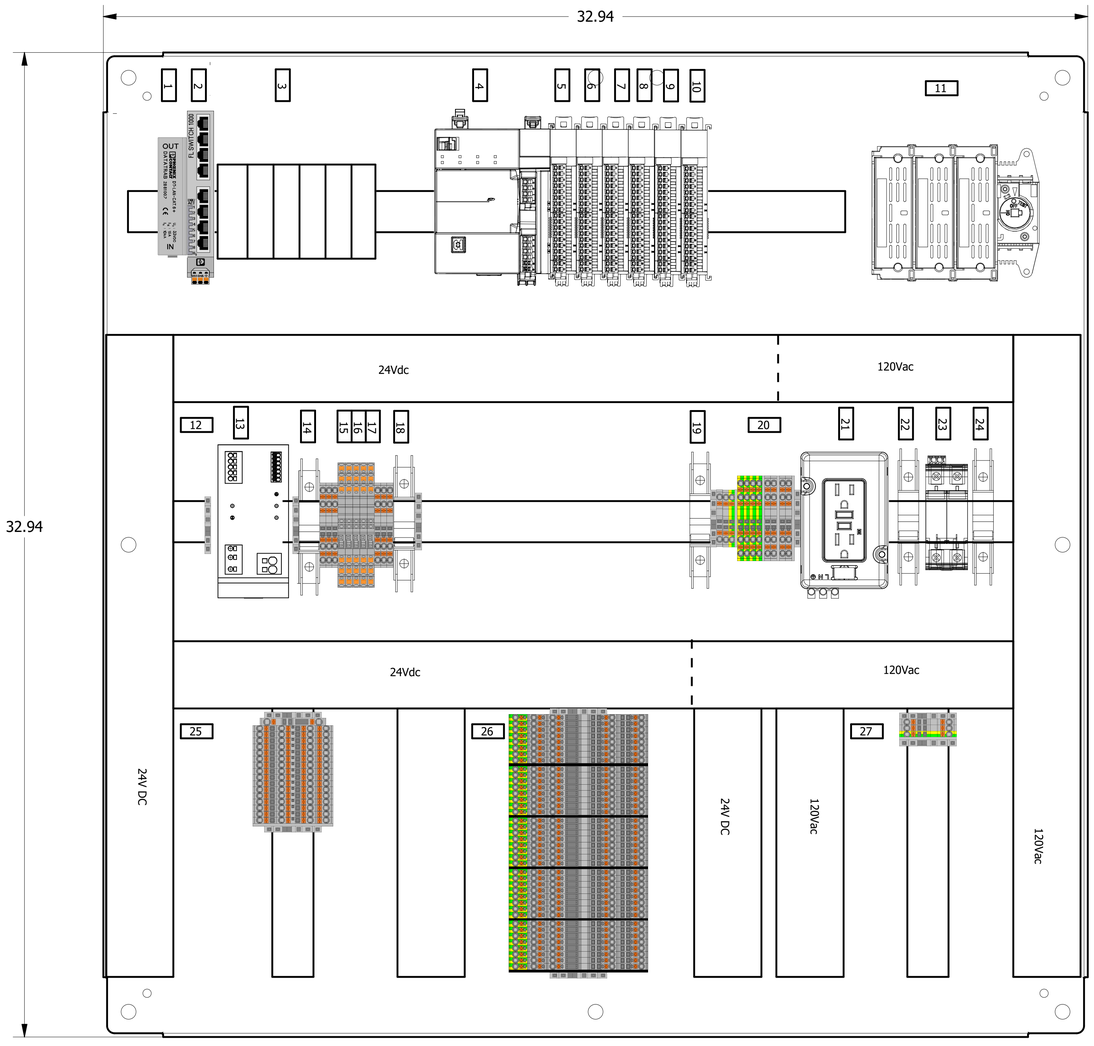
PROJECT:
Wastewater Treatment Facility Phase 2 Improvements

PAGE TITLE:
Parts List

DRAWN	10/19/22	MODIFIED	02/08/23	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
	TTI		JRH	22.0989		011	010

Parts List

Device Tag	Description	Qty	Order Number	Manufacturer	Mark Of Conformity	Certificate Number
TB1	End clamp, Width: 5.15 mm, Height: 35 mm, Length: 48.5 mm, Color: gray	2	3022276	Phoenix Contact	Non Critical	Non Critical
TB1	End cover, Length: 72 mm, Width: 2.2 mm, Height: 36.5 mm, Color: gray	2	3030514	Phoenix Contact	Non Critical	Non Critical
TB2	PT 2,5-QUATTRO, Feed-through terminal block, Connection method: Push-in connection, Cross section: 0.14 mm² - 4 mm², AWG: 26 - 12, Width: 5.2 mm, Color: gray	2	3209578	Phoenix Contact	UL, CSA, CE	E60425
TB2	End clamp, Width: 5.15 mm, Height: 35 mm, Length: 48.5 mm, Color: gray	1	3022276	Phoenix Contact	Non Critical	Non Critical
TB2	PT 2,5-QUATTRO-PE, Ground modular terminal block, Connection method: Push-in connection, Cross section: 0.14 mm² - 4 mm², AWG: 26 - 12, Width: 5.2 mm, Height: 35.3 mm, Color: green-yellow	4	3209594	Phoenix Contact	UL, CSA, CE	E60425
TB2	End cover, Length: 72 mm, Width: 2.2 mm, Height: 36.5 mm, Color: gray	2	3030514	Phoenix Contact	Non Critical	Non Critical
TB3	Disconnect terminal block, nom. voltage: 400 V, nominal current: 20 A, connection method: Push-in connection.	1	3211922	Phoenix Contact	cULus	E60425
TB3	End cover, Length: 56 mm, Width: 2.2 mm, Height: 36.5 mm, Color: gray	1	3030420	Phoenix Contact	Non Critical	Non Critical
TB3	Fuse plug, Nominal current: 6.3 A, Width: 5.2 mm, Fuse type: G / 5 x 20, Fuse type: Glass, Mounting type: Plug-in mounting, Color: black	1	3209248	Phoenix Contact	UL, CSA, CE	E60425
TB3	End clamp, Width: 5.15 mm, Height: 35 mm, Length: 48.5 mm, Color: gray	1	3022276	Phoenix Contact	Non Critical	Non Critical
TB3	Double-level terminal block, Cross section: 0.14 mm² - 4 mm², AWG: 26 - 12, Connection type: Push-in connection, Width: 5.2 mm, Color: gray, Mounting type: NS 35/7,5, NS 35/15	16	3210567	Phoenix Contact	cULus	E60425
TB3	End cover, Length: 68 mm, Width: 2.2 mm, Color: gray	1	3211634	Phoenix Contact	Non Critical	Non Critical
TB4	Installation ground terminal block, Push-in connection, Cross section: 0.14 mm² - 4 mm², AWG: 26 - 12, Width: 5.2 mm, Color: gray, Mounting type: NS 35/7,5, NS 35/15	40	3210539	Phoenix Contact	UL, CSA, CE	E60425
TB4	Fuse plug, Nominal current: 6.3 A, Width: 5.2 mm, Fuse type: G / 5 x 20, Fuse type: Glass, Mounting type: Plug-in mounting, Color: black	40	3209248	Phoenix Contact	UL, CSA, CE	E60425
TB4	500 mA 5 x 20 Glass Type Mini Fuse	40	GMA-500-R	Bussman	UL, CSA	E19180
TB5	Feed-through terminal block, Connection method: Push-in connection, Cross section: 0.5 mm² - 10 mm², AWG: 20 - 8, Width: 8.2 mm, Height: 42.2 mm, Color: gray, Mounting type: NS 35/7,5, NS 35/15	3	3211813	Phoenix Contact	cULus,UL	E192998
U10500	Ewon Flexy 201 Modular INdustrial IOT Router and data Gateway	1	Flexy201	HMS Industrial Networks	cULus	E350576
U10709	Surge protection in accordance with Class EA (CAT6A), for Gigabit Ethernet (up to 10 Gbps), token ring, FDDI/CDDI, ISDN, and DS1. Suitable for Power over Ethernet (PoE+)	1	2881007	Phoenix Contact	UL	E138168
UPS10300	Uninterruptible power supply with integrated power supply unit. For lead AGM energy storage with 1.3 Ah to 12 Ah nominal capacity. Input: 1-phase, output: 24 V DC/5 A. Push-in connection technology	1	2907160	Phoenix Contact	UL	E123528



Label #	Device Tag	Description
1	NSW10400	Network Switch
2	U10200	Ethernet Surge Protection Device
3	U10500	Flexy 201
4	PLC10700	PLC Proccessor
5	LIO10800	DC Input Module
6	LIO10900	Analog Input Module
7	LIO11000	Analog Input Module
8	LIO11100	Analog Input Module
9	LIO11200	Analog Output Module
10	LIO11300	Analog Output Module
11	DSC10000	Incoming Power Disconnect Switch
12	TB1	Terminal Block 1
13	UPS10300	24VDC UPS
14	CB10307	Control Power Secondary Breaker
15	CB10500 CB10400	U10500 Power Breaker NSW10400 Power Breaker
16	CB10500 CB10600	PLC10700 MOD Power Breaker OIT10600 Power Breaker
17	CB10710	PLC10700 SA Power Breaker
18	CB10528	Panel Light Breaker
19	CB10300	Control Power Primary Breaker
20	TB2	Terminal Block 2
21	REC10211	120VAC Outlet
22	CB10211	REC10211 Breaker
23	SLP10200	Surge Protector
24	CB10000	120VAC Incoming Breaker
25	TB3	Terminal Block 3
26	TB4	Terminal Block 4
27	TB5	Terminal Block 5
28	OIT10600	Panel View

NEXT TURBO AMERICAS, LLC
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PROJECT:
Wastewater Treatment Facility Phase 2 Improvements

PAGE TITLE:
Back Panel Layout

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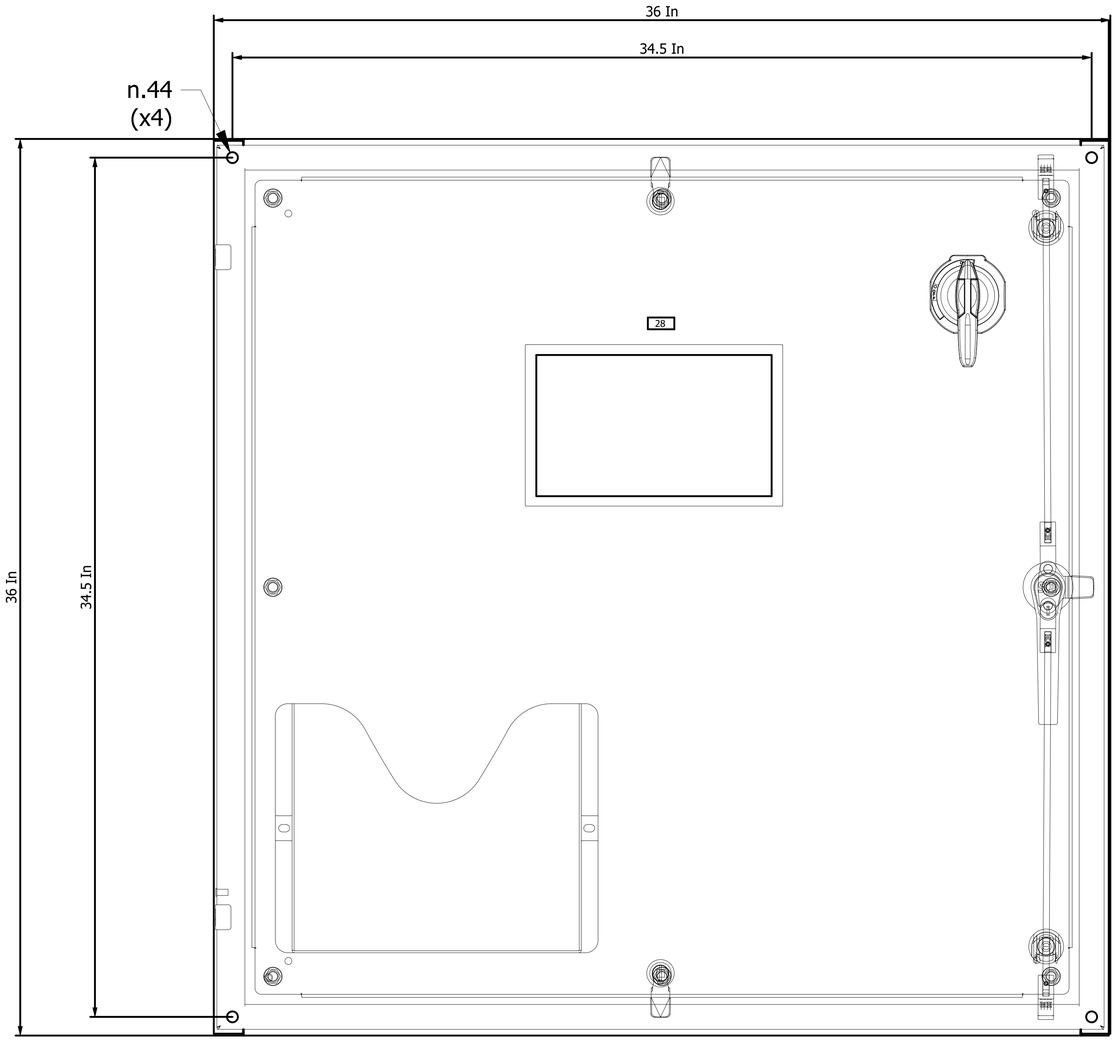
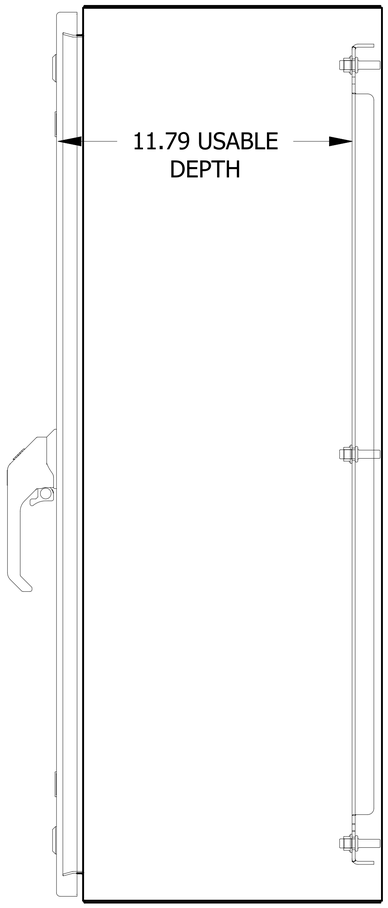


FRONT VIEW



RIGHT SIDE VIEW

NEXT TURBO AMERICAS, LLC
824 Woodswether Rd, East
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PHONE: 816-588-6054

PROJECT:
Wastewater Treatment Facility Phase 2 Improvements

PAGE TITLE:
Enclosure Layout

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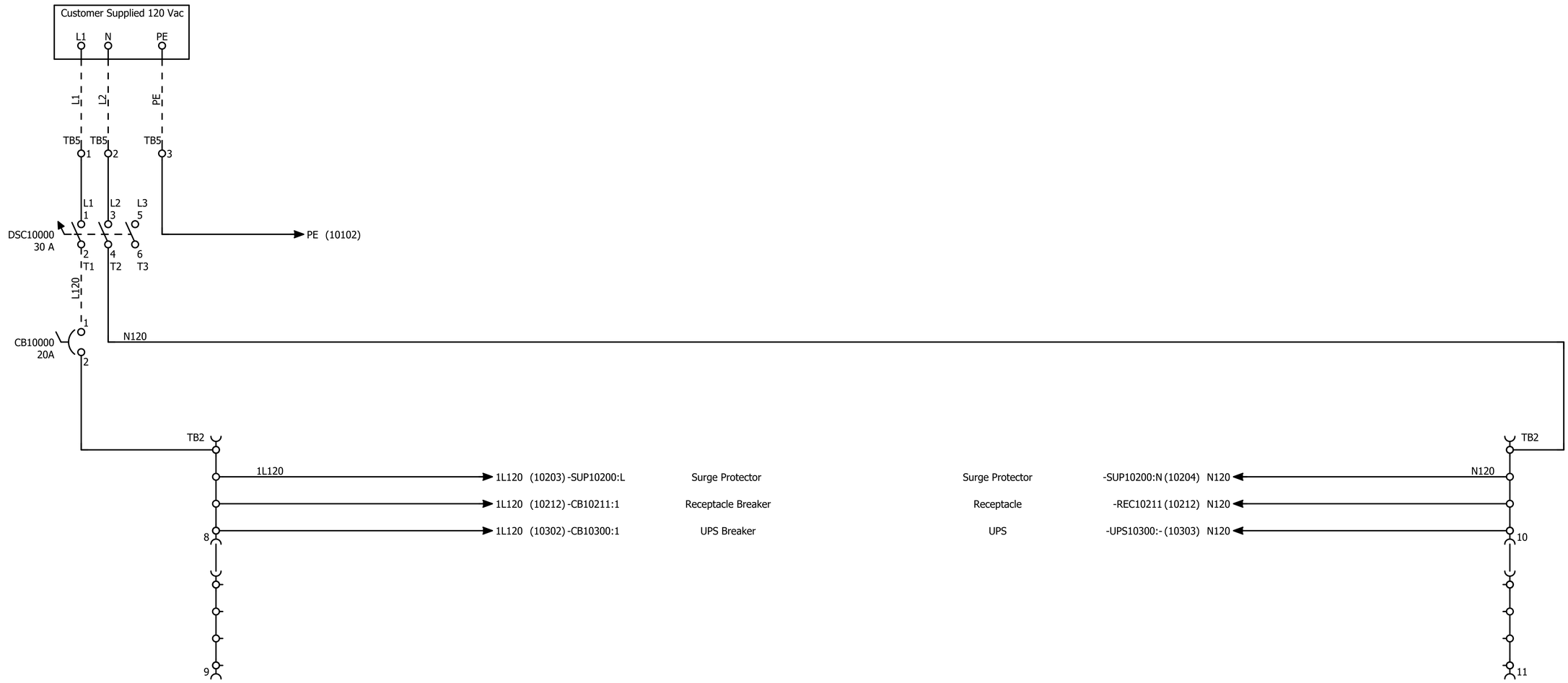
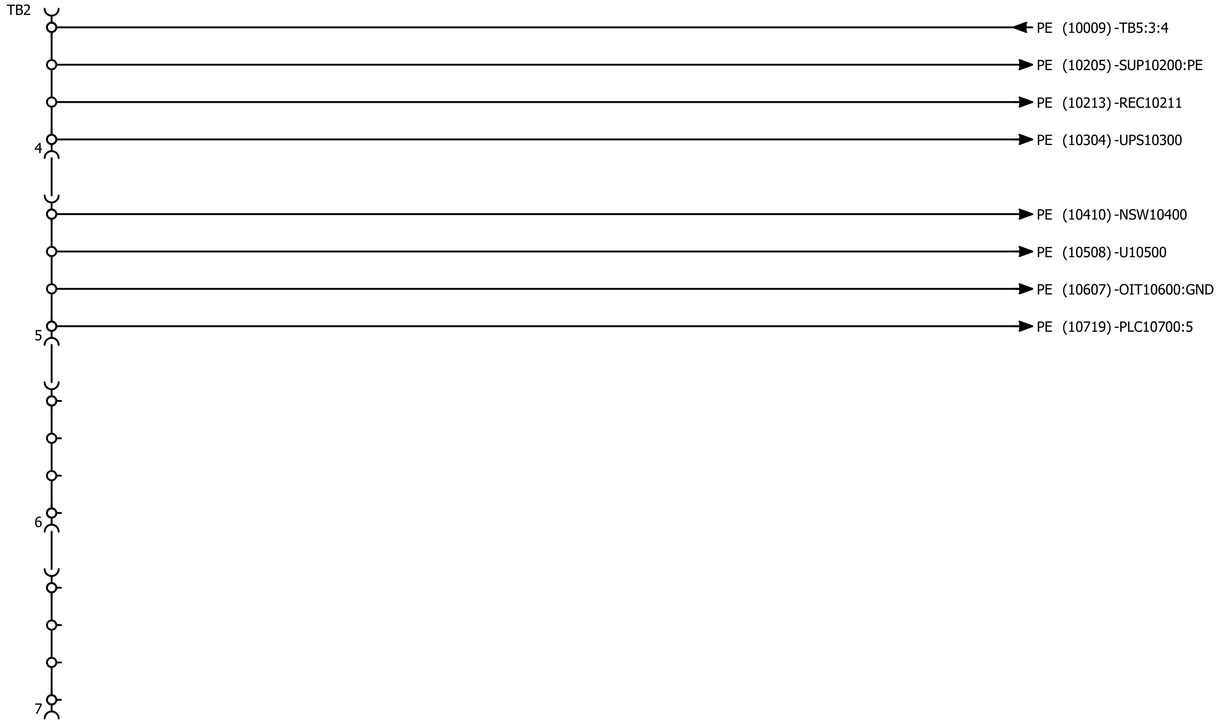
TB4			
Voltage:	4-20mA Analog Inputs		
Term. #	Description	Wire #	Page
1A	Main Pressure Diff. Pressure(PIT6001)	109021	109
1B	Main Pressure Diff. Pressure(PIT6001)	1H24	109
1G	Main Pressure Diff. Pressure(PIT6001)	PE	109
2A	Train 1 Sing Zone 1 Meter(FIT3175)	109061	109
2B	Train 1 Sing Zone 1 Meter(FIT3175)	109081	109
2G	Train 1 Sing Zone 1 Meter(FIT3175)	PE	109
3A	Train 1 Oxic 1 Meter(FIT3171)	109101	109
3B	Train 1 Oxic 1 Meter(FIT3171)	109121	109
3G	Train 1 Oxic 1 Meter(FIT3171)	PE	109
4A	Train 1 Oxic 2 Meter(FIT3172)	109141	109
4B	Train 1 Oxic 2 Meter(FIT3172)	109161	109
4G	Train 1 Oxic 2 Meter(FIT3172)	PE	109
5A	Train 1 Oxic 3 Meter(FIT3173)	109181	109
5B	Train 1 Oxic 3 Meter(FIT3173)	109201	109
5G	Train 1 Oxic 3 Meter(FIT3173)	PE	109
6A	Train 1 Swing Zone 2 Meter(FIT3174)	109221	109
6B	Train 1 Swing Zone 2 Meter(FIT3174)	109241	109
6G	Train 1 Swing Zone 2 Meter(FIT3174)	PE	109
7A	Train 2 Swing Zone 1 Meter(FIT3275)	109261	109
7B	Train 2 Swing Zone 1 Meter(FIT3275)	109281	109
7G	Train 2 Swing Zone 1 Meter(FIT3275)	PE	109
8A	Train 2 Oxic 1 Meter(FIT3271)	109301	109
8B	Train 2 Oxic 1 Meter(FIT3271)	109321	109
8G	Train 2 Oxic 1 Meter(FIT3271)	PE	109
9A	Train 2 Oxic 2 Meter(FIT3272)	110021	110
9B	Train 2 Oxic 2 Meter(FIT3272)	110041	110
9G	Train 2 Oxic 2 Meter(FIT3272)	PE	110
10A	Train 2 Oxic 3 Meter(FIT3273)	110061	110
10B	Train 2 Oxic 3 Meter(FIT3273)	110081	110
10G	Train 2 Oxic 3 Meter(FIT3273)	PE	110
11A	Train 2 Swing Zone 2 Meter(FIT3274)	110101	110
11B	Train 2 Swing Zone 2 Meter(FIT3274)	110121	110
11G	Train 2 Swing Zone 2 Meter(FIT3274)	PE	110
12A	Train 1 Swing Zone 1 Valve(MBV3175)	110141	110
12B	Train 1 Swing Zone 1 Valve(MBV3175)	110161	110
12G	Train 1 Swing Zone 1 Valve(MBV3175)	PE	110
13A	Train 1 Oxic 1 Valve(MBV3171)	110181	110
13B	Train 1 Oxic 1 Valve(MBV3171)	110201	110
13G	Train 1 Oxic 1 Valve(MBV3171)	PE	110
14A	Train 1 Oxic 2 Valve(MBV3172)	110221	110
14B	Train 1 Oxic 2 Valve(MBV3172)	110241	110
14G	Train 1 Oxic 2 Valve(MBV3172)	PE	110
15A	Train 1 Oxic 3 Valve(MBV3173)	110261	110
15B	Train 1 Oxic 3 Valve(MBV3173)	110281	110
15G	Train 1 Oxic 3 Valve(MBV3173)	PE	110
16A	Train 1 Swing Zone 2 Valve(MBV3174)	110301	110
16B	Train 1 Swing Zone 2 Valve(MBV3174)	110321	110
16G	Train 1 Swing Zone 2 Valve(MBV3174)	PE	110

TB4			
Voltage:	4-20mA Analog Inputs		
17A	Train 2 Swing Zone 1 Valve(MBV3275)	111021	111
17B	Train 2 Swing Zone 1 Valve(MBV3275)	111041	111
17G	Train 2 Swing Zone 1 Valve(MBV3275)	PE	111
18A	Train 2 Oxic 1 Valve(MBV3271)	111061	111
18B	Train 2 Oxic 1 Valve(MBV3271)	111081	111
18G	Train 2 Oxic 1 Valve(MBV3271)	PE	111
19A	Train 2 Oxic 2 Valve(MBV3272)	111101	111
19B	Train 2 Oxic 2 Valve(MBV3272)	111121	111
19G	Train 2 Oxic 2 Valve(MBV3272)	PE	111
20A	Train 2 Oxic 3 Valve(MBV3273)	111141	111
20B	Train 2 Oxic 3 Valve(MBV3273)	111161	111
20G	Train 2 Oxic 3 Valve(MBV3273)	PE	111
21A	Train 2 Swing Zone 2 Valve(MBV3274)	111181	111
21B	Train 2 Swing Zone 2 Valve(MBV3274)	111201	111
21G	Train 2 Swing Zone 2 Valve(MBV3274)	PE	111
TB4			
Voltage:	4-20mA Analog Outputs		
Term. #	Description	Wire #	Page
25A	Train 1 Swing Zone 1 Valve Position(MBV3175)	112022	112
25B	Train 1 Swing Zone 1 Valve Position(MBV3175)	112031	112
25G	Train 1 Swing Zone 1 Valve Position(MBV3175)	PE	112
26A	Train 1 Oxic 1 Valve Position(MBV3171)	112062	112
26B	Train 1 Oxic 1 Valve Position(MBV3171)	112071	112
26G	Train 1 Oxic 1 Valve Position(MBV3171)	PE	112
27A	Train 1 Oxic 2 Valve Position(MBV3172)	112102	112
27B	Train 1 Oxic 2 Valve Position(MBV3172)	112111	112
27G	Train 1 Oxic 2 Valve Position(MBV3172)	PE	112
28A	Train 1 Oxic 3 Valve Position(MBV3173)	112142	112
28B	Train 1 Oxic 3 Valve Position(MBV3173)	112151	112
28G	Train 1 Oxic 3 Valve Position(MBV3173)	PE	112
29A	Train 1 Swing Zone 2 Valve Position(MBV3174)	112182	112
29B	Train 1 Swing Zone 2 Valve Position(MBV3174)	112191	112
29G	Train 1 Swing Zone 2 Valve Position(MBV3174)	PE	112
30A	Train 2 Swing Zone 1 Valve Position(MBV3275)	112222	112
30B	Train 2 Swing Zone 1 Valve Position(MBV3275)	112231	112
30G	Train 2 Swing Zone 1 Valve Position(MBV3275)	PE	112
31A	Train 2 Oxic 1 Valve Position(MBV3271)	112262	112
31B	Train 2 Oxic 1 Valve Position(MBV3271)	112271	112
31G	Train 2 Oxic 1 Valve Position(MBV3271)	PE	112
32A	Train 2 Oxic 2 Valve Position(MBV3272)	112302	112
32B	Train 2 Oxic 2 Valve Position(MBV3272)	112311	112
32G	Train 2 Oxic 2 Valve Position(MBV3272)	PE	112
33A	Train 2 Oxic 3 Valve Position(MBV3273)	113022	113
33B	Train 2 Oxic 3 Valve Position(MBV3273)	113031	113
33G	Train 2 Oxic 3 Valve Position(MBV3273)	PE	113
34A	Train 2 Swing Zone 2 Valve Position(MBV3274)	113062	113
34B	Train 2 Swing Zone 2 Valve Position(MBV3274)	113071	113
34G	Train 2 Swing Zone 2 Valve Position(MBV3274)	PE	113



NextTurbo	NEXT TURBO AMERICAS, LLC 824 Woodswether Rd, East KANSAS CITY, MO 64105 PHONE: 816-588-6054	PROJECT: Wastewater Treatment Facility Phase 2 Improvements	PAGE TITLE: 120V AC Incoming Power Distribution	DRAWN	10/19/22 TTI	MODIFIED	02/08/23 JRH	JOB NUMBER: 22.0989	LOCATION: MAIN	NEXT PAGE: 101	PAGE: 100



NEXT TURBO AMERICAS, LLC 824 Woodswether Rd, East KANSAS CITY, MO 64105 PHONE: 816-588-6054	PROJECT: Wastewater Treatment Facility Phase 2 Improvements	PAGE TITLE: PE Ground Distribution	DRAWN	10/19/22	MODIFIED	02/08/23	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
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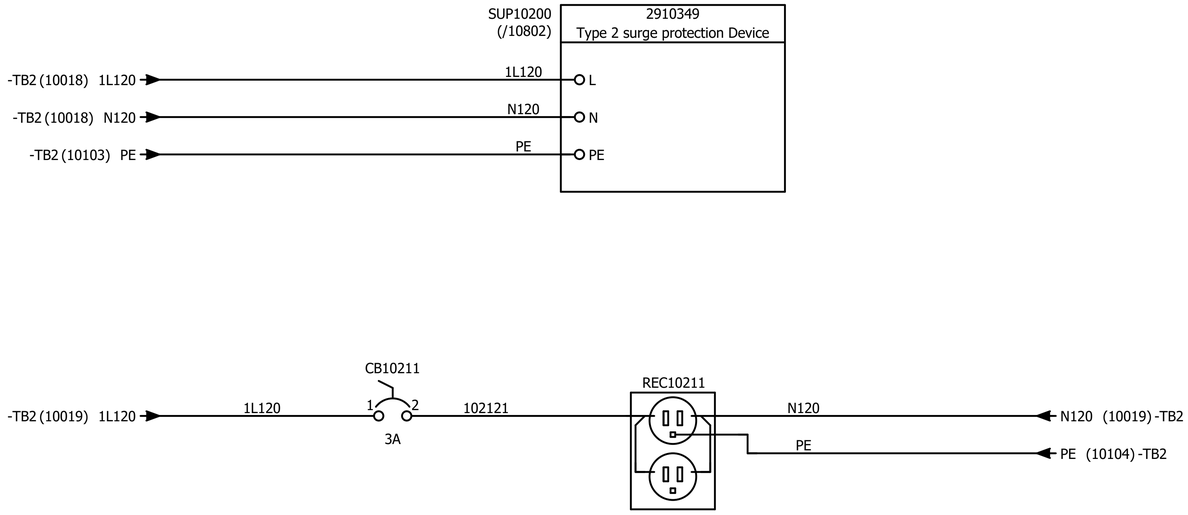
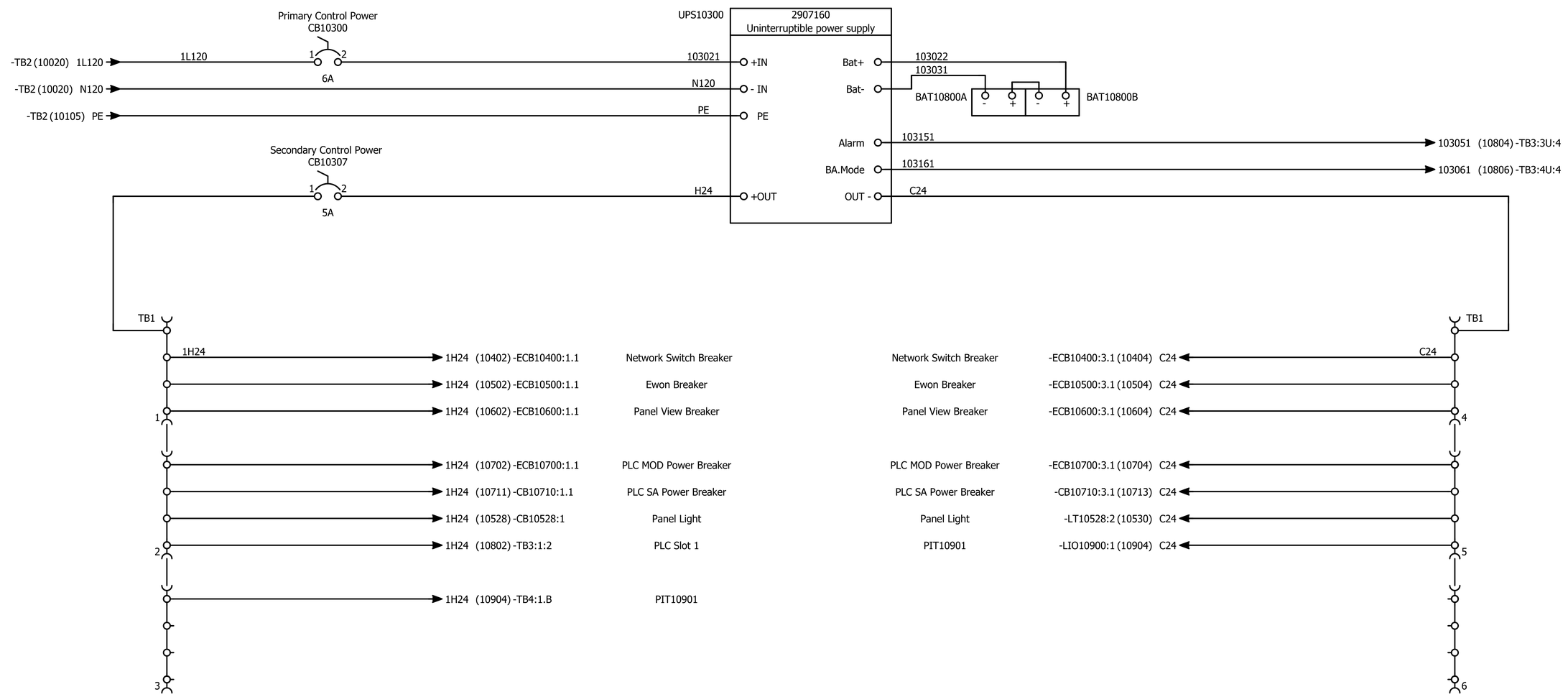
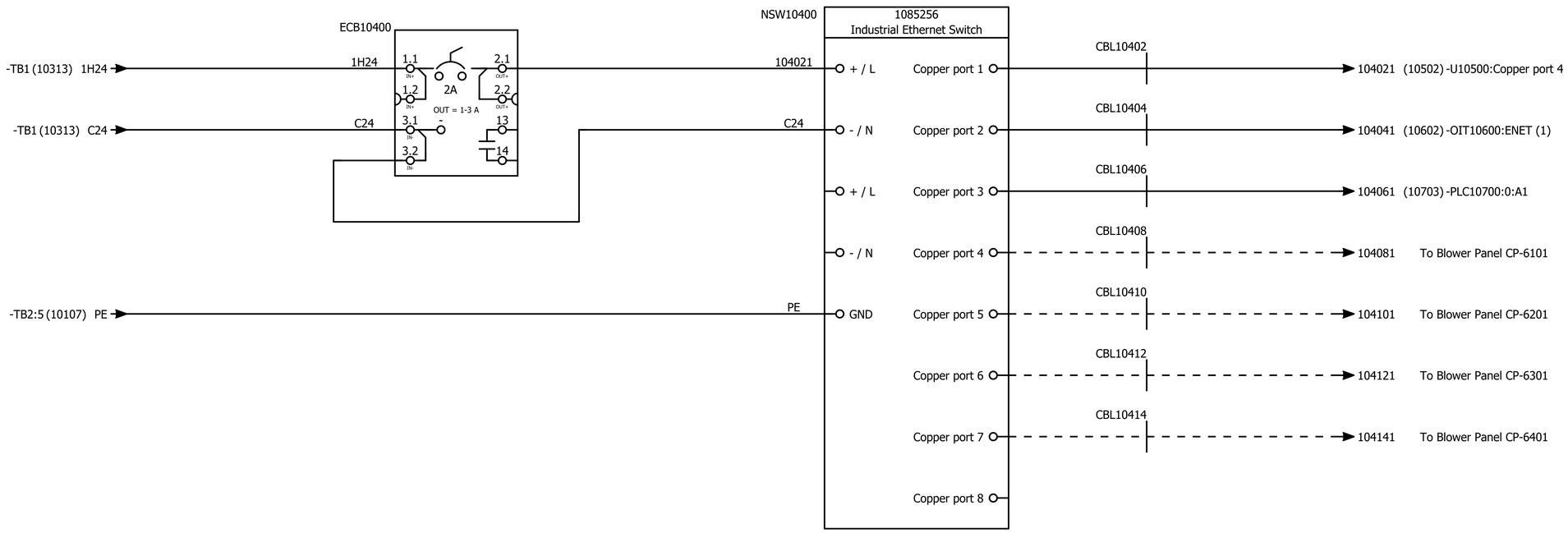


NextTurbo NEXT TURBO AMERICAS, LLC 824 Woodswether Rd, East KANSAS CITY, MO 64105 PHONE: 816-588-6054	PROJECT: Wastewater Treatment Facility Phase 2 Improvements	PAGE TITLE: Surge Suppresor/Recepticle	DRAWN	10/19/22 TTI	MODIFIED	02/08/23 JRH	JOB NUMBER: 22.0989	LOCATION: MAIN	NEXT PAGE: 103	PAGE: 102



NextTurbo	NEXT TURBO AMERICAS, LLC 824 Woodswether Rd, East KANSAS CITY, MO 64105 PHONE: 816-588-6054	PROJECT: Wastewater Treatment Facility Phase 2 Improvements	PAGE TITLE: 24V DC UPS/Control Power Distribution	DRAWN	10/19/22 TTI	MODIFIED	02/08/23 JRH	JOB NUMBER: 22.0989	LOCATION: MAIN	NEXT PAGE: 104	PAGE: 103



