Hart Engineering Corporation

SUBMITTAL:
11300-02

PROJECT: 9900. - Veolia/Taunton WWTF Phase 1 Improvements **DATE: 05/03/2022**

SUBMITTAL: 11300-02 - Peristaltic Metering Pump O&M Manual
REVISION: 0
STATUS: Eng
SPEC #: 11300

TO:
Michael Andrus
Beta Group Inc.
6 Blackstone Place
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FROM:
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Item	Revision	Description	Status	Date Sent	Date Returned
11300-02	0	Peristaltic Metering Pump O&M Manual	Eng	05/03/2022	
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: 05/03/2022

BARTLETT & BRILLON, LLC

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Walpole, MA
(508) 668-1337
www.bartlettbrillon.com
info@bartlettbrillon.com

MANUFACTURER'S REPRESENTATIVES

Table of Contents

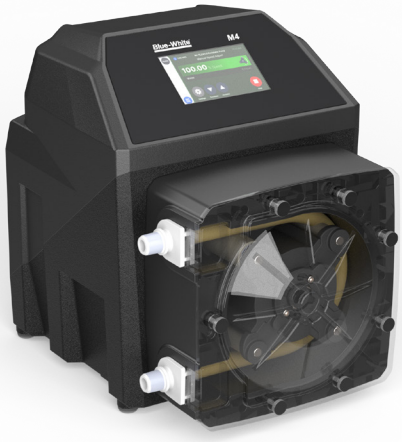
Numbers in parentheses are the beginning of the manual for that piece of equipment.

M-424-MNL for Sodium Hypochlorite

Blue-White®

M4

FLEXFLO® Peristaltic Metering Pump



Video link:

Features

> 5” touchscreen color LCD display
> User-friendly configurations
> Self priming peristaltic metering pump delivers smooth chemical feed
> Tube Failure Detection (TFD) system senses tube failure
> Inputs include: 4-20mA, Pulse Inputs, EtherNet/IP, Modbus TCP/IP, Profibus, Remote Start/Stop
> Revolution count display & user programmable alarm

NSF Certified to NSF / ANSI Standard 61 | c ETL us | CE | NEMA 4X

Highlights

Flow range
.0028 -158.5 GPH
.0108 - 600 LPH

Pressures
125 PSI
(8.6 bar)

Turndown ratio
10,000 : 1

Exclusive
Tube Failure Detection (TFD)

Motor
Brushless DC Motor

Warranty
5 Years

Control Methods

Control Methods	Manual Control	4-20mA Input	Remote Start/Stop	Pulse Input	Frequency Input	Ethernet/ IP	Modbus TCP/IP	Profibus	Alarm Outputs
M4	•	•	•	•	•	•	•	•	•

For more help and information regarding **M4**, please visit www.blue-white.com or scan this QR code.

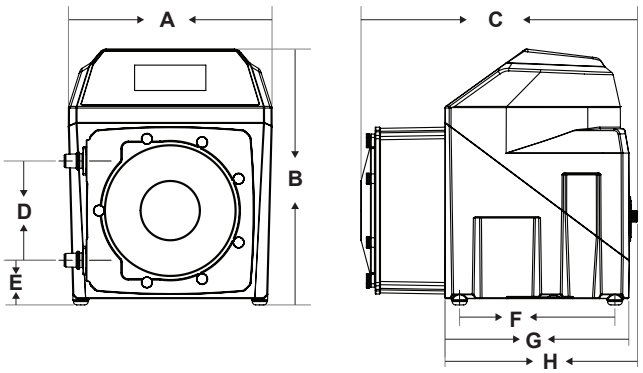
Engineering Specifications

Maximum Working Pressure (excluding pump tubes)	125 psig (8.6 bar)
	NOTE: See individual pump tube assembly max. pressure ratings.
Maximum Fluid Temperature (excluding pump tubes)	185 °F (85 °C)
	NOTE: See individual pump tube assembly max. temperature ratings.
Maximum Viscosity	12,000 Centipoise
Maximum Suction Lift	30 ft. Water, 0 psig (9.14 m, 0 bar)
Ambient Operating Temperature	14 °F to 115 °F (-10 °C to 46 °C)
Ambient Storage Temperature	-40 °F to 158 °F (-40 °C to 70 °C)
Operating Voltage	115VAC/60Hz, 1ph (2.0 Amp Maximum)
	230VAC/60Hz, 1ph (1.0 Amp Maximum)
	220VAC/50Hz, 1ph (1.0 Amp Maximum)
	240VAC/50Hz, 1ph (1.0 Amp Maximum)
	230VAC/50Hz, 1ph (2.0 Amp Maximum)
Power Cord Options	115V60Hz = NEMA 5/15 (USA)
	230V60Hz = NEMA 6/15 (USA)
	220V50Hz = CEE 7/VII (EU)
	240V50Hz = AS 3112 (Australia/New Zealand)
	230V50Hz = BS 1363/A (UK)
Motor	Brushless DC, 1/4 H.P.
Motor Speed Adjustment Range	10,000:1 (0.01% - 100% motor speed) Max RPM = 125
Motor Speed Adjustment Resolution	0.1% increments > 1% motor speed and < 100%
	0.01% increments < 1% motor speed
Display	5” touchscreen color LCD, UV resistant.
Display Languages	English, Spanish, French, German, and Portuguese selectable
Maximum Overall Dimensions	12-1/8”W x 15-1/4”H x 16-1/2”D (30.8W x 38.8H x 41.9D cm)
Product Weight	45.5 lb. (20.64 Kg)
Security	Programmable 6-digit password
Approximate Shipping Weight	50 lb. (22.68 Kg)
Enclosure	NEMA 4X (IP66), Polyester powder coated aluminum & Noryl
RoHS Compliant	Yes
Standards	cETLus, CE, NSF61

Dimensions

Dim	Inch	cm
A	12.1”	30.8
B	15.3”	38.8
C	16.5”	41.9
D	5.9”	15.0

Dim	Inch	cm
E	2.7”	6.8
F	9.3”	23.5
G	11.0”	27.8
H	11.5”	29.2



Materials of Construction

Non-wetted Components:
Pump Head: Valox® (PBT) thermoplastic
Pump Head Cover: Polycarbonate
Permanently lubricated sealed motor shaft support ball bearing
Cover Screws: Stainless steel
Roller Assembly:
Rotor: Valox® (PBT)
Rollers: Nylon
Roller Bearings: SS Ball bearings
Motor Shaft: Chrome plated steel
TFD System Sensor: Hastelloy C-276
Power Cord: 3 conductor, SJTW-A water-resistant
Tube Installation Tool: GF nylon
Mounting Brackets and Hardware: 316 Stainless steel

Wetted Components:
Pump Tube Assembly:
Tubing: Flex-A-Prene®, Flex-A-Chem® or Flex-A-Thane®
Adapter Fittings: PVDF

Output Specifications

Feed Rate			Max Speed	Max Pressure	Max Temperature	Tube Material / Size
GPH	LPH	mL/Min	RPM	PSI (bar)	°F (°C)	
Flex-A-Prene® M4 Tube Pumps						
.0028 - 28.5	.0108 - 108	.180 - 1800	125	125 (8.6)	185 (85)	NH
.0044 - 44.4	.0168 - 168	.280 - 2800	125	100 (6.9)	185 (85)	NJ
.0054 - 54.4	.0204 - 204	3400 - 3400	125	65 (4.5)	185 (85)	NHHL
.0050 - 50.7	.0192 - 192	.320 - 3200	125	80 (5.5)	185 (85)	NK
.0054 - 54.0	.0204 - 204	.340 - 3400	125	100 (6.9)	185 (85)	NHH
.010 - 100.0	.0378 - 378	.630 - 6300	125	50 (3.4)	185 (85)	NL
.015 - 158.5	.0600 - 600	1.00 - 10000	125	30 (2.1)	185 (85)	NP**
Flex-A-Chem® M4 Tube Pumps						
.0054 - 54.00	.0204 - 204	.3400 - 3400	125	30 (2.1)	130 (54)	TK
.0126 - 126.0	.0477 - 477.0	.800 - 8000	125	30 (2.1)	130 (54)	TKK
Flex-A-Thane® M4 Tube Pumps						
.0039 - 39.6	.0150 - 150	.250 - 2500	125	65 (4.5)	130 (54)	GH
.0055 - 55.5	.0210 - 210	.350 - 3500	125	65 (4.5)	130 (54)	GK
.010 - 100.0	.0378 - 378	.630 - 6300	125	65 (4.5)	130 (54)	GKK