NEXT TURBO AMERICAS, LLC
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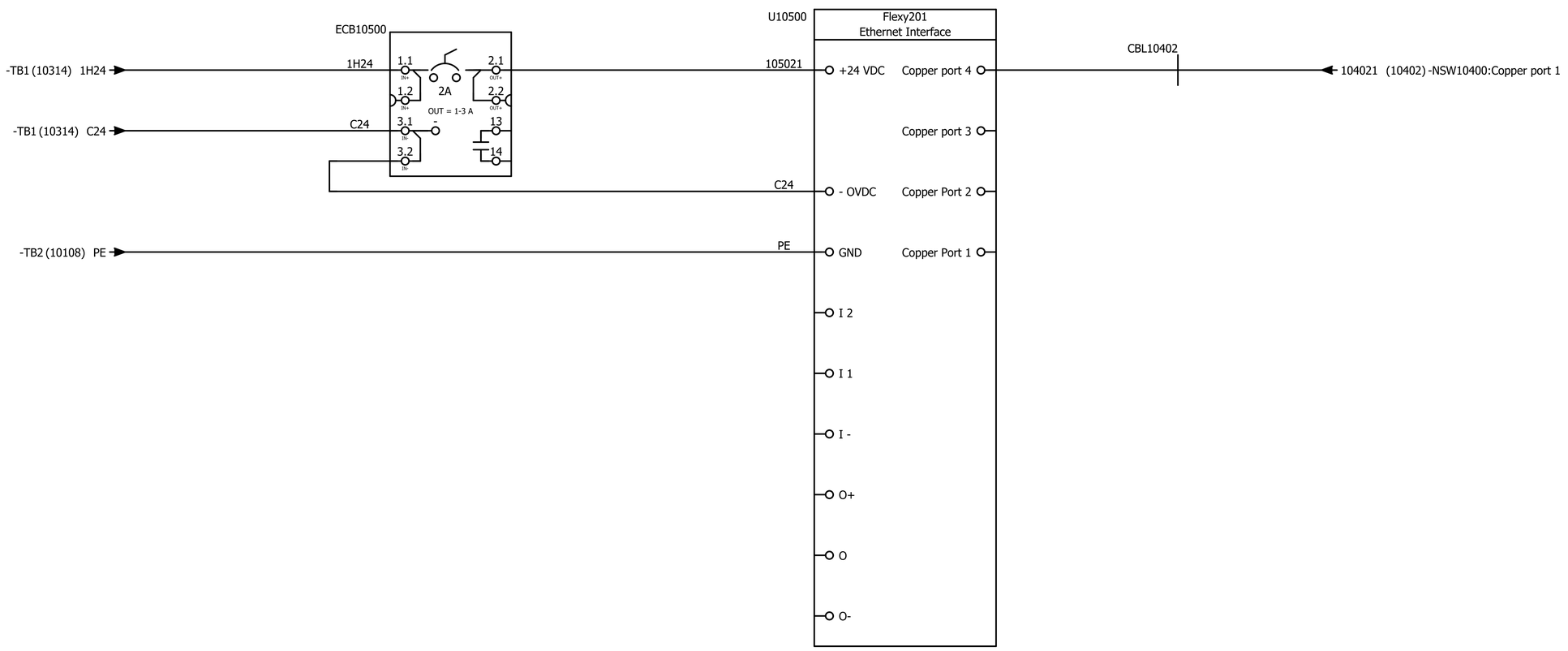
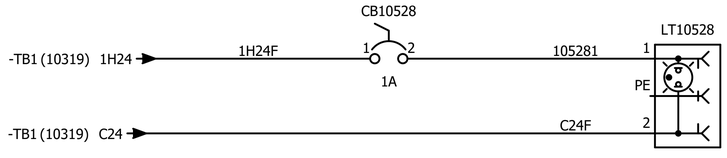
PROJECT:	PAGE TITLE:	DRAWN	10/19/22	MODIFIED	02/08/23	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
Wastewater Treatment Facility Phase 2 Improvements	Ethernet Network Switch		TTI		JRH	22.0989	MAIN	105	104





NEXT TURBO AMERICAS, LLC 824 Woodswether Rd, East KANSAS CITY, MO 64105 PHONE: 816-588-6054	PROJECT: Wastewater Treatment Facility Phase 2 Improvements	PAGE TITLE: HMS Flexy 201/Panel Light	DRAWN	10/19/22	MODIFIED	02/08/23	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
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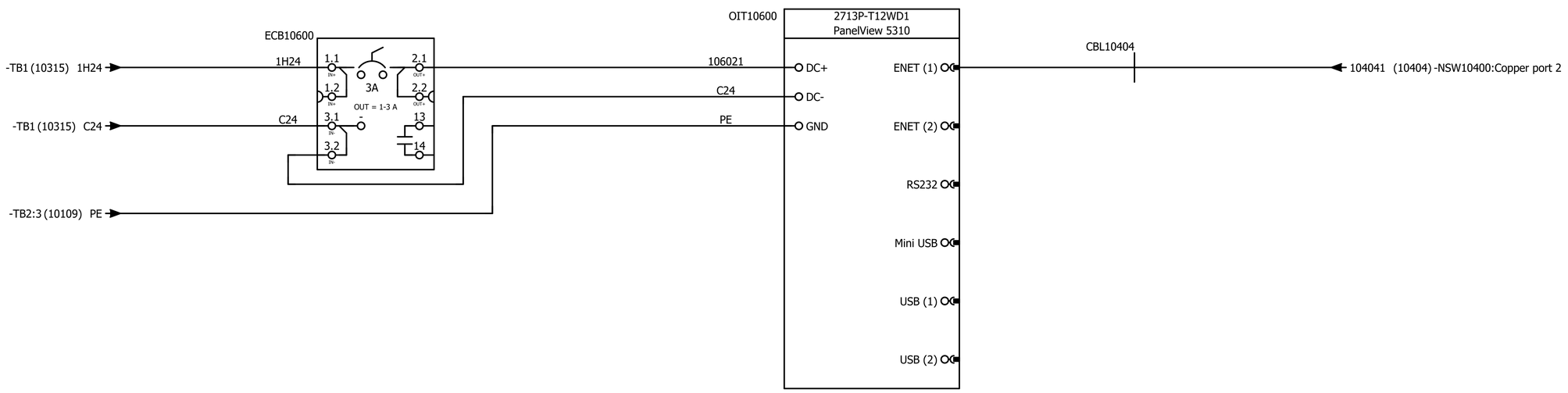

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PROJECT:
Wastewater Treatment Facility Phase 2 Improvements

PAGE TITLE:
Operator Interface Terminal

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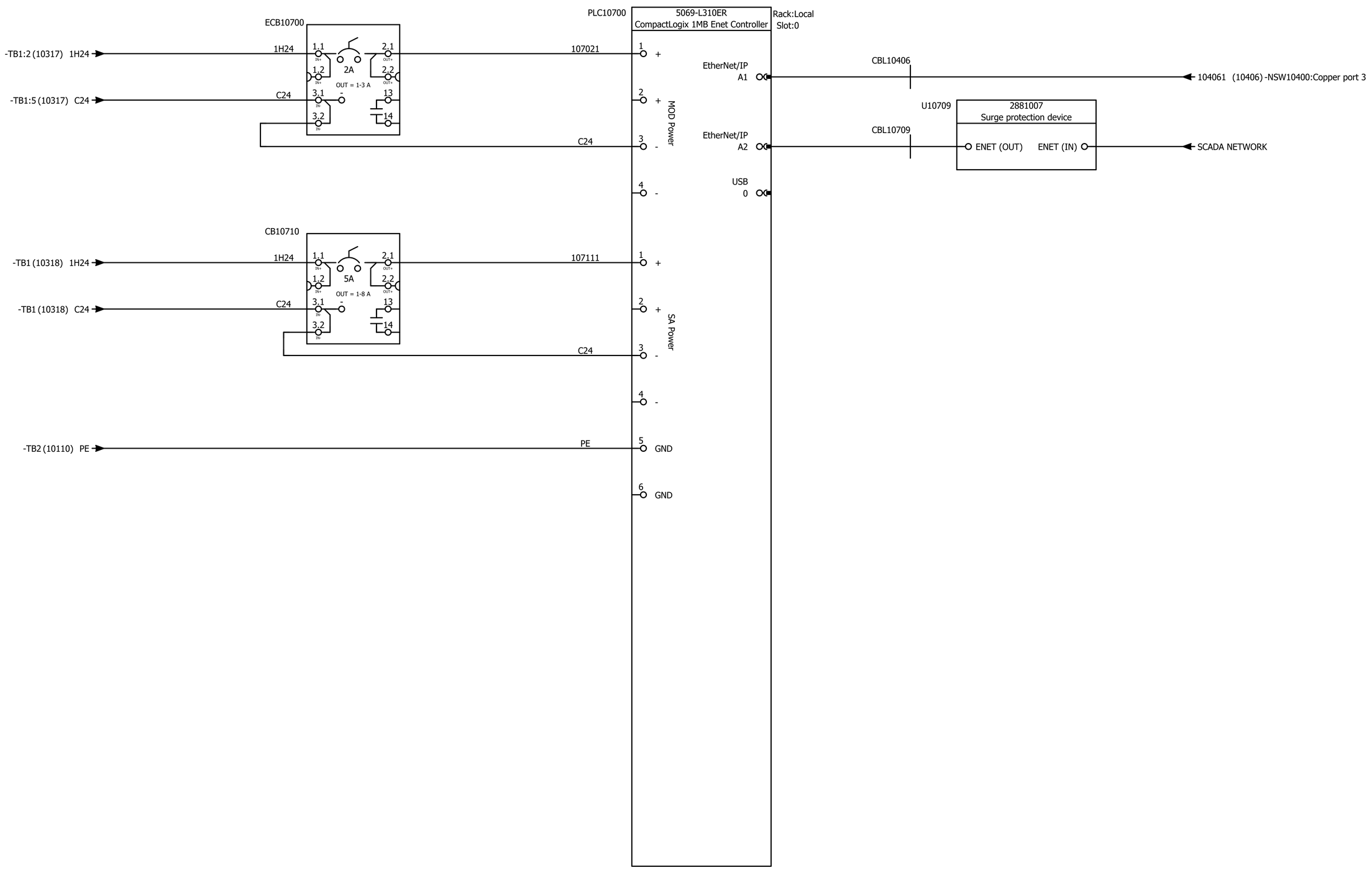

NextTurbo	NEXT TURBO AMERICAS, LLC 824 Woodswether Rd, East KANSAS CITY, MO 64105 PHONE: 816-588-6054	PROJECT: Wastewater Treatment Facility Phase 2 Improvements	PAGE TITLE: PLC Rack: Local Slot: 0 CompactLogix Processor	DRAWN	10/19/22	MODIFIED	02/08/23	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
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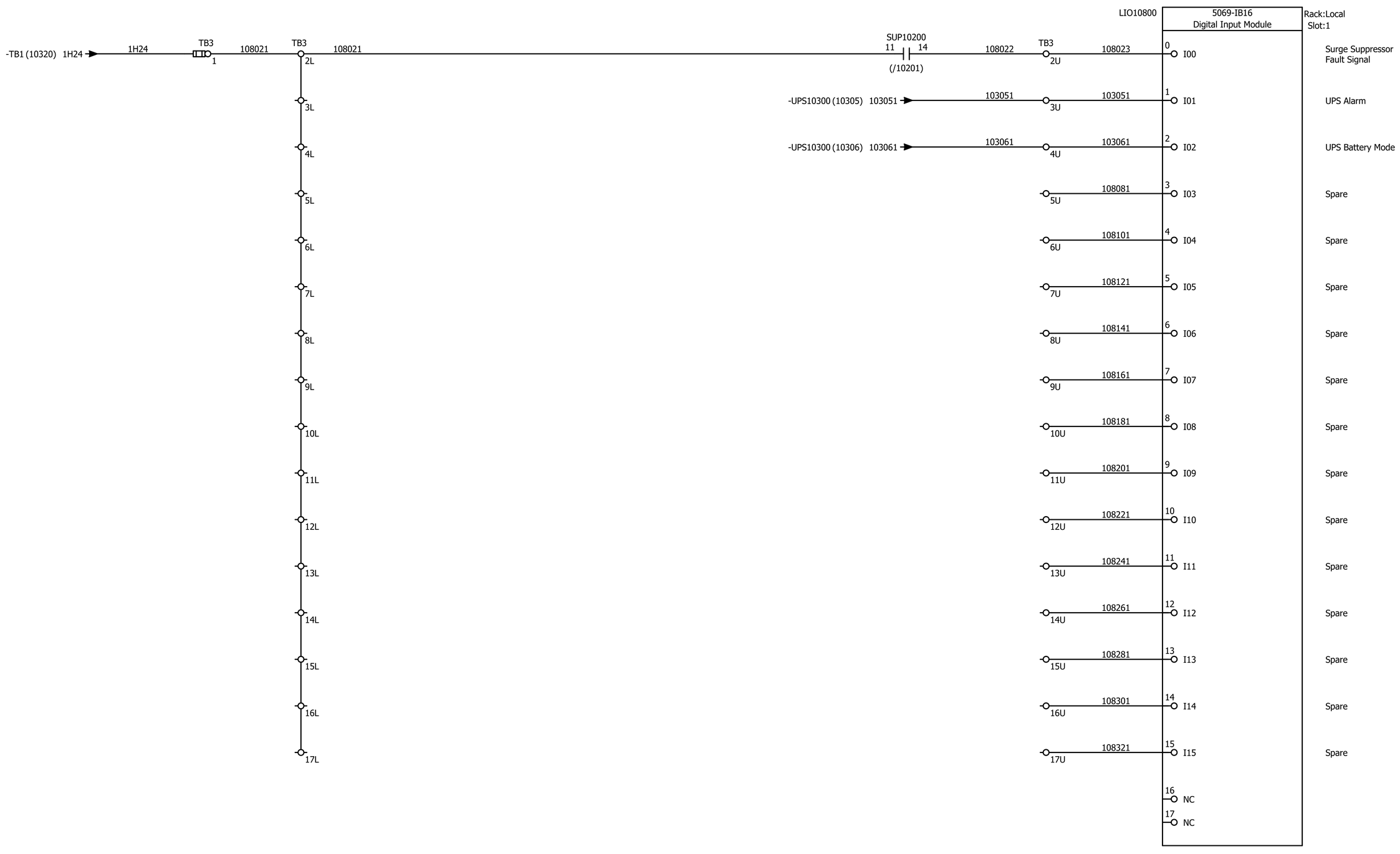
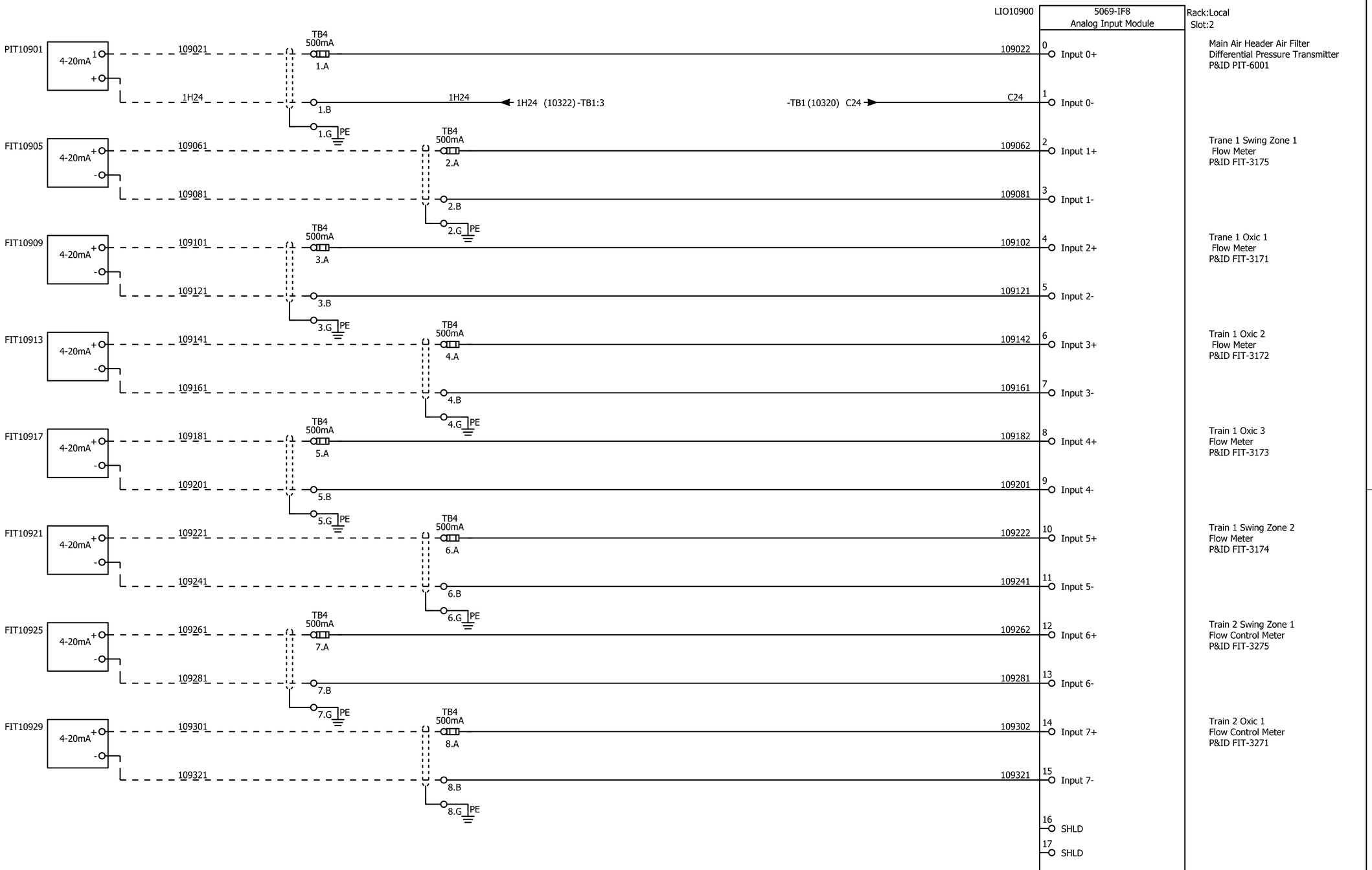
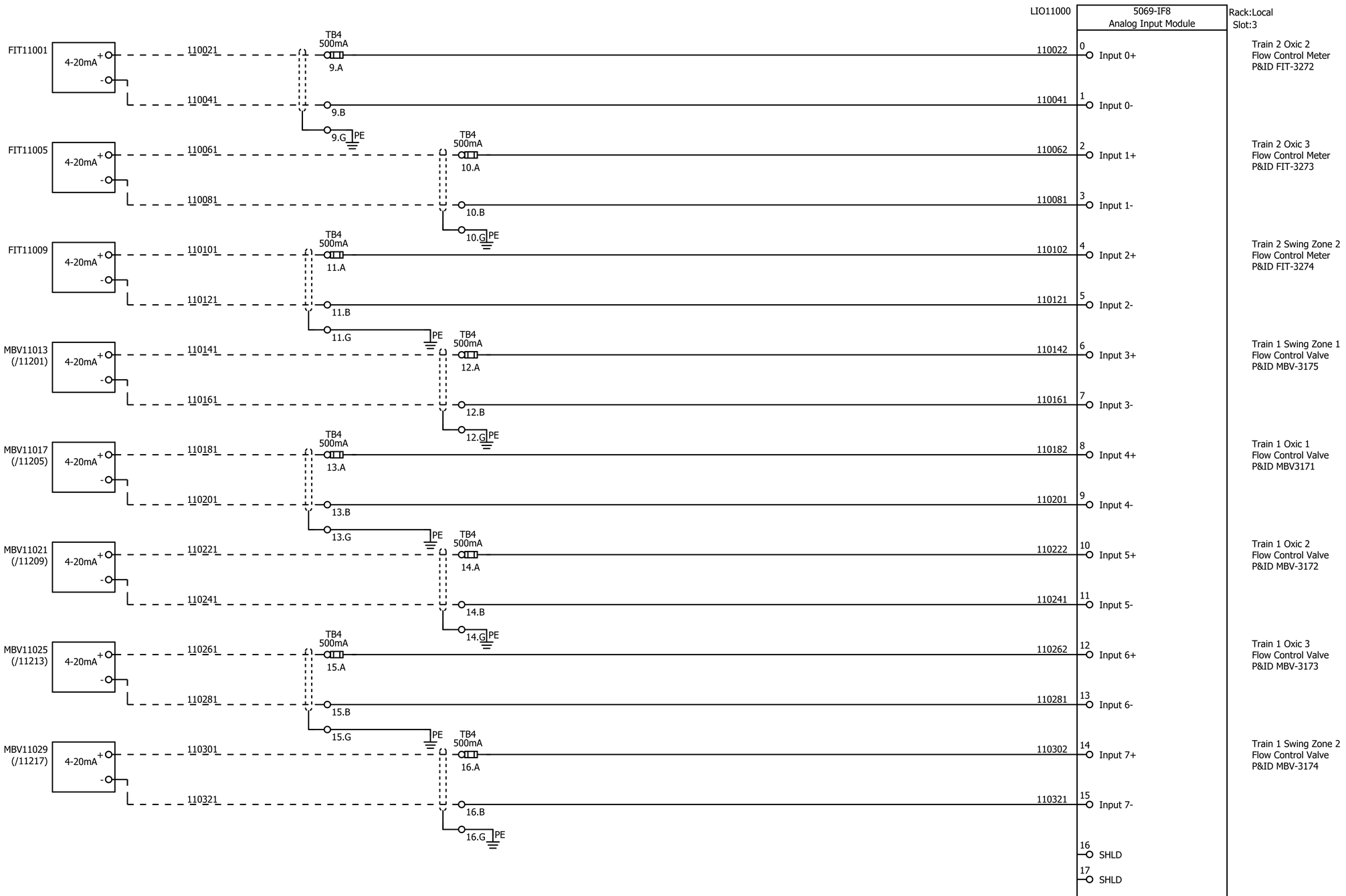


NextTurbo NEXT TURBO AMERICAS, LLC 824 Woodswether Rd, East KANSAS CITY, MO 64105 PHONE: 816-588-6054	PROJECT: Wastewater Treatment Facility Phase 2 Improvements	PAGE TITLE: PLC Rack: Local Slot:1 Input Module	DRAWN	10/19/22	MODIFIED	02/08/23	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
				TTI		JRH	22.0989	MAIN	109	108



NextTurbo NEXT TURBO AMERICAS, LLC 824 Woodswether Rd, East KANSAS CITY, MO 64105 PHONE: 816-588-6054	PROJECT: Wastewater Treatment Facility Phase 2 Improvements	PAGE TITLE: PLC Rack: Local Slot:2 Analog Input Module	DRAWN	10/19/22 TTI	MODIFIED	02/08/23 JRH	JOB NUMBER: 22.0989	LOCATION: MAIN	NEXT PAGE: 110	PAGE: 109



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PROJECT:	PAGE TITLE:	DRAWN	10/19/22	MODIFIED	02/08/23	JOB NUMBER:	LOCATION:	NEXT PAGE:	PAGE:
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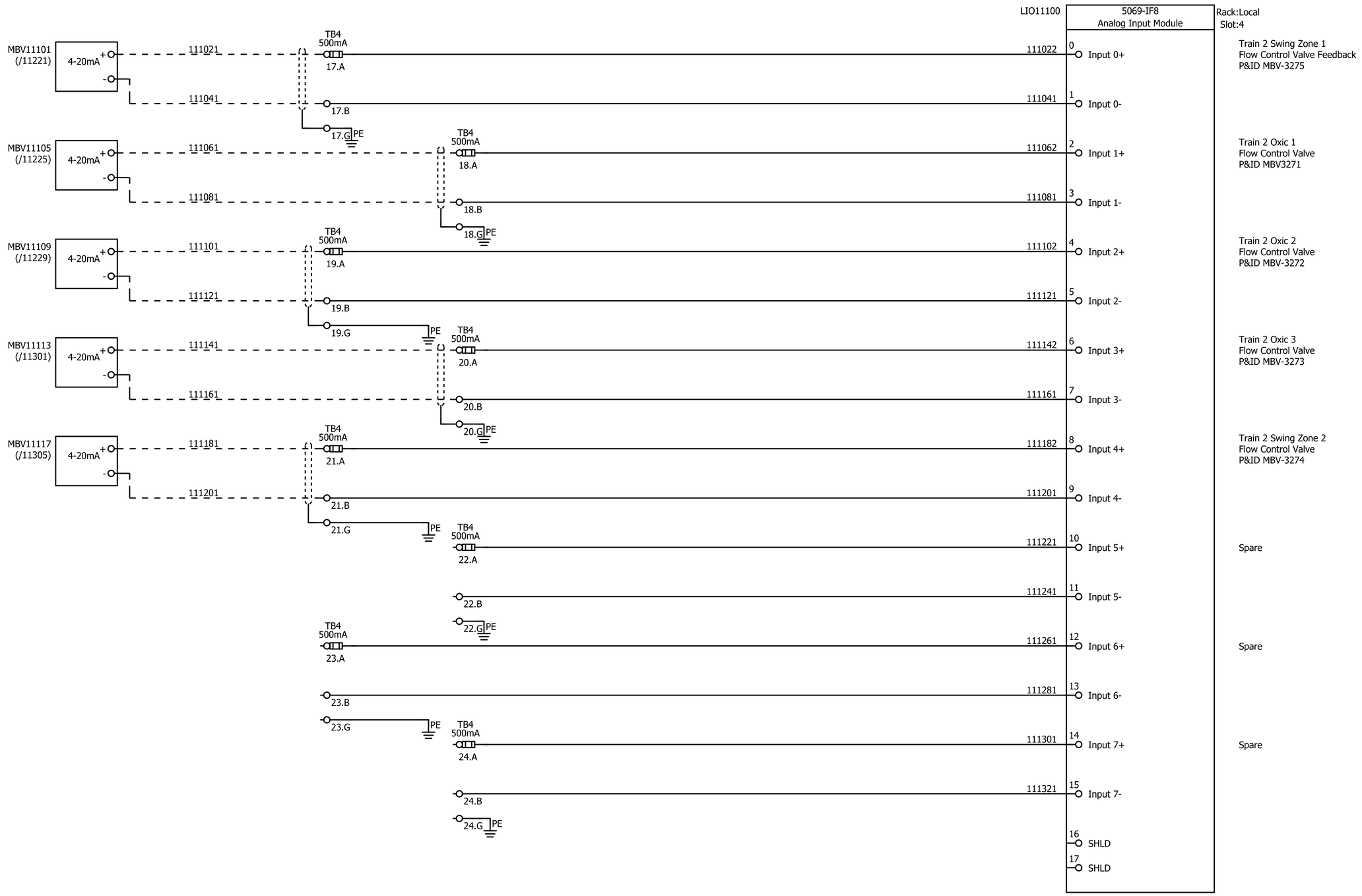

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LIO11200 — 5069-OF8 Analog Output Module — Rack:Local Slot:5

11200									
11201									
11202	Train 1 Swing Zone 1 Flow Control Valve Position P&ID MBV-3175	0	Output 0+	112021	TB4 500mA	25.A	112022	+ 4-20mA	MBV11013 (/11013)
11203				112031		25.B	112031	-	
11204		1	Output 0-			PE 25.G			
11205									
11206	Train 1 Oxic 1 Flow Control Valve Position P&ID MBV-3171	2	Output 1+	112061	TB4 500mA	26.A	112062	+ 4-20mA	MBV11017 (/11017)
11207				112071		26.B	112071	-	
11208		3	Output 1-			PE 26.G			
11209									
11210	Train 1 Oxic 2 Flow Control Valve Position P&ID MBV-3172	4	Output 2+	112101	TB4 500mA	27.A	112102	+ 4-20mA	MBV11021 (/11021)
11211				112111		27.B	112111	-	
11212		5	Output 2-			PE 27.G			
11213									
11214	Train 1 Oxic 3 Flow Control Valve Position P&ID MBV-3173	6	Output 3+	112141	TB4 500mA	28.A	112142	+ 4-20mA	MBV11025 (/11025)
11215				112151		28.B	112151	-	
11216		7	Output 3-			PE 28.G			
11217									
11218	Train 1 Swing Zone 2 Flow Control Valve Position P&ID MBV-3174	8	Output 4+	112181	TB4 500mA	29.A	112182	+ 4-20mA	MBV11029 (/11029)
11219				112191		29.B	112191	-	
11220		9	Output 4-			PE 29.G			
11221									
11222	Train 2 Swing Zone 1 Flow Control Valve Position P&ID MBV-3275	10	Output 5+	112221	TB4 500mA	30.A	112222	+ 4-20mA	MBV11101 (/11101)
11223				112231		30.B	112231	-	
11224		11	Output 5-			PE 30.G			
11225									
11226	Train 2 Oxic 1 Flow Control Valve Position P&ID MBV-3271	12	Output 6+	112261	TB4 500mA	31.A	112262	+ 4-20mA	MBV11105 (/11105)
11227				112271		31.B	112271	-	
11228		13	Output 6-			PE 31.G			
11229									
11230	Train 2 Oxic 2 Flow Control Valve Position P&ID MBV-3272	14	Output 7+	112301	TB4 500mA	32.A	112302	+ 4-20mA	MBV11109 (/11109)
11231				112311		32.B	112311	-	
11232		15	Output 7-			PE 32.G			
11233									
11234		16	SHLD						
11235		17	SHLD						
11236									
11237									
11238									
11239									

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PAGE TITLE: PLC Rack: Local Slot:5 Analog Output Module

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LIO11300 — 5069-OF8 Analog Output Module — Rack:Local Slot:6

11302	Train 2 Oxic 3 Flow Control Valve Position P&ID MBV-3273	Output 0+	0	113021	TB4 500mA 33.A	113022 → MBV11113 (/11113) + 4-20mA +
11303				113031	33.B	113031 → -
11304		Output 0-	1		PE 33.G	
11305						
11306	Train 2 Swing Zone 2 Flow Control Valve Position P&ID MBV-3274	Output 1+	2	113061	TB4 500mA 34.A	113062 → MBV11117 (/11117) + 4-20mA +
11307				113071	34.B	113071 → -
11308		Output 1-	3		PE 34.G	
11309						
11310	Spare	Output 2+	4	113101	TB4 500mA	
11311				113111	35.A	
11312		Output 2-	5		35.B PE 35.G	
11313						
11314	Spare	Output 3+	6	113141	TB4 500mA	
11315				113151	36.A	
11316		Output 3-	7		36.B PE 36.G	
11317						
11318	Spare	Output 4+	8	113181	TB4 500mA	
11319				113191	37.A	
11320		Output 4-	9		37.B PE 37.G	
11321						
11322	Spare	Output 5+	10	113221	TB4 500mA	
11323				113231	38.A	
11324		Output 5-	11		38.B PE 38.G	
11325						
11326	Spare	Output 6+	12	113261	TB4 500mA	
11327				113271	39.A	
11328		Output 6-	13		39.B PE 39.G	
11329						
11330	Spare	Output 7+	14	113301	TB4 500mA	
11331				113311	40.A	
11332		Output 7-	15		40.B PE 40.G	
11333						
11334		SHLD	16			
11335		SHLD	17			
11336						
11337						
11338						
11339						

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PROJECT: Wastewater Treatment Facility Phase 2 Improvements

PAGE TITLE: PLC Rack: Local Slot:6 Analog Output Module

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Next Turbo Americas
Kansas City, Missouri

Project No.: 22.0989
Project Name: Taunton, MA
Document No.: NTA-11-003
Title: Master Control Panel System Operation

Revision	BY	Date
1	JK	February 8, 2023

Contents

1. Overview

A Next Turbo Master Control Panel (MCP) automatically sequences and controls the operating blowers' airflow based on cascade control philosophy. This allows for optimum process stability, accurate delivery of process air and the lowest possible energy consumption.

Cascade Control delivers process air to the system with no air gaps. This control philosophy only regulates one blower, while the remaining blowers are at minimum, maximum, or standby. This philosophy is only available to blower technologies with guaranteed airflow regulation between 40 to 100% or 45 to 100% (100% is max blower airflow design). This large turndown guarantees the aeration process is supplied with the correct amount of air without compromising energy efficiency. In addition, this control philosophy is designed to allow a smooth transition of air between the lead blower and the lag blower. This has the advantage of minimizing, or even avoiding potential instabilities of the system while airflow is increasing or decreasing to satisfy the process control variable, i.e. header pressure set point.

Main header pressure is used as the control variable for the Next Turbo MCP. The MCP measures the system header pressure (control variable, CV) from a pressure transmitter connected to the main air header. The process setpoint (SP) is provided by SCADA or entered locally at the MCP HMI. The MCP constantly monitors the difference between measured CV and SP of the main header and adjusts the blower airflow output accordingly.

The MCP sequences multiple blowers connected to the same discharge pipe via priority control. Priority control properly balances operating hours for each blower. This facilitates a routine and preventive maintenance schedule.

2. Setting Blower Priority

The priorities are set by the plant operator or automatically from the MCP based on runtime hours. Priorities should be regularly changed once or twice a month to equalize the runtime hours at year end. It is recommended to keep runtime hours within 500 hours of each blower.

Possible priority selections in a four blower system:

BLOWER "A"	BLOWER "B"	BLOWER "C"	BLOWER "D"
1	2	3	4
4	1	2	3
3	4	1	2
2	3	4	1
4	3	2	1
3	4	2	1
2	3	1	4
1	2	4	3

The priority is interchangeable between blowers. Selecting priority 0 (zero) means the blower is not allowed to start. The MCP logic does not allow selection of the same priority or a priority sequence which does not respect the consecutive numbers (example 0, 1, 2, 4). A priority error will appear when the blowers have an invalid priority number.

NOTE: it is recommended to NOT change priorities within a short period of time. The MCP needs to consolidate and harmonize blower functionalities with newly selected priorities. Applying new priorities within short time might unbalance the system and such might create unwanted blower start & stop situations. Minimum timeframe between priorities should not be less than 24 hours.

If a blower trips, the MCP will automatically shift priority of the faulted blower to the least priority. For instance, if all four blowers are available to run and the lead blower trips, the lead blower would be set to priority 4, or Standby. If one blower is set to a priority of 0, meaning it is offline, and the lead blower trips, the lead blower would be set to priority 3, or Lag 2.

3. Air Header Pressure Control

3.1 Types of Control

The MCP is designed for two types of air header pressure control: Fixed Air Header Pressure and Calculated Air Header Pressure via Most Open Valve.

3.1.1 Fixed Air Header Pressure

When using Fixed Air Header Pressure, the MCP is modulating blower output to maintain a constant pressure in the air header. The setpoint is entered locally at the MCPs OIT or sent to the MCP from SCADA.

3.1.2 Calculated Air Header Pressure via Most Open Valve

When using Calculated Air Header Pressure, the MCP is using valve positions to determine if more or less air is needed in the header. There will always be one valve that is “most open.” Any valve could be the most open at any given time, therefore all valves are constantly being evaluated to determine which is the most open. The position of the most open valve (MOV) is used to calculate the required air header pressure.

For example, if the MOV is only 40% open, there is excess air entering the header. The MCP will calculate a lower air header pressure setpoint than the current setpoint. The MCP will then decrease the blower output to meet this new setpoint. Since the pressure has dropped in the main header, the MOV will then open to allow more air into its respective zone. Vice versa, if the MOV is open 70% or more, there is not enough air entering the header. The MCP will calculate a higher air header pressure setpoint. The MCP will then increase the blower output to meet this new setpoint. Since the pressure has increased in the main header, the MOV will then close to decrease the air into its respective zone.

4. Blower Operation

4.1 General

4.1.1 Flow Control (Diffuser Vane Pulsing)

Two parallel control relays are used to increase and decrease the diffuser vane position. The relays have maximum operational limits that must not be exceeded. The relays cannot exceed 4 operations per second and 3600 operations per hour. It is recommended to pulse the diffuser vanes open and closed with a 10% to 30% duty cycle at 1Hz frequency.

4.1.2 Diffuser Vane Travel

Increasing a blower's flow into the main header at a high rate of diffuser vane travel can cause process instability, air hammer in the downstream piping, or damage to aeration basin membrane diffusers. It is recommended that the blower diffuser vanes are pulsed from full close to full open no faster than 60 seconds, typically 120 seconds. There is no limit on the speed of decreasing the diffuser vanes.

4.1.3 Diffuser position vs Blower airflow output

An often-misunderstood concept is the relationship between diffuser vane position and blower output. When the blower is on and the diffuser is set at minimum, the airflow output of the blower is 40% of the total blower capacity, depending on the design. When the blower is on and the diffuser is set to maximum, the airflow output of the blower is 100% of the total blower capacity.

Diffuser position 0% = Air output 40% of blower capacity.

Diffuser position 100% = Air output 100% of blower capacity.

4.1.4 Starting additional blowers

When the process requires more air than one blower at 100% output can provide, another blower needs to be started. The process for starting an additional blower is to decrease the blower currently at maximum output to minimum output and start the new blower. When this happens, the air into the header will drop by 55% to 60% of one blower capacity. Starting a new blower can cause other parts of the process to incorrectly react to this temporary decrease in air.

Therefore, when an additional blower is required to start, the MCP will output a "Hold" command (see Network Setup). The "hold" command indicates to other controllers involved in the aeration control process to freeze valves and calculated setpoints that affect the main air header pressure and flow. When the new blower is fully operational, the MCP will deactivate the "hold" command to indicate the process can be controlled as normal.

4.2 Cascade Control - Increase Airflow

Note: In this example, it is assumed the minimum blower output is 45% of design capacity.

The MCP will start the blower with priority 1. Once blower priority 1 is fully started, the MCP automatically increases or decreases the blower output to meet process demand.

If the aeration process requires more air, the MCP will increase airflow output of blower priority 1 by sending pulsed signals to the local control panel, which will actuate the diffuser vanes. If the diffuser vane reaches the maximum position (100% airflow output) and the process still requires more air, the MCP should start the blower having priority 2.

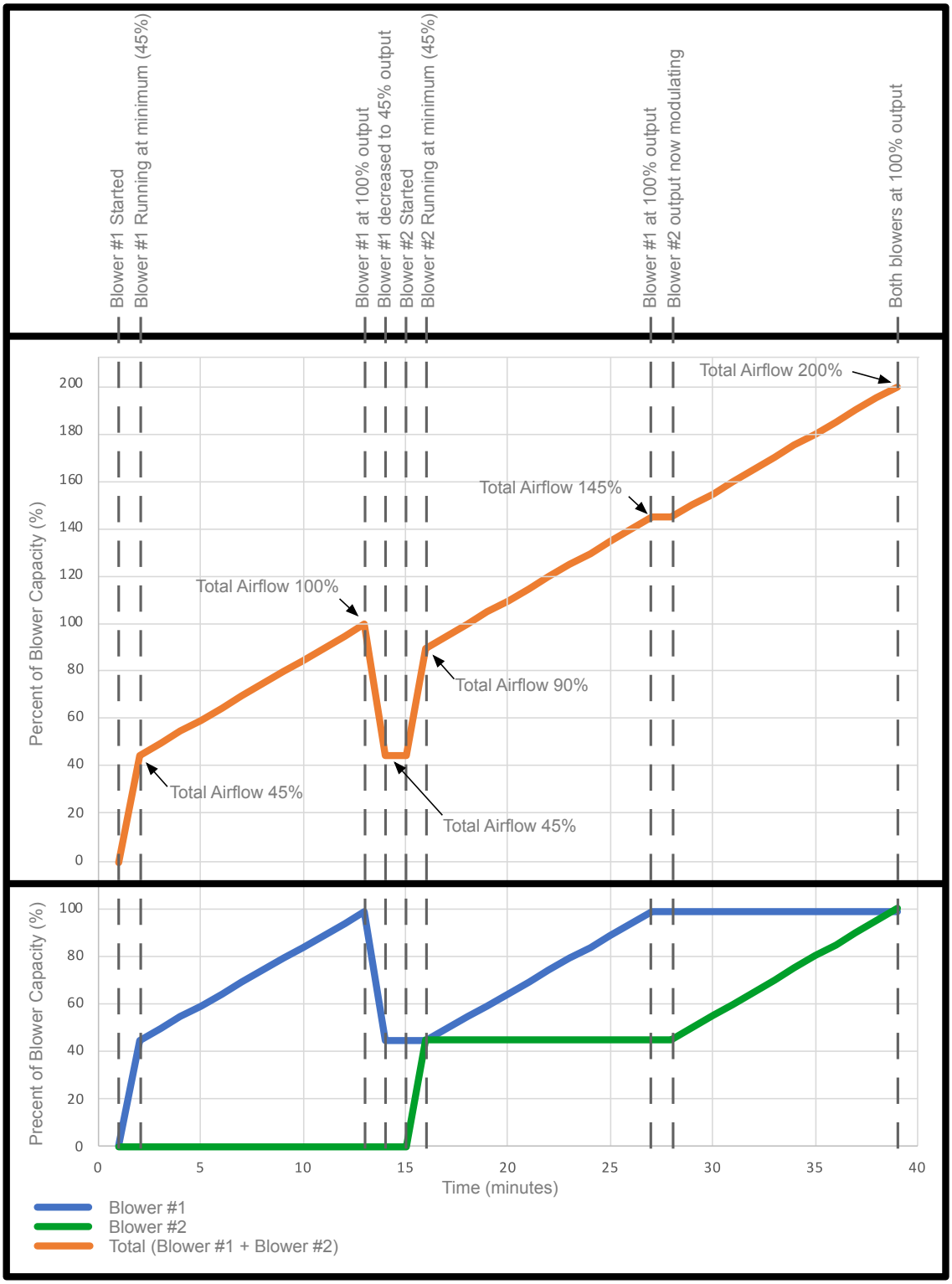
To allow a smooth transition while an additional blower is started, cascade logic reduces the airflow to minimum of the blower in operation with the least priority. Reducing the overall airflow into the process minimizes potential instabilities during blower startup and shutdown when several blowers are connected to the same discharge header pipe.

Before the MCP initiates the start procedure of blower priority 2, the MCP will decrease the diffuser vane of blower priority 1 to minimum position. When blower priority 1 is at minimum position, blower priority 2 is allowed to start. When blower priority 2 completes the startup sequence and the blower is fully operational, it is suppling 45% of its maximum airflow.

The process is now fed with 90% of total airflow, 45% from blower priority 1 and 45% from blower priority 2. The diffuser vane of blower priority 1 can now be modulated to meet process demand (set point). If the diffuser vanes of blower priority 1 reach 100% (full open) and the process requires more air (CV < SP), the MCP should then begin to modulate the diffuser vanes of blower priority 2.

See the “Two blowers with process demand increasing” chart below.

Example: Two blowers with process demand increasing



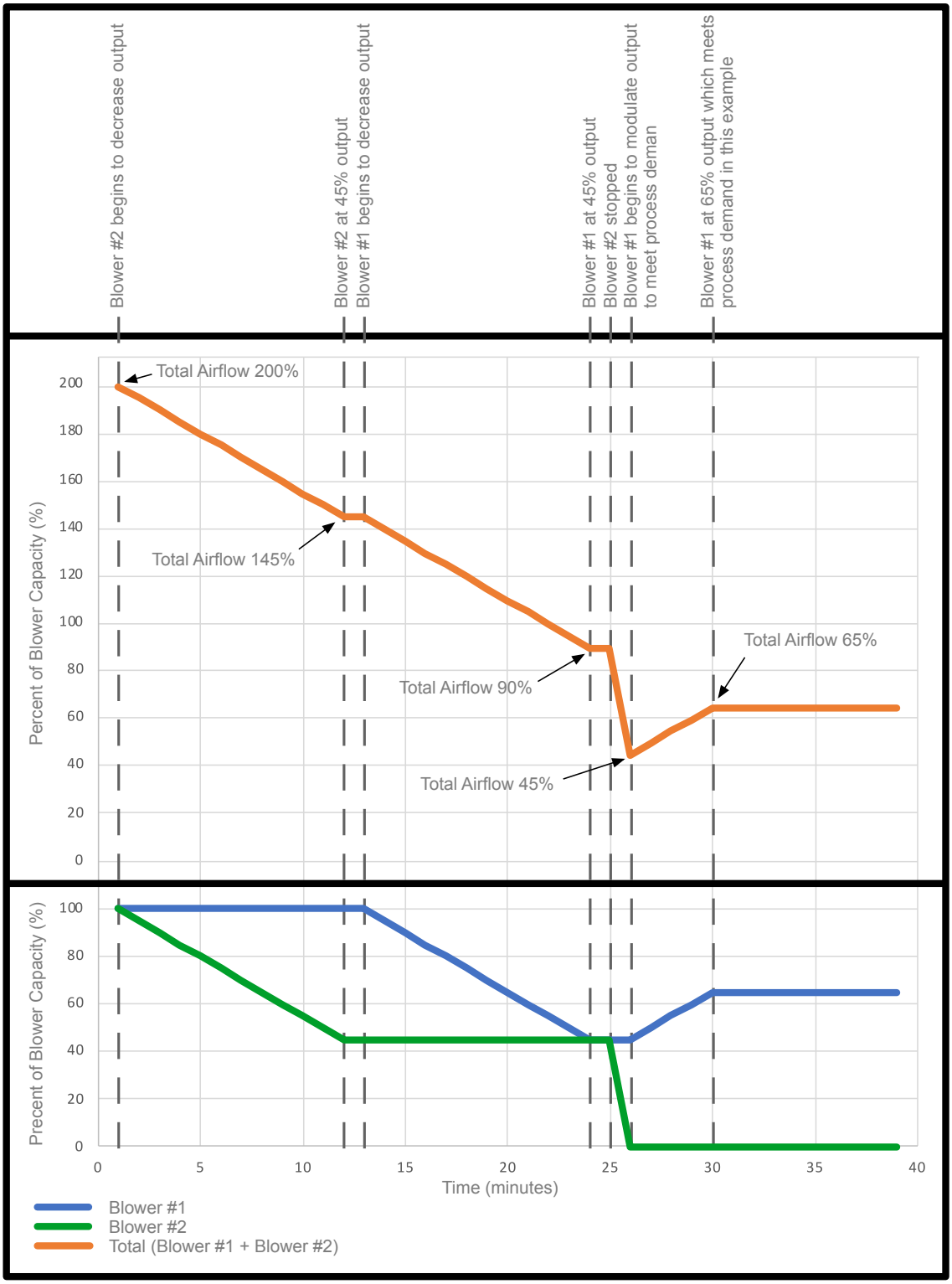
4.3 Cascade Control - Decrease Airflow

If the aeration process requires less air, the MCP will decrease the airflow output of blower priority 2 by sending pulsed signals to the local control panel. If the diffuser vane reaches the minimum position (45% output) and the process still requires less air, the MCP will decrease the diffuser vane position of blower priority 1. If blower priority 1 diffuser vane reaches 18%, the output of blower priority 1 would be 55% of total blower capacity. The process is now being supplied with 100% of one blower's capacity, 55% from blower priority 1 and 45% from blower priority 2.

In order to avoid rapid cycling of a blower, when the diffuser position of blower priority 1 is less than 18% the MCP will wait for a timer to expire and then turn off blower priority 2. For instance, if blower priority 1 is at a diffuser vane position of 17% for 5 minutes, the MCP will then turn off blower priority 2 and let blower priority 1 modulate to meet the process air requirements.

See the "Two blowers with process demand decreasing" chart below.

Example: Two blowers with process demand decreasing



4.4 Start of Next Available Blower due to Fault Condition

If blower priority 1 is running but trips (see section 10 and section 11 in Document # NTA-11-003 - Local Control Panel Functional Description), the MCP will immediately start the next available blower.

The blower started should be the highest priority blower not currently running. For instance, if blower priority 1 and blower priority 2 are running and blower priority 1 trips, blower priority 2 will replace blower priority 1 and blower priority 3 should be started to replace blower priority 2 using the control method described in paragraph 2.3 above. If blower priority 1 is the only blower running and it trips, then blower priority 2 will be started and replace blower priority 1.

4.5 Loss of Network Communication

When any of the blower LCPs lose communication with the MCP, the LCP will hold the last blower settings. If the MCP loses communication with an LCP and that blower is running, the MCP will freeze all blower's output at their current position. If the MCP loses communication with an LCP but that blower is not running, the MCP continues to control the process as normal. If the MCP loses communication with SCADA, the MCP will continue to modulate blower output to meet the last known air header pressure Setpoint passed from SCADA or set locally at the HMI.

4.6 Alarms

The MCP receives blower status via network. The HMI will indicates which blower is subject to failure. All alarms appear in a pop-up window as well as on the alarm screen. A list of all available alarms can be found in the Network Setup document.

5. Aeration Process Control

5.1 Types of Control

The MCP is designed for two types of aeration control: Dissolved Oxygen Control and Dissolved Oxygen Control with Ammonia Trim.

5.1.1 Dissolved Oxygen Control

When using Dissolved Oxygen Control, the MCP is modulating each valves position to meet a flow setpoint required to maintain a constant Dissolved Oxygen (DO) concentration in the respective zones. The DO setpoint for each zone is entered locally at the MCPs OIT.

5.1.2 Calculated Dissolved Oxygen via Ammonia Concentration

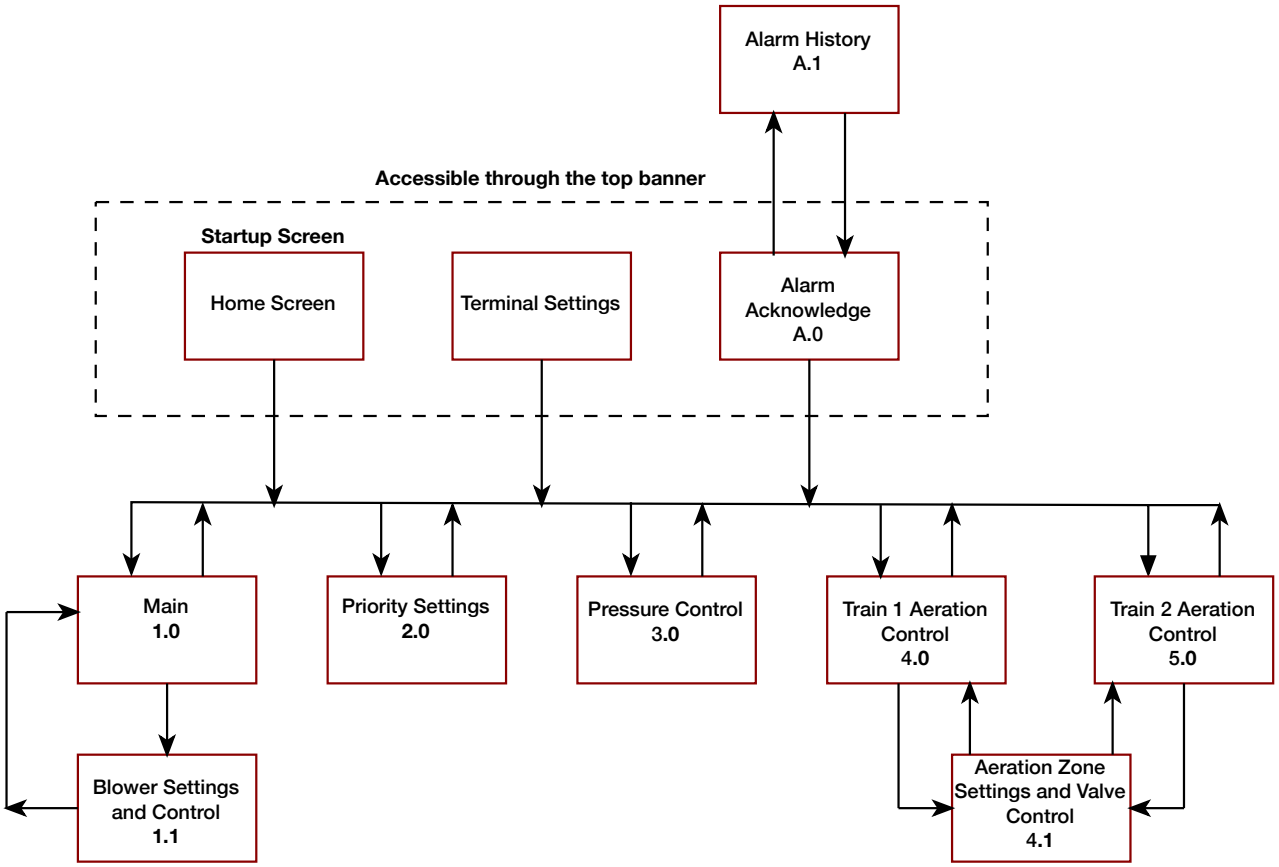
When using calculated DO control, the MCP is using the ammonia concentration at the end of each zone to determine if more or less air is needed in the entire train. The ammonia set point for each train is entered locally at the MCPs OIT.

For example, if the ammonia concentration is reading zero, there is excess air entering the train. The MCP will calculate a lower DO setpoint for each zone. The MCP will then calculate a new flow setpoint required to meet the new DO setpoint. The MCP will then decrease the position of each valve to meet the new flow setpoint. This will decrease the flow entering the zone, thereby decreasing the DO concentration and in turn, the ammonia concentration will increase.

Vice versa, if the ammonia concentration is above the setpoint, there is not enough air entering the train. The MCP will calculate a higher DO setpoint for each zone. The MCP will then calculate a new flow setpoint required to meet the new DO setpoint. The MCP will then increase the position of each valve to meet the new flow setpoint. This will increase the flow entering the zone, thereby increasing the DO concentration and in turn, the ammonia concentration will decrease.

6. Control Using the Local HMI

6.1 HMI Screen Navigation



6.2 Screen Explanation

6.2.1 Home (Startup Screen)

1	Log On Button	Opens the Logon popup screen and allows the user the log on to the HMI. See logon screen explanation in section 5.2.2.
2	Bottom Banner	Displays the navigation buttons

6.2.2 Logon Popup

1	User Name Input	Tap on this input to type in the user name.
2	Password Input	Tap on this input to type in the password.
3	Log on Button	Tap this button to log on after a valid user name and corresponding password have been entered.
4	Logged on Display	Displays the user name that is currently logged in.
5	Log off Button	Tap this button to log off.

HMI Logins and Passwords

Type	User Name	Password
Supervisor	supervisor	nttspa
Operator	plant	ntt

6.2.3 Top Banner

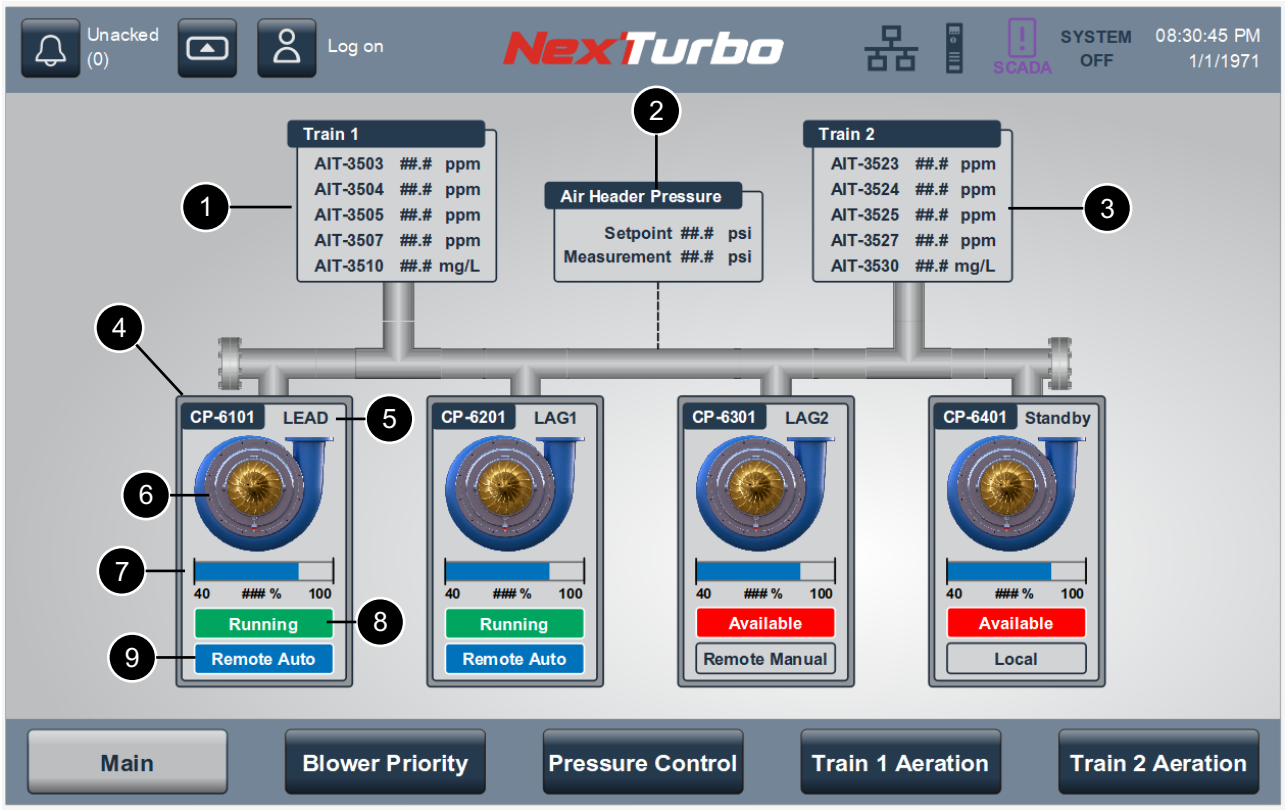
1	Alarm Acknowledgement screen	Opens the Alarm Summary screen when pressed. The indicator turns on red and flashes when there are active alarms that are unacknowledged. When all active alarms are acknowledged the indicator turns solid red. The indicator returns to the default gray icon when all alarms return to normal.
2	Unacknowledged Alarms Count	Indicates the number of unacknowledged alarms and trips.
3	Menu Button	Opens a drop-down menu to allow the user to navigate to either the Home Screen or the Terminal Settings Page
4	Log on Button	Opens the Logon popup screen. Allows the user to Log off. Will display the current logon type (admin [Administrator], plant [Operator], supervisor [Supervisor]).
5	Network Status	Will display a caution indicator or error indicator if there is an issue with network communication. Caution will appear if the network is functioning but has an issue that requires attention. Error will appear if the network is not functioning, i.e. an ethernet cable is disconnected or there is a duplicate IP address.
6	Controller Status	Will display an error, caution or unknown indicator if there is an issue with the controller. Error will appear if the controller is disconnected, powered down, or not configured. Caution will appear if the controller is not in run mode or the tag data is not synchronized with the HMI. Unknown indicator will appear if no controller is visible to the HMI.
7	SCADA Communication Status	This icon will be displayed if communication has been lost between the MCP and SCADA.
8	MCP Status	See Control Screen 1.0. Displays “System Off” if the Master Control System is turned off.
9	Time	The current time and date of the HMI

6.2.4 Bottom Banner

1	Main Button	Opens the Main Screen
2	Priority Settings Button	Opens the Priority Settings screen
3	Pressure Control Button	Opens the Pressure Control Screen
4	Train 1 Aeration Button	Opens the Aeration Control Screen for Train 1
5	Train 2 Aeration Button	Opens the Aeration Control Screen for Train 2

Note: The button of the current screen will be gray to indicate that screen is active.

6.2.5 Main (1.0)



1	Train 1 Status	Displays the DO and Ammonia measurements for Train 1.
2	Air Header Pressure Measurement	Displays the air header pressure measurement and setpoint.
3	Train 2 Status	Displays the DO and Ammonia measurements for Train 2.
4	Blower Faceplate	Displays the current priority setting, the current state of the blower, and the current percent of airflow output. Pressing anywhere on the faceplate will bring up the Blower Control Popup. See sections 5.2.6.
5	Priority Setting Indication	Displays the current priority setting of the respective blower. Can be one of the following: - Lead - Lag1 - Lag2 - Standby
6	Blower Icon	Green = Blower starting, running, or stopping Red = Blower Off and ready to start or Blower not available or not ready to start Amber = Blower has Faulted and needs reset locally Black = Lost Communication
7	Air Flow Bar Graph	Displays the current air flow output of the blower.

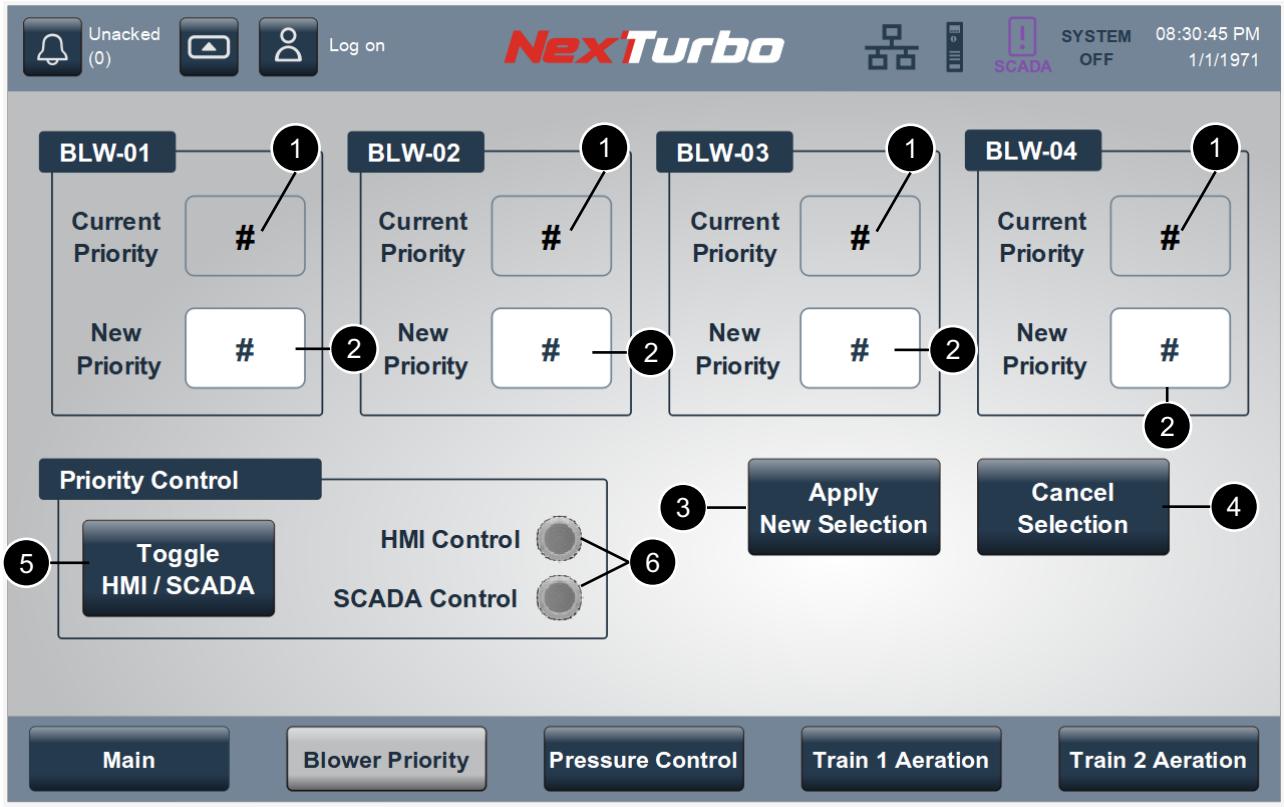
8	Blower State	Displays the current state of the blower. 1. Available 2. Starting 3. Running 4. Stopping 5. Not Available 6. Fault 7. Lost Comms 8. Out of Service
9	Blower Mode	Displays if the blower is in Local Mode or Remote Mode. This is set locally at each blower HMI. A blower in Local Mode is controlled locally at the blower HMI and will not respond to MCP commands. A blower in Remote Mode is controlled remotely by the MCP.

6.2.6 Blower Settings and Control (1.1)

1	Blower State	Displays the current state of the blower. 1. Available 2. Starting 3. Running 4. Stopping 5. Not Available 6. Fault 7. Lost Comms 8. Out of Service
2	Blower Mode	Displays if the blower is in Local Mode or Remote Mode. This is set locally at each blower HMI. A blower in Local Mode is controlled locally at the blower HMI and will not respond to MCP commands. A blower in Remote Mode is controlled remotely by the MCP.
3	Auto/Manual Button	Toggles between the blower being controlled in Auto mode by the MCP or Manual mode by an operator.
4	Auto Manual LEDs	Displays which control is currently selected. The LED will be on Green when selected.
5	Start Blower Button	If the blower is set in Manual Control, the blower can be started and stopped from the OIT. Pressing this button will start a blower if it is stopped.

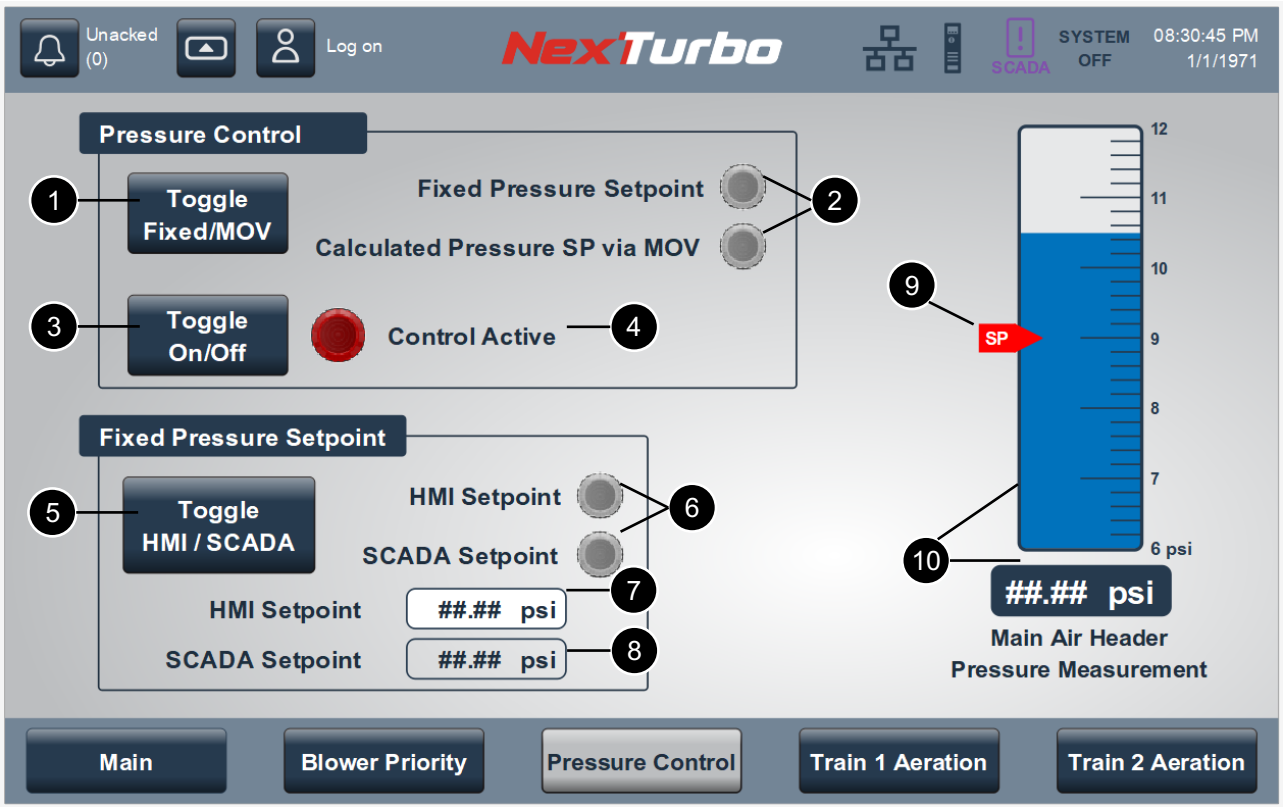
6	Stop Blower Button	If the blower is set in Manual Control, the blower can be started and stopped from the OIT. Pressing this button will stop a blower if it is running.
7	Decrease Airflow Button	If the blower is set to Manual Control and is running, the airflow output can be adjusted. Pressing this button will decrease the airflow out of the blower.
8	Increase Airflow Button	If the blower is set to Manual Control and is running, the airflow output can be adjusted. Pressing this button will increase the airflow out of the blower.
9	Air Flow Bar Graph	Displays the current air flow output of the blower.
10	Close Button	Closes the popup and returns to the Main Screen

6.2.7 Priority Selection (2.0)



1	Current Blower Priority Indication	Displays the current priority of each blower. 0 = Not Used 1 = Lead 2 = Lag 1 3 = Lag 2 4 = Lag 3
2	New Blower Priority Input	User inputs a new priority for each blower.
3	Apply New Selection Button	Applies the new priority set in each “New Priority” input box. Invisible if SCADA Control is selected.
4	Cancel Selection Button	Resets “New Priority” input box to the current priority. Invisible if SCADA Control is selected
5	Toggle HMI/SCADA Button	Selects whether SCADA is setting the priorities or if the user is setting the prioirites at the local HMI.
6	Control LEDs	Indicates if the Local HMI or if SCADA has control over the blower priorities. The light will be on green to indicate who has control.

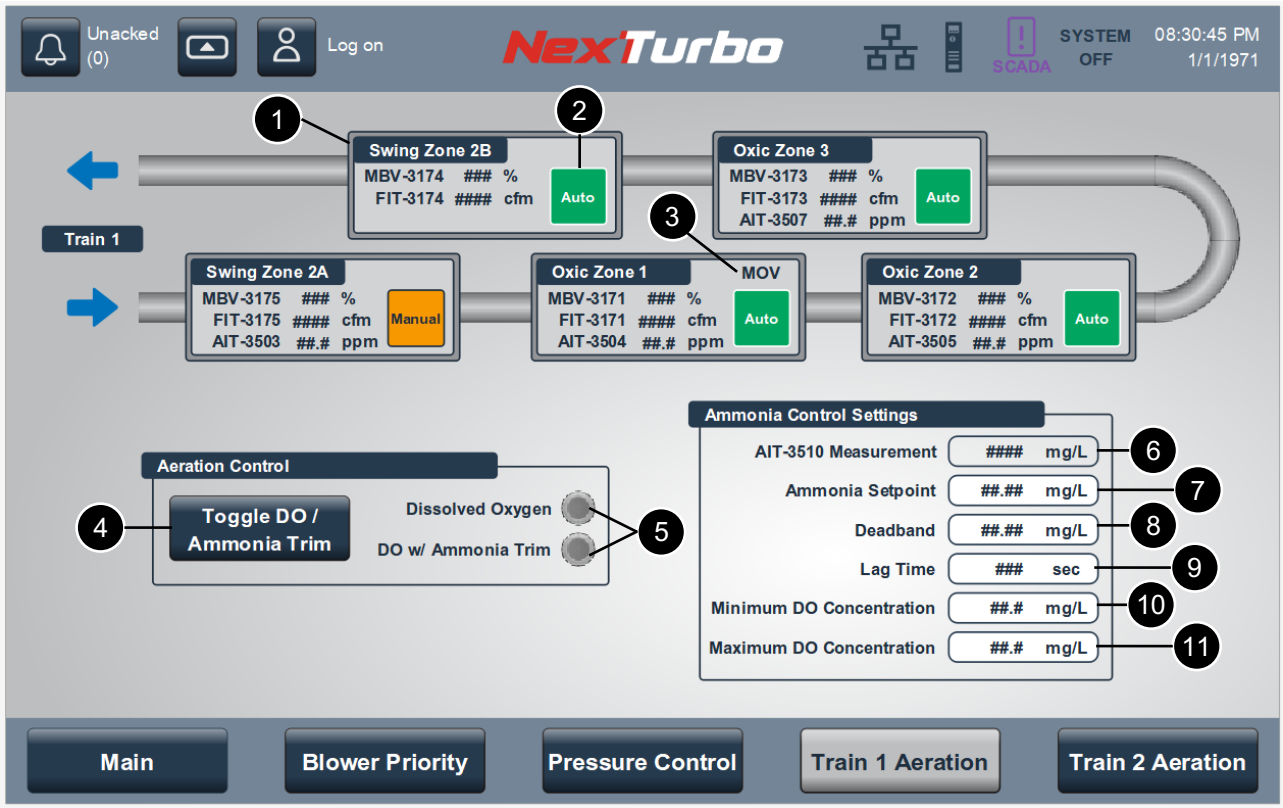
6.2.8 Pressure Settings (3.0)



1	Local/Remote Button	Toggles between the header pressure setpoint being provided remotely by SCADA or locally at the MCP HMI input.
2	Local/Remote Indication	Indicates if the MCP is using the Local header pressure setpoint or the Remote header pressure setpoint supplied by SCADA.
3	Pressure Control On/Off Button	Turns the Master Control Panel air header pressure control functionality on or off.
4	Pressure Control On/Off Indication	If the Air Header Pressure Control is on, the green light will be on and the text will say “Master Control System On.” If the MCP is off and then turned on, there is a 60 second delay that occurs before the MCP is fully operational. During this time, the test will say “System Starting in xx seconds.” If the Air Header Pressure Control is off, the light will be red and the text will display “Master Control System Off.”
5	Toggle HMI/SCADA Button	Toggles between the header pressure setpoint being provided remotely by SCADA or locally at the MCP HMI input. (See section 5.2.11 for more information)
6	LED Indication	Indicates if the MCP is using the Local HMI header pressure setpoint or the Remote header pressure setpoint supplied by SCADA. The light will be on Green indicated which setpoint is being used.
7	HMI Setpoint Input	User inputs the header pressure setpoint to use when “HMI Setpoint” is selected.
8	SCADA Setpoint Display	Displays the header pressure setpoint supplied by SCADA to be used when “SCADA Setpoint” is selected.

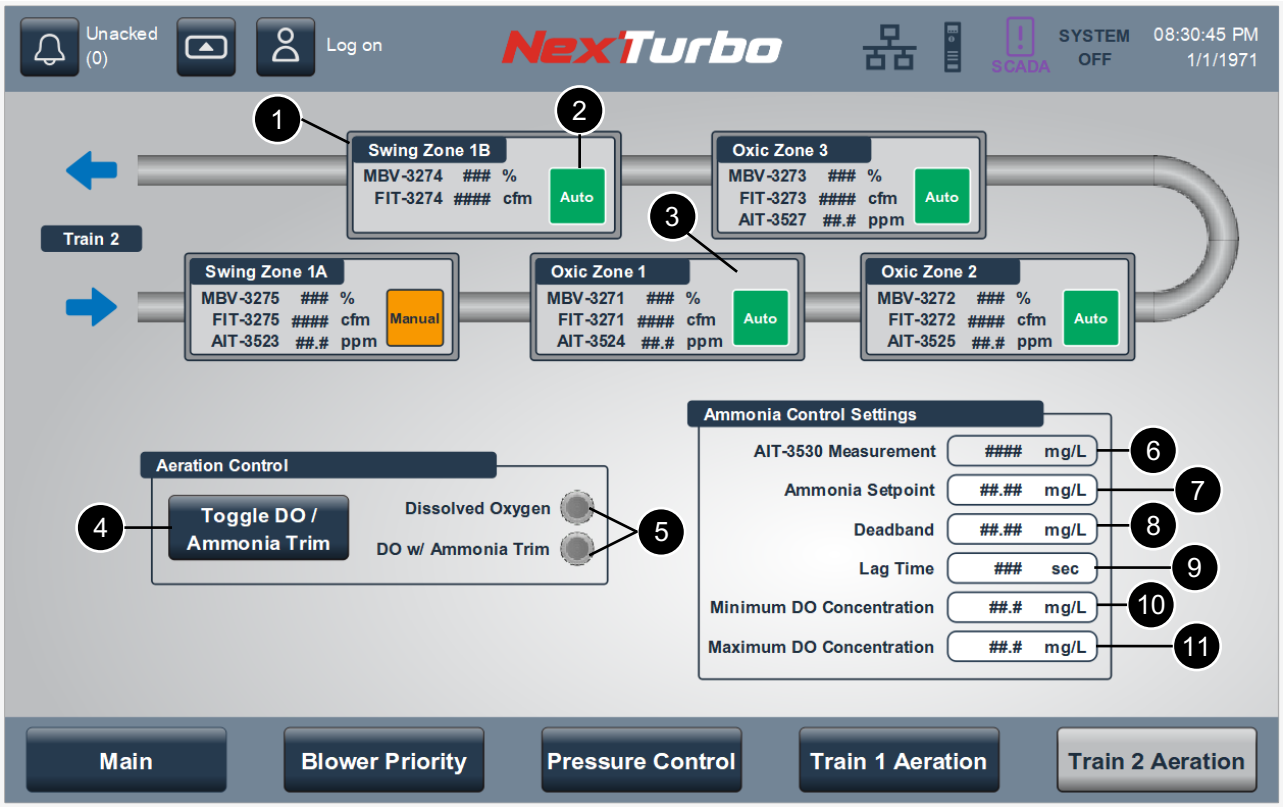
9	Pressure Setpoint Indication	Displays the current header pressure setpoint being used by the MCP.
10	Pressure Measurement Indication	Displays the process measurement of the main air header pressure transmitter

6.2.9 Train 1 Aeration Control (4.0)



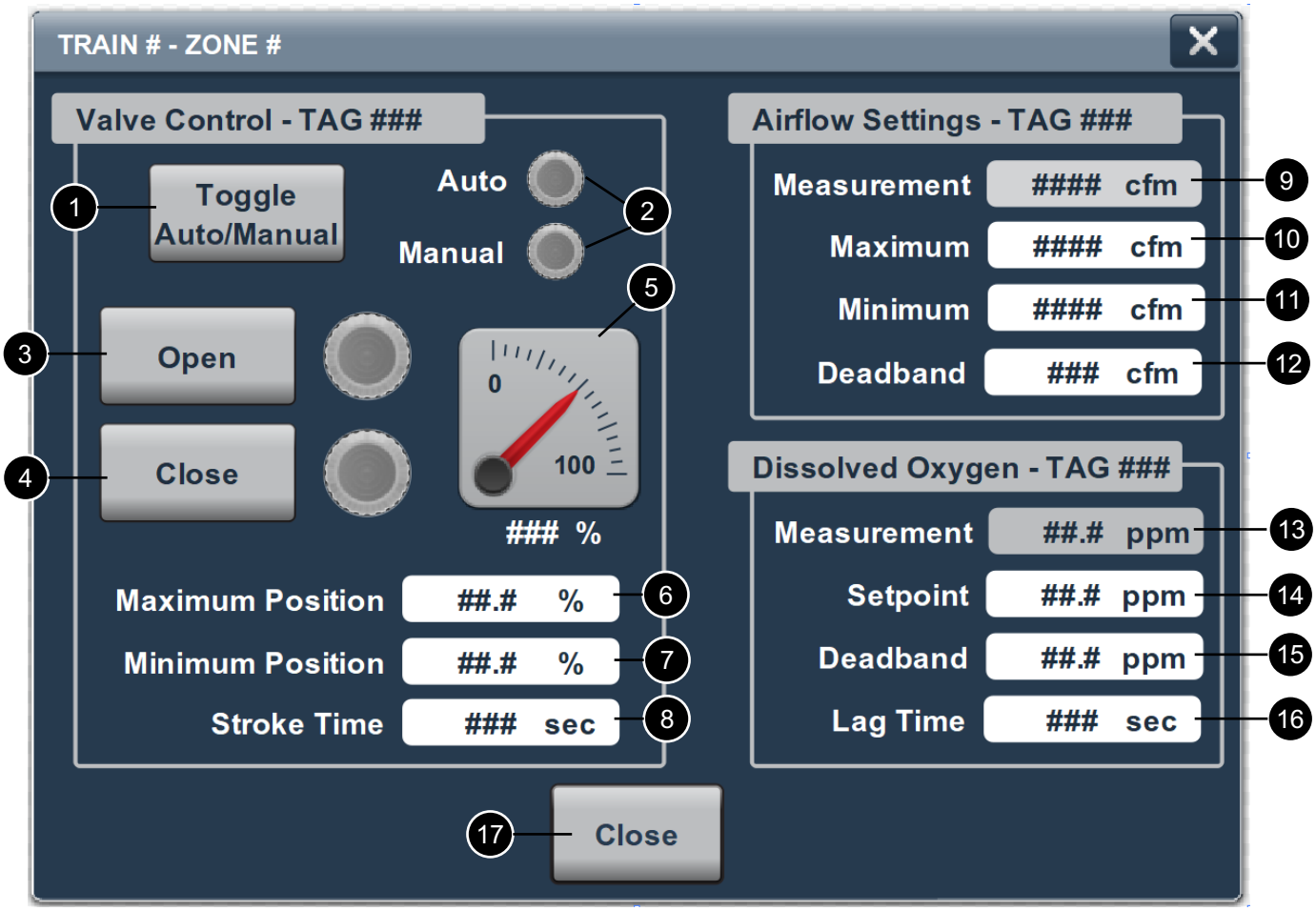
1	Aeration Zone Faceplate	Displays valve position, flow measurement, and DO measurement for each respective zone. Pressing anywhere on the faceplate will bring up the Aeration Zone Popup. See section 5.2.11.
2	Auto/Manual Status	Indicates if the valve is in auto control or manual control.
3	Most Open Valve Status	The zone whose valve is currently the most open will have this icon displayed.
4	Toggle DO/Ammonia Trim Button	Selects whether the MCP will control the aeration process using a fixed DO setpoints or by using the Ammonia measurement to calculate the DO setpoints.
5	Control LEDs	Indicates if the MCP will use fixed DO setpoints or calculated DO setpoints. The light will be on green to indicate which control method is currently selected.
6	Ammonia Measurement	Displays the current Ammonia measurement for Train 1.
7	Setpoint Input	Setpoint of the Ammonia concentration to control the process to. This is only active is “DO w/ Ammonia Trim” is selected.
8	Deadband Input	Sets the deadband around the ammonia setpoint.
9	Lag Time Input	Sets the time between changes of the DO setpoint.
10	Minimum DO Concentration Input	Sets the minimum allowed DO concentration any/all aeration zones.
11	Maximum DO Concentration Input	Sets the maximum allowed DO concentration any/all aeration zones.