Model Number Matrix

FLEXFLO® Model Number

M4	FLEXFLO® Peristaltic metering pump

Power Cord (operating voltage user selectable 115V/240 VAC 50/60Hz)

4	115V / 60Hz, power cord NEMA 5/15 plug (US)	**8**	240V / 50Hz, power cord AS 3112 plug (AU/New Zealand)
5	230V / 60Hz, power cord NEMA 6/15 plug (US)	**9**	230V / 50Hz, power cord BS 1363/A plug (UK)
6	220V / 50Hz, power cord CEE 7/VII plug (EU)	**X**	No Power Cord

Inlet/Outlet Connection Size, Connection Type, Connection Material

M	1/2” Male NPT Fitting, Natural PVDF (Kynar)	**Q**	Quick Disconnect, Natural PVDF (Kynar), available for all tubes (valves sold seperately)
B	1/2” Hose Barb, Natural PVDF (Kynar) available for all tubes	**MB**	1/2” Male BSPT Fitting, Natural PVDF (Kynar)
C	1/2” - 3/4” Tri-clamp connections, Natural PVDF (Kynar), available for all tubes		

Pump Tube Material, Pump Tube Size, Output Range

NH	Flex-A-Prene® .250 ID	**NKL**	Flex-A-Prene® .375 ID	**GK**	Flex-A-Thane® .375 ID
NHH	Flex-A-Prene® .250 ID (dual tube)	**NL**	Flex-A-Prene® .500 ID	**GKK**	Flex-A-Thane® .375 ID (dual tube)
NHHL	Flex-A-Thane® .250 ID (dual tube)	**NP**	Flex-A-Prene® .750 ID	**TH**	Flex-A-Chem® .250 ID
NHL	Flex-A-Prene® .250 ID	**GH**	Flex-A-Thane® .312 ID	**TK**	Flex-A-Chem® .375 ID
NJ	Flex-A-Prene® .312 ID	**GHH**	Flex-A-Thane® .312 ID (dual tube)	**TKK**	Flex-A-Chem® .375 ID (dual tube)
NK	Flex-A-Prene® .375 ID				

Options (leave this blank for standard model with left facing pump head inlet/outlet)

R	Right facing pump head, input / output (Left facing fluid input / output is standard)
D	Down facing pump head, input / output (Left facing fluid input / output is standard)

M4	**S**	**2**	**4**	**-**	**M**	**NH**	**R**	**Sample Model Number**

Accessories

NOTE: For use with the Quick Disconnect Tube Assembly. Kits sold separately.

KIT-MVM
M-TUBE FITTINGS KIT

1/2” HOSE BARB

*KIT-QBV FKM O-RINGS /
*KIT-QBE EP O-RINGS

1/2” M/NPT

*KIT-QMV FKM O-RINGS /
*KIT-QME EP O-RINGS

CABLE-UAC
USB A-C CABLE

NOTE: Accessories sold separately.

KIT-M12
TWO M12 CABLES

*KIT-M12-3 THREE M12 CABLES

KIT-DP3
One 3ft Profibus Cable

5300 Business Drive, Huntington Beach, CA 92649
TEL 714-893-8529 | FAX 714-894-9492 | www.blue-white.com | sales@blue-white.com

Blue-White®

Operating Manual

FLEXFLO®

Peristaltic Metering Pump

Series M4

READ THE ENTIRE OPERATING MANUAL PRIOR TO INSTALLATION AND USE.


+1 (714) 893 - 8529


sales@blue-white.com


customerservice@blue-white.com


5300 Business Drive
Huntington Beach, CA 92649

Congratulations on purchasing the M4 FLEXFLO® variable speed Peristaltic Metering Pump.

Your FLEXFLO® M4 pump is pre-configured for the tubing that shipped with your metering pump. The tubing assembly has an Identification number printed for easy re-order.

Please Note: Your new pump has been pressure tested at the factory with clean water before shipping. You may notice trace amounts of clean water in the pre-installed tube assembly. This is part of our stringent quality assurance program at Blue-White Industries.

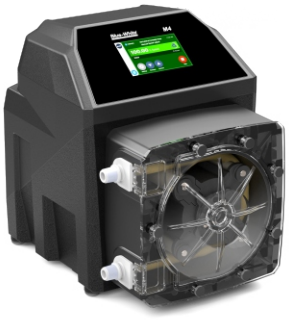
For more information please visit us at: ww.blue-white.com

For videos and tutorials please visit as at:
https://www.blue-white.com/resources/videos

1.1 What's In The Box

The following items are included with every M4 peristaltic metering pump:

M4 Peristaltic Pump
With 6ft (1.8m) power cord



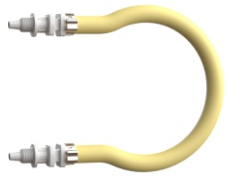
USB Flash Drive With Instruction Manual

Standard Mounting Brackets

Extended Mounting Brackets

Tube Installation Tool

Spare Tubing



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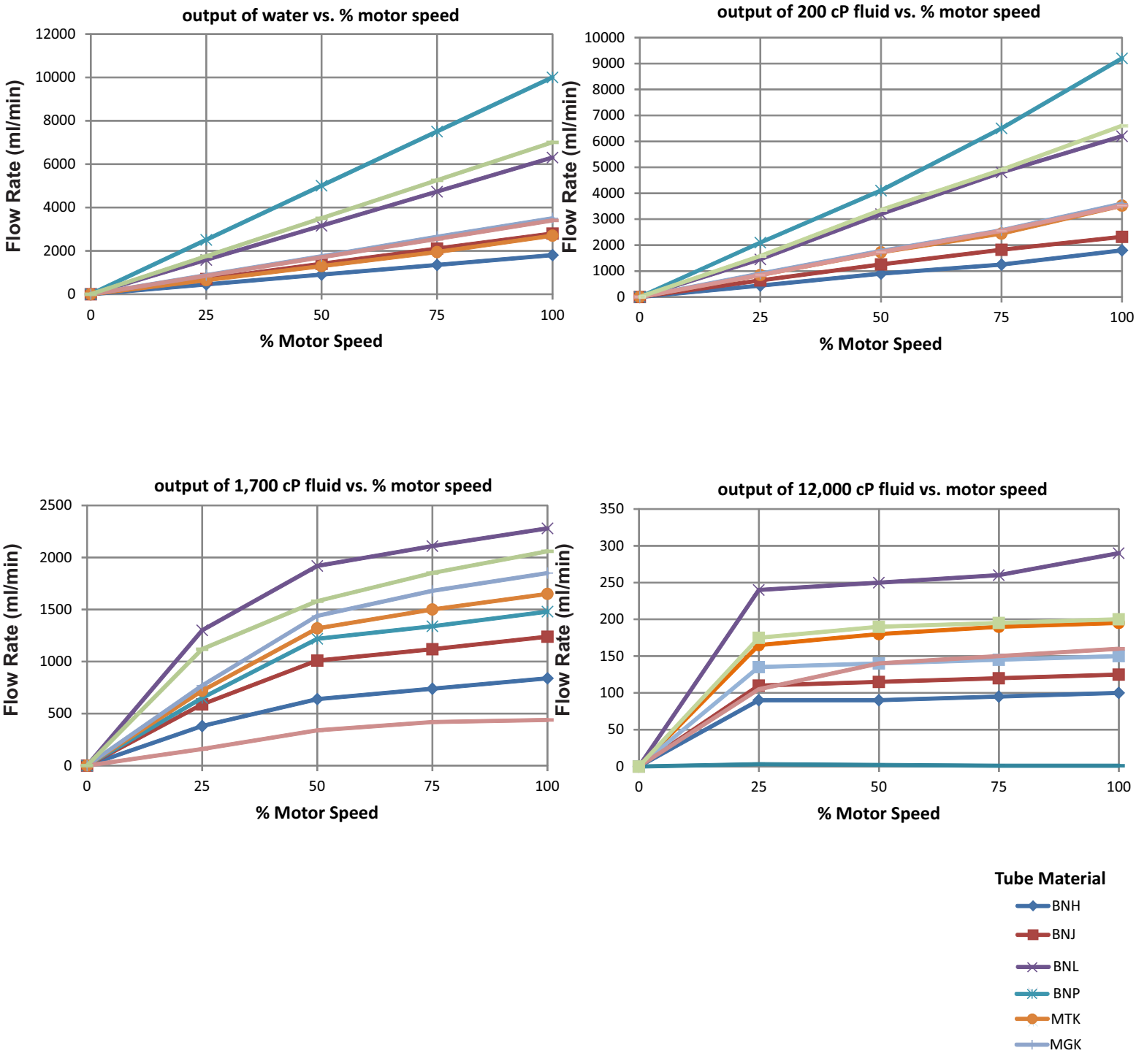
Motor Speed Adjustment Range	10,000:1 (0.01% - 100% motor speed) Max RPM = 125
Motor Speed Adjustment Resolution	0.1% increments > 1% motor speed and < 100%
	0.01% increments < 1% motor speed
Display	5” touchscreen color LCD, UV resistant.
Display Languages	English, Spanish, French, German, and Portuguese selectable
Maximum Overall Dimensions	12-1/8”W x 15-1/4”H x 16-1/2”D (30.8W x 38.8H x 41.9D cm)
Product Weight	45.5 lb. (20.64 Kg)
Security	Programmable 6-digit password
Approximate Shipping Weight	50 lb. (22.68 Kg)
Enclosure	NEMA 4X (IP66), Polyester powder coated aluminum & Noryl
RoHS Compliant	Yes
Standards	cETLus, CE, NSF61

2.1 OUTPUT VERSUS FLUID VISCOSITY

Fluid viscosity and motor RPM both have an effect on fluid output. For your reference the charts below display the various tubes we offer and their output at different viscosities and different motor RPM. All testing was conducted with a three foot suction lift.



3.1 Non-Wetted Components

Enclosure: 413 Aluminum (Polyester powder coated) & Noryl

Pump Head: Valox® (PBT) thermoplastic

Pump Head Cover: Polycarbonate

Permanently lubricated sealed motor shaft support ball bearing.

Cover Screws: Stainless steel, polypropylene cap

Roller Assembly:

Rotor: Valox® (PBT)

Rollers: Nylon

Roller Bearings: SS Ball bearings

Motor Shaft: Chrome plated steel

TFD System Sensor: Hastelloy C-276

Power Cord: 3 conductor, SJTW-A water-resistant

Tube Installation Tool: GF nylon

Mounting Brackets and Hardware: 316 Stainless steel

3.2 Wetted Components

Pump Tube Assembly:

Tubing: Flex-A-Prene®, Flex-A-Chem® or Flex-A-Thane®

Adapter Fittings: PVDF

4.1 Agency Listings

This pump is ETL listed to conforms to the following: UL Standard 778 as a motor operated water pump. CSA Standard C22.2 as process control equipment

This pump complies to the Machinery Directive 2006/42/EC, BS, EN 60204-1, Low Voltage Directive 2014/35/EU BS EN 61010-1, EMC Directive 2014/30/EU, BS EN 50081-1/BS EN 50082-1.

This pump is certified to NSF/ANSI Standard 61- Drinking Water System Components - Health Effects

Symbol	Description
	Warning (Risk of electric shock)
	Caution (Refer to the user's guide)
	Ground, Protective Conductor Terminal

ENCLOSURE RATING

NEMA 4X Constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, and hose-directed water; and that will be undamaged by external formation of ice on enclosure.

IP66 No ingress of dust; complete protection against contact. Water projected in powerful jets against enclosure from any direction shall have no harmful effects.

CAUTION The pump should be serviced by qualified persons only. If equipment is used in a manner not specified in this manual, the protection provided by the equipment may be impaired.

CAUTION Risk of chemical overdose. Be certain pump does not overdose chemical during backwash and periods of no flow in circulation system.

CAUTION Always wear protective clothing, face shield, safety glasses and gloves when working on or near your metering pump. Additional precautions should be taken depending on solution being pumped. Refer to MSDS precautions from your solution supplier.

CAUTION All diagrams are strictly for guideline purposes only. Always consult an expert before installing metering pump on specialized systems. Metering pump should be serviced by qualified persons only.

CAUTION Be sure that installation does not constitute a cross connection with drinking water supply. Check your local plumbing codes.

CAUTION The pump should be supplied by an isolating transformer or RCD (operating current less or equal 30 mA).

5.1 Mounting Location

1. Choose an area located near the chemical supply tank, chemical injection point, and electrical supply. Also, choose an area where the pump can be easily serviced.

2. Finding a secure surface and using the provided mounting hardware, mount the pump close to the injection point. Keep the inlet (suction) and outlet (discharge) tubing as short as possible. Longer discharge tubing increases back pressure at pump head.

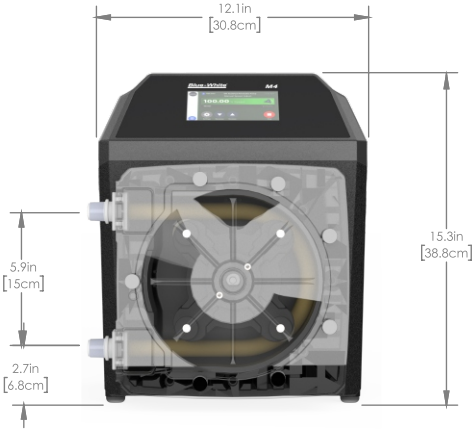
NOTE: Mounting the pump lower than the chemical container will gravity-feed chemical into it. This “flooded suction” installation will reduce output error due to increased suction lift. A shut-off valve, pinch-clamp, or other means to halt gravity-feed to the pump must be installed during servicing.

NOTE: Install a back flow prevention check valve at the discharge side of the pump to prevent the system fluid from flowing back through pump during tube replacement or during tube rupture.

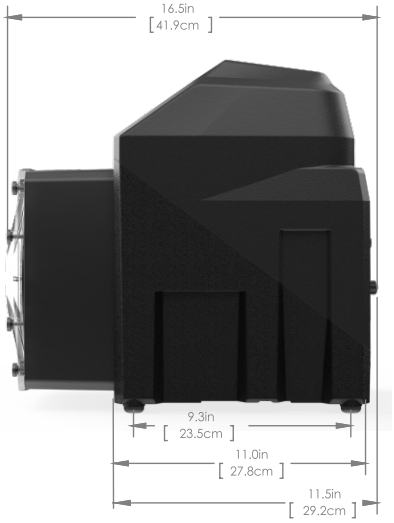
NOTE: It is recommended to have a pressure relief valve at the discharge side of the of pump to prevent premature wear and damage to the pump tube, in the event that the discharge line becomes blocked.

NOTE: The pump does not require back pressure. Keep the discharge pressure as low as possible to maximize the tube life.

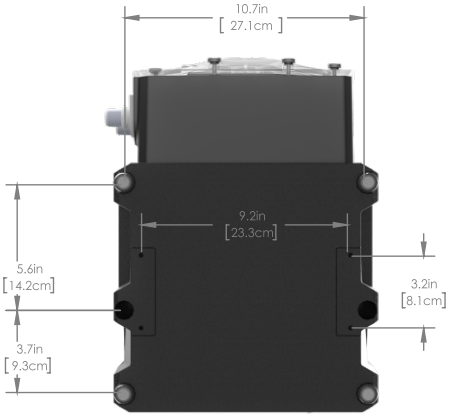
5.2 Pump Dimensions



Front View

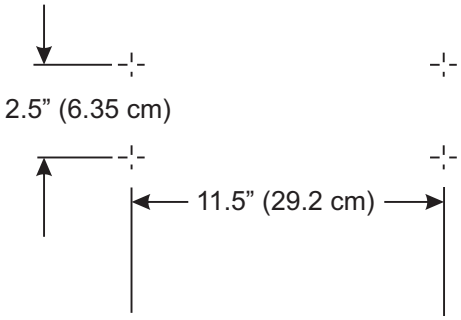


Side View



Bottom View

Mounting Hole Spacings
(for standard and extended type brackets)



Maximum bolt hole size
0.200” diameter (4 places)

Extended Brackets

Stainless Steel extended brackets allow the pump to be securely mounted to most any surface; floor, shelf, or skid. Brackets lift the pump up 4-1/2 inches (11.43 cm), for easy pump access in hard to reach areas.