6.2.10 Train 2 Aeration Control (5.0)



1	Aeration Zone Faceplate	Displays valve position, flow measurement, and DO measurement for each respective zone. Pressing anywhere on the faceplate will bring up the Aeration Zone Popup. See section 5.2.11.
2	Auto/Manual Status	Indicates if the valve is in auto control or manual control.
3	Most Open Valve Status	The zone whose valve is currently the most open will have this icon displayed.
4	Toggle DO/Ammonia Trim Button	Selects whether the MCP will control the aeration process using a fixed DO setpoints or by using the Ammonia measurement to calculate the DO setpoints.
5	Control LEDs	Indicates if the MCP will use fixed DO setpoints or calculated DO setpoints. The light will be on green to indicate which control method is currently selected.
6	Ammonia Measurement	Displays the current Ammonia measurement for Train 2.
7	Setpoint Input	Setpoint of the Ammonia concentration to control the process to. This is only active is “DO w/ Ammonia Trim” is selected.
8	Deadband Input	Sets the deadband around the ammonia setpoint.
9	Lag Time Input	Sets the time between changes of the DO setpoint.
10	Minimum DO Concentration Input	Sets the minimum allowed DO concentration any/all aeration zones.
11	Maximum DO Concentration Input	Sets the maximum allowed DO concentration any/all aeration zones.

6.2.11 Aeration Zone Settings and Valve Control (4.1)

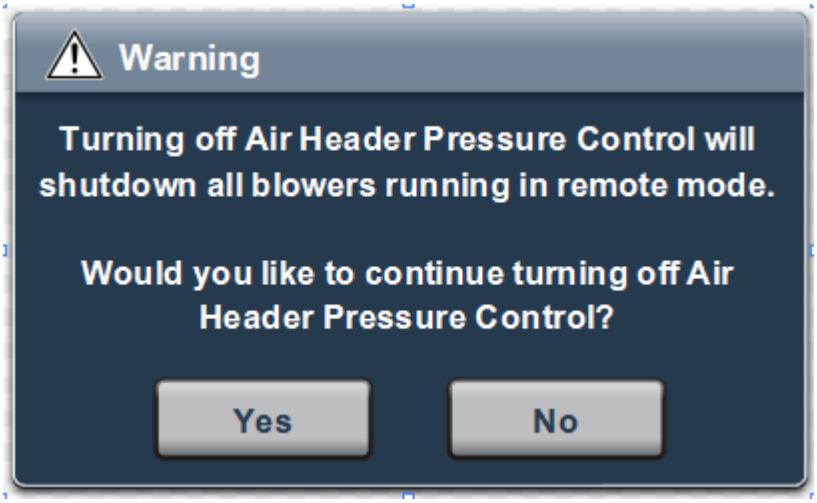


1	Auto/Manual Button	Toggles between the valve being controlled in Auto mode by the MCP or Manual mode by an operator.
2	Auto Manual LEDs	Displays which control is currently selected. The LED will be on Green when selected.
3	Open Button	If the valve is set to Manual Control the valve position can be adjusted. Pressing this button will increase the position of the valve. When the valve is full open, the LED will be on Green.
4	Close Button	If the valve is set to Manual Control the valve position can be adjusted. Pressing this button will increase the position of the valve. When the valve is full closed, the LED will be on Green
5	Position Display	Shows the percentage open of the valve
6	Maximum Position Input	Sets the maximum position of the valve for it to be considered “Full Open”
7	Minimum Position Input	Sets the minimum position of the valve for it to be considered “Full Closed”
8	Stroke Time Input	Sets the time the valve will take to go from full closed to full open or vice versa.
9	Air Flow Measurement	Displays the current air flow measurement to the aeration zone.

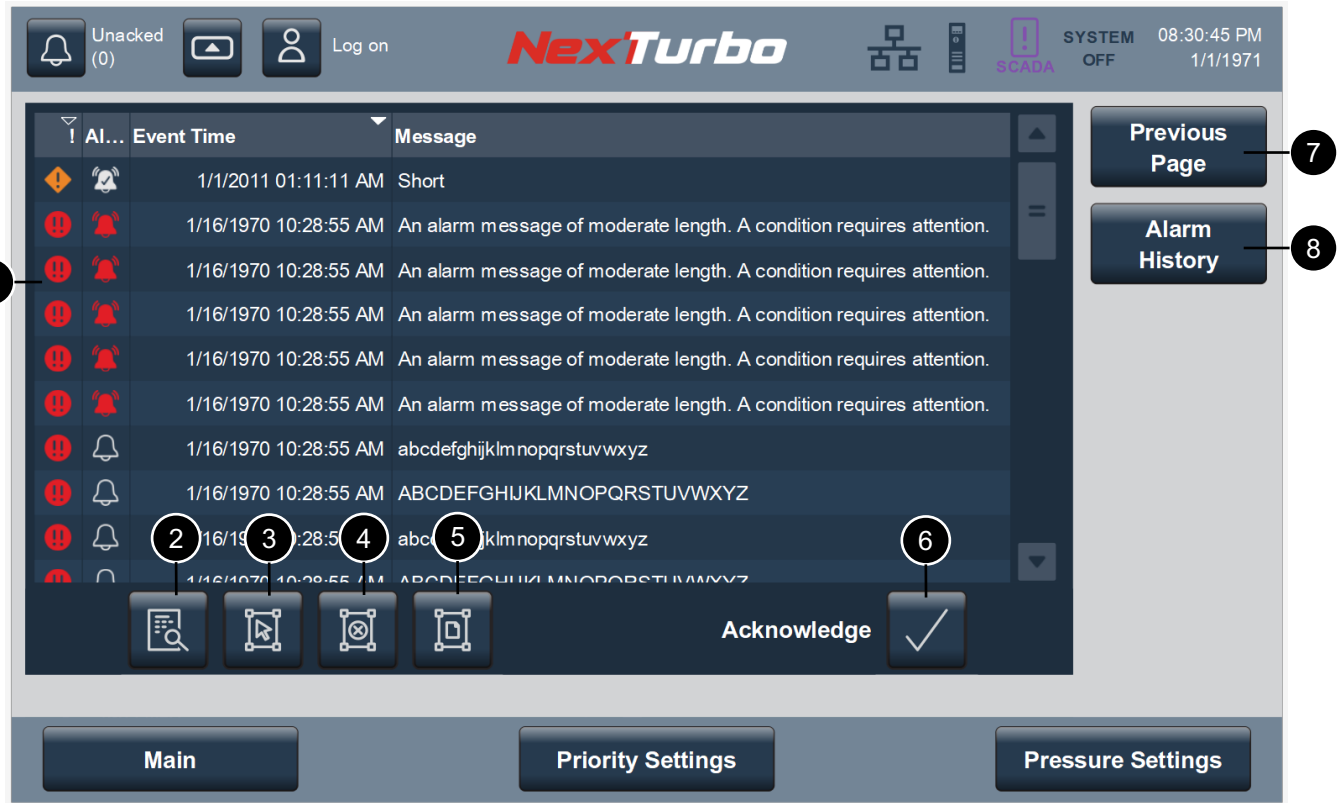
10	Maximum Input	Sets the maximum allowed airflow to the aeration zone.
11	Minimum Input	Sets the minimum allowed airflow to the aeration zone.
12	Deadband Input	Sets the deadband around the airflow setpoint.
13	Dissolved Oxygen Measurement	Displays the current dissolved oxygen measurement in the aeration zone.
14	Setpoint Input	Setpoint to control the Dissolved Oxygen to in the aeration zone.
15	Deadband Input	Sets the deadband around the Dissolved Oxygen setpoint.
16	Lag Time Input	Sets the time between changes of the airflow setpoint.
17	Close Button	Closes the popup and returns to the Main Screen

6.2.12 System Off Verification Popup

If the system is on and the “Toggle On/Off” button described above is pressed, the following popup will be displayed. Answering “No” keeps the system on. Answering “Yes” will turn the system off and all blowers that are in remote mode and are running will be turned off.



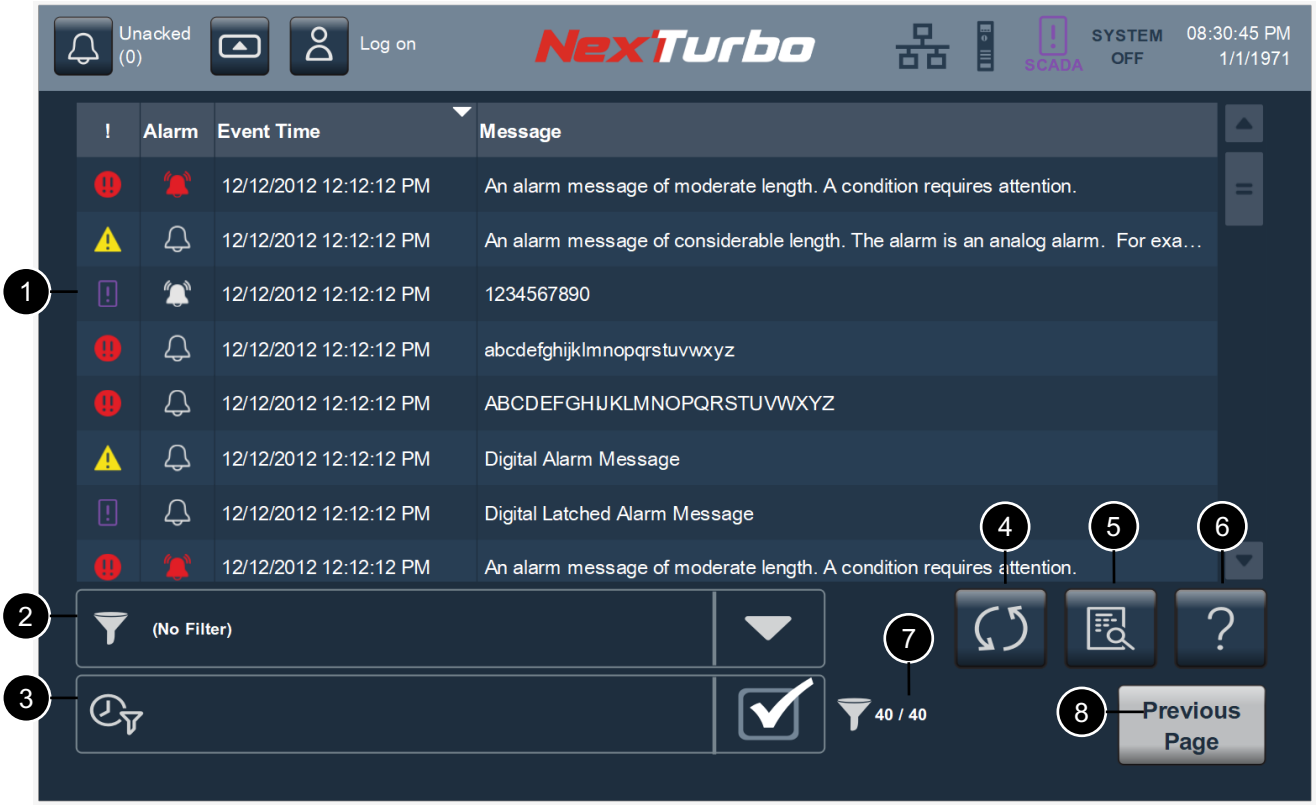
6.2.13 Alarm Acknowledge (A.0)



1	Alarm Table	The list of "In Alarm" and/or Unacknowledged alarms. Each row contains a single alarm condition.
	Priority	• Low • Medium • High • Urgent
	Alarm State	• Normal, Unacknowledged and Urgent • In Alarm, Acknowledged and Urgent • In Alarm, Unacknowledged and Urgent
	Event Time	The time the alarm condition or sub-condition changed to the currently displayed state
	Message	The message assigned to the alarm
2	Details Pane	Shows the details of the last selected alarm. If no alarm is selected, the Details pane is empty.
3	Select All Button	Selects all alarms in the Alarm Table, including those not displayed on the current page of alarms.

4	Deselect All Button	Deselects all alarms in the Alarm Table, including those not displayed on the current page of alarms.
5	Select Page Button	Selects all the alarms displayed on the current page of alarms.
6	Acknowledge Button	Indicates that you are aware of the alarm. This button changes the state of the alarm from unacknowledged to acknowledged. An alarm must be selected from the list in order for it to be acknowledged.
7	Previous Page Button	Navigates back to the previous screen.
8	Alarm History Button	Navigates to the Alarm History Page (screen A.1)

6.2.14 Alarm History (A.1)

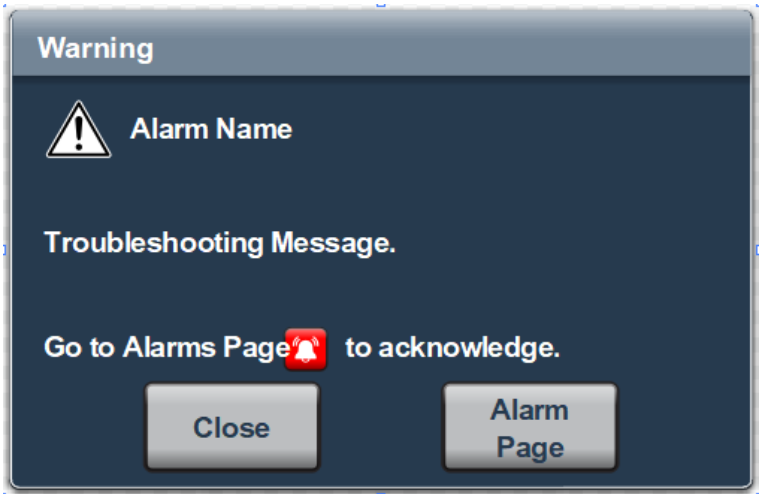


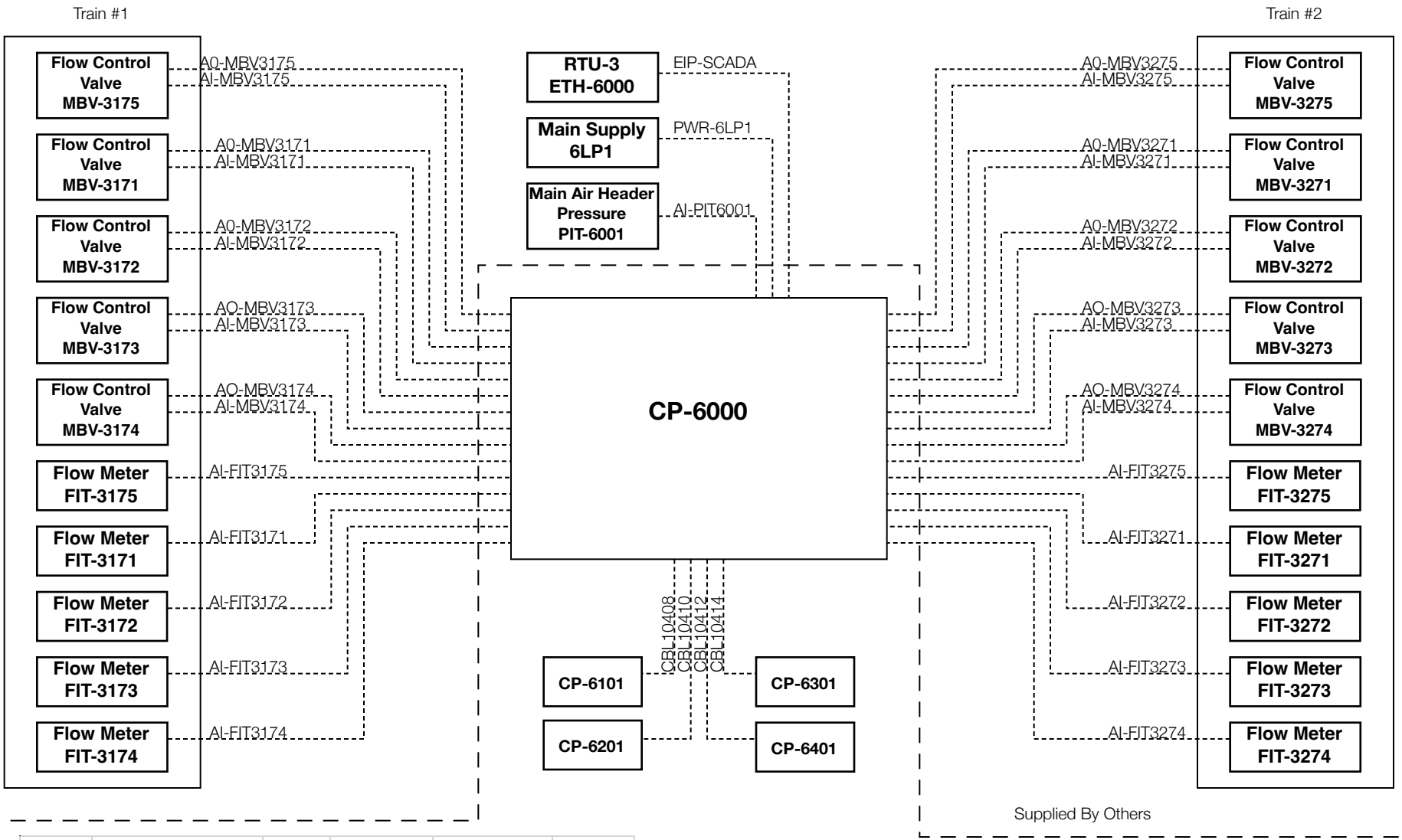
1	Alarm Table	The list of "In Alarm" and/or Unacknowledged alarms. Each row contains a single alarm condition.
	! (Priority)	• Low  • Medium  • High  • Urgent 
	Alarm State	• Normal, Acknowledged  • Normal, Unacknowledged  and Urgent  • In Alarm, Acknowledged  and Urgent  • In Alarm, Unacknowledged  and Urgent 
	Event Time	The time the condition occurred
	Message	The message assigned to the event
2	Filter List	Select a filter in the HMI device to list only the alarm state change records containing the filter value for the indicated column. For example, if the filter exists, select the filter Priority:High to show only those alarm state changes with a high priority.
3	Date Filter	Select the box and enter a date and time to list only the alarm state change records that occurred between the chosen date and time and the present. Select the checkbox on the right side to activate the filter.

4	Refresh Button	Loads the latest alarm state changes from the alarm history. The operator has to refresh the table to see the latest changes. The operator can also exit and enter the Alarm History screen again to refresh.
5	Details Button	Hides or shows the Details pane, which contains the details of the last selected alarm state change record. The Details pane appears on the bottom half of large alarm tables and replaces the list of alarms in medium alarm tables. If no record is selected, the Details pane is empty.
6	Help Button	Opens the Help popup. This popup displays a legend of icons and the task each button on an alarm table performs
7	Number of Records	Number of filtered records and total number of records.
8	Previous Page Button	Navigates to the previous page.

6.2.15 Alarm Popup

If an alarm occurs, the following popup screen will be displayed.





CONDUIT TAG #	DESCRIPTION	SIGNAL TYPE	WIRE NUMBER	WIRE TYPE(1)(2)	WIRE SIZE(2)
PWR-6LP1	Main Supply Power	120VAC	2 wire + PE	Belden 9912	12 AWG
AI-PIT6001	Main Air Header Pressure	Analog	Qty (1) TSP	Belden 8760	18 AWG
AI-FIT3171	Train #2 Flow Meter	Analog	Qty (1) TSP	Belden 8760	18 AWG
AI-FIT3172	Train #2 Flow Meter	Analog	Qty (1) TSP	Belden 8760	18 AWG
AI-FIT3173	Train #1 Flow Meter	Analog	Qty (1) TSP	Belden 8760	18 AWG
AI-FIT3174	Train #1 Flow Meter	Analog	Qty (1) TSP	Belden 8760	18 AWG
AI-FIT3175	Train #2 Flow Meter	Analog	Qty (1) TSP	Belden 8760	18 AWG
AI-MBV3171	Train #2 Flow Control Valve Demand	Analog	Qty (1) TSP	Belden 8760	18 AWG
AO-MBV3171	Train #2 Flow Control Valve Feedback	Analog	Qty (1) TSP	Belden 8760	18 AWG
AI-MBV3172	Train #2 Flow Control Valve Demand	Analog	Qty (1) TSP	Belden 8760	18 AWG
AO-MBV3172	Train #2 Flow Control Valve Feedback	Analog	Qty (1) TSP	Belden 8760	18 AWG
AI-MBV3173	Train #1 Flow Control Valve Demand	Analog	Qty (1) TSP	Belden 8760	18 AWG
AO-MBV3173	Train #1 Flow Control Valve Feedback	Analog	Qty (1) TSP	Belden 8760	18 AWG
AI-MBV3174	Train #1 Flow Control Valve Demand	Analog	Qty (1) TSP	Belden 8760	18 AWG
AO-MBV3174	Train #1 Flow Control Valve Feedback	Analog	Qty (1) TSP	Belden 8760	18 AWG
AI-MBV3175	Train #2 Flow Control Valve Demand	Analog	Qty (1) TSP	Belden 8760	18 AWG
AO-MBV3175	Train #2 Flow Control Valve Feedback	Analog	Qty (1) TSP	Belden 8760	18 AWG
EIP-SCADA	Network Cable from MCP to SCADA	Network	CAT6	Belden 7883A	24 AWG
CBL10408	Network Cable from LCP to MCP	Network	CAT6	Belden 7883A	24 AWG
CBL10410	Network Cable from LCP to MCP	Network	CAT6	Belden 7883A	24 AWG
CBL10412	Network Cable from LCP to MCP	Network	CAT6	Belden 7883A	24 AWG
CBL10414	Network Cable from LCP to MCP	Network	CAT6	Belden 7883A	24 AWG

(1) Or equivalent

(2) Using the appropriate wire gauage is the electrical contractors responsibility since length of wire runs in unknown by Next Turbo

NOTE:

1. Power to Flow Meters and Flow Control Valves is supplied from a different panel supplied by others.

2. All wiring/cabling is supplied by others. Landing of all wiring in CP-6000 is performed by others.

NexTurbo

Title	Cable Layout
Document No.	
Project	Taunton, MA
Project No.	22.0989
Revision	1

MASTER CONTROL PANEL - POINT to POINT DIAGRAM - EXTERNAL WIRING

MASTER CONTROL PANEL			CABLE	EXTERNAL LOCATION			
TERMINAL #	WIRE #			WIRE #	PIN #	TERMINAL	NOTES
TB2	1 o	L1	PWR-6LP1 Main Supply	L1	o	6LP1	
	2 o	L2		L2	o		
	3 o	PE		PE	o		
Surge Protector U10709 Port ENET (IN)	o		EIP-SCADA CAT6		o	RTU-3 ETH-6000	
	o				o		
	o				o		
	o				o		
Ethernet Switch NSW10400 Port 4	o		CBL10408 CAT6		o	CP-6101 Ethernet Switch	
	o				o		
	o				o		
	o				o		
Ethernet Switch NSW10400 Port 5	o		CBL10410 CAT6		o	CP-6201 Ethernet Switch	
	o				o		
	o				o		
	o				o		
Ethernet Switch NSW10400 Port 6	o		CBL10412 CAT6		o	CP-6301 Ethernet Switch	
	o				o		
	o				o		
	o				o		
Ethernet Switch NSW10400 Port 7	o		CBL10414 CAT6		o	CP-6401 Ethernet Switch	
	o				o		
	o				o		
	o				o		

POINT to POINT DIAGRAM - EXTERNAL DEVICES

BLOWER LOCAL CONTROL PANEL				CABLE	EXTERNAL LOCATION			
TERMINAL #		WIRE #			WIRE #	PIN #	TERMINAL	NOTES
TB4	1A o	109021		AI-PIT6001 Main Air Header Pressure		o TBD	PIT-6001	Do not connect the cable shield to GND in the Device
	1B o	109041				o TBD		
	1G o	PE				o NC		
TB4	2A o	109061		AI-FIT3175 Train #1 Flow Meter		o TBD	FIT-3175	Do not connect the cable shield to GND in the Device
	2B o	109081				o TBD		
	2G o	PE				o NC		
TB4	3A o	109101		AI-FIT3171 Train #1 Flow Meter		o TBD	FIT-3171	Do not connect the cable shield to GND in the Device
	3B o	109121				o TBD		
	3G o	PE				o NC		
TB4	4A o	109141		AI-FIT3172 Train #1 Flow Meter		o TBD	FIT-3172	Do not connect the cable shield to GND in the Device
	4B o	109161				o TBD		
	4G o	PE				o NC		
TB4	5A o	109181		AI-FIT3173 Train #1 Flow Meter		o TBD	FIT-3173	Do not connect the cable shield to GND in the Device
	5B o	109201				o TBD		
	5G o	PE				o NC		
TB4	6A o	109221		AI-FIT3174 Train #1 Flow Meter		o TBD	FIT-3174	Do not connect the cable shield to GND in the Device
	6B o	109241				o TBD		
	6G o	PE				o NC		

POINT to POINT DIAGRAM - EXTERNAL DEVICES

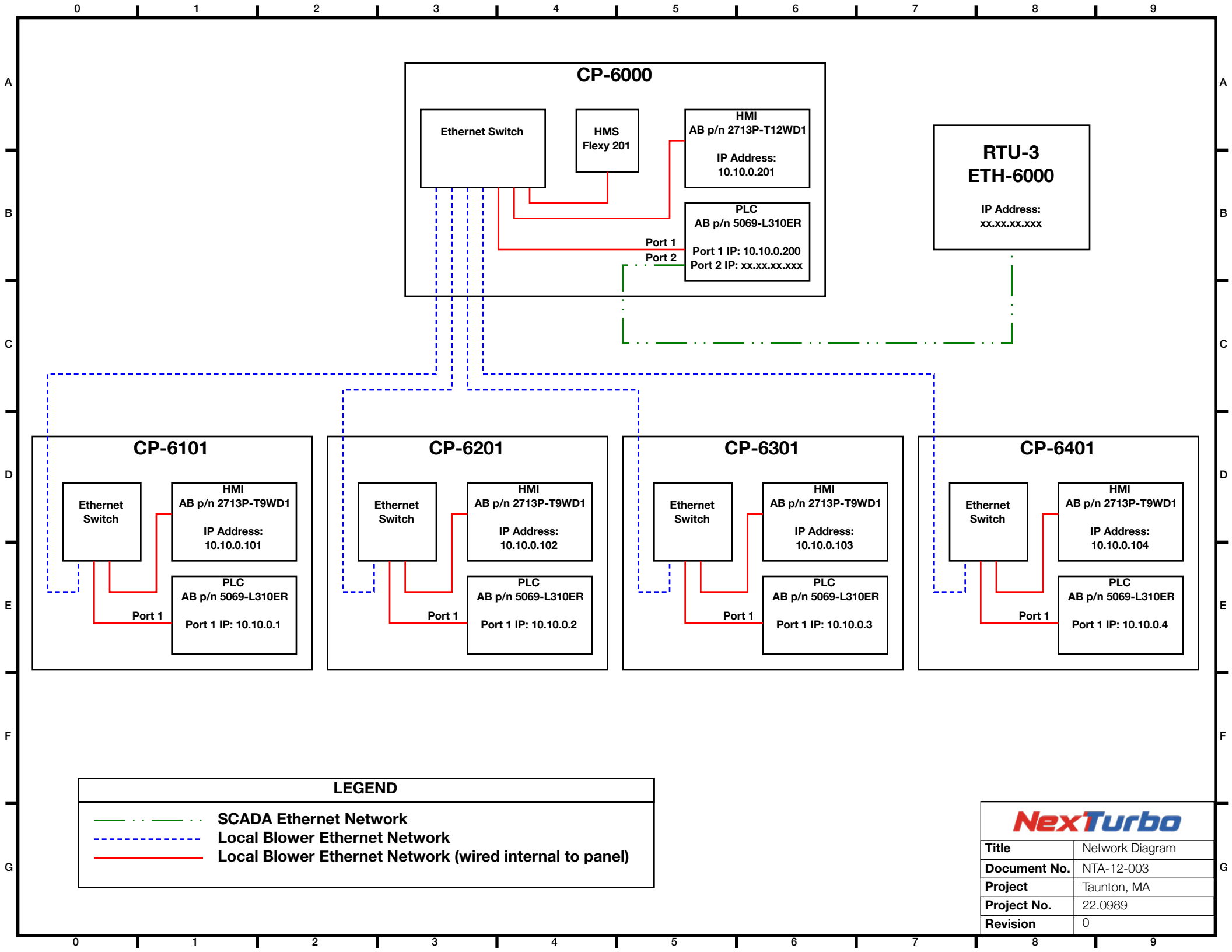
BLOWER LOCAL CONTROL PANEL				CABLE	EXTERNAL LOCATION			
TERMINAL #		WIRE #			WIRE #	PIN #	TERMINAL	NOTES
TB4	7A o	109261		AI-FIT3275 Train #2 Flow Meter		o TBD	FIT-3275	Do not connect the cable shield to GND in the Device
	7B o	109281				o TBD		
	7G o	PE				o NC		
TB4	8A o	109301		AI-FIT3271 Train #1 Flow Meter		o TBD	FIT-3271	Do not connect the cable shield to GND in the Device
	8B o	109321				o TBD		
	8G o	PE				o NC		
TB4	9A o	110021		AI-FIT3272 Train #1 Flow Meter		o TBD	FIT-3272	Do not connect the cable shield to GND in the Device
	9B o	110041				o TBD		
	9G o	PE				o NC		
TB4	10A o	110061		AI-FIT3273 Train #1 Flow Meter		o TBD	FIT-3273	Do not connect the cable shield to GND in the Device
	10B o	110081				o TBD		
	10G o	PE				o NC		
TB4	11A o	110101		AI-FIT3274 Train #1 Flow Meter		o TBD	FIT-3274	Do not connect the cable shield to GND in the Device
	11B o	110121				o TBD		
	11G o	PE				o NC		

POINT to POINT DIAGRAM - EXTERNAL DEVICES

BLOWER LOCAL CONTROL PANEL			CABLE		EXTERNAL LOCATION				
TERMINAL #		WIRE #			WIRE #	PIN #		TERMINAL	NOTES
TB4	12A o	110141		AI-MBV3175 Valve Position Feedback		o TBD		Train #1 Flow Control Valve MBV-3175	Do not connect the cable shield to GND in the Device
	12B o	110161				o TBD			
	12G o	PE				o NC			
	25A o	112022		AO-MBV3175 Valve Position Setpoint		o TBD			Do not connect the cable shield to GND in the Device
	25B o	112031				o TBD			
	25G o	PE				o NC			
TB4	13A o	110181		AI-MBV3171 Valve Position Feedback		o TBD		Train #1 Flow Control Valve MBV-3171	Do not connect the cable shield to GND in the Device
	13B o	110201				o TBD			
	13G o	PE				o NC			
	26A o	112061		AO-MBV3171 Valve Position Setpoint		o TBD			Do not connect the cable shield to GND in the Device
	26B o	112071				o TBD			
	26G o	PE				o NC			
TB4	14A o	110221		AI-MBV3172 Valve Position Feedback		o TBD		Train #1 Flow Control Valve MBV-3172	Do not connect the cable shield to GND in the Device
	14B o	110241				o TBD			
	14G o	PE				o NC			
	27A o	112101		AO-MBV3172 Valve Position Setpoint		o TBD			Do not connect the cable shield to GND in the Device
	27B o	112111				o TBD			
	27G o	PE				o NC			
TB4	15A o	110261		AI-MBV3173 Valve Position Feedback		o TBD		Train #1 Flow Control Valve MBV-3173	Do not connect the cable shield to GND in the Device
	15B o	110281				o TBD			
	15G o	PE				o NC			
	28A o	112141		AO-MBV3173 Valve Position Setpoint		o TBD			Do not connect the cable shield to GND in the Device
	28B o	112151				o TBD			
	28G o	PE				o NC			
TB4	16A o	110301		AI-MBV3174 Valve Position Feedback		o TBD		Train #1 Flow Control Valve MBV-3174	Do not connect the cable shield to GND in the Device
	16B o	110321				o TBD			
	16G o	PE				o NC			
	29A o	112181		AO-MBV3174 Valve Position Setpoint		o TBD			Do not connect the cable shield to GND in the Device
	29B o	112191				o TBD			
	29G o	PE				o NC			

POINT to POINT DIAGRAM - EXTERNAL DEVICES

BLOWER LOCAL CONTROL PANEL			CABLE		EXTERNAL LOCATION				
TERMINAL #		WIRE #			WIRE #	PIN #		TERMINAL	NOTES
TB4	17A o	110141		AI-MBV3275 Valve Position Feedback		o TBD		Train #2 Flow Control Valve MBV-3275	Do not connect the cable shield to GND in the Device
	17B o	110161				o TBD			
	17G o	PE				o NC			
	30A o	112022		AO-MBV3275 Valve Position Setpoint		o TBD			Do not connect the cable shield to GND in the Device
	30B o	112031				o TBD			
	30G o	PE				o NC			
TB4	18A o	110181		AI-MBV3271 Valve Position Feedback		o TBD		Train #2 Flow Control Valve MBV-3271	Do not connect the cable shield to GND in the Device
	18B o	110201				o TBD			
	18G o	PE				o NC			
	31A o	112061		AO-MBV3271 Valve Position Setpoint		o TBD			Do not connect the cable shield to GND in the Device
	31B o	112071				o TBD			
	31G o	PE				o NC			
TB4	19A o	110221		AI-MBV3272 Valve Position Feedback		o TBD		Train #2 Flow Control Valve MBV-3272	Do not connect the cable shield to GND in the Device
	19B o	110241				o TBD			
	19G o	PE				o NC			
	32A o	112101		AO-MBV3272 Valve Position Setpoint		o TBD			Do not connect the cable shield to GND in the Device
	32B o	112111				o TBD			
	32G o	PE				o NC			
TB4	20A o	110261		AI-MBV3273 Valve Position Feedback		o TBD		Train #1 Flow Control Valve MBV-3273	Do not connect the cable shield to GND in the Device
	20B o	110281				o TBD			
	20G o	PE				o NC			
	33A o	112141		AO-MBV3273 Valve Position Setpoint		o TBD			Do not connect the cable shield to GND in the Device
	33B o	112151				o TBD			
	33G o	PE				o NC			
TB4	21A o	110301		AI-MBV3274 Valve Position Feedback		o TBD		Train #1 Flow Control Valve MBV-3274	Do not connect the cable shield to GND in the Device
	21B o	110321				o TBD			
	21G o	PE				o NC			
	34A o	112181		AO-MBV3274 Valve Position Setpoint		o TBD			Do not connect the cable shield to GND in the Device
	34B o	112191				o TBD			
	34G o	PE				o NC			



NexTurbo

Title	Network Diagram
Document No.	NTA-12-003
Project	Taunton, MA
Project No.	22.0989
Revision	0

PROJECT : Taunton
NTT no: 22.0989
rev: 3

NETWORK SETUP for LCPs

PROJECT: 22.0989 Taunton

NETWORK DETAILS & HARDWARE CONFIGURATION

PROTOCOL PARAMETERS

SCADA Network	
Blower Network Hardware Interface to SCADA	5069-L310ER
Blower PLC Firmware Version	V34
Network Mode	Ethernet
Network Protocol	Ethernet TCP/IP A&B
Connection Type	2 x RJ45 (separated network)
MCP 22.0989 (CP-6000) IP Address	TBD
Subnet Mask	TBD
Default Gateway	TBD
SCADA Hardware Interface	TBD
DCS/SCADA IP Address	TBD