- Raise metering pump 4-1/2 inches (11.43 cm) off ground or a surface.
- Made out of tough Stainless Steel.
- Provides a stable mounting surface.

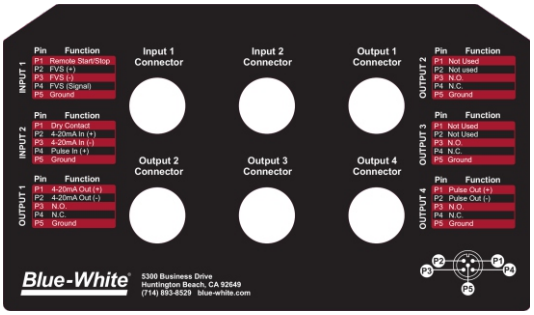
5.3 Input Power Connections

WARNING 	Risk of electric shock – cord connected models are supplied with a grounding conductor and grounding-type attachment plug. To reduce risk of electric shock, be certain that it is connected only to a properly grounded, grounding-type receptacle.
WARNING 	Electrical connections and grounding (earthing) must conform to local wiring codes.
WARNING 	Risk of electric shock - Disconnect electricity before removing the wiring compartment cover.

- Be certain to connect pump to proper supply voltage. Using incorrect voltage will damage pump and may result in injury. Voltage requirement is printed on pump serial label.
- Input power range is 96VAC to 264VAC 50/60 Hz.
- Voltage Selection is automatically detected and adjusted by power supply. No mechanical switch necessary.
- Use voltage your power cord is rated for.
- Power cord models are supplied with a ground wire conductor and a grounding type attachment plug (power cord). To reduce risk of electric shock, be certain that power cord is connected only to a properly grounded, grounding type receptacle.
- Be sure all M12 wiring cable glands are properly installed and sealed.
- Never strap control (input / output) cables and power cables together.
- **Power Interruption:** This pump has a user programmable auto-restart feature which will can either restore the pump to the operating state it was in when power was lost or require a user action to restart.

Note: *When in doubt regarding your electrical installation, contact a licensed electrician.*

5.4 Wiring Terminals and I/O Schematics



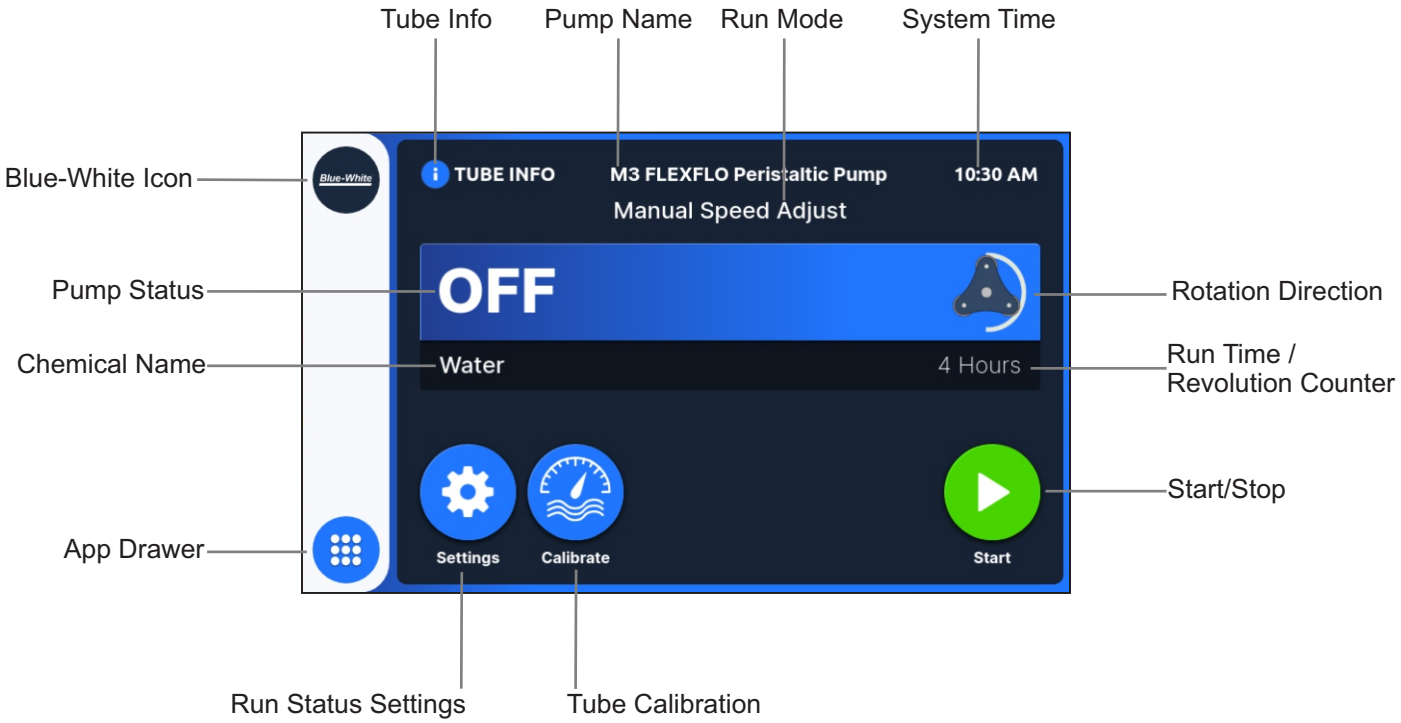
WARNING

Risk of electric shock - All wiring must be insulated and rated 300V minimum.

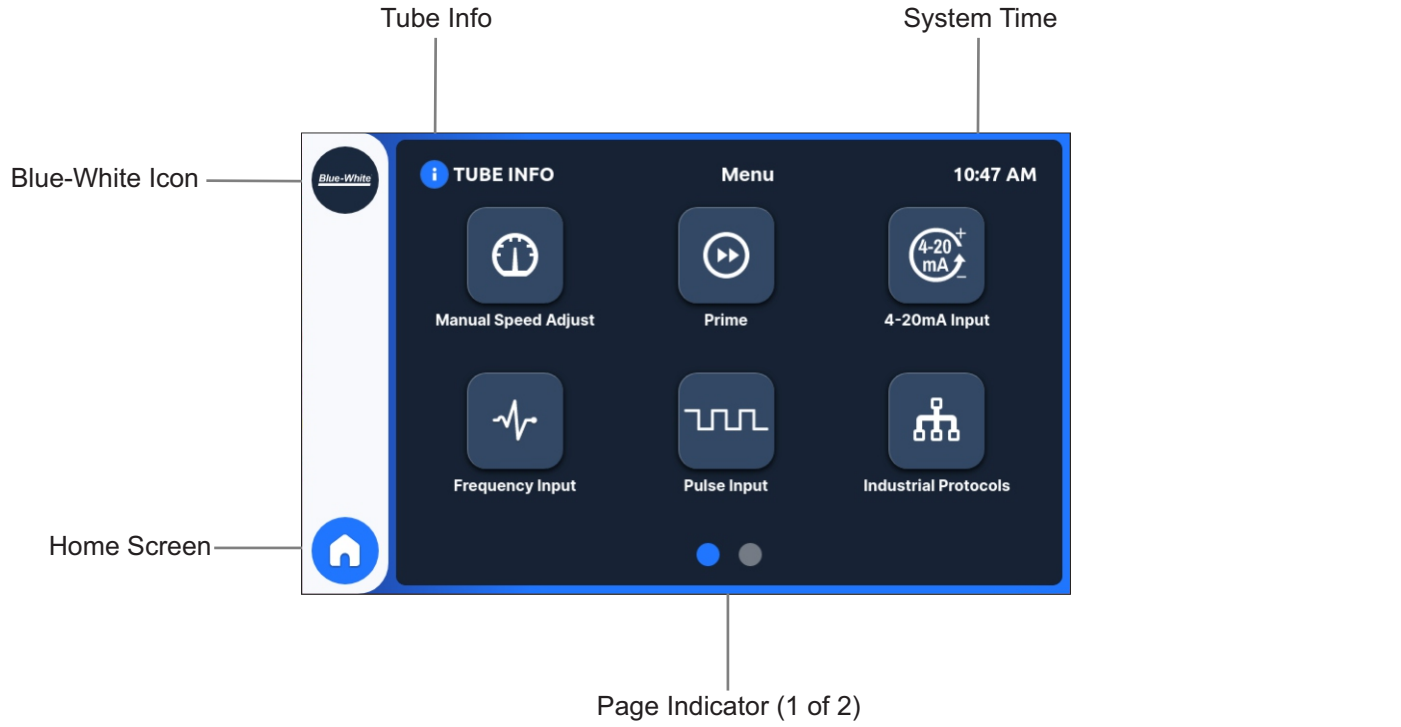
Shielded cables should be used on all input signal wires.