Local Blower Network				
Next Turbo Name	**Contract Tag Name**	**PLC**	**HMI**	
MCP 22.0989	CP-6000	10.10.0.200	10.10.0.201	NTT internal use only
LCP 22.0989	CP-6101	10.10.0.1	10.10.0.101	NTT internal use only
LCP 22.0990	CP-6201	10.10.0.2	10.10.0.102	NTT internal use only
LCP 22.0991	CP-6301	10.10.0.3	10.10.0.103	NTT internal use only
LCP 22.0992	CP-6401	10.10.0.4	10.10.0.104	NTT internal use only

NOTE :
MCP = Master Control Panel
LCP = Local Control Panel

	10 DINTS	
UDT Size	40 REALS	
Note 1: Signals Typical for all LCPs		
Blower Serial #'s	2209##	--> ## = 89, 90, 91, 92

Signals from LCP to SCADA(1) via MCP

LCP Address UDT Output Prod.	Format	Signal type	Range	NTT P&ID Tags	Signal available	SCADA Address	Description of Signal
SEND_DCS.STATUS_DINT[0].0	Bool	Monitoring	0-1	-	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].0	Compressor in REMOTE and Ready to Start
SEND_DCS.STATUS_DINT[0].1	Bool	Monitoring	0-1	-	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].1	Blower at maximum air output
SEND_DCS.STATUS_DINT[0].2	Bool	Monitoring	0-1	-	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].2	Blower at minimum air output - VDV in Minimum position
SEND_DCS.STATUS_DINT[0].3	Bool	Monitoring	0-1	-	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].3	Run Command Received - Compressor Starting
SEND_DCS.STATUS_DINT[0].4	Bool	Monitoring	0-1	-	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].4	Compressor running
SEND_DCS.STATUS_DINT[0].5	Bool	Monitoring	0-1	-	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].5	Compressor Fault - Common Trip
SEND_DCS.STATUS_DINT[0].6	Bool	Monitoring	0-1	-	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].6	Compressor Permissive Alarm (restrict blower from starting) - Common Alarm
SEND_DCS.STATUS_DINT[0].7	Bool	Monitoring	0-1	-	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].7	Compressor Unacknowledged Alarm - Common Alarm
SEND_DCS.STATUS_DINT[0].8	Bool	Monitoring	0-1	-	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].8	Service mode
SEND_DCS.STATUS_DINT[0].9	Bool	Monitoring	0-1	-	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].9	Manual mode
SEND_DCS.STATUS_DINT[0].10	Bool	Monitoring	0-1	-	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].10	Automatic mode
SEND_DCS.STATUS_DINT[0].11	Bool	Monitoring	0-1	-	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].11	Compressor ready to start - No alarms, All devices in prestart condition
SEND_DCS.STATUS_DINT[0].12	Bool	Monitoring	0-1	ZSC-103	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].12	Blow-off valve closed
SEND_DCS.STATUS_DINT[0].13	Bool	Monitoring	0-1	ZSO-102	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].13	Blow-off valve open
SEND_DCS.STATUS_DINT[0].14	Bool	Monitoring	0-1	ZSC-100	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].14	Diffuser in minimum position (limit switch set)
SEND_DCS.STATUS_DINT[0].15	Bool	Monitoring	0-1	ZSO-101	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].15	Diffuser in maximum position (limit switch set)
SEND_DCS.STATUS_DINT[0].16	Bool	Monitoring	0-1	ZSC-104	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].16	IGV in minimum position (limit switch set)
SEND_DCS.STATUS_DINT[0].17	Bool	Monitoring	0-1	ZSO-105	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].17	IGV in maximum position (limit switch set)
SEND_DCS.STATUS_DINT[0].18	Bool	Monitoring	0-1	ZSC-111	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].18	Isolation valve closed
SEND_DCS.STATUS_DINT[0].19	Bool	Monitoring	0-1	ZSO-110	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].19	Isolation valve open
SEND_DCS.STATUS_DINT[0].20	Bool	Monitoring	0-1	M030	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].20	Extraction fan motor running
SEND_DCS.STATUS_DINT[0].21	Bool	Monitoring	0-1	M020	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].21	Oil cooler fan motor running
SEND_DCS.STATUS_DINT[0].22	Bool	Monitoring	0-1	MA005	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].22	Oil Heater Running
SEND_DCS.STATUS_DINT[0].23	Bool	Monitoring	0-1	M001	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].23	Main Motor Running
SEND_DCS.STATUS_DINT[0].24	Bool	Monitoring	0-1	C-0301	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].24	Electric Oil Pump Running
SEND_DCS.STATUS_DINT[0].25	Bool	Monitoring	-	M060	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].25	Oil Cooler Water Ball valve closed
SEND_DCS.STATUS_DINT[0].26	Bool	Monitoring	-	M060	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].26	Oil Cooler Water Ball valve open
SEND_DCS.STATUS_DINT[0].27	Bool	Monitoring	-	-	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].27	Spare
SEND_DCS.STATUS_DINT[0].28	Bool	Monitoring	-	-	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].28	Spare
SEND_DCS.STATUS_DINT[0].29	Bool	Monitoring	-	-	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].29	Spare
SEND_DCS.STATUS_DINT[0].30	Bool	Monitoring	-	-	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].30	Spare
SEND_DCS.STATUS_DINT[0].31	Bool	Monitoring	-	-	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[0].31	Spare

LCP Address UDT Output Prod.	Format	Signal type	Range	NTT P&ID Tags	Signal available	SCADA Address	Description of Signal
SEND_DCS.STATUS_DINT[1].0	Bool	Alarm	0-1	LSL-050	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].0	Gearbox - Oil Low Level
SEND_DCS.STATUS_DINT[1].1	Bool	Alarm	0-1	PT-100	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].1	Gearbox - Oil Low Pressure
SEND_DCS.STATUS_DINT[1].2	Bool	Alarm	0-1	PT-100	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].2	Gearbox - Oil High Pressure
SEND_DCS.STATUS_DINT[1].3	Bool	Alarm	0-1	TT-200	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].3	Gearbox - Oil High Temperature
SEND_DCS.STATUS_DINT[1].4	Bool	Alarm	0-1	TT-100	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].4	Gearbox - Inlet Air High Temperature
SEND_DCS.STATUS_DINT[1].5	Bool	Alarm	0-1	VT-100	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].5	Gearbox - High Vibration
SEND_DCS.STATUS_DINT[1].6	Bool	Alarm	0-1	VX-100	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].6	Gearbox - High X-Axis Vibration
SEND_DCS.STATUS_DINT[1].7	Bool	Alarm	0-1	VY-100	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].7	Gearbox - High Y-Axis Vibration
SEND_DCS.STATUS_DINT[1].8	Bool	Alarm	0-1	VZ-100	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].8	Gearbox - High Z-Axis Vibration
SEND_DCS.STATUS_DINT[1].9	Bool	Alarm	0-1	TE-130	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].9	Gearbox - High speed shaft Drive End bearing High Temperature
SEND_DCS.STATUS_DINT[1].10	Bool	Alarm	0-1	TE-131	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].10	Gearbox - High speed shaft Non-drive End bearing High Temperature
SEND_DCS.STATUS_DINT[1].11	Bool	Alarm	0-1	TE-132	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].11	Gearbox - Low speed shaft Drive End bearing High Temperature
SEND_DCS.STATUS_DINT[1].12	Bool	Alarm	0-1	TE-133	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].12	Gearbox - Low speed shaft Non-drive End bearing High Temperature
SEND_DCS.STATUS_DINT[1].13	Bool	Alarm	0-1	TE-134	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].13	Gearbox - High speed shaft Thrust bearing High Temperature
SEND_DCS.STATUS_DINT[1].14	Bool	Alarm	0-1	TE-135	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].14	Gearbox - High speed shaft Z1 bearing High Temperature
SEND_DCS.STATUS_DINT[1].15	Bool	Alarm	0-1	TE-136	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].15	Gearbox - High speed shaft Z2 bearing High Temperature
SEND_DCS.STATUS_DINT[1].16	Bool	Alarm	0-1	PDSH-300	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].16	Gearbox - Oil filter clogged
SEND_DCS.STATUS_DINT[1].17	Bool	Alarm	0-1	TS-110	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].17	Main Motor - Winding PTC High Temperature
SEND_DCS.STATUS_DINT[1].18	Bool	Alarm	0-1	TE-110	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].18	Main Motor - Winding U High Temperature
SEND_DCS.STATUS_DINT[1].19	Bool	Alarm	0-1	TE-111	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].19	Main Motor - Winding V High Temperature
SEND_DCS.STATUS_DINT[1].20	Bool	Alarm	0-1	TE-112	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].20	Main Motor - Winding W High Temperature
SEND_DCS.STATUS_DINT[1].21	Bool	Alarm	0-1	TE-120	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].21	Main Motor - Drive End Bearing High Temperature
SEND_DCS.STATUS_DINT[1].22	Bool	Alarm	0-1	TE-121	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].22	Main Motor - Non-drive End Bearing High Temperature
SEND_DCS.STATUS_DINT[1].23	Bool	Alarm	0-1	VT-120	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].23	Main Motor - Drive End Bearing High Vibration
SEND_DCS.STATUS_DINT[1].24	Bool	Alarm	0-1	VT-121	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].24	Main Motor - Non-drive End Bearing High Vibration
SEND_DCS.STATUS_DINT[1].25	Bool	Alarm	0-1	M001	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].25	Main Motor - Amp Limit - High
SEND_DCS.STATUS_DINT[1].26	Bool	Alarm	0-1	M001	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].26	Main Motor - Amp Limit - High High
SEND_DCS.STATUS_DINT[1].27	Bool	Alarm	0-1	SS-100	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].27	Main Motor - Shaft Rotation detected while blower is off
SEND_DCS.STATUS_DINT[1].28	Bool	Alarm	0-1	M001	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].28	Main Motor - Run Feedback present while blower off
SEND_DCS.STATUS_DINT[1].29	Bool	Alarm	0-1	M001	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].29	Main Motor - Maximum Number of Starts in 1hour period
SEND_DCS.STATUS_DINT[1].30	Bool	Alarm	0-1	TS160	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].30	Blow Off Valve - Monitor Relay Trip
SEND_DCS.STATUS_DINT[1].31	Bool	Alarm	0-1	M040	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[1].31	Blow Off Valve - Not in Remote Mode

LCP Address UDT Output Prod.	Format	Signal type	Range	NTT P&ID Tags	Signal available	SCADA Address	Description of Signal
SEND_DCS.STATUS_DINT[2].0	Bool	Alarm	0-1	TS170	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].0	Isolation Valve - Monitor Relay Trip
SEND_DCS.STATUS_DINT[2].1	Bool	Alarm	0-1	M050	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].1	Isolation Valve - Not in Remote Mode
SEND_DCS.STATUS_DINT[2].2	Bool	Alarm	0-1	C-0250	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].2	Isolation Valve - Manual Valve - Valve not open
SEND_DCS.STATUS_DINT[2].3	Bool	Alarm	0-1	TT-101	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].3	Discharge Air - High Temperature
SEND_DCS.STATUS_DINT[2].4	Bool	Alarm	0-1	TT-101	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].4	Discharge Air - Sensor Failure - Temperature
SEND_DCS.STATUS_DINT[2].5	Bool	Alarm	0-1	PTD-200	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].5	Differential Pressure Across Blower - Sensor Failure
SEND_DCS.STATUS_DINT[2].6	Bool	Alarm	0-1	PT-200	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].6	Inlet Pressure - Sensor Failure
SEND_DCS.STATUS_DINT[2].7	Bool	Alarm	0-1	PT-201	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].7	Discharge Pressure - Sensor Failure
SEND_DCS.STATUS_DINT[2].8	Bool	Alarm	0-1	PDT-210	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].8	Inlet Air Filter - Coarse Filter clogged
SEND_DCS.STATUS_DINT[2].9	Bool	Alarm	0-1	PDT-210	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].9	Inlet Air Filter - Coarse DPT Sensor Failure
SEND_DCS.STATUS_DINT[2].10	Bool	Alarm	0-1	PDT-211	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].10	Inlet Air Filter - Fine Filter clogged
SEND_DCS.STATUS_DINT[2].11	Bool	Alarm	0-1	PDT-211	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].11	Inlet Air Filter - Fine DPT Sensor Failure
SEND_DCS.STATUS_DINT[2].12	Bool	Alarm	0-1	M020	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].12	Oil Heater - Circuit Breaker Trip
SEND_DCS.STATUS_DINT[2].13	Bool	Alarm	0-1	TT-300	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].13	Oil Tank - Low Temperature
SEND_DCS.STATUS_DINT[2].14	Bool	Alarm	0-1	LCP	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].14	UPS - Main Power Failure while blower off. On Battery Backup Power
SEND_DCS.STATUS_DINT[2].15	Bool	Alarm	0-1	LCP	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].15	UPS - Fault
SEND_DCS.STATUS_DINT[2].16	Bool	Alarm	0-1	M030	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].16	Sound Enclosure - Extraction Fan Circuit Breaker Trip
SEND_DCS.STATUS_DINT[2].17	Bool	Alarm	0-1	TT-110	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].17	Sound Enclosure - High Temperature
SEND_DCS.STATUS_DINT[2].18	Bool	Alarm	0-1	TT-110	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].18	Sound Enclosure - Temperature Sensor Failure
SEND_DCS.STATUS_DINT[2].19	Bool	Alarm	0-1	LCP	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].19	Electrical Surge Suppressor in Panel needs replaced
SEND_DCS.STATUS_DINT[2].20	Bool	Alarm	0-1	LCP	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].20	Pre-Rotation Control Disabled
SEND_DCS.STATUS_DINT[2].21	Bool	Alarm	0-1	LCP	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].21	LCP Air Conditioner Fault
SEND_DCS.STATUS_DINT[2].22	Bool	Alarm	0-1	LCP	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].22	LCP High Internal Temperature
SEND_DCS.STATUS_DINT[2].23	Bool	Alarm	0-1	LCP	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].23	LCP Temperature Sensor Failure
SEND_DCS.STATUS_DINT[2].24	Bool	Alarm	0-1	C-0301	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].24	Electric Oil Pump Circuit Breaker Trip (While Blower Running)
SEND_DCS.STATUS_DINT[2].25	Bool	Alarm	0-1	RVSS	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].25	Motor Starter Bypass Enabled
SEND_DCS.STATUS_DINT[2].26	Bool	Alarm	0-1	M060	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].26	Water Cooler Ball Valve - Circuit Breaker Trip
SEND_DCS.STATUS_DINT[2].27	Bool	Alarm	0-1	-	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].27	Reserved
SEND_DCS.STATUS_DINT[2].28	Bool	Alarm	0-1	-	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].28	Reserved
SEND_DCS.STATUS_DINT[2].29	Bool	Alarm	0-1	-	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].29	Reserved
SEND_DCS.STATUS_DINT[2].30	Bool	Alarm	0-1	-	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].30	Reserved
SEND_DCS.STATUS_DINT[2].31	Bool	Alarm	0-1	-	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[2].31	Reserved

LCP Address UDT Output Prod.	Format	Signal type	Range	NTT P&ID Tags	Signal available	SCADA Address	Description of Signal
SEND_DCS.STATUS_DINT[3].0	Bool	Trip	0-1	LCP	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].0	Emergency Stop Button Activated
SEND_DCS.STATUS_DINT[3].1	Bool	Trip	0-1	PSLL-100	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].1	Gearbox - Oil LoLo Pressure Switch
SEND_DCS.STATUS_DINT[3].2	Bool	Trip	0-1	PSLL-101	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].2	Gearbox - Oil LoLo Pressure meck. Switch
SEND_DCS.STATUS_DINT[3].3	Bool	Trip	0-1	PT-100	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].3	Gearbox - Oil LoLo Pressure
SEND_DCS.STATUS_DINT[3].4	Bool	Trip	0-1	PT-100	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].4	Gearbox - Oil HiHi Pressure
SEND_DCS.STATUS_DINT[3].5	Bool	Trip	0-1	TT-200	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].5	Gearbox - Oil HiHi Temperature
SEND_DCS.STATUS_DINT[3].6	Bool	Trip	0-1	PSH-200	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].6	Gearbox - Surging
SEND_DCS.STATUS_DINT[3].7	Bool	Trip	0-1	TT-100	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].7	Gearbox - Inlet Air HiHi Temperature
SEND_DCS.STATUS_DINT[3].8	Bool	Trip	0-1	TT-100	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].8	Gearbox - Inlet Air HiHi Temperature while Blower Off
SEND_DCS.STATUS_DINT[3].9	Bool	Trip	0-1	VT-100	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].9	Gearbox - HiHi Vibration
SEND_DCS.STATUS_DINT[3].10	Bool	Trip	0-1	VX-100	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].10	Gearbox - X-Axis HiHiVibration
SEND_DCS.STATUS_DINT[3].11	Bool	Trip	0-1	VY-100	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].11	Gearbox - Y-Axis HiHiVibration
SEND_DCS.STATUS_DINT[3].12	Bool	Trip	0-1	VZ-100	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].12	Gearbox - Z-Axis HiHiVibration
SEND_DCS.STATUS_DINT[3].13	Bool	Trip	0-1	TE-130	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].13	Gearbox - High speed shaft Drive End Bearing HiHi Temp
SEND_DCS.STATUS_DINT[3].14	Bool	Trip	0-1	TE-131	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].14	Gearbox - High speed shaft Non-drive End Bearing HiHi Temp
SEND_DCS.STATUS_DINT[3].15	Bool	Trip	0-1	TE-132	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].15	Gearbox - Low speed shaft Drive End Bearing HiHi Temp
SEND_DCS.STATUS_DINT[3].16	Bool	Trip	0-1	TE-133	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].16	Gearbox - Low speed shaft Non-drive End Bearing HiHi Temp
SEND_DCS.STATUS_DINT[3].17	Bool	Trip	0-1	TE-134	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].17	Gearbox - High speed shaft Thrust Bearing HiHi Temp
SEND_DCS.STATUS_DINT[3].18	Bool	Trip	0-1	TE-135	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].18	Gearbox - High speed shaft Z1 Bearing HiHi Temp
SEND_DCS.STATUS_DINT[3].19	Bool	Trip	0-1	TE-136	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].19	Gearbox - High speed shaft Z2 Bearing HiHi Temp
SEND_DCS.STATUS_DINT[3].20	Bool	Trip	0-1	TT-100	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].20	Gearbox - Sensor Failure - Inlet Air Temperature
SEND_DCS.STATUS_DINT[3].21	Bool	Trip	0-1	PT-100	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].21	Gearbox - Sensor Failure - Oil Pressure
SEND_DCS.STATUS_DINT[3].22	Bool	Trip	0-1	TT-200	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].22	Gearbox - Sensor Failure - Oil Temperature
SEND_DCS.STATUS_DINT[3].23	Bool	Trip	0-1	VT-100	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].23	Gearbox - Sensor Failure - Vibration Transmitter
SEND_DCS.STATUS_DINT[3].24	Bool	Trip	0-1	VX-100	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].24	Gearbox - Sensor Failure - X-Axis Vibration Transmitter
SEND_DCS.STATUS_DINT[3].25	Bool	Trip	0-1	VY-100	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].25	Gearbox - Sensor Failure - Y-Axis Vibration Transmitter
SEND_DCS.STATUS_DINT[3].26	Bool	Trip	0-1	VZ-100	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].26	Gearbox - Sensor Failure - Z-Axis Vibration Transmitter
SEND_DCS.STATUS_DINT[3].27	Bool	Trip	0-1	TE-130	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].27	Gearbox - Sensor Failure - High Speed Shaft Bearing DE RTD
SEND_DCS.STATUS_DINT[3].28	Bool	Trip	0-1	TE-131	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].28	Gearbox - Sensor Failure - High Speed Shaft Bearing NDE RTD
SEND_DCS.STATUS_DINT[3].29	Bool	Trip	0-1	TE-132	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].29	Gearbox - Sensor Failure - Low Speed Shaft Bearing DE RTD
SEND_DCS.STATUS_DINT[3].30	Bool	Trip	0-1	TE-133	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].30	Gearbox - Sensor Failure - Low Speed Shaft Bearing NDE RTD
SEND_DCS.STATUS_DINT[3].31	Bool	Trip	0-1	TE-134	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[3].31	Gearbox - Sensor Failure - High speed shaft bearing Thrust RTD

LCP Address UDT Output Prod.	Format	Signal type	Range	NTT P&ID Tags	Signal available	SCADA Address	Description of Signal
SEND_DCS.STATUS_DINT[4].0	Bool	Trip	0-1	TE-135	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].0	Gearbox - Sensor Failure - Low speed shaft bearing Thrust RTD
SEND_DCS.STATUS_DINT[4].1	Bool	Trip	0-1	TE-136	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].1	Gearbox - Sensor Failure - High speed shaft bearing Z2 RTD
SEND_DCS.STATUS_DINT[4].2	Bool	Trip	0-1	M001	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].2	Main Motor - No run Feedback during start-up
SEND_DCS.STATUS_DINT[4].3	Bool	Trip	0-1	M001	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].3	Main Motor - Run Feedback lost during operation
SEND_DCS.STATUS_DINT[4].4	Bool	Trip	0-1	M001	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].4	Main Motor - Motor Starter Fault
SEND_DCS.STATUS_DINT[4].5	Bool	Trip	0-1	M001	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].5	Main Motor - Motor Failed to Stop, Run feedback from Soft Starter present
SEND_DCS.STATUS_DINT[4].6	Bool	Trip	0-1	TS-110	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].6	Main Motor - Winding PTC HiHi Temperature
SEND_DCS.STATUS_DINT[4].7	Bool	Trip	0-1	TE-110	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].7	Main Motor - Winding U HiHi Temperature
SEND_DCS.STATUS_DINT[4].8	Bool	Trip	0-1	TE-111	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].8	Main Motor - Winding V HiHi Temperature
SEND_DCS.STATUS_DINT[4].9	Bool	Trip	0-1	TE-112	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].9	Main Motor - Winding W HiHi Temperature
SEND_DCS.STATUS_DINT[4].10	Bool	Trip	0-1	TE-120	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].10	Main Motor - Drive End Bearing HiHi Temperature
SEND_DCS.STATUS_DINT[4].11	Bool	Trip	0-1	TE-121	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].11	Main Motor - Non-drive End Bearing HiHi Temperature
SEND_DCS.STATUS_DINT[4].12	Bool	Trip	0-1	VT-120	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].12	Main Motor - Drive End Bearing HiHi Vibration
SEND_DCS.STATUS_DINT[4].13	Bool	Trip	0-1	VT-121	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].13	Main Motor - Non-drive End Bearing HiHi Vibration
SEND_DCS.STATUS_DINT[4].14	Bool	Trip	0-1	TS-110	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].14	Main Motor - Sensor Failure - Windings PTC
SEND_DCS.STATUS_DINT[4].15	Bool	Trip	0-1	TE-110	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].15	Main Motor - Sensor Failure - Winding U RTD
SEND_DCS.STATUS_DINT[4].16	Bool	Trip	0-1	TE-111	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].16	Main Motor - Sensor Failure - Winding V RTD
SEND_DCS.STATUS_DINT[4].17	Bool	Trip	0-1	TE-112	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].17	Main Motor - Sensor Failure - Winding W RTD
SEND_DCS.STATUS_DINT[4].18	Bool	Trip	0-1	TE-120	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].18	Main Motor - Sensor Failure - Drive End Bearing RTD
SEND_DCS.STATUS_DINT[4].19	Bool	Trip	0-1	TE-121	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].19	Main Motor - Sensor Failure - Non-drive End Bearing RTD
SEND_DCS.STATUS_DINT[4].20	Bool	Trip	0-1	VT-120	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].20	Main Motor - Sensor Failure - Drive End Vibration
SEND_DCS.STATUS_DINT[4].21	Bool	Trip	0-1	VT-121	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].21	Main Motor - Sensor Failure - Non-drive End Motor Vibration
SEND_DCS.STATUS_DINT[4].22	Bool	Trip	0-1	M001	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].22	Main Motor - Current Sensor Failure
SEND_DCS.STATUS_DINT[4].23	Bool	Trip	0-1	M040	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].23	Blow Off Valve - Failed to open during shutdown
SEND_DCS.STATUS_DINT[4].24	Bool	Trip	0-1	M040	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].24	Blow Off Valve - Failed to close during startup
SEND_DCS.STATUS_DINT[4].25	Bool	Trip	0-1	M040	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].25	Blow Off Valve - Open during operation
SEND_DCS.STATUS_DINT[4].26	Bool	Trip	0-1	M040	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].26	Blow Off Valve - Circuit Breaker Trip
SEND_DCS.STATUS_DINT[4].27	Bool	Trip	0-1	M050	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].27	Isolation Valve - Failed to open during startup
SEND_DCS.STATUS_DINT[4].28	Bool	Trip	0-1	M050	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].28	Isolation valve - Failed to close during shutdown
SEND_DCS.STATUS_DINT[4].29	Bool	Trip	0-1	M050	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].29	Isolation valve - Closed during operation
SEND_DCS.STATUS_DINT[4].30	Bool	Trip	0-1	M050	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].30	Isolation valve - Circuit Breaker Trip
SEND_DCS.STATUS_DINT[4].31	Bool	Trip	0-1	M010	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[4].31	Diffuser Vanes - Failed to reach minimum during shutdown

LCP Address UDT Output Prod.	Format	Signal type	Range	NTT P&ID Tags	Signal available	SCADA Address	Description of Signal
SEND_DCS.STATUS_DINT[5].0	Bool	Trip	0-1	M010	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].0	Diffuser Vanes - Failed to reach maximum during diagnostic check
SEND_DCS.STATUS_DINT[5].1	Bool	Trip	0-1	ZIL-1000	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].1	Diffuser Vanes - Position Sensor Failure
SEND_DCS.STATUS_DINT[5].2	Bool	Trip	0-1	M010	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].2	Diffuser Vanes - Circuit Breaker Overload Trip
SEND_DCS.STATUS_DINT[5].3	Bool	Trip	0-1	M011	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].3	Inlet Guide Vanes - Failed to reach maximum during startup
SEND_DCS.STATUS_DINT[5].4	Bool	Trip	0-1	M011	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].4	Inlet Guide Vanes - Failed to reach minimum during shutdown
SEND_DCS.STATUS_DINT[5].5	Bool	Trip	0-1	ZIL-1001	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].5	Inlet Guide Vanes - Position Sensor Failure
SEND_DCS.STATUS_DINT[5].6	Bool	Trip	0-1	M011	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].6	Inlet Guide Vanes - Circuit Breaker Overload Trip
SEND_DCS.STATUS_DINT[5].7	Bool	Trip	0-1	M011	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].7	Inlet Guide Vanes - Actuator Fault
SEND_DCS.STATUS_DINT[5].8	Bool	Trip	0-1	TT-101	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].8	Discharge Air - HiHi Temperature
SEND_DCS.STATUS_DINT[5].9	Bool	Trip	0-1	M020	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].9	Oil Cooler - Circuit Breaker Trip
SEND_DCS.STATUS_DINT[5].10	Bool	Trip	0-1	TT-300	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].10	Oil Tank - Oil LoLo Temperature
SEND_DCS.STATUS_DINT[5].11	Bool	Trip	0-1	TT-300	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].11	Oil Tank - Sensor Failure - Temperature
SEND_DCS.STATUS_DINT[5].12	Bool	Trip	0-1	LCP	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].12	UPS - Main Power Failure while running. On Battery Backup Power
SEND_DCS.STATUS_DINT[5].13	Bool	Trip	0-1	C-0301	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].13	Electric Oil Pump Circuit Breaker Trip (During Blower startup)
SEND_DCS.STATUS_DINT[5].14	Bool	Trip	0-1	C-0301	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].14	Electric Oil Pump Low Pressure During Pre Lubrication
SEND_DCS.STATUS_DINT[5].15	Bool	Trip	0-1	LCP	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].15	PLC Digital Output Card Failure
SEND_DCS.STATUS_DINT[5].16	Bool	Trip	0-1	M060	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].16	Water Cooler Ball Valve - Failed to close
SEND_DCS.STATUS_DINT[5].17	Bool	Trip	0-1	M060	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].17	Water Cooler Ball Valve - Failed to open
SEND_DCS.STATUS_DINT[5].18	Bool	Trip	0-1	M060	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].18	Water Cooler Ball Valve - Not Open During Operation
SEND_DCS.STATUS_DINT[5].19	Bool	Trip	0-1		-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].19	
SEND_DCS.STATUS_DINT[5].20	Bool	Trip	0-1		-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].20	
SEND_DCS.STATUS_DINT[5].21	Bool	Trip	0-1		-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].21	
SEND_DCS.STATUS_DINT[5].22	Bool	Trip	0-1		-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].22	
SEND_DCS.STATUS_DINT[5].23	Bool	Trip	0-1		-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].23	
SEND_DCS.STATUS_DINT[5].24	Bool	Trip	0-1		-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].24	
SEND_DCS.STATUS_DINT[5].25	Bool	Trip	0-1		-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].25	
SEND_DCS.STATUS_DINT[5].26	Bool	Trip	0-1		-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].26	
SEND_DCS.STATUS_DINT[5].27	Bool	Trip	0-1		-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].27	
SEND_DCS.STATUS_DINT[5].28	Bool	Trip	0-1		-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].28	
SEND_DCS.STATUS_DINT[5].29	Bool	Trip	0-1		-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].29	
SEND_DCS.STATUS_DINT[5].30	Bool	Trip	0-1		-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].30	
SEND_DCS.STATUS_DINT[5].31	Bool	Trip	0-1		-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[5].31	

LCP Address UDT Output Prod.	Format	Signal type	Range	NTT P&ID Tags	Signal available	SCADA Address	Description of Signal
SEND_DCS.STATUS_DINT[6]	DINT	Monitoring	-	-	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[6]	Status (0-Ready, 1-starting, 2-running, 3-stopping, 4-not ready, 5-fault)
SEND_DCS.STATUS_DINT[7]	DINT	Monitoring	-	-	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[7]	Watchdog Incremental Counter
SEND_DCS.STATUS_DINT[8]	DINT	-	-	-	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[8]	Spare
SEND_DCS.STATUS_DINT[9]	DINT	-	-	-	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_DINT[9]	Spare
LCP Address UDT Output Prod.	**Format**	**Signal type**	**Range**	**NTT P&ID Tags**	**Signal available**	**SCADA Address**	**Description of Signal**
SEND_DCS.STATUS_REAL[0]	Float	Monitoring	0-100%	ZIL1000	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[0]	Diffuser position VALUE
SEND_DCS.STATUS_REAL[1]	Float	Monitoring	0-100%	ZIL1001	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[1]	IGV position VALUE
SEND_DCS.STATUS_REAL[2]	Float	Monitoring	0-X00A	M001	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[2]	Main Motor current VALUE
SEND_DCS.STATUS_REAL[3]	Float	Monitoring	0-25psi	PDT-200	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[3]	Differential pressure across blower VALUE
SEND_DCS.STATUS_REAL[4]	Float	Monitoring	-58 - 392°F	TT-100	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[4]	Inlet air temperature VALUE
SEND_DCS.STATUS_REAL[5]	Float	Monitoring	-58 - 392°F	TT-110	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[5]	Sound enclosure temperature VALUE
SEND_DCS.STATUS_REAL[6]	Float	Monitoring	0-145psi	PT-100	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[6]	Oil pressure VALUE
SEND_DCS.STATUS_REAL[7]	Float	Monitoring	-58 - 392°F	TT-200	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[7]	Oil temperature VALUE
SEND_DCS.STATUS_REAL[8]	Float	Monitoring	-58 - 392°F	TT-101	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[8]	Outlet air temperature VALUE
SEND_DCS.STATUS_REAL[9]	Float	Monitoring	0-25mm/s	VT-100	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[9]	Vibration VALUE
SEND_DCS.STATUS_REAL[10]	Float	Monitoring	-	VX-100	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[10]	Gearbox - Vibration X-axis Velometer VALUE
SEND_DCS.STATUS_REAL[11]	Float	Monitoring	-	VY-100	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[11]	Gearbox - Vibration Y-axis Velometer VALUE
SEND_DCS.STATUS_REAL[12]	Float	Monitoring	-	VZ-100	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[12]	Gearbox - Vibration Z-axis Velometer VALUE
SEND_DCS.STATUS_REAL[13]	Float	Monitoring	-28 - 28inW.c.	PDT-210	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[13]	Coarse Inlet air filter delta pressure VALUE
SEND_DCS.STATUS_REAL[14]	Float	Monitoring	-28 - 28inW.c.	PDT-211	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[14]	Fine Inlet air filter delta pressure VALUE
SEND_DCS.STATUS_REAL[15]	Float	Monitoring	-58 - 392°F	TE-130	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[15]	High speed shaft bearing temp. DE VALUE
SEND_DCS.STATUS_REAL[16]	Float	Monitoring	-58 - 392°F	TE-131	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[16]	High speed shaft bearing temp. NDE VALUE
SEND_DCS.STATUS_REAL[17]	Float	Monitoring	-58 - 392°F	TE-132	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[17]	Low speed shaftt bearing temp. DE VALUE
SEND_DCS.STATUS_REAL[18]	Float	Monitoring	-58 - 392°F	TE-133	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[18]	Low speed shaftt bearing temp. NDE VALUE
SEND_DCS.STATUS_REAL[19]	Float	Monitoring	-58 - 392°F	TE-134	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[19]	High speed shaft bearing temp. TRUST VALUE
SEND_DCS.STATUS_REAL[20]	Float	Monitoring	-58 - 392°F	TE-135	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[20]	High speed shaft bearing temp. Z1 VALUE
SEND_DCS.STATUS_REAL[21]	Float	Monitoring	-58 - 392°F	TE-136	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[21]	High speed shaft bearing temp. Z2 VALUE
SEND_DCS.STATUS_REAL[22]	Float	Monitoring	-58 - 392°F	TE-110	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[22]	Main Motor - winding U temp. VALUE
SEND_DCS.STATUS_REAL[23]	Float	Monitoring	-58 - 392°F	TE-111	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[23]	Main Motor - winding V temp. VALUE
SEND_DCS.STATUS_REAL[24]	Float	Monitoring	-58 - 392°F	TE-112	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[24]	Main Motor - winding W temp. VALUE
SEND_DCS.STATUS_REAL[25]	Float	Monitoring	-58 - 392°F	TE-120	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[25]	Main Motor - bearing DE temp. VALUE
SEND_DCS.STATUS_REAL[26]	Float	Monitoring	-58 - 392°F	TE-121	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[26]	Main Motor - bearing NDE temp. VALUE
SEND_DCS.STATUS_REAL[27]	Float	Monitoring	0-25mm/s	VT-120	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[27]	Main Motor - DE vibration VALUE
SEND_DCS.STATUS_REAL[28]	Float	Monitoring	0-25mm/s	VT-121	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[28]	Main Motor - NDE vibration VALUE
SEND_DCS.STATUS_REAL[29]	Float	Monitoring	-58 - 392°F	TT-300	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[29]	Oil Tank Temperature VALUE
SEND_DCS.STATUS_REAL[30]	Float	Monitoring	KJ/Kg	-	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[30]	Calculated Isentropic Head
SEND_DCS.STATUS_REAL[31]	Float	Monitoring	-	-	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[31]	Reserved
SEND_DCS.STATUS_REAL[32]	Float	Monitoring	0-999999.9 hrs	-	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[32]	Total Machine Runtime
SEND_DCS.STATUS_REAL[33]	Float	Monitoring	0-999999.9 hrs	-	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[33]	Current Cycle Runtime
SEND_DCS.STATUS_REAL[34]	Float	Monitoring	0-60 minutes	-	✓	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[34]	Time Remaining until next restart allowed
SEND_DCS.STATUS_REAL[35]	Float	Monitoring	-58 - 392°F	TT-400	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[35]	LCP Enclosure Temperature
SEND_DCS.STATUS_REAL[36]	Float	Monitoring	0-45psi	PT-201	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[36]	Blower Discharge Pressure VALUE
SEND_DCS.STATUS_REAL[37]	Float	Monitoring	0-45psi	PT-200	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[37]	Blower Inlet Pressure VALUE
SEND_DCS.STATUS_REAL[38]	Float	Monitoring	-	-	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[38]	Spare
SEND_DCS.STATUS_REAL[39]	Float	Monitoring	-	-	-	DB_SEND_LCP_TO_DCS.STATUS_2209##_REAL[39]	Spare

	10 DINTS
UDT Size	10 REALS

Note 1: Signals Typical for all LCPs

Signals from MCP to LCP(1)							
LCP Address UDT Input Consu.	**Format**	**Signal type**	**Range**	**NTT P&ID Tags**	**Signal available**	**SCADA address**	**Description of Signal**
RECV_DCS.CMD_DINT[0].0	Bool	Command	0-1	-	✓	NA	Blower start/stop (when AUTO mode is selected)
RECV_DCS.CMD_DINT[0].1	Bool	Command	0-1	-	✓	NA	Increase VDV (from PID SCADA)
RECV_DCS.CMD_DINT[0].2	Bool	Command	0-1	-	✓	NA	Decrease VDV (from PID SCADA)
RECV_DCS.CMD_DINT[0].3	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].4	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].5	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].6	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].7	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].8	Bool	Command	0-1	-	✓	NA	Write System Time to PLC Clock
RECV_DCS.CMD_DINT[0].9	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].10	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].11	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].12	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].13	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].14	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].15	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].16	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].17	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].18	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].19	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].20	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].21	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].22	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].23	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].24	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].25	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].26	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].27	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].28	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].29	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].30	Bool	-	0-1	-	-	NA	Spare
RECV_DCS.CMD_DINT[0].31	Bool	-	0-1	-	-	NA	Spare
LCP Address UDT Input Consu.	**Format**	**Signal type**	**Range**	**NTT P&ID Tags**	**Signal available**	**SCADA address**	**Description of Signal**
RECV_DCS.CMD_DINT[1]	DINT	Setpoint	0-9999	-	✓	NA	System Clock Years
RECV_DCS.CMD_DINT[2]	DINT	Setpoint	1-12	-	✓	NA	System Clock Month
RECV_DCS.CMD_DINT[3]	DINT	Setpoint	1-31	-	✓	NA	System Clock Day
RECV_DCS.CMD_DINT[4]	DINT	Setpoint	0-24	-	✓	NA	System Clock Hours
RECV_DCS.CMD_DINT[5]	DINT	Setpoint	0-60	-	✓	NA	System Clock Minutes
RECV_DCS.CMD_DINT[6]	DINT	Setpoint	0-60	-	✓	NA	System Clock Seconds
RECV_DCS.CMD_DINT[7]	DINT	Setpoint	0	-	✓	NA	System Clock Microseconds
RECV_DCS.CMD_DINT[8]	DINT	Setpoint	0-4294967295	-	✓	NA	Watchdog Incremental Signal
RECV_DCS.CMD_DINT[9]	DINT	-	-	-	-	NA	Spare
LCP Address UDT Input Consu.	**Format**	**Signal type**	**Range**	**NTT P&ID Tags**	**Signal available**	**SCADA address**	**Description of Signal**
RECV_DCS.CMD_REAL[0]	Float	-	-	-	-	NA	Spare
RECV_DCS.CMD_REAL[1]	Float	-	-	-	-	NA	Spare
RECV_DCS.CMD_REAL[2]	Float	-	-	-	-	NA	Spare
RECV_DCS.CMD_REAL[3]	Float	-	-	-	-	NA	Spare
RECV_DCS.CMD_REAL[4]	Float	-	-	-	-	NA	Spare
RECV_DCS.CMD_REAL[5]	Float	-	-	-	-	NA	Spare
RECV_DCS.CMD_REAL[6]	Float	-	-	-	-	NA	Spare
RECV_DCS.CMD_REAL[7]	Float	-	-	-	-	NA	Spare
RECV_DCS.CMD_REAL[9]	Float	-	-	-	-	NA	Spare

	15 DINTS
UDT Size	50 REALS

Signals from MCP to SCADA

MCS Address UDT output produced	Format	Signal type	Range	NTT P&ID TAGS	Signal available	MCS Address UDT output produced	Description of Signal
STATUS_DINT[0].0	Bool	Monitoring	0-1		✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].0	MCP Blower Control On/Off - 1 = On, 0 = Off
STATUS_DINT[0].1	Bool	Monitoring	0-1		✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].1	Blower Priority Control (SCADA/OIT) - 1 = SCADA, 0 = OIT
STATUS_DINT[0].2	Bool	Monitoring	0-1		✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].2	Pressure Control - (Fixed Air Header Pressure or MOV) - 0 = Fixed
STATUS_DINT[0].3	Bool	Monitoring	0-1		✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].3	Process Pressure Set-point Control (SCADA/OIT) - 1 = SCADA, 0 = OIT
STATUS_DINT[0].4	Bool	Monitoring	0-1		✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].4	Aeration Control - (DO or DO/Ammonia Trim) - 0 = DO
STATUS_DINT[0].3	Bool	Command	0-1		✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].3	Hold command - Blower starting/stopping, freeze all aeration control devices/parameters (1 = hold)
STATUS_DINT[0].6	Bool	-	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].6	Spare
STATUS_DINT[0].7	Bool	-	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].7	Spare
STATUS_DINT[0].8	Bool	Monitoring	0-1	BTB-6101	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].8	Blower BTB-6101 (Auto/Manual) - 1 = Auto
STATUS_DINT[0].9	Bool	Monitoring	0-1	BTB-6201	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].9	Blower BTB-6201 (Auto/Manual) - 1 = Auto
STATUS_DINT[0].10	Bool	Monitoring	0-1	BTB-6301	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].10	Blower BTB-6301 (Auto/Manual) - 1 = Auto
STATUS_DINT[0].11	Bool	Monitoring	0-1	BTB-6401	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].11	Blower BTB-6401 (Auto/Manual) - 1 = Auto
STATUS_DINT[0].12	Bool	Monitoring	0-1	MBV-3175	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].12	MBV-3175 Control Valve Control (Auto/Manual) - 1 = Auto
STATUS_DINT[0].13	Bool	Monitoring	0-1	MBV-3171	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].13	MBV-3171 Control Valve Control (Auto/Manual) - 1 = Auto
STATUS_DINT[0].14	Bool	Monitoring	0-1	MBV-3172	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].14	MBV-3172 Control Valve Control (Auto/Manual) - 1 = Auto
STATUS_DINT[0].15	Bool	Monitoring	0-1	MBV-3173	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].15	MBV-3173 Control Valve Control (Auto/Manual) - 1 = Auto
STATUS_DINT[0].16	Bool	Monitoring	0-1	MBV-3174	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].16	MBV-3174 Control Valve Control (Auto/Manual) - 1 = Auto
STATUS_DINT[0].17	Bool	Monitoring	0-1	MBV-3275	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].17	MBV-3275 Control Valve Control (Auto/Manual) - 1 = Auto
STATUS_DINT[0].18	Bool	Monitoring	0-1	MBV-3271	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].18	MBV-3271 Control Valve Control (Auto/Manual) - 1 = Auto
STATUS_DINT[0].19	Bool	Monitoring	0-1	MBV-3272	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].19	MBV-3272 Control Valve Control (Auto/Manual) - 1 = Auto
STATUS_DINT[0].20	Bool	Monitoring	0-1	MBV-3273	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].20	MBV-3273 Control Valve Control (Auto/Manual) - 1 = Auto
STATUS_DINT[0].21	Bool	Monitoring	0-1	MBV-3274	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].21	MBV-3274 Control Valve Control (Auto/Manual) - 1 = Auto
STATUS_DINT[0].22	Bool	-	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].22	Spare
STATUS_DINT[0].23	Bool	-	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].23	Spare
STATUS_DINT[0].24	Bool	-	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].24	Spare
STATUS_DINT[0].25	Bool	-	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].25	Spare
STATUS_DINT[0].26	Bool	-	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].26	Spare
STATUS_DINT[0].27	Bool	-	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].27	Spare
STATUS_DINT[0].28	Bool	-	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].28	Spare
STATUS_DINT[0].29	Bool	-	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].29	Spare
STATUS_DINT[0].30	Bool	-	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].30	Spare
STATUS_DINT[0].31	Bool	-	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[0].31	Spare

MCS Address UDT output produced	Format	Signal type	Range	NTT P&ID TAGS	Signal available	MCS Address UDT output produced	Description of Signal
STATUS_DINT[1].0	Bool	Alarm	0-1		✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].0	MCP Power Failure - on battery backup
STATUS_DINT[1].1	Bool	Alarm	0-1		✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].1	UPS Fault
STATUS_DINT[1].2	Bool	Alarm	0-1		✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].2	Surge Suppressor in panel needs replaced
STATUS_DINT[1].3	Bool	Alarm	0-1		✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].3	Reached Maximum System Output - All available blowers are at 100% output
STATUS_DINT[1].4	Bool	Alarm	0-1	BTB-6101	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].4	Comunication Fault with Blower BTB-6101
STATUS_DINT[1].5	Bool	Alarm	0-1	BTB-6201	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].5	Comunication Fault with Blower BTB-6201
STATUS_DINT[1].6	Bool	Alarm	0-1	BTB-6301	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].6	Comunication Fault with Blower BTB-6301
STATUS_DINT[1].7	Bool	Alarm	0-1	BTB-6401	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].7	Comunication Fault with Blower BTB-6401
STATUS_DINT[1].8	Bool	Alarm	0-1	BTB-6101	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].8	Blower BTB-6101 Failed to Respond to command
STATUS_DINT[1].9	Bool	Alarm	0-1	BTB-6201	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].9	Blower BTB-6201 Failed to Respond to command
STATUS_DINT[1].10	Bool	Alarm	0-1	BTB-6301	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].10	Blower BTB-6301 Failed to Respond to command
STATUS_DINT[1].11	Bool	Alarm	0-1	BTB-6401	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].11	Blower BTB-6401 Failed to Respond to command
STATUS_DINT[1].12	Bool	Alarm	0-1	PIT-6001	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].12	Air Header Pressure setpoint at maximum allowed system pressure
STATUS_DINT[1].13	Bool	Alarm	0-1	PIT-6001	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].13	Main Air Header Pressure Transmitter Fault
STATUS_DINT[1].14	Bool	Alarm	0-1	FIT-3175	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].14	FIT-3175 Flow Meter Signal Fault
STATUS_DINT[1].15	Bool	Alarm	0-1	FIT-3171	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].15	FIT-3171 Flow Meter Signal Fault
STATUS_DINT[1].16	Bool	Alarm	0-1	FIT-3172	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].16	FIT-3172 Flow Meter Signal Fault
STATUS_DINT[1].17	Bool	Alarm	0-1	FIT-3173	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].17	FIT-3173 Flow Meter Signal Fault
STATUS_DINT[1].18	Bool	Alarm	0-1	FIT-3174	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].18	FIT-3174 Flow Meter Signal Fault
STATUS_DINT[1].19	Bool	Alarm	0-1	FIT-3275	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].19	FIT-3275 Flow Meter Signal Fault
STATUS_DINT[1].20	Bool	Alarm	0-1	FIT-3271	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].20	FIT-3271 Flow Meter Signal Fault
STATUS_DINT[1].21	Bool	Alarm	0-1	FIT-3272	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].21	FIT-3272 Flow Meter Signal Fault
STATUS_DINT[1].22	Bool	Alarm	0-1	FIT-3273	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].22	FIT-3273 Flow Meter Signal Fault
STATUS_DINT[1].23	Bool	Alarm	0-1	FIT-3274	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].23	FIT-3274 Flow Meter Signal Fault
STATUS_DINT[1].24	Bool	Alarm	0-1	MBV-3175	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].24	MBV-3175 Control Valve Signal Fault
STATUS_DINT[1].25	Bool	Alarm	0-1	MBV-3171	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].25	MBV-3171 Control Valve Signal Fault
STATUS_DINT[1].26	Bool	Alarm	0-1	MBV-3172	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].26	MBV-3172 Control Valve Signal Fault
STATUS_DINT[1].27	Bool	Alarm	0-1	MBV-3173	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].27	MBV-3173 Control Valve Signal Fault
STATUS_DINT[1].28	Bool	Alarm	0-1	MBV-3174	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].28	MBV-3174 Control Valve Signal Fault
STATUS_DINT[1].29	Bool	Alarm	0-1	MBV-3275	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].29	MBV-3275 Control Valve Signal Fault
STATUS_DINT[1].30	Bool	Alarm	0-1	MBV-3271	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].30	MBV-3271 Control Valve Signal Fault
STATUS_DINT[1].31	Bool	Alarm	0-1	MBV-3272	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[1].31	MBV-3272 Control Valve Signal Fault
MCS Address UDT output produced	Format	Signal type	Range	NTT P&ID TAGS	Signal available	MCS Address UDT output produced	Description of Signal
STATUS_DINT[2].0	Bool	Alarm	0-1	MBV-3273	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].0	MBV-3273 Control Valve Signal Fault
STATUS_DINT[2].1	Bool	Alarm	0-1	MBV-3274	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].1	MBV-3274 Control Valve Signal Fault
STATUS_DINT[2].2	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].2	Spare
STATUS_DINT[2].3	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].3	Spare
STATUS_DINT[2].4	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].4	Spare
STATUS_DINT[2].5	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].5	Spare
STATUS_DINT[2].6	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].6	Spare
STATUS_DINT[2].7	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].7	Spare
STATUS_DINT[2].8	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].8	Spare
STATUS_DINT[2].9	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].9	Spare
STATUS_DINT[2].10	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].10	Spare
STATUS_DINT[2].11	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].11	Spare
STATUS_DINT[2].12	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].12	Spare
STATUS_DINT[2].13	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].13	Spare
STATUS_DINT[2].14	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].14	Spare
STATUS_DINT[2].15	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].15	Spare
STATUS_DINT[2].16	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].16	Spare
STATUS_DINT[2].17	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].17	Spare
STATUS_DINT[2].18	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].18	Spare
STATUS_DINT[2].19	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].19	Spare
STATUS_DINT[2].20	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].20	Spare

STATUS_DINT[2].21	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].21	Spare
STATUS_DINT[2].22	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].22	Spare
STATUS_DINT[2].23	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].23	Spare
STATUS_DINT[2].24	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].24	Spare
STATUS_DINT[2].25	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].25	Spare
STATUS_DINT[2].26	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].26	Spare
STATUS_DINT[2].27	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].27	Spare
STATUS_DINT[2].28	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].28	Spare
STATUS_DINT[2].29	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].29	Spare
STATUS_DINT[2].30	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].30	Spare
STATUS_DINT[2].31	Bool	Alarm	0-1		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[2].31	Spare
MCS Address UDT output produced	**Format**	**Signal type**	**Range**	**NTT P&ID TAGS**	**Signal available**	**MCS Address UDT output produced**	**Description of Signal**
STATUS_DINT[3]	DINT	Monitoring	0-1000000	-	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[3]	Watchdog Incremental Counter
STATUS_DINT[4]	DINT	Monitoring	0-600 seconds	-	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[4]	Hold command timeout
STATUS_DINT[5]	DINT	Monitoring	0-4	BTB-6101	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[5]	Blower BTB-6101 - current priority (0-1-2-3-4)
STATUS_DINT[6]	DINT	Monitoring	0-4	BTB-6201	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[6]	Blower BTB-6201 - current priority (0-1-2-3-4)
STATUS_DINT[7]	DINT	Monitoring	0-4	BTB-6301	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[7]	Blower BTB-6301 - current priority (0-1-2-3-4)
STATUS_DINT[8]	DINT	Monitoring	0-4	BTB-6401	✓	DB_SEND_MCP_TO_DCS.STATUS_DINT[8]	Blower BTB-6401 - current priority (0-1-2-3-4)
STATUS_DINT[9]	DINT	-	-		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[9]	Spare
STATUS_DINT[10]	DINT	-	-		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[10]	Spare
STATUS_DINT[11]	DINT	-	-		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[11]	Spare
STATUS_DINT[12]	DINT	-	-		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[12]	Spare
STATUS_DINT[13]	DINT	-	-		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[13]	Spare
STATUS_DINT[14]	DINT	-	-		-	DB_SEND_MCP_TO_DCS.STATUS_DINT[14]	Spare

MCS Address UDT output produced	Format	Signal type	Range	NTT P&ID TAGS	Signal available	MCS Address UDT output produced	Description of Signal
STATUS_REAL[0]	Real	Monitoring	0-25 psi	-	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[0]	Air Header Pressure setpoint
STATUS_REAL[1]	Real	Monitoring	0-25 psi	PIT-6001	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[1]	Air Header Pressure measurment
STATUS_REAL[2]	Real	Monitoring	???	-	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[2]	Train 1 Ammonia Setpoint
STATUS_REAL[3]	Real	Monitoring	???	-	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[3]	Train 2 Ammonia Setpoint
STATUS_REAL[4]	Real	Monitoring	???	-	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[4]	Train 1, Swing Zone 2A DO Setpoint
STATUS_REAL[5]	Real	Monitoring	???	-	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[5]	Train 1, Oxic Zone 1 DO Setpoint
STATUS_REAL[6]	Real	Monitoring	???	-	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[6]	Train 1, Oxic Zone 2 DO Setpoint
STATUS_REAL[7]	Real	Monitoring	???	-	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[7]	Train 1, Oxic Zone 3 DO Setpoint
STATUS_REAL[8]	Real	Monitoring	???	-	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[8]	Train 2, Swing Zone 1A DO Setpoint
STATUS_REAL[9]	Real	Monitoring	0-100%	-	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[9]	Train 2, Oxic Zone 1 DO Setpoint
STATUS_REAL[10]	Real	Monitoring	0-100%	-	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[10]	Train 2, Oxic Zone 2 DO Setpoint
STATUS_REAL[11]	Real	Monitoring	0-100%	-	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[11]	Train 2, Oxic Zone 3 DO Setpoint
STATUS_REAL[12]	Real	Monitoring	0-100%	BTB-6101	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[12]	Blower BTB-6101 Airflow output percentage
STATUS_REAL[13]	Real	Monitoring	0-100%	BTB-6201	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[13]	Blower BTB-6201 Airflow output percentage
STATUS_REAL[14]	Real	Monitoring	0-100%	BTB-6301	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[14]	Blower BTB-6301 Airflow output percentage
STATUS_REAL[15]	Real	Monitoring	0-100%	BTB-6401	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[15]	Blower BTB-6401 Airflow output percentage
STATUS_REAL[16]	Real	Monitoring	0-100%	MBV-3175	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[16]	MBV-3175 Control Valve Position
STATUS_REAL[17]	Real	Monitoring	???	FIT-3175	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[17]	FIT-3175 Flow Meter Measurement
STATUS_REAL[18]	Real	Monitoring	???	AIT-3503	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[18]	AIT-3503 DO Measurement
STATUS_REAL[19]	Real	Monitoring	0-100%	MBV-3171	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[19]	MBV-3171 Control Valve Position
STATUS_REAL[20]	Real	Monitoring	???	FIT-3171	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[20]	FIT-3171 Flow Meter Measurement
STATUS_REAL[21]	Real	Monitoring	???	AIT-3504	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[21]	AIT-3504 DO Measurement
STATUS_REAL[22]	Real	Monitoring	0-100%	MBV-3172	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[22]	MBV-3172 Control Valve Position
STATUS_REAL[23]	Real	Monitoring	???	FIT-3172	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[23]	FIT-3172 Flow Meter Measurement
STATUS_REAL[24]	Real	Monitoring	???	AIT-3505	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[24]	AIT-3505 DO Measurement
STATUS_REAL[25]	Real	Monitoring	0-100%	MBV-3173	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[25]	MBV-3173 Control Valve Position
STATUS_REAL[26]	Real	Monitoring	???	FIT-3173	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[26]	FIT-3173 Flow Meter Measurement
STATUS_REAL[27]	Real	Monitoring	???	AIT-3507	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[27]	AIT-3507 DO Measurement
STATUS_REAL[28]	Real	Monitoring	0-100%	MBV-3174	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[28]	MBV-3174 Control Valve Position
STATUS_REAL[29]	Real	Monitoring	???	FIT-3174	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[29]	FIT-3174 Flow Meter Measurement
STATUS_REAL[30]	Real	Monitoring	0-100%	MBV-3275	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[30]	MBV-3275 Control Valve Position
STATUS_REAL[31]	Real	Monitoring	???	FIT-3275	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[31]	FIT-3275 Flow Meter Measurement
STATUS_REAL[32]	Real	Monitoring	???	AIT-3523	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[32]	AIT-3523 DO Measurement
STATUS_REAL[33]	Real	Monitoring	0-100%	MBV-3271	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[33]	MBV-3271 Control Valve Position
STATUS_REAL[34]	Real	Monitoring	???	FIT-3271	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[34]	FIT-3271 Flow Meter Measurement
STATUS_REAL[35]	Real	Monitoring	???	AIT-3524	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[35]	AIT-3524 DO Measurement
STATUS_REAL[36]	Real	Monitoring	0-100%	MBV-3272	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[36]	MBV-3272 Control Valve Position
STATUS_REAL[37]	Real	Monitoring	???	FIT-3272	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[37]	FIT-3272 Flow Meter Measurement
STATUS_REAL[38]	Real	Monitoring	???	AIT-3525	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[38]	AIT-3525 DO Measurement
STATUS_REAL[39]	Real	Monitoring	0-100%	MBV-3273	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[39]	MBV-3273 Control Valve Position
STATUS_REAL[40]	Real	Monitoring	???	FIT-3273	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[40]	FIT-3273 Flow Meter Measurement
STATUS_REAL[41]	Real	Monitoring	???	AIT-3527	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[41]	AIT-3527 DO Measurement
STATUS_REAL[42]	Real	Monitoring	0-100%	MBV-3274	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[42]	MBV-3274 Control Valve Position
STATUS_REAL[43]	Real	Monitoring	???	FIT-3274	✓	DB_SEND_MCP_TO_DCS.STATUS_REAL[43]	FIT-3274 Flow Meter Measurement
STATUS_REAL[44]	Real	Monitoring	-	-	-	DB_SEND_MCP_TO_DCS.STATUS_REAL[44]	Spare
STATUS_REAL[45]	Real	Monitoring	-	-	-	DB_SEND_MCP_TO_DCS.STATUS_REAL[45]	Spare
STATUS_REAL[46]	Real	Monitoring	-	-	-	DB_SEND_MCP_TO_DCS.STATUS_REAL[46]	Spare
STATUS_REAL[47]	Real	Monitoring	-	-	-	DB_SEND_MCP_TO_DCS.STATUS_REAL[47]	Spare
STATUS_REAL[48]	Real	Monitoring	-	-	-	DB_SEND_MCP_TO_DCS.STATUS_REAL[48]	Spare
STATUS_REAL[49]	Real	Monitoring	-	-	-	DB_SEND_MCP_TO_DCS.STATUS_REAL[49]	Spare

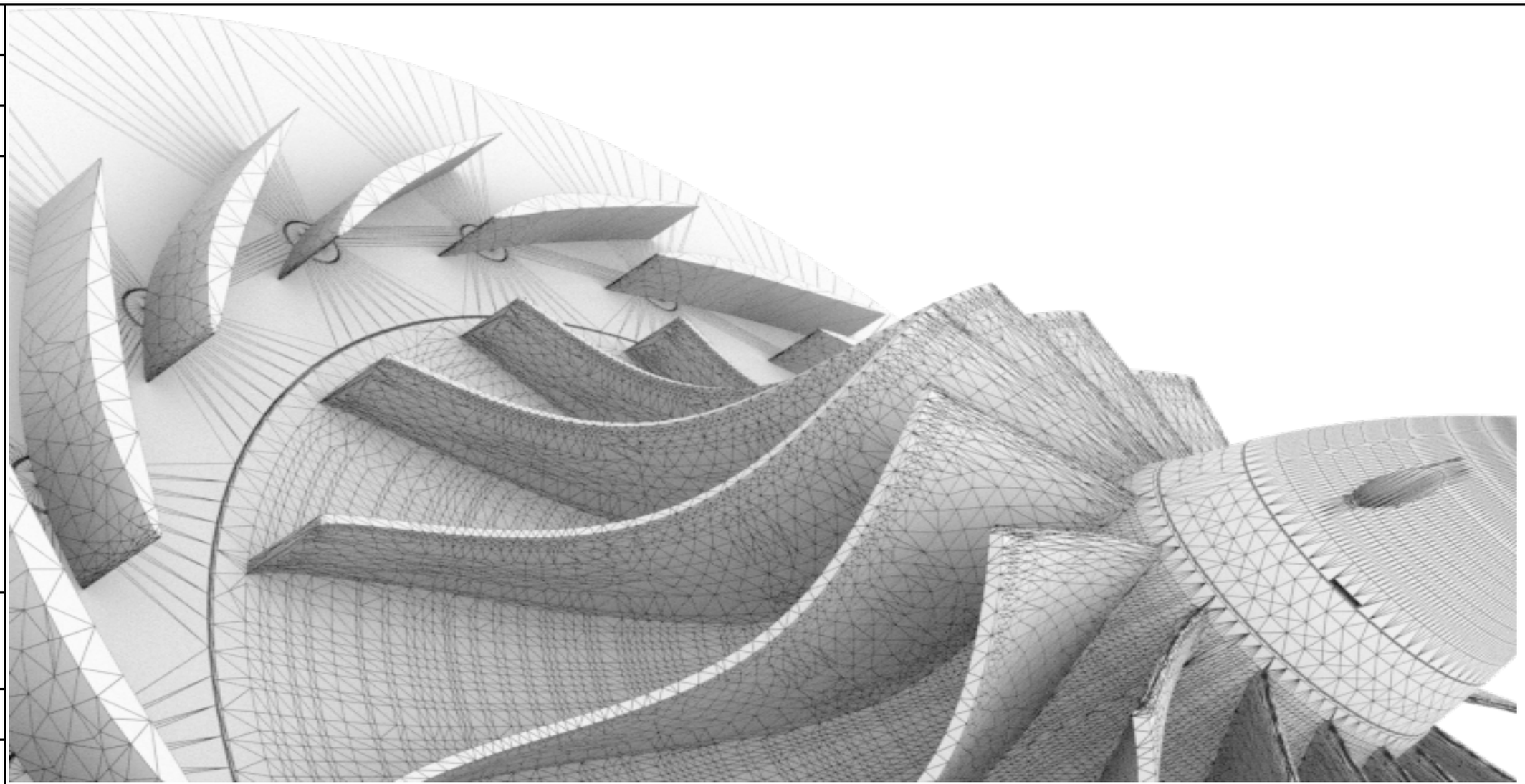
	20 DINTS
UDT Size	26 REALS

Signals from SCADA to MCP

	Format	Signal type	NTT P&ID TAGS	SCADA Attribute	Range	Signal available	MCS address UDT input consumed	Description of signal
SCADA_CMD_DINT[0].0	Bool	Command			0-1	✓	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].0	Trigger to save new blower priority selections
SCADA_CMD_DINT[0].1	Bool	Command			0-1	✓	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].1	Trigger to save System time
SCADA_CMD_DINT[0].2	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].2	Spare
SCADA_CMD_DINT[0].3	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].3	Spare
SCADA_CMD_DINT[0].4	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].4	Spare
SCADA_CMD_DINT[0].5	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].5	Spare
SCADA_CMD_DINT[0].6	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].6	Spare
SCADA_CMD_DINT[0].7	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].7	Spare
SCADA_CMD_DINT[0].8	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].8	Spare
SCADA_CMD_DINT[0].9	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].9	Spare
SCADA_CMD_DINT[0].10	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].10	Spare
SCADA_CMD_DINT[0].11	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].11	Spare
SCADA_CMD_DINT[0].12	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].12	Spare
SCADA_CMD_DINT[0].13	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].13	Spare
SCADA_CMD_DINT[0].14	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].14	Spare
SCADA_CMD_DINT[0].15	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].15	Spare
SCADA_CMD_DINT[0].16	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].16	Spare
SCADA_CMD_DINT[0].17	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].17	Spare
SCADA_CMD_DINT[0].18	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].18	Spare
SCADA_CMD_DINT[0].19	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].19	Spare
SCADA_CMD_DINT[0].20	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].20	Spare
SCADA_CMD_DINT[0].21	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].21	Spare
SCADA_CMD_DINT[0].22	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].22	Spare
SCADA_CMD_DINT[0].23	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].23	Spare
SCADA_CMD_DINT[0].24	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].24	Spare
SCADA_CMD_DINT[0].25	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].25	Spare
SCADA_CMD_DINT[0].26	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].26	Spare
SCADA_CMD_DINT[0].27	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].27	Spare
SCADA_CMD_DINT[0].28	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].28	Spare
SCADA_CMD_DINT[0].29	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].29	Spare
SCADA_CMD_DINT[0].30	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].30	Spare
SCADA_CMD_DINT[0].31	Bool	-			0-1	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[0].31	Spare

	Format	Signal type	NTT P&ID TAGS	SCADA Attribute	Range	Signal available	MCS address UDT input consumed	Description of signal
SCADA_CMD_DINT[1]	DINT	Setpoint			0-4	✓	DB_RECV_FROM_DCS.SCADA_CMD_DINT[1]	Blower BTB-6101 - priority selection (SCADA Control selected)
SCADA_CMD_DINT[2]	DINT	Setpoint			0-4	✓	DB_RECV_FROM_DCS.SCADA_CMD_DINT[2]	Blower BTB-6201 - priority selection (SCADA Control selected)
SCADA_CMD_DINT[3]	DINT	Setpoint			0-4	✓	DB_RECV_FROM_DCS.SCADA_CMD_DINT[3]	Blower BTB-6301 - priority selection (SCADA Control selected)
SCADA_CMD_DINT[4]	DINT	Setpoint			0-4	✓	DB_RECV_FROM_DCS.SCADA_CMD_DINT[4]	Blower BTB-6401 - priority selection (SCADA Control selected)
SCADA_CMD_DINT[5]	DINT	-			-	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[5]	Spare
SCADA_CMD_DINT[6]	DINT	-			-	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[6]	Spare
SCADA_CMD_DINT[7]	DINT	-			-	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[7]	Spare
SCADA_CMD_DINT[8]	DINT	-			-	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[8]	Spare
SCADA_CMD_DINT[9]	DINT	Monitor			0-1000000	✓	DB_RECV_FROM_DCS.SCADA_CMD_DINT[9]	Watchdog Incremental Counter
SCADA_CMD_DINT[10]	DINT	-			-	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[10]	Spare
SCADA_CMD_DINT[11]	DINT	-			-	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[11]	Spare
SCADA_CMD_DINT[12]	DINT	-			-	-	DB_RECV_FROM_DCS.SCADA_CMD_DINT[12]	Spare
SCADA_CMD_DINT[13]	DINT	Setpoint			0-9999	✓	DB_RECV_FROM_DCS.SCADA_CMD_DINT[13]	System Time - Year
SCADA_CMD_DINT[14]	DINT	Setpoint			1-12	✓	DB_RECV_FROM_DCS.SCADA_CMD_DINT[14]	System Time - Month
SCADA_CMD_DINT[15]	DINT	Setpoint			1-31	✓	DB_RECV_FROM_DCS.SCADA_CMD_DINT[15]	System Time - Day
SCADA_CMD_DINT[16]	DINT	Setpoint			0-23	✓	DB_RECV_FROM_DCS.SCADA_CMD_DINT[16]	System Time - Hour
SCADA_CMD_DINT[17]	DINT	Setpoint			0-59	✓	DB_RECV_FROM_DCS.SCADA_CMD_DINT[17]	System Time - Minute
SCADA_CMD_DINT[18]	DINT	Setpoint			0-59	✓	DB_RECV_FROM_DCS.SCADA_CMD_DINT[18]	System Time - Second
SCADA_CMD_DINT[19]	DINT	Setpoint			-	✓	DB_RECV_FROM_DCS.SCADA_CMD_DINT[19]	System Time - Microseconds (Unused)
	Format	**Signal type**	**NTT P&ID TAGS**	**SCADA Attribute**	**Range**	**Signal available**	**MCS address UDT input consumed**	**Description of signal**
SCADA_CMD_REAL[0]	Real	Setpoint			0-25 psi	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[0]	Air Header Pressure SetPoint (SCADA Control selected)
SCADA_CMD_REAL[1]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[1]	Train 1 Ammonia Setpoint (DO w/ NH4 Trim selected)
SCADA_CMD_REAL[2]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[2]	Train 1 Minimum DO Concentration (DO w/ NH4 Trim selected)
SCADA_CMD_REAL[3]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[3]	Train 1 Maxmum DO Concentration (DO w/ NH4 Trim selected)
SCADA_CMD_REAL[4]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[4]	Train 2 Ammonia Setpoint (DO w/ NH4 Trim selected)
SCADA_CMD_REAL[5]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[5]	Train 2 Minimum DO Concentration (DO w/ NH4 Trim selected)
SCADA_CMD_REAL[6]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[6]	Train 2 Maxmum DO Concentration (DO w/ NH4 Trim selected)
SCADA_CMD_REAL[7]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[7]	Train 1 Swing Zone 2A DO Setpoint (DO Control selected)
SCADA_CMD_REAL[8]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[8]	Train 1 Oxic Zone 1 DO Setpoint (DO Control selected)
SCADA_CMD_REAL[9]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[9]	Train 1 Oxic Zone 2 DO Setpoint (DO Control selected)
SCADA_CMD_REAL[10]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[10]	Train 1 Oxic Zone 3 DO Setpoint (DO Control selected)
SCADA_CMD_REAL[11]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[11]	Train 2 Swing Zone 1A DO Setpoint (DO Control selected)
SCADA_CMD_REAL[12]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[12]	Train 2 Oxic Zone 1 DO Setpoint (DO Control selected)
SCADA_CMD_REAL[13]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[13]	Train 2 Oxic Zone 2 DO Setpoint (DO Control selected)
SCADA_CMD_REAL[14]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[14]	Train 2 Oxic Zone 3 DO Setpoint (DO Control selected)
SCADA_CMD_REAL[15]	Real	Setpoint			0-25 psi	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[15]	Air Header Pressure Process Value from SCADA
SCADA_CMD_REAL[16]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[16]	Train 1 Ammonia DO w/ NH4 Trim Process Value from SCADA
SCADA_CMD_REAL[17]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[17]	Train 2 Ammonia DO w/ NH4 Trim Process Value from SCADA
SCADA_CMD_REAL[18]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[18]	Train 1 Swing Zone DO Process Value from SCADA
SCADA_CMD_REAL[19]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[19]	Train 1 Oxic Zone 1 DO Process Value from SCADA
SCADA_CMD_REAL[20]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[20]	Train 1 Oxic Zone 2 DO Process Value from SCADA
SCADA_CMD_REAL[21]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[21]	Train 1 Oxic Zone 3 DO Process Value from SCADA
SCADA_CMD_REAL[22]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[22]	Train 2 Swing Zone 1A DO Process Value from SCADA
SCADA_CMD_REAL[23]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[23]	Train 2 Oxic Zone 1 DO Process Value from SCADA
SCADA_CMD_REAL[24]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[24]	Train 2 Oxic Zone 2 DO Process Value from SCADA
SCADA_CMD_REAL[25]	Real	Setpoint			???	✓	DB_RECV_FROM_DCS.SCADA_CMD_REAL[25]	Train 2 Oxic Zone 3 DO Process Value from SCADA

Revision	DATE	Pre.	Check	App.
2	8/23/23	JT		
1	9/12/22	JK		
0				
No.		Description		
	Updated			
	Initial Revision			



Project name: Taunton	Location: USA	Rev.: 1	**BLOWER PARTS LIST**
Project No.: 22.0989	Date: 8/23/23		

PROJECT : 22.0989 Taunton

INSTRUMENT, CONSUMER AND PART LIST

PROJECT: PROJECT : 22.0989 Taunton
LOCATION/CITY: USA
Date 8/23/23
Rev 1

ITEM	Contract P&ID	NTT P&ID Tags	SERVICE	FUNCTION	refers to P&ID No.	RANGE/ UNITS MIN	MAX	UNIT	TYPE OF INSTRUMENT	SET-POINT ALARM	SET-POINT TRIP	SET-POINT UNIT	CONNECTION to LCP SIGNAL	TYPE	VOLTAGE	INSTRUMENTS DETAILS BRAND	MODEL	DETAILS
INSTRUMENT LIST - ELECTRICAL INSTRUMENTS																		
1	ZSO	102	Limit switch BOV: open	control		0	1	status	Limit switch	-	-	-	Hardwired to LCP	Digital	24Vdc	Bettis	SCE300	Part of M040
2	ZSC	103	Limit switch BOV: close	control		0	1	status	Limit switch	-	-	-	Hardwired to LCP	Digital	24Vdc	Bettis	SCE300	Part of M040
3	TS	160	BOV Overload switch	Trip		0	1	status	Thermistor	-	1	status	Hardwired to LCP	Digital	24Vdc	Bettis	SCE300	Part of M040
4	ZSO	110	Limit switch Isolation valve- open	control		0	1	status	Limit switch	-	-	-	Hardwired to LCP	Digital	24Vdc	Honeywell	14CE1 Q	M12 elect. Connection
5	ZSC	111	Limit switch Isolation valve- close	control		0	1	status	Limit switch	-	-	-	Hardwired to LCP	Digital	24Vdc	Honeywell	14CE1 Q	M12 elect. Connection
6	PDSI	300	Oil filter diff. Pressure switch Indicator	Alarm		0	6091	psi	Pressure switch	29.0	-	psi	Hardwired to LCP	Digital	24Vdc	MP Filter	DLE20 HA50 P01	2 bar fixed set
7	TT	101	Discharge temperature transmitter	control/alarm/trip		-58	392	F	Temperature transmitter	275	300	F	Hardwired to LCP	4 - 20 mA	24Vdc	Endress + Hauser	TMR31-A1EBACAH1AAA	Compact Transmitter 250mm length
8	PDT	200	Diff. Pressure across compressor	Control		0	15	psi	Diff. Pressure tranmsitter	-	-	psi	Hardwired to LCP	4 - 20 mA	24Vdc	Endress + Hauser	PMD55- AA22AD67GGJHA4A1A	M12 elect. Connection
9	TE	120	PT100 in motor bearing	control/alarm/trip		32	392	F	Temperature element PT100	230	248	F	Hardwired to LCP	PT100	-	part of motor	-	part of M-001
10	TE	121	PT100 in motor bearing	control/alarm/trip		32	392	F	Temperature element PT100	230	248	F	Hardwired to LCP	PT100	-	part of motor	-	part of M-001
11	TE	110	PT100 in motor winding	control/alarm/trip		32	392	F	Temperature element PT100	266	311	F	Hardwired to LCP	PT100	-	part of motor	-	part of M-001
12	TE	111	PT100 in motor winding	control/alarm/trip		32	392	F	Temperature element PT100	266	311	F	Hardwired to LCP	PT100	-	part of motor	-	part of M-001
13	TE	112	PT100 in motor winding	control/alarm/trip		32	392	F	Temperature element PT100	266	311	F	Hardwired to LCP	PT100	-	part of motor	-	part of M-001
14	ZSO	100	VDV limit switch -open	control		0	1	status	Limit switch	-	-	-	Hardwired to LCP	Digital	24Vdc	Honeywell	14CE1 Q	M12 elect. Connection
15	ZSC	101	VDV limit switch -close	control		0	1	status	Limit switch	-	-	-	Hardwired to LCP	Digital	24Vdc	Honeywell	14CE1 Q	M12 elect. Connection
16	ZIL	1000	VDV actuator switch	control		0	1000	Ohm	Positioner (0-100%)	-	-	Unit	Hardwired to LCP	Positioner	24Vdc	Elero	Junior 1	Part of M010
17	ZSO	105	IGV limit switch -open	control		0	1	status	Limit switch	-	-	-	Hardwired to LCP	Digital	24Vdc	Honeywell	14CE1 Q	M12 elect. Connection
18	ZSC	104	IGV limit position	control		0	1	status	Limit switch	-	-	-	Hardwired to LCP	Digital	24Vdc	Honeywell	14CE1 Q	M12 elect. Connection
19	ZIL	1001	IGV actuator switch	control		0	1000	Ohm	Positioner (0-100%)	-	-	Unit	Hardwired to LCP	Positioner	24Vdc	Elero	Junior 1	Part of M011
20	PDIT	210	Diff pressure across inlet filter	control		-28	28	inWc	Diff. Pressure transmitter	-3.9	-	inWc	Hardwired to LCP	4-20 mA	24Vdc	Dwyer	MSX-U23-IN-LCD	Air duct transmitter w/ LCD and M12 connection
21	TE	130	PT100 bearing high speed shaft motor end	control/alarm/trip		-22	662	F	Temperature element PT100	230	266	F	Hardwired to LCP	PT100	-	Italcoppie	TRM	150mm, M12 connection
22	TE	131	PT100 bearing high speed shaft kompressor end	control/alarm/trip		-22	662	F	Temperature element PT100	230	266	F	Hardwired to LCP	PT100	-	Italcoppie	TRM	150mm, M12 connection
23	VT	100	Vibration accelerometer	control/alarm/trip		0	25	mm/s	Vibration transmitter	2.5	3.5	mm/s	Hardwired to LCP	4 - 20 mA	24Vdc	IFM	VTV122	
24	PSH	200	Surge detector	Trip		0	1	status	Inductive sensor	-	1	status	Hardwired to LCP	Digital	24Vdc	IFM	IGS240	
25	PSLL	100	Low Low lube oil pressure	Trip		-14.5	145	psi	Pressure switch	-	10.15	psi	Hardwired to LCP	4 - 20 mA	24Vdc	IFM	PP7554	
26	PT	100	Lube oil pressure tranmsitter	control/alarm/trip		0	150	psi	Pressure transmitter	29	21.7	psi	Hardwired to LCP	4 - 20 mA	24Vdc	Endress + Hauser	PMC11-AA1L1PFVXJA+Z1	Compact Transmitter
27	TT	100	Air inlet temperature	control		-58	302	F	Temperature transmitter	149	158	F	Hardwired to LCP	4 - 20 mA	24Vdc	Endress + Hauser	TMR31-A1DAACAE1AAA	Compact Transmitter 150mm length
28	TT	200	Lube oil temperature transmitter	Trip		-58	302	F	Temperature transmitter	194	212	F	Hardwired to LCP	4 - 20 mA	24Vdc	Endress + Hauser	TMR31-A1DAACAB1AAA	Compact Transmitter 50mm length