FUNCTION	M12 Connector	PIN #	RATING	BLOCK DIAGRAM
INPUT: 4-20 mA	INPUT #2	2	(+) POSITIVE	(+) ACTIVE 4-20mA TRANSMITTER SOURCE (-) (OPTIONAL PUMP #2) Single or dual pump (series) input. Loop voltage must not exceed 24 Volts.
		3	(-) NEGATIVE	
INPUT: FREQUENCY, AC SINE WAVE, TTL, CMOS	INPUT #2	4	(+) POSITIVE	(-) FREQUENCY TRANSMITTER SOURCE (+)
		5	(-) NEGATIVE	
INPUT: FVS SYSTEM (FLOW VERIFICATION SENSOR) FV SENSOR ONLY	INPUT #1	2	(+) POSITIVE	RED (+) BARE BLACK (-) BLUE-WHITE FVS SENSOR
		3	(-) NEGATIVE	
		4	SIGNAL	
INPUT: FVS SYSTEM (FLOW VERIFICATION SENSOR) FS or FP MICRO-FLO FLOWMETER ONLY	INPUT #1	2	(+) POSITIVE	SIGNAL BLACK (-) BLUE-WHITE MICRO-FLO FLOWMETER PULSE OUTPUT
		3	(-) NEGATIVE	
		4	SIGNAL	
INPUT: REMOTE START/STOP DRY CONTACT C PRIMARY	INPUT #1	1	(+) POSITIVE	(+) OPEN CIRCUIT IMPEDANCE MUST BE GREATER THAN (-) 50K OHM
		5	(-) NEGATIVE	
INPUT: AUTO-PRIME/ DRY CONTACT C SECONDARY	INPUT #2	1	(+) POSITIVE	(+) OPEN CIRCUIT IMPEDANCE MUST BE GREATER THAN (-) 50K OHM
		5	(-) NEGATIVE	
OUTPUT: 4-20 mA	OUTPUT #1	1	(+) POSITIVE	(-) 4-20mA RECEIVER 600 OHM LOAD MAX. (+)
		2	(-) NEGATIVE	
OUTPUT: FREQUENCY- OPEN COLLECTOR	OUTPUT #4	1	(+) POSITIVE	(-) (+) DIGITAL PULSE RECEIVER CIRCUIT 1.5K OHM EXTERNAL SOURCE 6-30V DC
		2	(-) NEGATIVE	
OUTPUT: CONTACT CLOSURE #1	OUTPUT #1	3	NORMALLY OPEN	NO C NC SWITCH LOAD 1 AMP MAX @ 125V AC 0.8 AMP MAX @ 30V DC
		4	NORMALLY CLOSED	
		5	COMMON (GROUND)	
OUTPUT: CONTACT CLOSURE #2	OUTPUT #3	3	NORMALLY OPEN	NO C NC SWITCH LOAD 1 AMP MAX @ 125V AC 0.8 AMP MAX @ 30V DC
		4	NORMALLY CLOSED	
		5	COMMON (GROUND)	
OUTPUT: CONTACT CLOSURE #3	OUTPUT #4	3	NORMALLY OPEN	NO C NC SWITCH LOAD 1 AMP MAX @ 125V AC 0.8 AMP MAX @ 30V DC
		4	NORMALLY CLOSED	
		5	COMMON (GROUND)	
OUTPUT: RELAY 6 AMP	OUTPUT #2	3	NORMALLY OPEN	NO C NC SWITCH LOAD 6 AMP MAX @ 250V AC 5 AMP MAX @ 30V DC
		4	NORMALLY CLOSED	
		5	COMMON (GROUND)	

6.1 HOME SCREEN LAYOUT

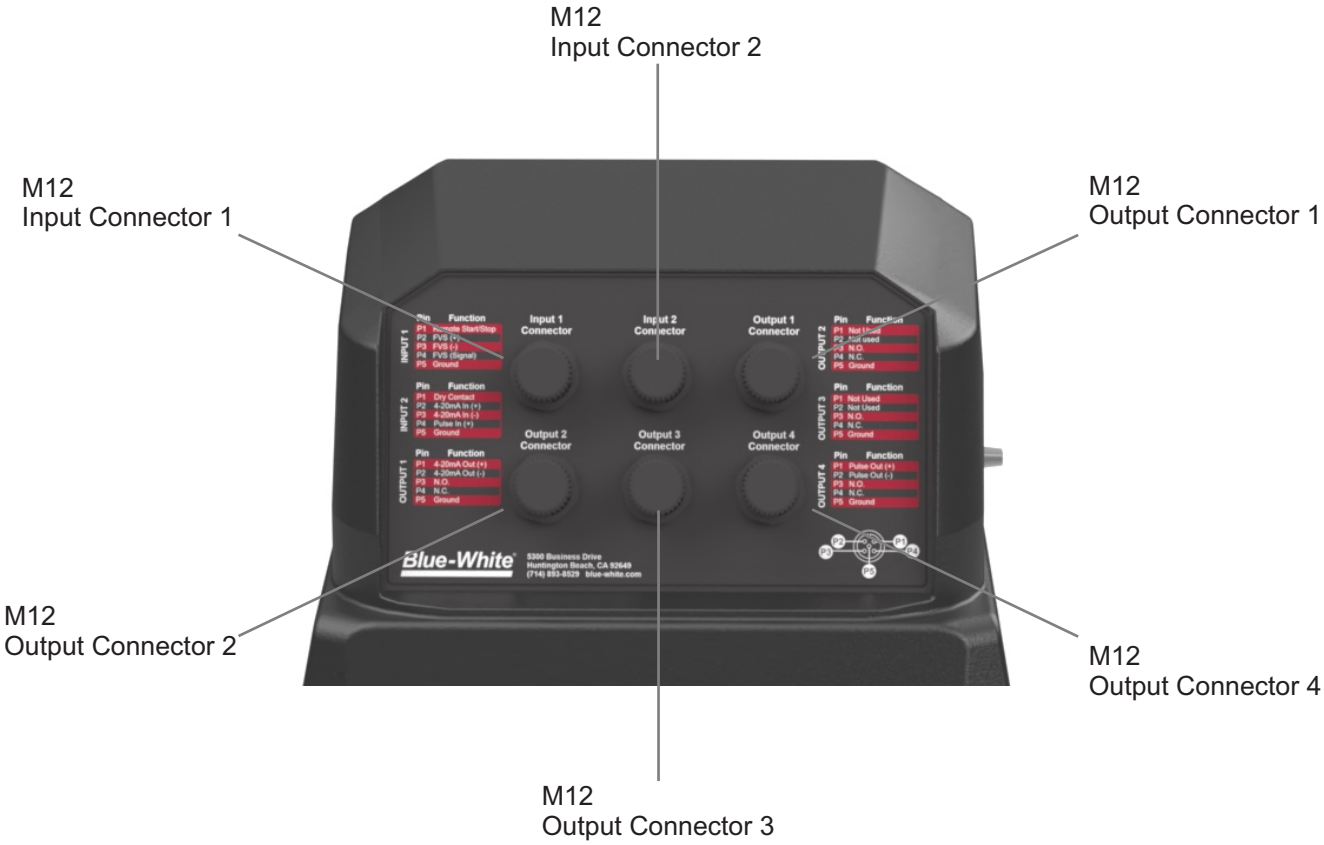


6.2 APP SCREEN LAYOUT



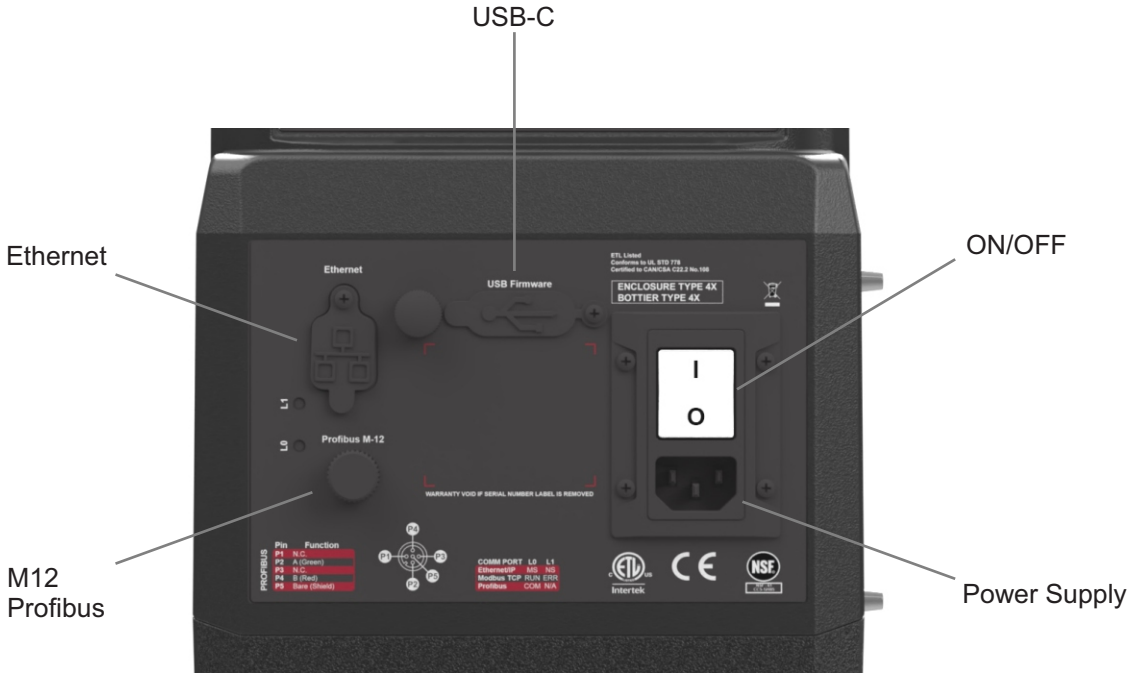
6.3 M12 Connector

Pump (Rear Upper Panel)

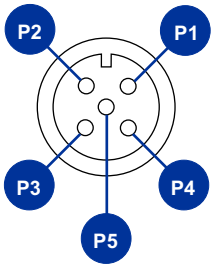


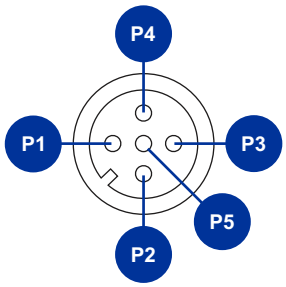
6.4 IO Connection

Pump (Rear Lower Panel)



6.5 M12 Connector





M12 Input/Output Connector

M12 Profibus Connector

M12 Input Connector 1

PIN	Function	Specifications	Reference
P1	Remote Start/Stop	No Voltage	
P2	FVS (+)	15 VDC @ 60 mA Supply	Power FVS Sensor
P3	FVS (-)	DC GND (0 VDC)	FVS Ground Input
P4	FVS (Signal)	Input Signal	FVS Input Signal
P5	Ground	DC Ground	0 VDC

M12 Input Connector 2

PIN	Function	Specifications	Reference
P1	Dry Contact	N.O. Dry Contact Closure	Open= Stop Gnd= Run
P2	4-20mA In (+)	120Ω Impedance Loop Ref. to Ground	
P3	4-20mA In (-)	DC GND (0 VDC)	
P4	Pulse In (+)	0-1000 Hz (AC. Square Wave) Ref. to Ground	
P5	Ground	DC GND (0 VDC)	

M12 Output Connector 1

PIN	Function	Specifications	Reference
P1	4-20mA Out (+)		250Ohm max load
P2	4-20mA Out (-)	DC GND (0 VDC)	
P3	N.O.	Relay Out, N.O. Contact 1 Amp @ 125 VAC	.8 Amp Max @ 30VDC 1 Amp @ 125 VAC
P4	N.C.	Relay Out, N.C. Contact	.8 Amp Max @ 30VDC 1 Amp @ 125 VAC
P5	Ground	Relay Out, COM Contact	

PIN	Function	Specifications	Reference
P1	Not Used		
P2	Not Used		
P3	N.O.	Relay Out, N.O. Contact	6 Amp Max @ 250VAC, 5 Amp MAX @ 30VDC
P4	N.C.	Relay Out, N.C. Contact	6 Amp Max @ 250VAC, 5 Amp MAX @ 30VDC
P5	Ground	Relay Out, COM Contact	

M12 Output Connector 3

PIN	Function	Specifications	Reference
P1	Not Used		
P2	Not Used		
P3	N.O.	Relay Out, N.O. Contact	.8 Amp Max @ 30VDC 1 Amp @ 125 VAC
P4	N.C.	Relay Out, N.C. Contact	.8 Amp Max @ 30VDC 1 Amp @ 125 VAC
P5	Ground	Relay Out, COM Contact	

M12 Output Connector 4

PIN	Function	Specifications	Reference
P1	Pulse Out (+)	0-1000 Hz (AC. Square Wave) Ref. to Ground	
P2	Pulse Out (-)	DC GND (0 VDC)	
P3	N.O.	Relay Out, N.O. Contact	.8 Amp Max @ 30VDC 1 Amp @ 125 VAC
P4	N.C.	Relay Out, N.C. Contact	.8 Amp Max @ 30VDC 1 Amp @ 125 VAC
P5	Ground	Relay Out, COM Contact	

M12 Profibus Connector

PIN	Function	Specifications	Reference
P1	VP		+5V supply for terminating resisters
P2	RxD/TxD-N		Data line minus (A-line)
P3	DGND		Data ground
P4	RxD/TxD-P		Data line plus (B-line)
P5	Shield		Ground connection

Note:

M12 connectors not included with product.

Input/Output Connectors requires any A-Type M12 connector with 5 position female sockets

Profibus Connectors requires any B-Type M12 connector with 5 position female sockets

If the pump is the last bus device connected to the PROFIBUS cable it must be terminated using terminating resistor (PROFIBUS standard EN 50170).

7.1 Powering On The Pump

The M4 is equipped with a rocker switch to power ON/OFF the pump. Ensure that the power cord is securely plugged into the corresponding power source before powering on the pump.

"I" is pressed to turn on the pump

"O" is pressed to turn off the pump

7.2 Welcome Screen

The first time the pump is powered on, or after a factory reset, the pump will boot up to the Welcome Screen. Follow the onscreen instructions to configure your M4 pump. Refer to section 11 of this manual to change any of these options after you have finished the initial configuration.

Welcome Screen Configuration

1
Local Language

2
Set Time
- Local Date
- Local Time Zone
- Local Time

3
Set Name
- Pump Name
- Chemical Name

4
Set Units
- Unit of Volume
- Unit of Time

5
Set Tube Type

6
Set User Password

8.1 Manual Speed Adjust

This input mode allows the user to set a specific speed and the pump will run at that speed until stopped. There are up and down arrows on the home screen to incrementally adjust the speed of the motor.

Default: Percent motor speed.

Also Available: Percent motor speed
RPM
Flow rate

To Enable Manual Speed Adjust:

1 
Open the **App Drawer**

2 
Select **Manual Speed Adust**

3 
Select **Start** to enable Manual Speed

4 

Tap on the feed rate to cycle through to the option you want to manually adjust

- Percent motor speed
- RPM
- Flow rate

5 
Adjust manual speed by selecting **Increase** or **Decrease**

Option: Stop pump and select settings to input desired motor speed. 