PROJECT : 22.0989 Taunton

INSTRUMENT, CONSUMER AND PART LIST

PROJECT: PROJECT : 22.0989 Taunton
LOCATION/CITY: USA
Date 8/23/23
Rev 0

ITEM	TAGs		SERVICE	FUNCTION	refers to P&ID	RANGE/ UNITS			TYPE OF INSTRUMENT	SET-POINT	SET-POINT	SET-POINT	CONNECTION to LCP			INSTRUMENTS DETAILS		DETAILS
	ISA Stdr.	NTT			No.	MIN	MAX	UNIT		ALARM	TRIP	UNIT	SIGNAL	TYPE	VOLTAGE	BRAND	MODEL	
INSTRUMENT LIST - MECHANICAL INSTRUMENTS																		
1	PI	103	Discharge air manometer	Pressure Gauge		0	30	psi	pressure gauge	-	-	-	-	-	-	Wika	213.53-E-PG321Z-ND-3ZZZ-ZZZZ	4" face, glycerine fill - 1/2" NPT
2	TI	102	Discharge air thermometer	Air Temperature		32	302	F	thermometer	-	-	-	-	-	-	Wika	TG53.4ZLM-S-C1HZ-ND-W110GZ-ZZZZZZZ	4" face, 11" insertion length - 1/2" NPT
3	LI	100	Lubrication oil level indicator	oil level		---	---	---	level indicator	-	-	-	-	-	-	Mintor	1GTLXP4A	Visual
4	PI	100	Lubrication oil manometer (downstream oil filter)	oil manometer		0	150	psi	Pressure gauge	-	-	-	-	-	-	WIKA	213.53-B-PG410Z-NB-UZZZ-ZZZ	2" face, glycerine fil - 1/4" NPT process connection - requires 1/4"
5	TI	100	Lubrication oil thermometer (downstream oil filter)	oil temperature		0	300	F	thermometer	-	-	-	-	-	-	WIKA	TM32.02 NS110	Visual

PROJECT : 22.0989 Taunton

INSTRUMENT, CONSUMER AND PART LIST

PROJECT: PROJECT : 22.0989 Taunton
LOCATION/CITY: USA
Date 8/23/23
Rev 1

ITEM	TAGs ISA Stdr.	NTT	SERVICE	FUNCTION	refers to P&ID No.	Nominal Power (kW)	Nominal Current (Amps)	Voltage (V)	Voltage phases	Powered from	Brand	MODEL	DETAILS
CONSUMER LIST													
1	M	040	BOV Actuator	Blow-Off Valve Actuator			0.81	120VAC	1	LCP	Bettis	SCE300	p/n SEU125HVPD0P2U8
2	M	020	Oil cooler motor	Oil cooler motor		0.25	4.3	120 VAC	1	LCP	EMMEGI	P/N 252504	motor & fan 1 piece
3	M	001	Main drive motor	Compressor driver		150	219	460VAC	3	MCC	WEG	W22 - 445/7TSD - 200HP	
4	MA	001	Motor Space heater	Anti-condensation heater motor						MCC			part of M-001
5	M	010	VDV Actuator	Diffuser actuator		0.0	0.8	24Vdc	1	Unit	Elero	Junior 1	100mm Stroke, 1,3mm/s - 2000N Torque
6	M	011	IGV Actuator	IGV actuator		0	0.8	24Vdc	1	Unit	Elero	Junior 1	100mm Stroke, 1,3mm/s - 2000N Torque

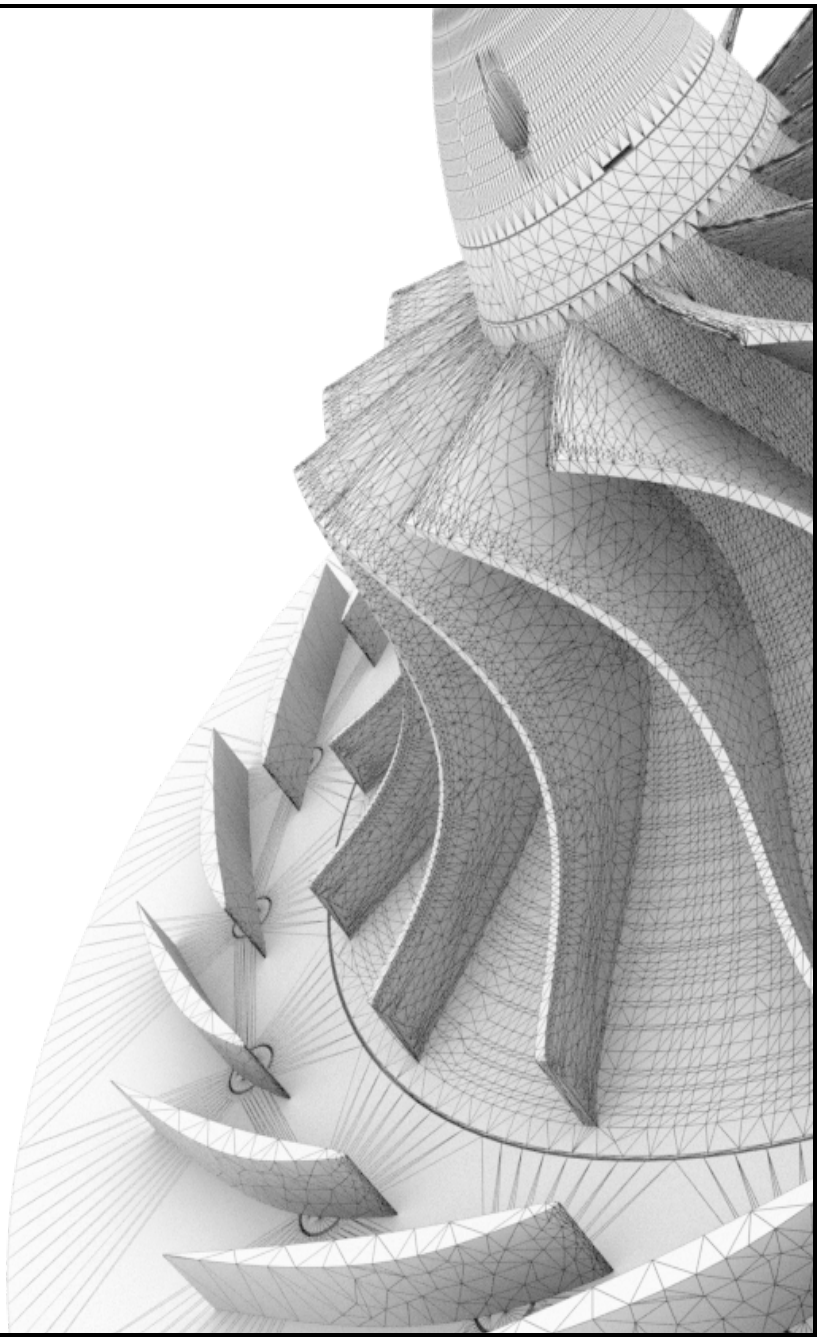
PROJECT : 22.0989 Taunton

INSTRUMENT, CONSUMER AND PART LIST

PROJECT: PROJECT : 22.0989 Taunton
LOCATION/CITY: USA
Date 8/23/23
Rev 1

ITEM	TAGs ISA Stdr.	TAGs NTT	SERVICE	FUNCTION	refers to P&ID No.	Quantity	Manufacture	Model	Details	Notes
PART LIST										
1	C	0220	BOV	Blow-off valve		1	Keystone	GR Series	4" Ductile Iron Body	
2	C	0230	BOV silencer (modular)	Silencer		1	Next Turbo Technologies	4"	ANSI 16.5	
3	C	0210	Cone diffuser	Silencer		1	Next Turbo Technologies	DN100 / 14"		
4	C	0200	Flexible Compensator	Compensator		1	Giorgi	100	PN2.5 - Aluminum flanges Class PN10	
5	C	0240	Checkvalve	Check valve in discharge		1	Titan	CV41DSV1400	14" Ductile Iron Body, Viton Seat	
6	C	0330	Oil filter	Oil filter		1	FAI Filtri	CS050 A10 V	10 micron - Viton	
7	C	0320	Oil cooler	Oil heat exchanger		1	EMMEGI	2024 K 2 pass	252503	
8	C	0340	Oil Demister GTB	Oil Demister		1	NTT	NTT	NTT	
9	C	0600	Motor control - SOFT STARTER	MCC		1	fill	client	Grid	
10	C	0400	Motor/ Compressor coupling (B5)	Main motor coupling		1	Flender	NBIPEX55F60F60,325		
11	C	0101	Inlet Coarse filter (EU2)	Coarse air inlet filter		1	Airgam	TZS-48 G2	Coarse 4 full (full:610*610 G2 EN779)	
12	C	0110	Inlet silencer	Silencer		1	Next Turbo	T20	–	
13	C	0300	Mechanical driven oil pump	Lubrication		1	Eckerle	EIPS2-005LA04-11	–	
14	C	0310	Lubrication oil safety relief valve	relief valve		1	Tognella	FT257/6-12 gas	11/2"	

Revision						
No.	Date	Description	Prep	Check	App	
0	Apr-28 2023	ISSUED	MD	AI	GB	



Project name **Taunton**	**Performance Test Report**
Project No. **22.0989**	Doc. No.: 22.0989 -71_05

COMPRESSOR TEST REPORT

Compressor type:	GTB-T20 XY
Project number:	22.0989
Serial numbers:	22.0989
Project/ Plant name:	Taunton
Country:	USA
Test type:	Performance test – Total energy balance Ref. ISO 5389:2005
Date:	April-19 2023

NexiTurbo TECHNOLOGIES

PERFORMANCE TEST

1. Compressor design

The following data refer to a centrifugal compressor type machine; single stage with integrated speed increasing gearbox.

1.1 Compressor design

Ambient pressure (p_0):	14.7 psi(a)
Discharge pressure ($p_{2,a}$):	23.4 psi(a)
Maximum inlet air temperature (t_1):	95 °F
Inlet air relative maximum humidity (rH):	50 %
Air flow (acfm):	4500 (ref. 14.7 psi – 95 °F – 50% RH)
Isentropic head (Btu/lb):	19.552 (ref. 14.7 psi – 95 °F – 50% RH)

1.2 Compressor extended performance data table (PDT)

Inlet pressure	Outlet pressure	Airflow turndown	Temperature T0 xx°F - xx% RH		Temperature T0 xx°F - xx% RH		Temperature T0 xx°F - xx% RH		Temperature T0 xx°F - xx% RH	
			V0	P	V0	P	V0	P	V0	P
(psia)	(psia)	(%)	(acfm)	(HP)	(acfm)	(HP)	(acfm)	(HP)	(acfm)	(HP)
14.7	23.4	100	4500	188.4	-	-	-	-	-	-
14.7	23.4	80	-	-	3166	138.8	-	-	-	-
14.7	23.4	60	-	-	-	-	2177	107.2	-	-
14.7	23.4	40	-	-	-	-	-	-	1712	83.3

Performance test total heat balance ref. ISO 5389

Tolerances:

Airflow:	±0%
Discharge pressure:	±0%
Energy consumption:	±4%

2. Test Setup

2.1 Object of guarantee

The following outputs of the machine are specified:

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Discharge Volume flow	$V_{2,s}$	4500	3166	2177	1712	acfm
Discharge pressure	$P_{2,s}$	23.4	23.4	23.4	23.4	psi(a)
Power at coupling	$P_{shaft,s}$	188.4	138.8	107.2	83.3	HP

Under the following specified conditions:

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Ambient pressure	P_0	14.7	14.7	14.7	14.7	psi(a)
Inlet air temperature	$T_{1,s}$	95	40	0	75	°F
Relative humidity	$RH_{,s}$	50	50	20	50	%
Filter pressure loss	dp_{filter}	0.15	0.15	0.15	0.15	psi(g)

The garantuee with reference to ISO5389 (heat balance) with the following tolerances:

Tolerances:
Airflow: ±0%
Discharge pressure: ±0%
Energy consumption: ±4%

2.2 General setup data

Discharge pipe utilized:	DN 200
Pipe diameter	8.248 [inch]
Orifice diameter	5.515 [inch]
Test metric	imperial

2.3 Standard references

The test is conduct with follow references:

- ISO 5389:2005 – *Turbocompressors – Performance Test Code*
- EN ISO 5167-1 : 2003 - *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full -Part 1: General principles and requirements*
- EN ISO 5167-2 : 2003 - *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 2: Orifice plates*

2.4 Instruments

The working instruments used for the test are as follows:

Internal Code	Description	Number Certificate	Calibration due date
NTT0051	Inlet Relative Humidity Main	22DWY00-0385	11/04/24
NTT0049	Inlet Temperature Main T0-1	220711	22/07/23
NTT0050	Inlet Temperature Main T0-2	220712	22/07/23
NTT0072	Inlet Temperature Main T0-3	220713	22/07/23
NTT0073	Inlet Temperature Main T0-4	220714	22/07/23
NTT0091	Inlet Water Temperature Tw1 Main	220715	22/07/23
NTT0092	Outlet Water Temperature Tw2 Main	220716	22/07/23
NTT0090	Volute Temperature Main	220722	22/07/23
NTT0052	Differential Pressure Filter Losses Main	8613/22	19/09/24
NTT0043	Absolute Pressure 200-P OR1	RE-SP-110913-2022	09/11/23
NTT0054	Absolute Pressure 200-P OR2	RE-SP-110915-2022	09/11/23
NTT0044	Absolute Pressure 200-P2-1	RE-SP-110915-2022	09/11/23

NTT0045	Absolute Pressure 200-P2-2	RE-SP-110916-2022	09/11/23
NTT0059	Absolute Pressure 200-P2-3	RE-SP-110917-2022	09/11/23
NTT0056	Absolute Pressure 200-P2-4	RE-SP-110918-2022	09/11/23
NTT0042	Differential Pressure 200-DP OR1	RE-SP110923-2022	09/11/23
NTT0053	Differential Pressure 200-DP OR2	RE-SP-110913-2022	09/11/23
NTT0048	Orifice Temperature T-OR-200	220732	22/07/23
NTT0046	Outlet Temperature 200 T2-1	220727	22/07/23
NTT0047	Outlet Temperature 200 T2-2	220728	22/07/23
NTT0070	Outlet Temperature 200 T2-3	220729	22/07/23
NTT0071	Outlet Temperature 200 T2-4	220730	22/07/23

3. Test results calculated from test-data

3.1 Test conditions readings

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Ambient pressure	$P_{0,t}$	14.0005	14.2471	14.2978	14.2935	psi(a)
Pressure loss filter	$dp_{filter,t}$	0.0189	0.0131	0.0029	0.0029	psi(g)
Relative humidity	$RH_{,t}$	25.6	28.6	37	33.5	%
Inlet temperature	$T_{1,t}$	82.904	77.576	68.936	72.356	°F

3.2 Test data readings

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Discharge pressure	$P_{2,t}$	22.5715	22.0965	21.6759	23.1154	psi(a)
Pressure at orifice	$P_{orifice}$	22.2198	21.9007	21.5671	23.0465	psi(a)
Delta pressure orifice	$dp_{orifice}$	2.8023	1.3734	0.6473	0.3830	psi(g)
Temperature orifice	$T_{orifice}$	183.164	169.592	158.504	174.218	°F

3.3 Test Result Calculations

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Inlet pressure	$P_{1,t}$	13.9802	14.2340	14.2935	14.2906	psi(a)
Inlet temperature	$T_{1,Kelvin,t}$	301.43	298.47	293.67	295.57	K
Univ. Gas Constant	R_{univ}	1545.35	1545.35	1545.35	1545.35	lbf*ft/(lbmol*°R)
Mole weight air	M_{air}	28.97	28.97	28.97	28.97	lb/lbmol
Mole weight water	M_{water}	18.015	18.015	18.015	18.015	lb/lbmol
Actual Mole weight	$M_{gas,t}$	28.86	28.87	28.87	28.87	lb/lbmol
Spec. Gas Constant	$R_{gas,t}$	53.546	53.528	53.528	53.528	lbf*ft/(lbmol*°R)
Air density	$rho_{1,t}$	0.0693	0.0712	0.0727	0.0722	lb/ft^3
Isentropic head	$His_{,t}$	19.614	17.554	16.193	18.936	btu/lb
Discharge Airflow	$V_{,t}$	4582.7	3201.3	2181.9	1734.0	acfm
Euler Power	$P_{euler,t}$	184.26	123.11	88.24	78.58	HP

4. Test results converted to specified condition

4.1 Specified conditions

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Ambient pressure	$P_{0,s}$	14.7	14.7	14.7	14.7	psi(a)
Pressure loss filter	$dp_{filter,s}$	0.15	0.15	0.15	0.15	psi(a)
Inlet pressure	$P_{1,s}$	14.55	14.55	14.55	14.55	psi(a)
Relative humidity	$RH_{,s}$	50	50	20	50	%
Inlet temperature	$T1_{,s}$	95	40	0	75	°F
Univ. Gas Constant	R_{univ}	1545.35	1545.35	1545.35	1545.35	lbf*ft/(lbmol*°R)
Mole weight air	M_{air}	28.97	28.97	28.97	28.97	lb/lbmol
Mole weight water	M_{water}	18.015	18.015	18.015	18.015	lb/lbmol
Actual Mole weight	$M_{gas,s}$	28.66	28.92	28.96	28.81	lb/lbmol
Spec. Gas Constant	$R_{gas,s}$	53.920	53.435	53.361	53.639	btu/lb/°F
Air density	$rho1_{,s}$	0.0701	0.0785	0.0854	0.0731	lb/ft^3

4.2 Correction of test data to specified conditions

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Inlet temperature	$T_{1,Kelvin,s}$	308.15	277.59	255.37	297.04	K
Saturated pressure	$p_{sat,s}$	0.8151	0.1218	0.0566	0.4293	psi
His	$His_{,s}$	19.552	17.454	16.036	18.752	btu/lb
Discharge pressure	$P_{2,s}$	23.4	23.4	23.4	23.4	psi(a)
Discharge airflow	$V_{2,s}$	4500	3166	2177	1712	acfm
Euler Power	$P_{euler,\ corr}$	182.51	133.43	102.45	77.65	HP
Mechanical losses	P_{mech}	7.01	7.63	7.16	7.12	HP
Power at coupling	$P_{shaft,\ corr}$	189.49	141.04	109.64	84.81	HP

4.3 Compliance comparison

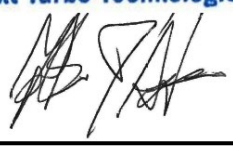
	SYMBOL	NUMERICAL VALUE				TOTAL
Test points		**P1**	**P2**	**P3**	**P4**	
Shaft Power, test	$P_{shaft,\ corr}$	189.49	141.04	109.64	84.81	524.97
Shaft Power,spec.	$P_{shaft,s}$	188.4	138.8	107.2	83.3	517.70
Evaluated Factor	EF	0.10	0.40	0.40	0.10	1.00
Factored Power, test	$P_{shaft,\ eval}$	**18.95**	**56.41**	**43.86**	**8.48**	**127.70**
Factored Power, spec.	$P_{shaft,s\ eval}$	18.84	55.52	42.88	8.33	125.57
Tolerance	%	±4%	±4%	±4%	±4%	±4%
Max. allowed Factored Power, specified	$P_{shaft,\ eval\ tol}$	**19.59**	**57.74**	**44.60**	**8.66**	**130.59**
Compliance	-	☑	☑	☑	☑	TEST PASSED

Result: The shaft power sum of the tested points is within the specified tolerances: The test is passed. Shaft power is determined by establishing a total energy balance for the compressor, by adding all the losses to the energy input to the compressed gas (Reference: ISO 5389-2.5.9 c).

This performance test has been conducted on April-19 2023

Inarzo, Varese Italy.

Next Turbo Technologies SpA



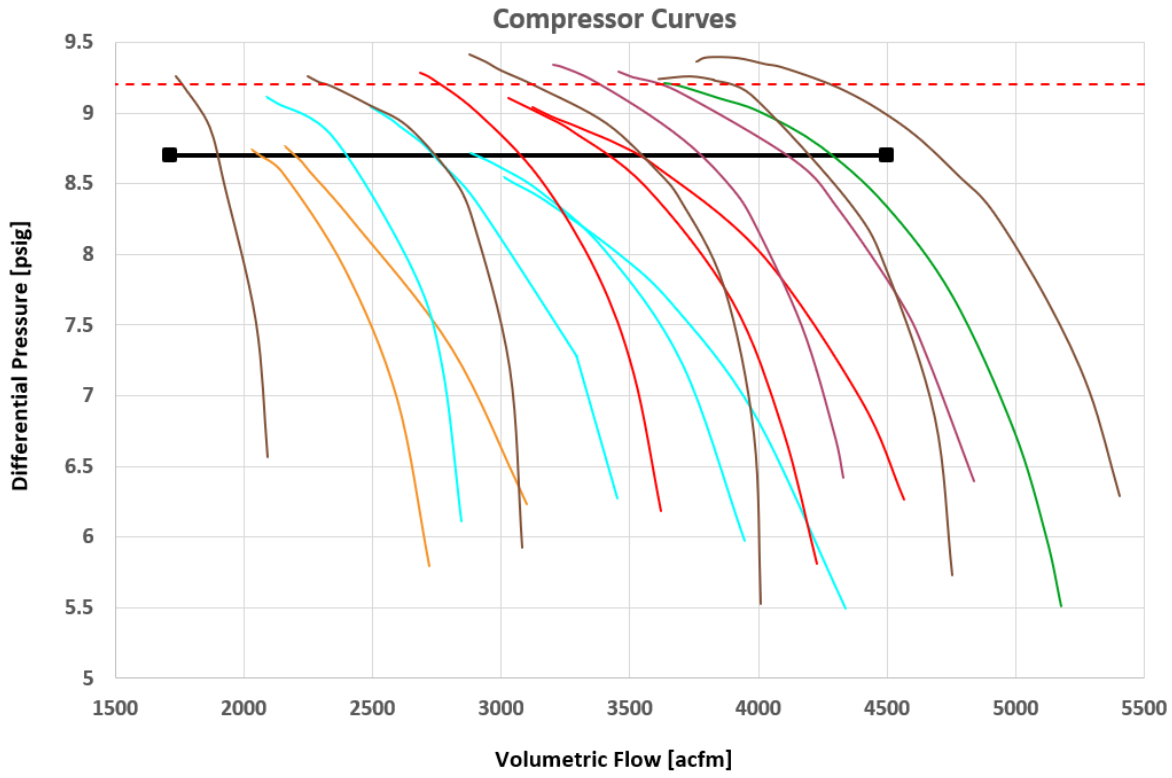
Test Engineer

6. Compressor performance curve

Performance curve result of the compressor based on the test readings, corrected for the following garantuee conditions.

Barometric pressure	P_0	**14.7**	[psi]
Pressure loss over filter	dp filter	**0.15**	[psig]
Discharge pressure	P_2	**23.4**	[psi]
Inlet temperature	T_1	**95**	[°F]
Inlet Relative humidity	RH	**50**	[%]

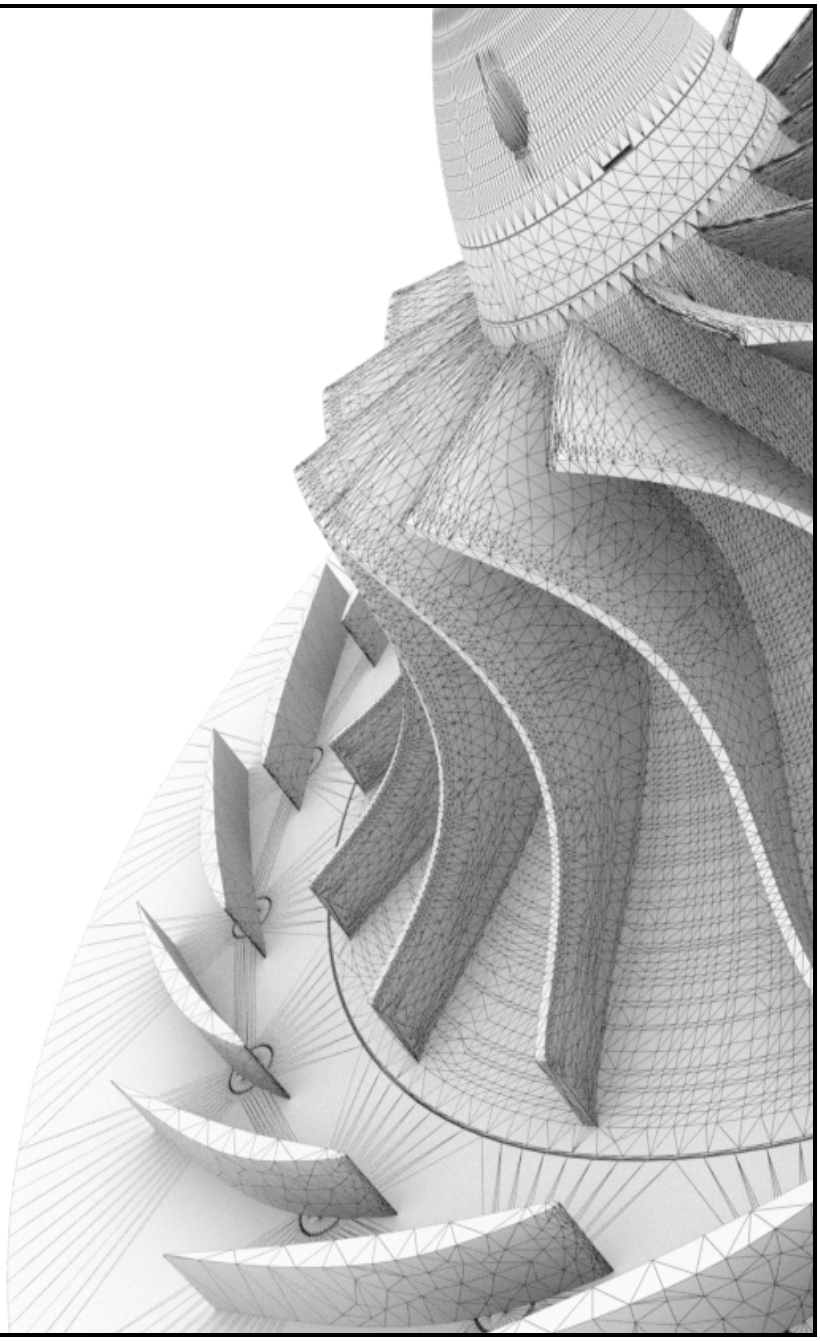
Performance curve graph:



Legend:

- IGV 3 VDV 2
- IGV 4 VDV 2; 3; 4; 5
- IGV 5 VDV 3; 4; 5
- IGV 6 VDV 4; 5
- IGV 7 VDV 5
- IGV 8 VDV
- IGV 9 VDV
- IGV 10 VDV 1; 2; 3; 4; 5
- IGV 11 VDV
- Maximum and Minimum volumetric airflow according to PDS
- Rise to Surge (9.2 psig)

Revision						
No.	Date	Description	Prep	Check	App	
0	Apr-28 2023	ISSUED	MD	AI	GB	



Project name **Taunton**	**Performance Test Report**
Project No. **22.0989**	Doc. No.: 22.0990 -71_05

COMPRESSOR TEST REPORT

Compressor type:	GTB-T20 XY
Project number:	22.0989
Serial numbers:	22.0990
Project/ Plant name:	Taunton
Country:	USA
Test type:	Performance test – Total energy balance Ref. ISO 5389:2005
Date:	April-20 2023

NexiTurbo TECHNOLOGIES

PERFORMANCE TEST

1. Compressor design

The following data refer to a centrifugal compressor type machine; single stage with integrated speed increasing gearbox.

1.1 Compressor design

Ambient pressure (p_0):	14.7 psi(a)
Discharge pressure ($p_{2,a}$):	23.4 psi(a)
Maximum inlet air temperature (t_1):	95 °F
Inlet air relative maximum humidity (rH):	50 %
Air flow (acfm):	4500 (ref. 14.7 psi – 95 °F – 50% RH)
Isentropic head (Btu/lb):	19.552 (ref. 14.7 psi – 95 °F – 50% RH)

1.2 Compressor extended performance data table (PDT)

Inlet pressure	Outlet pressure	Airflow turndown	Temperature T0 xx°F - xx% RH		Temperature T0 xx°F - xx% RH		Temperature T0 xx°F - xx% RH		Temperature T0 xx°F - xx% RH	
			V0	P	V0	P	V0	P	V0	P
(psia)	(psia)	(%)	(acfm)	(HP)	(acfm)	(HP)	(acfm)	(HP)	(acfm)	(HP)
14.7	23.4	100	4500	188.4	-	-	-	-	-	-
14.7	23.4	80	-	-	3166	138.8	-	-	-	-
14.7	23.4	60	-	-	-	-	2177	107.2	-	-
14.7	23.4	40	-	-	-	-	-	-	1712	83.3

Performance test total heat balance ref. ISO 5389

Tolerances:

Airflow:	±0%
Discharge pressure:	±0%
Energy consumption:	±4%

2. Test Setup

2.1 Object of guarantee

The following outputs of the machine are specified:

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Discharge Volume flow	$V_{2,s}$	4500	3166	2177	1712	acfm
Discharge pressure	$P_{2,s}$	23.4	23.4	23.4	23.4	psi(a)
Power at coupling	$P_{shaft,s}$	188.4	138.8	107.2	83.3	HP

Under the following specified conditions:

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Ambient pressure	P_0	14.7	14.7	14.7	14.7	psi(a)
Inlet air temperature	$T_{1,s}$	95	40	0	75	°F
Relative humidity	$RH_{,s}$	50	50	20	50	%
Filter pressure loss	dp_{filter}	0.15	0.15	0.15	0.15	psi(g)

The garantuee with reference to ISO5389 (heat balance) with the following tolerances:

Tolerances:
Airflow: ±0%
Discharge pressure: ±0%
Energy consumption: ±4%

2.2 General setup data

Discharge pipe utilized:	DN 200
Pipe diameter	8.248 [inch]
Orifice diameter	5.515 [inch]
Test metric	imperial

2.3 Standard references

The test is conduct with follow references:

- ISO 5389:2005 – *Turbocompressors – Performance Test Code*
- EN ISO 5167-1 : 2003 - *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full -Part 1: General principles and requirements*
- EN ISO 5167-2 : 2003 - *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 2: Orifice plates*

2.4 Instruments

The working instruments used for the test are as follows:

Internal Code	Description	Number Certificate	Calibration due date
NTT0051	Inlet Relative Humidity Main	22DWY00-0385	11/04/24
NTT0049	Inlet Temperature Main T0-1	220711	22/07/23
NTT0050	Inlet Temperature Main T0-2	220712	22/07/23
NTT0072	Inlet Temperature Main T0-3	220713	22/07/23
NTT0073	Inlet Temperature Main T0-4	220714	22/07/23
NTT0091	Inlet Water Temperature Tw1 Main	220715	22/07/23
NTT0092	Outlet Water Temperature Tw2 Main	220716	22/07/23
NTT0090	Volute Temperature Main	220722	22/07/23
NTT0052	Differential Pressure Filter Losses Main	8613/22	19/09/24
NTT0043	Absolute Pressure 200-P OR1	RE-SP-110913-2022	09/11/23
NTT0054	Absolute Pressure 200-P OR2	RE-SP-110915-2022	09/11/23
NTT0044	Absolute Pressure 200-P2-1	RE-SP-110915-2022	09/11/23

NTT0045	Absolute Pressure 200-P2-2	RE-SP-110916-2022	09/11/23
NTT0059	Absolute Pressure 200-P2-3	RE-SP-110917-2022	09/11/23
NTT0056	Absolute Pressure 200-P2-4	RE-SP-110918-2022	09/11/23
NTT0042	Differential Pressure 200-DP OR1	RE-SP110923-2022	09/11/23
NTT0053	Differential Pressure 200-DP OR2	RE-SP-110913-2022	09/11/23
NTT0048	Orifice Temperature T-OR-200	220732	22/07/23
NTT0046	Outlet Temperature 200 T2-1	220727	22/07/23
NTT0047	Outlet Temperature 200 T2-2	220728	22/07/23
NTT0070	Outlet Temperature 200 T2-3	220729	22/07/23
NTT0071	Outlet Temperature 200 T2-4	220730	22/07/23

3. Test results calculated from test-data

3.1 Test conditions readings

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Ambient pressure	$P_{0,t}$	14.1890	14.1890	14.1890	14.1890	psi(a)
Pressure loss filter	$dp_{filter,t}$	0.0174	0.0102	0.0044	0.0058	psi(g)
Relative humidity	$RH_{,t}$	46	43.3	43.5	42.7	%
Inlet temperature	$T_{1,t}$	71.15	73.022	72.428	71.69	°F

3.2 Test data readings

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Discharge pressure	$P_{2,t}$	23.0392	22.0675	21.4438	22.9377	psi(a)
Pressure at orifice	$P_{orifice}$	22.6984	21.8717	21.3351	22.8579	psi(a)
Delta pressure orifice	$dp_{orifice}$	2.7347	1.3808	0.6622	0.3784	psi(g)
Temperature orifice	$T_{orifice}$	171.608	163.598	164.786	171.032	°F

3.3 Test Result Calculations

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Inlet pressure	$P_{1,t}$	14.1716	14.1789	14.1847	14.1818	psi(a)
Inlet temperature	$T_{1,Kelvin,t}$	294.9	295.94	295.61	295.2	K
Univ. Gas Constant	R_{univ}	1545.35	1545.35	1545.35	1545.35	lbf*ft/(lbmol*°R)
Mole weight air	M_{air}	28.97	28.97	28.97	28.97	lb/lbmol
Mole weight water	M_{water}	18.015	18.015	18.015	18.015	lb/lbmol
Actual Mole weight	$M_{gas,t}$	28.84	28.84	28.84	28.84	lb/lbmol
Spec. Gas Constant	$R_{gas,t}$	53.584	53.584	53.584	53.584	lbf*ft/(lbmol*°R)
Air density	$rho_{1,t}$	0.0717	0.0715	0.0716	0.0717	lb/ft^3
Isentropic head	$His_{,t}$	19.482	17.531	16.195	18.923	btu/lb
Discharge Airflow	$V_{,t}$	4467.3	3208.9	2215.4	1732.2	acfm
Euler Power	$P_{euler,t}$	185.73	121.90	87.57	76.84	HP

4. Test results converted to specified condition

4.1 Specified conditions

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Ambient pressure	$P_{0,s}$	14.7	14.7	14.7	14.7	psi(a)
Pressure loss filter	$dp_{filter,s}$	0.15	0.15	0.15	0.15	psi(a)
Inlet pressure	$P_{1,s}$	14.55	14.55	14.55	14.55	psi(a)
Relative humidity	$RH_{,s}$	50	50	20	50	%
Inlet temperature	$T1_{,s}$	95	40	0	75	°F
Univ. Gas Constant	R_{univ}	1545.35	1545.35	1545.35	1545.35	lbf*ft/(lbmol*°R)
Mole weight air	M_{air}	28.97	28.97	28.97	28.97	lb/lbmol
Mole weight water	M_{water}	18.015	18.015	18.015	18.015	lb/lbmol
Actual Mole weight	$M_{gas,s}$	28.66	28.92	28.96	28.81	lb/lbmol
Spec. Gas Constant	$R_{gas,s}$	53.920	53.435	53.361	53.639	btu/lb/°F
Air density	$rho1_{,s}$	0.0701	0.0785	0.0854	0.0731	lb/ft^3

4.2 Correction of test data to specified conditions

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Inlet temperature	$T_{1,Kelvin,s}$	308.15	277.59	255.37	297.04	K
Saturated pressure	$p_{sat,s}$	0.8151	0.1218	0.0566	0.4293	psi
His	$His_{,s}$	19.552	17.454	16.036	18.752	btu/lb
Discharge pressure	$P_{2,s}$	23.4	23.4	23.4	23.4	psi(a)
Discharge airflow	$V_{2,s}$	4500	3166	2177	1712	acfm
Euler Power	$P_{euler,\ corr}$	183.45	131.42	101.65	76.71	HP
Mechanical losses	P_{mech}	6.54	6.10	6.07	6.05	HP
Power at coupling	$P_{shaft,\ corr}$	189.97	137.51	107.75	82.75	HP

4.3 Compliance comparison

	SYMBOL	NUMERICAL VALUE				TOTAL
Test points		**P1**	**P2**	**P3**	**P4**	
Shaft Power, test	$P_{shaft,\ corr}$	189.97	137.51	107.75	82.75	517.98
Shaft Power,spec.	$P_{shaft,s}$	188.4	138.8	107.2	83.3	517.70
Evaluated Factor	EF	0.10	0.40	0.40	0.10	1.00
Factored Power, test	$P_{shaft,\ eval}$	**19.00**	**55.00**	**43.10**	**8.28**	**125.38**
Factored Power, spec.	$P_{shaft,s\ eval}$	18.84	55.52	42.88	8.33	125.57
Tolerance	%	±4%	±4%	±4%	±4%	±4%
Max. allowed Factored Power, specified	$P_{shaft,\ eval\ tol}$	**19.59**	**57.74**	**44.60**	**8.66**	**130.59**
Compliance	-	☑	☑	☑	☑	TEST PASSED

Result: The shaft power sum of the tested points is within the specified tolerances: The test is passed. Shaft power is determined by establishing a total energy balance for the compressor, by adding all the losses to the energy input to the compressed gas (Reference: ISO 5389-2.5.9 c).

This performance test has been conducted on April-20 2023

Inarzo, Varese Italy.