Confirm by pressing “Save”

8.2 4-20mA Input

This input mode allows the user to set a range of mA input signals to a given motor speed, flow rate or rpm. Used to remotely control the pump with an incoming 4-20mA signal.

Four points on the slope must be defined:

1) a low mA value
2) an output rate at the low mA value
3) a high mA value
4) an output rate at the high mA value

Default settings: 4mA = 0% motor speed
20mA = 100% motor speed

To Enable 4-20mA Input:

1 
Open the **App Drawer**

2 
Select **4-20mA Input**

3 
Select **Settings** to adjust 4-20mA input values

4
Confirm by selecting **Save**

5 
Select **Start** to enable 4-20mA Input

Option: Stop the pump and select the graph icon to easily adjust sliders to desired settings

Confirm by pressing “Save” 

8.3 Frequency Input

This input mode is used to remotely control the pump with an incoming high speed frequency signal.

Four points on the slope must be defined:

1) a low Hz value
2) an output rate at the low Hz value
3) a high Hz value
4) an output rate at the high Hz value

Default settings: 0 (Hz) = 0% motor speed
1000 (Hz) = 100% motor speed

To Enable Frequency Input:

1 
Open the **App Drawer**

2 
Select **Frequency Input**

3 
Select **Settings** to adjust Frequency Input

6
Confirm by pressing **Save**

5 
Select **Start** to enable Frequency Input

Option: Stop pump and select graph icon to easily adjust sliders to desired settings 

Confirm by pressing “Save”

8.4 Pulse Input

This input mode allows the user to trigger the pump to dispense a measured amount of chemical (Amount Per Trigger) over a specific period of time (Pump On Time), after a specific number of pulses (Pulses Count Trigger). Used to remotely control the pump with an incoming pulse signal.

Default settings: Pulse Count Trigger = 1

Pump On Time = 2.5 seconds

Amount Per Trigger = Fluid supplied per trigger

To Enable Pulse Input:

1 

Open the **App Drawer**

2 

Select **Pulse Input**

3 

Select **Settings** to adjust Pulse Input

- Input value for Pulse Count Trigger
- Input value for Amount Per Trigger
- Input value for Pump On Time

4

Confirm by pressing **Save**

5 

Select **Start** to enable

6

Pump will be in **Standby Mode**

8.5 Remote Start/Stop

This input mode is used to remotely start and stop the pump using a close=stop or open=stop signal.

Primary Remote Switch - Used to Start/Stop the pump

Secondary Remote Switch - Used in conjunction with a pressure switch or level switch

Default settings: Disabled

Dry Contact Closure (no voltage required)

To Enable Remote Start/Stop:

1 

Open the **App Drawer**

2 

Select **Settings**

3 

Select **Remote Start/Stop**

4

Set **Remote Switch**

- Disable
- Normally Open (Closed to stop the pump)
- Normally Closed (Open to stop the pump)

5

Set **Secondary Remote Switch**

- Disable
- Enable

6

Confirm by pressing **Save** Pump will be in Standby Mode.

IMPORTANT: To begin operation, press the START button to place pump in STANDBY. The display background will turn yellow indicating the pump has been stopped remotely. When the pump is started by the remote contact, the display background will turn green.

IMPORTANT: If the Remote Start/Stop Input is enabled, the pump will display STANDBY if the pump has been stopped by the Remote Start/Stop. **Please use caution in this mode as the pump may Start at anytime. If you must perform maintenance to the pump, Press STOP button.**

8.6 Set FVS (Flow Verification System)

This input mode is used to monitor the pump fluid input. If the pump does not dispense fluid when pump head rotor is turning, the pump will go into an alarm mode and stop. FVS requires a sensor that is connected to the inlet of the pump to monitor the fluid input. Blue-White offers two flow verification sensors: The MS6 & The MICRO-FLO Flow Meter that easily install into the inlet of the M4.

Default settings: Disabled

When enabled set trigger display (in seconds)

To Enable FVS:

1 
Open the **App Drawer**

2 
Select **Settings**

3 

Select **FVS**

4
Enable **FVS Input**

5
Set **Desired Trigger Delay** (1-1000 seconds)

6
Confirm by pressing **Save**

8.7 Prime

This mode allows the user to prime the pump at 100% motor speed for sixty seconds. After the prime is complete the pump will remain in this mode ready to be primed again.

To exit: select another input method.

To Prime The Pump:

1 
Open the **App Drawer**

2 
Select **Prime**

3 
Select **Start** to Prime the pump

4
Pump will run at 100% motor speed for sixty seconds

5
Pump will remain in **Prime Input**

8.8 Auto-Prime

This mode will allow the user to prime the pump remotely using the dry contact. Both prime duration and percent motor speed is configurable.

Default settings: 60 Seconds at 100% Motor Speed

To Enable Auto-Prime:

1 
Open the **App Drawer**

2 
Select **Settings**

3 
Select **Auto-Prime**

4
Enable **Auto-Prime**

5
Input Values
- Prime duration (in seconds)
- Percent Motor Speed

6
Select **Save** to save the settings

8.9 Time of Day

This mode allows the user to run the pump at a specific motor speed for a specific length of time beginning at a specific time of day.

Three values to be defined:

1) Percent Motor Speed
2) Run time (in minutes)
3) Time of Day that the pump will turn on

To Enable Time of Day:

1 

Open the **App Drawer**

2 

Select **Time of Day**

3 

Select **Settings** to configure

4

Input Values

- Motor Speed (percentage)
- Run Time (in minutes)
- Time of Day

5

Select **Save** to save the settings

Verify the time on the pump is in synch with your local time zone

8.10 Revolution Alarm

This mode will allow the user to set an alert once a set number of revolutions has been reached. One of the primary factors effecting tube life is the number of revolutions the tube has operated. The M4 includes a roller revolution counter. A revolution alarm set point can be inputted which will alert the user when the tube should be serviced. When the set point is reached, the pump will display “Revolution Count Exceeded”
however **THE PUMP WILL NOT STOP**

Default settings: Amount will vary depending on tube that is installed

---

To Enable Revolution Alarm:

1 
Open the **App Drawer**

2 
Select **Settings**

3 
Select **Revolution Alarm**

4
Enable **Revolution Alarm**

5
Input Values
- Amount of Revolutions

6
Select **Save** to save the settings

9.1 Set 4-20mA Output

This output sends a configurable 4-20mA. This feature can be used to control other pumps (in sync / proportionally), data logging systems, and other external devices for plant automation.

Four points on the slope must be defined:

1) a low mA value
2) an output rate at the low mA value
3) a high mA value
4) an output rate at the high mA value

Default settings: 4mA = 0 percent motor speed
20mA = 100 percent motor speed

To Enable 4-20mA Output:

1 
Open the **App Drawer**

2 
Select **Outputs**

3 
Select **4-20mA Output**

4
Enable **4-20mA Output**

5
Set desired values for the four points that is required.

6
Confirm by pressing **Save**

Option: Stop the pump and select the graph icon to easily adjust sliders to desired settings

Confirm by pressing “Save” 

9.2 Frequency Output

This output sends a configurable high speed frequency signal. This feature can be used to control other pumps (in sync / proportionally), data logging systems, and other external devices for plant automation.