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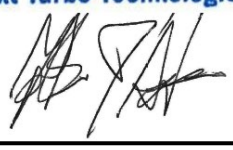


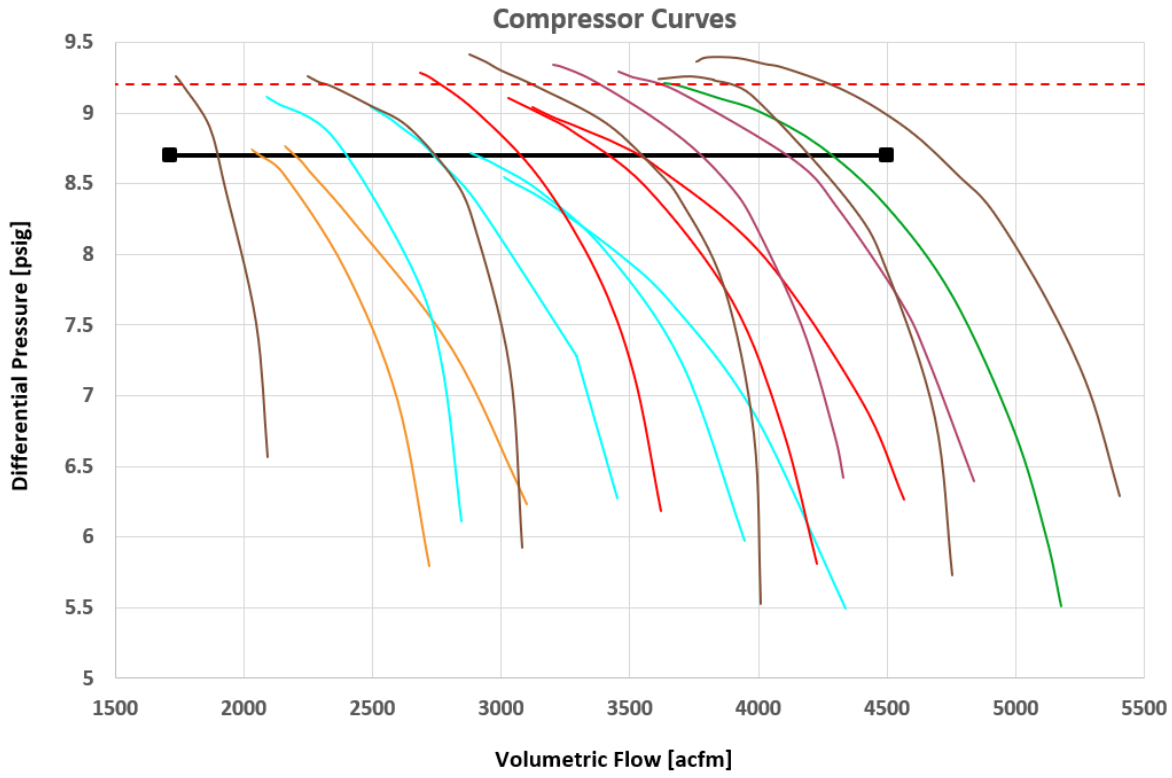
Test Engineer

6. Compressor performance curve

Performance curve result of the compressor based on the test readings, corrected for the following garantuee conditions.

Barometric pressure	P_0	**14.7**	[psi]
Pressure loss over filter	dp filter	**0.15**	[psig]
Discharge pressure	P_2	**23.4**	[psi]
Inlet temperature	T_1	**95**	[°F]
Inlet Relative humidity	RH	**50**	[%]

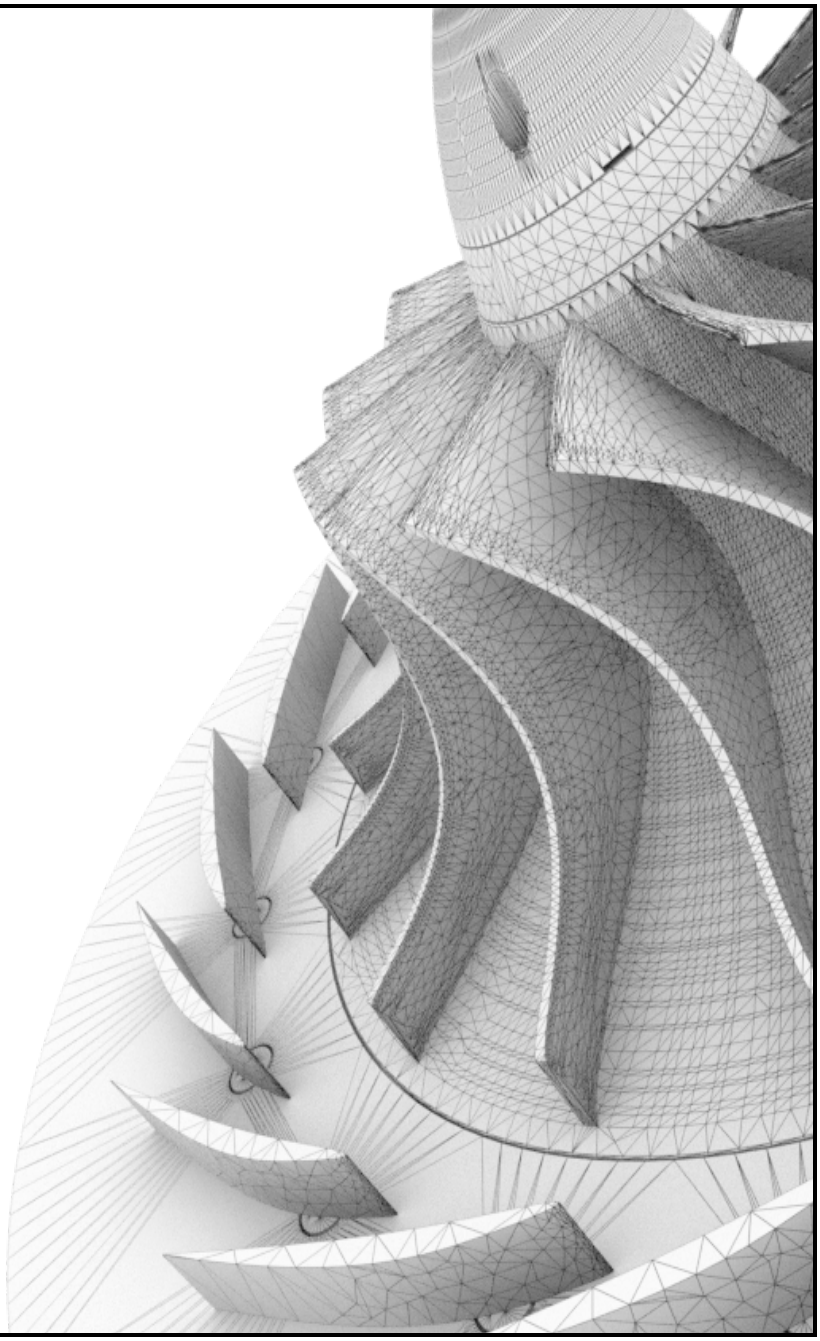
Performance curve graph:



Legend:

- IGV 3 VDV 2
- IGV 4 VDV 2; 3; 4; 5
- IGV 5 VDV 3; 4; 5
- IGV 6 VDV 4; 5
- IGV 7 VDV 5
- IGV 8 VDV
- IGV 9 VDV
- IGV 10 VDV 1; 2; 3; 4; 5
- IGV 11 VDV
- Maximum and Minimum volumetric airflow according to PDS
- Rise to Surge (9.2 psig)

Revision			
No.	Date	Description	Prep	Check	App
0	Apr-28 2023	ISSUED	MD	AI	GB



Project name **Taunton**	**Performance Test Report**
Project No. **22.0989**	Doc. No.: 22.0991 -71_05

COMPRESSOR TEST REPORT

Compressor type:	GTB-T20 XY
Project number:	22.0989
Serial numbers:	22.0991
Project/ Plant name:	Taunton
Country:	USA
Test type:	Performance test – Total energy balance Ref. ISO 5389:2005
Date:	April-21 2023

NexiTurbo TECHNOLOGIES

PERFORMANCE TEST

1. Compressor design

The following data refer to a centrifugal compressor type machine; single stage with integrated speed increasing gearbox.

1.1 Compressor design

Ambient pressure (p_0):	14.7 psi(a)
Discharge pressure ($p_{2,a}$):	23.4 psi(a)
Maximum inlet air temperature (t_1):	95 °F
Inlet air relative maximum humidity (rH):	50 %
Air flow (acfm):	4500 (ref. 14.7 psi – 95 °F – 50% RH)
Isentropic head (Btu/lb):	19.552 (ref. 14.7 psi – 95 °F – 50% RH)

1.2 Compressor extended performance data table (PDT)

Inlet pressure	Outlet pressure	Airflow turndown	Temperature T0 xx°F - xx% RH		Temperature T0 xx°F - xx% RH		Temperature T0 xx°F - xx% RH		Temperature T0 xx°F - xx% RH	
			V0	P	V0	P	V0	P	V0	P
(psia)	(psia)	(%)	(acfm)	(HP)	(acfm)	(HP)	(acfm)	(HP)	(acfm)	(HP)
14.7	23.4	100	4500	188.4	-	-	-	-	-	-
14.7	23.4	80	-	-	3166	138.8	-	-	-	-
14.7	23.4	60	-	-	-	-	2177	107.2	-	-
14.7	23.4	40	-	-	-	-	-	-	1712	83.3

Performance test total heat balance ref. ISO 5389

Tolerances:

Airflow:	±0%
Discharge pressure:	±0%
Energy consumption:	±4%

2. Test Setup

2.1 Object of guarantee

The following outputs of the machine are specified:

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Discharge Volume flow	$V_{2,s}$	4500	3166	2177	1712	acfm
Discharge pressure	$P_{2,s}$	23.4	23.4	23.4	23.4	psi(a)
Power at coupling	$P_{shaft,s}$	188.4	138.8	107.2	83.3	HP

Under the following specified conditions:

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Ambient pressure	P_0	14.7	14.7	14.7	14.7	psi(a)
Inlet air temperature	$T_{1,s}$	95	40	0	75	°F
Relative humidity	$RH_{,s}$	50	50	20	50	%
Filter pressure loss	dp_{filter}	0.15	0.15	0.15	0.15	psi(g)

The garantuee with reference to ISO5389 (heat balance) with the following tolerances:

Tolerances:
Airflow: ±0%
Discharge pressure: ±0%
Energy consumption: ±4%

2.2 General setup data

Discharge pipe utilized:	DN 200
Pipe diameter	8.248 [inch]
Orifice diameter	5.515 [inch]
Test metric	imperial

2.3 Standard references

The test is conduct with follow references:

- ISO 5389:2005 – *Turbocompressors – Performance Test Code*
- EN ISO 5167-1 : 2003 - *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full -Part 1: General principles and requirements*
- EN ISO 5167-2 : 2003 - *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 2: Orifice plates*

2.4 Instruments

The working instruments used for the test are as follows:

Internal Code	Description	Number Certificate	Calibration due date
NTT0051	Inlet Relative Humidity Main	22DWY00-0385	11/04/24
NTT0049	Inlet Temperature Main T0-1	220711	22/07/23
NTT0050	Inlet Temperature Main T0-2	220712	22/07/23
NTT0072	Inlet Temperature Main T0-3	220713	22/07/23
NTT0073	Inlet Temperature Main T0-4	220714	22/07/23
NTT0091	Inlet Water Temperature Tw1 Main	220715	22/07/23
NTT0092	Outlet Water Temperature Tw2 Main	220716	22/07/23
NTT0090	Volute Temperature Main	220722	22/07/23
NTT0052	Differential Pressure Filter Losses Main	8613/22	19/09/24
NTT0043	Absolute Pressure 200-P OR1	RE-SP-110913-2022	09/11/23
NTT0054	Absolute Pressure 200-P OR2	RE-SP-110915-2022	09/11/23
NTT0044	Absolute Pressure 200-P2-1	RE-SP-110915-2022	09/11/23

NTT0045	Absolute Pressure 200-P2-2	RE-SP-110916-2022	09/11/23
NTT0059	Absolute Pressure 200-P2-3	RE-SP-110917-2022	09/11/23
NTT0056	Absolute Pressure 200-P2-4	RE-SP-110918-2022	09/11/23
NTT0042	Differential Pressure 200-DP OR1	RE-SP110923-2022	09/11/23
NTT0053	Differential Pressure 200-DP OR2	RE-SP-110913-2022	09/11/23
NTT0048	Orifice Temperature T-OR-200	220732	22/07/23
NTT0046	Outlet Temperature 200 T2-1	220727	22/07/23
NTT0047	Outlet Temperature 200 T2-2	220728	22/07/23
NTT0070	Outlet Temperature 200 T2-3	220729	22/07/23
NTT0071	Outlet Temperature 200 T2-4	220730	22/07/23

3. Test results calculated from test-data

3.1 Test conditions readings

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Ambient pressure	$P_{0,t}$	14.2427	14.2471	14.2500	14.2471	psi(a)
Pressure loss filter	$dp_{filter,t}$	0.0160	0.0102	0.0044	0.0044	psi(g)
Relative humidity	$RH_{,t}$	50.6	46.5	45.7	45.2	%
Inlet temperature	$T_{1,t}$	67.262	69.224	69.854	70.25	°F

3.2 Test data readings

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Discharge pressure	$P_{2,t}$	23.3039	22.2343	21.4910	23.0392	psi(a)
Pressure at orifice	$P_{orifice}$	22.9595	22.0457	21.3786	22.9595	psi(a)
Delta pressure orifice	$dp_{orifice}$	2.7235	1.3210	0.6625	0.3762	psi(g)
Temperature orifice	$T_{orifice}$	163.346	160.214	161.942	169.232	°F

3.3 Test Result Calculations

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Inlet pressure	$P_{1,t}$	14.2268	14.2369	14.2456	14.2413	psi(a)
Inlet temperature	$T_{1,Kelvin,t}$	292.74	293.83	294.18	294.4	K
Univ. Gas Constant	R_{univ}	1545.35	1545.35	1545.35	1545.35	lbf*ft/(lbmol*°R)
Mole weight air	M_{air}	28.97	28.97	28.97	28.97	lb/lbmol
Mole weight water	M_{water}	18.015	18.015	18.015	18.015	lb/lbmol
Actual Mole weight	$M_{gas,t}$	28.84	28.84	28.84	28.84	lb/lbmol
Spec. Gas Constant	$R_{gas,t}$	53.584	53.584	53.584	53.584	lbf*ft/(lbmol*°R)
Air density	$rho_{1,t}$	0.0725	0.0723	0.0723	0.0722	lb/ft^3
Isentropic head	$His_{,t}$	19.644	17.534	16.025	18.883	btu/lb
Discharge Airflow	$V_{,t}$	4464.4	3127.7	2203.0	1722.2	acfm
Euler Power	$P_{euler,t}$	185.60	121.76	88.51	76.97	HP

4. Test results converted to specified condition

4.1 Specified conditions

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Ambient pressure	$P_{0,s}$	14.7	14.7	14.7	14.7	psi(a)
Pressure loss filter	$dp_{filter,s}$	0.15	0.15	0.15	0.15	psi(a)
Inlet pressure	$P_{1,s}$	14.55	14.55	14.55	14.55	psi(a)
Relative humidity	$RH_{,s}$	50	50	20	50	%
Inlet temperature	$T1_{,s}$	95	40	0	75	°F
Univ. Gas Constant	R_{univ}	1545.35	1545.35	1545.35	1545.35	lbf*ft/(lbmol*°R)
Mole weight air	M_{air}	28.97	28.97	28.97	28.97	lb/lbmol
Mole weight water	M_{water}	18.015	18.015	18.015	18.015	lb/lbmol
Actual Mole weight	$M_{gas,s}$	28.66	28.92	28.96	28.81	lb/lbmol
Spec. Gas Constant	$R_{gas,s}$	53.920	53.435	53.361	53.639	btu/lb/°F
Air density	$rho1_{,s}$	0.0701	0.0785	0.0854	0.0731	lb/ft^3

4.2 Correction of test data to specified conditions

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Inlet temperature	$T_{1,Kelvin,s}$	308.15	277.59	255.37	297.04	K
Saturated pressure	$p_{sat,s}$	0.8151	0.1218	0.0566	0.4293	psi
His	$His_{,s}$	19.552	17.454	16.036	18.752	btu/lb
Discharge pressure	$P_{2,s}$	23.4	23.4	23.4	23.4	psi(a)
Discharge airflow	$V_{2,s}$	4500	3166	2177	1712	acfm
Euler Power	$P_{euler,\ corr}$	179.83	133.16	103.53	76.97	HP
Mechanical losses	P_{mech}	7.12	6.61	6.37	6.22	HP
Power at coupling	$P_{shaft,\ corr}$	186.98	139.80	109.84	83.16	HP

4.3 Compliance comparison

	SYMBOL	NUMERICAL VALUE				TOTAL
Test points		**P1**	**P2**	**P3**	**P4**	
Shaft Power, test	$P_{shaft, corr}$	186.98	139.80	109.84	83.16	519.78
Shaft Power,spec.	$P_{shaft,s}$	188.4	138.8	107.2	83.3	517.70
Evaluated Factor	EF	0.10	0.40	0.40	0.10	1.00
Factored Power, test	$P_{shaft, eval}$	**18.70**	**55.92**	**43.94**	**8.32**	**126.87**
Factored Power, spec.	$P_{shaft,s\ eval}$	18.84	55.52	42.88	8.33	125.57
Tolerance	%	±4%	±4%	±4%	±4%	±4%
Max. allowed Factored Power, specified	$P_{shaft, eval\ tol}$	**19.59**	**57.74**	**44.60**	**8.66**	**130.59**
Compliance	-	☑	☑	☑	☑	TEST PASSED

Result: The shaft power sum of the tested points is within the specified tolerances: The test is passed. Shaft power is determined by establishing a total energy balance for the compressor, by adding all the losses to the energy input to the compressed gas (Reference: ISO 5389-2.5.9 c).

This performance test has been conducted on April-21 2023

Inarzo, Varese Italy.

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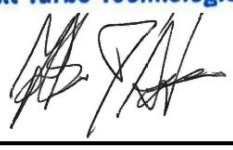


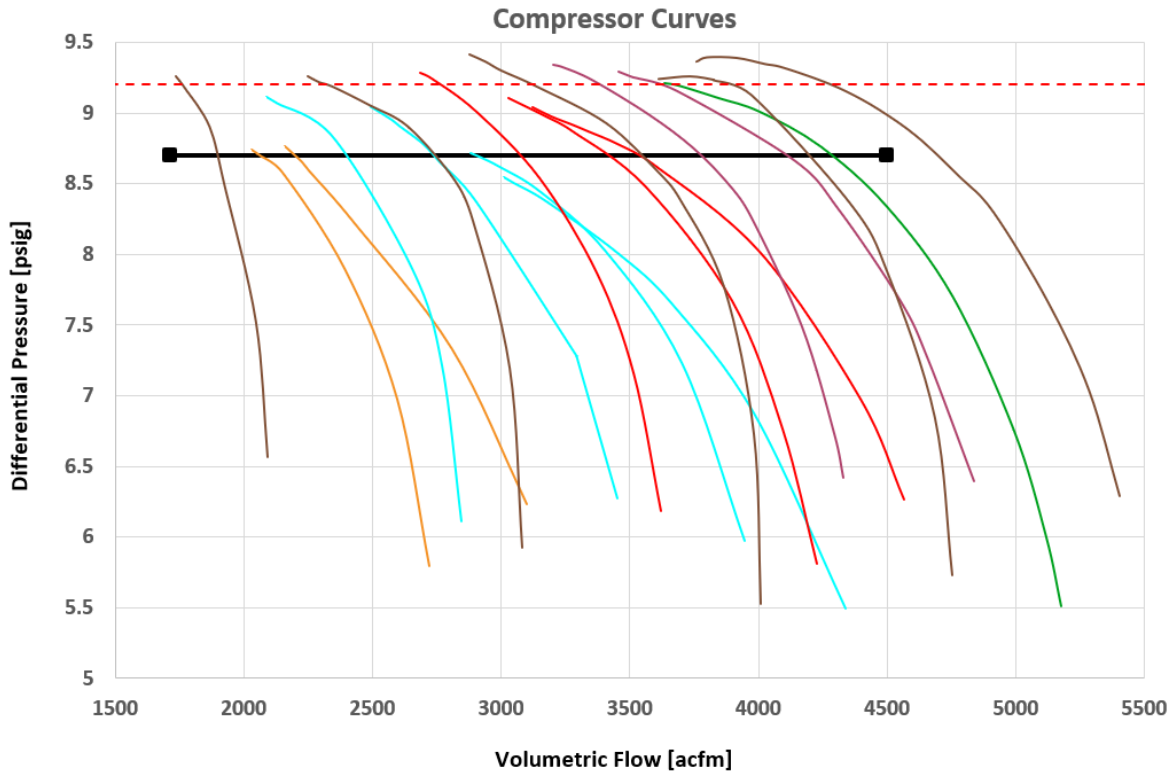
Test Engineer

6. Compressor performance curve

Performance curve result of the compressor based on the test readings, corrected for the following garantuee conditions.

Barometric pressure	P_0	**14.7**	[psi]
Pressure loss over filter	dp filter	**0.15**	[psig]
Discharge pressure	P_2	**23.4**	[psi]
Inlet temperature	T_1	**95**	[°F]
Inlet Relative humidity	RH	**50**	[%]

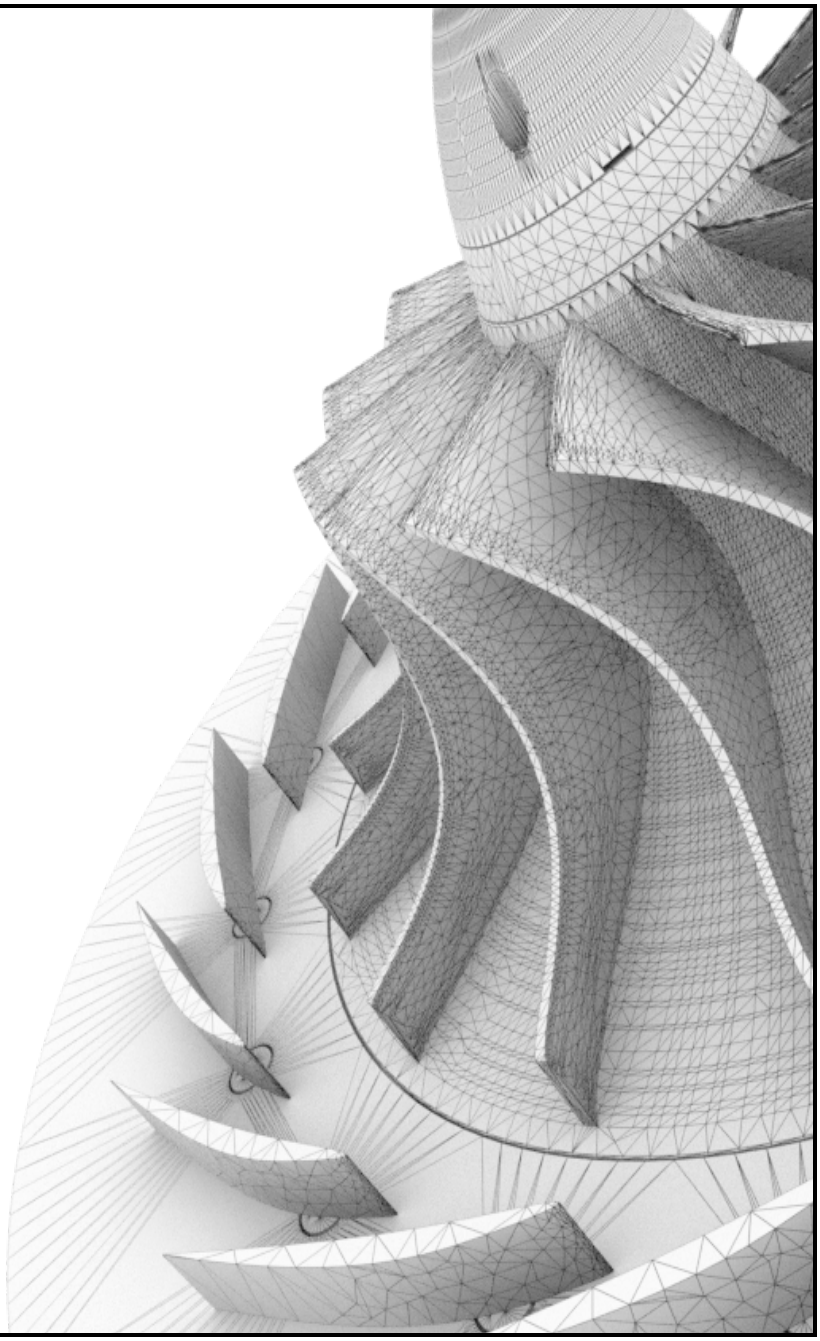
Performance curve graph:



Legend:

- IGV 3 VDV 2
- IGV 4 VDV 2; 3; 4; 5
- IGV 5 VDV 3; 4; 5
- IGV 6 VDV 4; 5
- IGV 7 VDV 5
- IGV 8 VDV
- IGV 9 VDV
- IGV 10 VDV 1; 2; 3; 4; 5
- IGV 11 VDV
- Maximum and Minimum volumetric airflow according to PDS
- Rise to Surge (9.2 psig)

Revision			
No.	Date	Description	Prep	Check	App
0	Apr-28 2023	ISSUED	MD	AI	GB



Project name	**Taunton**
Project No.	**22.0989**

Performance Test Report

Doc. No.: 22.0992 -71_05

COMPRESSOR TEST REPORT

Compressor type:	GTB-T20 XY
Project number:	22.0989
Serial numbers:	22.0992
Project/ Plant name:	Taunton
Country:	USA
Test type:	Performance test – Total energy balance Ref. ISO 5389:2005
Date:	April-22 2023

NexiTurbo TECHNOLOGIES

PERFORMANCE TEST

1. Compressor design

The following data refer to a centrifugal compressor type machine; single stage with integrated speed increasing gearbox.

1.1 Compressor design

Ambient pressure (p_0):	14.7 psi(a)
Discharge pressure ($p_{2,a}$):	23.4 psi(a)
Maximum inlet air temperature (t_1):	95 °F
Inlet air relative maximum humidity (rH):	50 %
Air flow (acfm):	4500 (ref. 14.7 psi – 95 °F – 50% RH)
Isentropic head (Btu/lb):	19.552 (ref. 14.7 psi – 95 °F – 50% RH)

1.2 Compressor extended performance data table (PDT)

Inlet pressure	Outlet pressure	Airflow turndown	Temperature T0 xx°F - xx% RH		Temperature T0 xx°F - xx% RH		Temperature T0 xx°F - xx% RH		Temperature T0 xx°F - xx% RH	
			V0	P	V0	P	V0	P	V0	P
(psia)	(psia)	(%)	(acfm)	(HP)	(acfm)	(HP)	(acfm)	(HP)	(acfm)	(HP)
14.7	23.4	100	4500	188.4	-	-	-	-	-	-
14.7	23.4	80	-	-	3166	138.8	-	-	-	-
14.7	23.4	60	-	-	-	-	2177	107.2	-	-
14.7	23.4	40	-	-	-	-	-	-	1712	83.3

Performance test total heat balance ref. ISO 5389

Tolerances:

Airflow:	±0%
Discharge pressure:	±0%
Energy consumption:	±4%

2. Test Setup

2.1 Object of guarantee

The following outputs of the machine are specified:

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Discharge Volume flow	$V_{2,s}$	4500	3166	2177	1712	acfm
Discharge pressure	$P_{2,s}$	23.4	23.4	23.4	23.4	psi(a)
Power at coupling	$P_{shaft,s}$	188.4	138.8	107.2	83.3	HP

Under the following specified conditions:

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Ambient pressure	P_0	14.7	14.7	14.7	14.7	psi(a)
Inlet air temperature	$T_{1,s}$	95	40	0	75	°F
Relative humidity	$RH_{,s}$	50	50	20	50	%
Filter pressure loss	dp_{filter}	0.15	0.15	0.15	0.15	psi(g)

The garantuee with reference to ISO5389 (heat balance) with the following tolerances:

Tolerances:
Airflow: ±0%
Discharge pressure: ±0%
Energy consumption: ±4%

2.2 General setup data

Discharge pipe utilized:	DN 200
Pipe diameter	8.248 [inch]
Orifice diameter	5.515 [inch]
Test metric	imperial

2.3 Standard references

The test is conduct with follow references:

- ISO 5389:2005 – *Turbocompressors – Performance Test Code*
- EN ISO 5167-1 : 2003 - *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full -Part 1: General principles and requirements*
- EN ISO 5167-2 : 2003 - *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 2: Orifice plates*

2.4 Instruments

The working instruments used for the test are as follows:

Internal Code	Description	Number Certificate	Calibration due date
NTT0051	Inlet Relative Humidity Main	22DWY00-0385	11/04/24
NTT0049	Inlet Temperature Main T0-1	220711	22/07/23
NTT0050	Inlet Temperature Main T0-2	220712	22/07/23
NTT0072	Inlet Temperature Main T0-3	220713	22/07/23
NTT0073	Inlet Temperature Main T0-4	220714	22/07/23
NTT0091	Inlet Water Temperature Tw1 Main	220715	22/07/23
NTT0092	Outlet Water Temperature Tw2 Main	220716	22/07/23
NTT0090	Volute Temperature Main	220722	22/07/23
NTT0052	Differential Pressure Filter Losses Main	8613/22	19/09/24
NTT0043	Absolute Pressure 200-P OR1	RE-SP-110913-2022	09/11/23
NTT0054	Absolute Pressure 200-P OR2	RE-SP-110915-2022	09/11/23
NTT0044	Absolute Pressure 200-P2-1	RE-SP-110915-2022	09/11/23

NTT0045	Absolute Pressure 200-P2-2	RE-SP-110916-2022	09/11/23
NTT0059	Absolute Pressure 200-P2-3	RE-SP-110917-2022	09/11/23
NTT0056	Absolute Pressure 200-P2-4	RE-SP-110918-2022	09/11/23
NTT0042	Differential Pressure 200-DP OR1	RE-SP110923-2022	09/11/23
NTT0053	Differential Pressure 200-DP OR2	RE-SP-110913-2022	09/11/23
NTT0048	Orifice Temperature T-OR-200	220732	22/07/23
NTT0046	Outlet Temperature 200 T2-1	220727	22/07/23
NTT0047	Outlet Temperature 200 T2-2	220728	22/07/23
NTT0070	Outlet Temperature 200 T2-3	220729	22/07/23
NTT0071	Outlet Temperature 200 T2-4	220730	22/07/23

3. Test results calculated from test-data

3.1 Test conditions readings

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Ambient pressure	$P_{0,t}$	14.2616	14.2616	14.2572	14.2572	psi(a)
Pressure loss filter	$dp_{filter,t}$	0.0160	0.0087	0.0058	0.0044	psi(g)
Relative humidity	$RH_{,t}$	51.4	44.8	44.6	44.8	%
Inlet temperature	$T_{1,t}$	67.694	71.87	72.248	72.284	°F

3.2 Test data readings

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Discharge pressure	$P_{2,t}$	23.2060	22.1509	21.4765	22.9994	psi(a)
Pressure at orifice	$P_{orifice}$	22.8579	21.9442	21.3641	22.9305	psi(a)
Delta pressure orifice	$dp_{orifice}$	2.7721	1.3767	0.6631	0.3774	psi(g)
Temperature orifice	$T_{orifice}$	162.21	162.43	163.80	171.19	°F

3.3 Test Result Calculations

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Inlet pressure	$P_{1,t}$	14.2442	14.2529	14.2514	14.2529	psi(a)
Inlet temperature	$T_{1,Kelvin,t}$	292.98	295.3	295.51	295.53	K
Univ. Gas Constant	R_{univ}	1545.35	1545.35	1545.35	1545.35	lbf*ft/(lbmol*°R)
Mole weight air	M_{air}	28.97	28.97	28.97	28.97	lb/lbmol
Mole weight water	M_{water}	18.015	18.015	18.015	18.015	lb/lbmol
Actual Mole weight	$M_{gas,t}$	28.84	28.84	28.84	28.83	lb/lbmol
Spec. Gas Constant	$R_{gas,t}$	53.584	53.584	53.584	53.602	lbf*ft/(lbmol*°R)
Air density	$rho_{1,t}$	0.0726	0.0720	0.0720	0.0720	lb/ft^3
Isentropic head	$His_{,t}$	19.444	17.433	16.057	18.853	btu/lb
Discharge Airflow	$V_{,t}$	4492.6	3189.5	2209.5	1726.3	acfm
Euler Power	$P_{euler,t}$	184.39	122.30	87.70	76.57	HP

4. Test results converted to specified condition

4.1 Specified conditions

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Ambient pressure	$P_{0,s}$	14.7	14.7	14.7	14.7	psi(a)
Pressure loss filter	$dp_{filter,s}$	0.15	0.15	0.15	0.15	psi(a)
Inlet pressure	$P_{1,s}$	14.55	14.55	14.55	14.55	psi(a)
Relative humidity	$RH_{,s}$	50	50	20	50	%
Inlet temperature	$T1_{,s}$	95	40	0	75	°F
Univ. Gas Constant	R_{univ}	1545.35	1545.35	1545.35	1545.35	lbf*ft/(lbmol*°R)
Mole weight air	M_{air}	28.97	28.97	28.97	28.97	lb/lbmol
Mole weight water	M_{water}	18.015	18.015	18.015	18.015	lb/lbmol
Actual Mole weight	$M_{gas,s}$	28.66	28.92	28.96	28.81	lb/lbmol
Spec. Gas Constant	$R_{gas,s}$	53.920	53.435	53.361	53.639	btu/lb/°F
Air density	$rho1_{,s}$	0.0701	0.0785	0.0854	0.0731	lb/ft^3

4.2 Correction of test data to specified conditions

	SYMBOL	NUMERICAL VALUE				UNIT
Test points		**P1**	**P2**	**P3**	**P4**	
Inlet temperature	$T_{1,Kelvin,s}$	308.15	277.59	255.37	297.04	K
Saturated pressure	$p_{sat,s}$	0.8151	0.1218	0.0566	0.4293	psi
His	$His_{,s}$	19.552	17.454	16.036	18.752	btu/lb
Discharge pressure	$P_{2,s}$	23.4	23.4	23.4	23.4	psi(a)
Discharge airflow	$V_{2,s}$	4500	3166	2177	1712	acfm
Euler Power	$P_{euler,\ corr}$	179.29	132.36	102.45	76.71	HP
Mechanical losses	P_{mech}	7.23	6.81	6.66	6.52	HP
Power at coupling	$P_{shaft,\ corr}$	186.55	139.18	109.05	83.21	HP

4.3 Compliance comparison

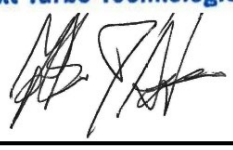
	SYMBOL	NUMERICAL VALUE				TOTAL
Test points		**P1**	**P2**	**P3**	**P4**	
Shaft Power, test	$P_{shaft,\ corr}$	186.55	139.18	109.05	83.21	518.00
Shaft Power,spec.	$P_{shaft,s}$	188.4	138.8	107.2	83.3	517.70
Evaluated Factor	EF	0.10	0.40	0.40	0.10	1.00
Factored Power, test	$P_{shaft,\ eval}$	**18.65**	**55.67**	**43.62**	**8.32**	**126.27**
Factored Power, spec.	$P_{shaft,s\ eval}$	18.84	55.52	42.88	8.33	125.57
Tolerance	%	±4%	±4%	±4%	±4%	±4%
Max. allowed Factored Power, specified	$P_{shaft,\ eval\ tol}$	**19.59**	**57.74**	**44.60**	**8.66**	**130.59**
Compliance	-	☑	☑	☑	☑	TEST PASSED

Result: The shaft power sum of the tested points is within the specified tolerances: The test is passed. Shaft power is determined by establishing a total energy balance for the compressor, by adding all the losses to the energy input to the compressed gas (Reference: ISO 5389-2.5.9 c).

This performance test has been conducted on April-22 2023

Inarzo, Varese Italy.

Next Turbo Technologies SpA



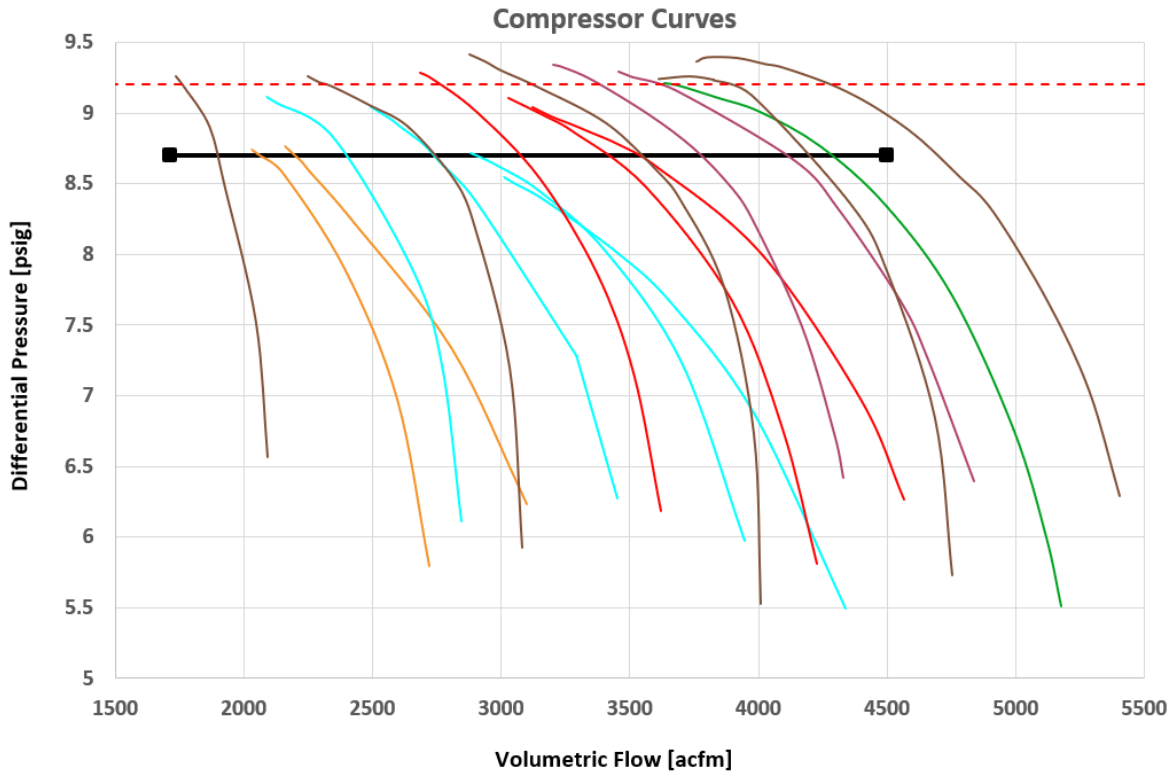
Test Engineer

6. Compressor performance curve

Performance curve result of the compressor based on the test readings, corrected for the following garantuee conditions.

Barometric pressure	P_0	**14.7**	[psi]
Pressure loss over filter	dp filter	**0.15**	[psig]
Discharge pressure	P_2	**23.4**	[psi]
Inlet temperature	T_1	**95**	[°F]
Inlet Relative humidity	RH	**50**	[%]

Performance curve graph:



Legend:

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- IGV 8 VDV
- IGV 9 VDV
- IGV 10 VDV 1; 2; 3; 4; 5
- IGV 11 VDV
- Maximum and Minimum volumetric airflow according to PDS
- Rise to Surge (9.2 psig)