Four points on the slope must be defined:

1) a low Hz value
2) an output rate at the low Hz value
3) a high Hz value
4) an output rate at the high Hz value

Default settings: 0 Frequency (Hz) = 0 percent motor speed
1000 Frequency (Hz) = 100 percent motor speed

To Enable Frequency Output:

1 Open the **App Drawer**

2 Select **Outputs**

3 Select **Frequency Output**

4 Enable **Frequency Output**

5 Set **Desired Values**

6 Confirm by pressing **Save**

Option: Stop the pump and select the graph icon to easily adjust sliders to desired settings

Confirm by pressing “Save”

9.3 Relay & Contacts

This feature is used to assign alarms to relay & contact closures

Four values to be defined:
1) Contact #1
2) Contact #2
3) Contact #3
4) Relay Output

To Enable Relay & Contacts:

1 
Open the **App Drawer**

2 
Select **Outputs**

3 
Select **Relay & Contacts**

4
Set **Desired Values (refer to chart below)**
- Contact #1
- Contact #2
- Contact #3
- Relay Output

5
Confirm by pressing **Save**

Selection:	Contact energizes when:
Pump Run/Stop	Motor turning (roller assembly is rotating)
Monitor Input	Incoming analog or digital signal is not received or out of range
Monitor Output	Outgoing analog or digital signal not transmitted or out of range
Monitor Run/Fail	Motor fails to respond to commands
4-20 In Active	4-20mA mode is running
Frequency In Active	Frequency mode is running
Manual Speed Active	Manual Speed mode is running
Pulse In Active	Pulse In mode is running
Prime Active	Prime mode is running
FVS	After the programmed delay time pulses are not received from flow sensor.
TFD	Tube failure is detected by sensors in the head
Both TFD/FVS	Either TFD or FVS system triggers
Revolution Alarm	Revolution count set point has been achieved

10.1 Control and Status Mapping for Industrial Protocols

Output Data (PLC to Pump) - Pump Control

Offset	Name	Description
0 - 1	Motor Percent Speed	Up to 2 decimal places, with most significant Offset representing the whole number and least significant Offset representing the decimal number. (Eg. 50.15 => MSB = 50, LSB = 15)
2	Motor Direction	0 = Clockwise, 1 = Counter-clockwise.
3	Prime	Prime pump or run motor at 100% for 60 seconds. 0 = deactivate prime, 1 = activated prime.
4	Reset Alarms	Reset alarms (TFD, FVS) on the pump. 0 = nothing, 1 = reset alarms. Only reset on a 0 -> 1 transition
5	Reset Tube Stats	Reset tube revolutions counter and hours ran
6	Cyclic Counter Direction	Cyclic counter direction (debugging purpose only). 0 = count up, 1 = count down
7	Cyclic Counter Speed	Cyclic counter speed (debugging purpose only). 0 = counter not incremented/decremented. Values > 0 = number of cycles it takes to increment/decrement the counter by one

Input Data (Pump to PLC) - Pump Status

Offset	Name	Description
0	Prime Status	0 = Deactivated, 1 = Activated
1	Cover Status	0 = Cover Attached, 1 = Cover Detached
2	Motor Direction	0 = Clockwise, 1 = Counter-clockwise
3	TFD status	0 = No TFD alarm, 1 = TFD alarm
4	FVS status	0 = No FVS alarm, 1 = FVS alarm
5	Relay Output	Relay output statuses represented by each bit, where 0 = not triggered, and 1 = triggered. Bit 0 = Dry Contact 1, Bit 1 = Dry Contact 2, Bit 3 = Dry Contact 3, Bit 4 = Standard Relay
6 - 7	4-20 mA Output	Range: 400 - 2000 mA, where MSB represents the whole number and LSB represents the decimal number. Eg. 4.50 mA => Offset 6 = 4, Offset 7 = 50
8 - 9	Frequency Output	Range: 0 - 1000 Hz
10 - 11	Motor Percent Speed	Up to 2 decimal places, with most significant Offset representing the whole number and least significant Offset representing the decimal number. (Eg. 50.15 => MSB = 50, LSB = 15)
12 - 15	Firmware Version	Firmware version in semantic versioning format. Channel can be one of three values: 0 = stable, a(0x61) = alpha, b(0x62) = beta. Example: (1.0.5-beta => Offset 15: 1, Offset 14: 0, Offset 13: 5, Offset 12: b(0x62))
16 - 19	Tube Revolutions	Current tube revolution counter
20 - 23	Tube Hours	Number of hours ran for current tube
24 - 25	Cyclic Counter	Cyclic counter (debugging purpose only)

10.2 Control and Status Mapping for ModBus TCP

Holding Registers (PLC to Pump) - Pump Control

Modbus Data Address	Name	Description
0000 - 0001	Motor Percent Speed	Up to 2 decimal places, with most significant byte representing the whole number and least significant byte representing the decimal number. (Eg. 50.15 => MSB = 50, LSB = 15)
0002	Motor Direction	0x00 = Clockwise, 0x01 = Counter-clockwise.
0003	Prime	Prime pump or run motor at 100% for 60 seconds. 0x00 = deactivate prime, 0x01 = activated prime.
0004	Reset Alarms	Reset alarms (TFD, FVS) on the pump. 0x00 = nothing, 0x01 = reset alarms. Only reset on a 0 -> 1 transition
0005	Reset Tube Stats	Reset tube revolutions counter and hours ran
0006	Cyclic Counter Direction	Cyclic counter direction (debugging purpose only). 0 = count up, 1 = count down
0007	Cyclic Counter Speed	Cyclic counter speed (debugging purpose only). 0 = counter not incremented/decremented. Values > 0 = number of cycles it takes to increment/decrement the counter by one

Input Registers (Pump to PLC) - Pump Status

Modbus Data Address	Name	Description
0000	Prime Status	0 = Deactivated, 1 = Activated
0001	Cover Status	0 = Cover Attached, 1 = Cover Detached
0002	Motor Direction	0 = Clockwise, 1 = Counter-clockwise
0003	TFD status	0 = No TFD alarm, 1 = TFD alarm
0004	FVS status	0 = No FVS alarm, 1 = FVS alarm
0005	Relay Output	Relay output statuses represented by each bit, where 0 = not triggered, and 1 = triggered. Bit 0 = Dry Contact 1, Bit 1 = Dry Contact 2, Bit 3 = Dry Contact 3, Bit 4 = Standard Relay
0006 - 0007	4-20 mA Output	Range: 400 - 2000 mA, where MSB represents the whole number and LSB represents the decimal number. Eg. 4.50 mA => Byte 6 = 4, Byte 7 = 50
0008 - 0009	Frequency Output	Range: 0 - 1000 Hz
000A - 000B	Motor Percent Speed	Up to 2 decimal places, with most significant byte representing the whole number and least significant byte representing the decimal number. (Eg. 50.15 => MSB = 50, LSB = 15)
000C - 000F	Firmware Version	Firmware version in semantic versioning format. Channel can be one of three values: 0 = stable, a(0x61) = alpha, b(0x62) = beta. Example: (1.0.5-beta => Byte 15: 1, Byte 14: 0, Byte 13: 5, Byte 12: b(0x62))
0010 - 0013	Tube Revolutions	Current tube revolution counter
0014 - 0017	Tube Hours	Number of hours ran for current tube
0018 - 0019	Cyclic Counter	Cyclic counter (debugging purpose only)

10.3 EtherNet/IP

This is used to configure the EtherNet/IP

Four values to be defined:
1) IP Address
2) Subnet Mask
3) Gateway
4) Always On (Connection will remain active even when mode is inactive/OFF)

To Enable EtherNet/IP:

1 
Open the **App Drawer**

2 
Select **Industrial Protocols**

3 

Select **EtherNet/IP**

4
Pump will go to home screen

5 
Select **Settings** to input:

- IP Address
- Subnet Mask
- Gateway
- Always On

6
Confirm by pressing **Save**

10.4 Modbus TCP/IP

This is used to configure the Modbus TCP/IP

Three values to be defined:
1) IP Address
2) Subnet Mask
3) Gateway
4) Always On (Connection will remain active even when mode is inactive/OFF)

To Enable Modbus TCP:

1 
Open the **App Drawer**

2 
Select **Industrial Protocols**

3 

Select **Modbus TCP/IP**

4
Pump will go to home screen

5 
Select **Settings** to input:

- IP Address
- Subnet Mask
- Gateway
- Always On

6
Confirm by pressing **Save**

10.5 Profibus

This is used to configure the Profibus

Three values to be defined:
1) IP Address
2) Subnet Mask
3) Gateway
4) Always On (Connection will remain active even when mode is inactive/OFF)

To Enable Profibus:

1 Open the **App Drawer**

2 Select **Industrial Protocols**

3 Select **Profibus**

4 Pump will go to home screen

5 Select **Settings** to input:

- IP Address
- Subnet Mask
- Gateway
- Always On

6 Confirm by pressing **Save**

11.1 Tube Info

This feature will display information regarding the tubing within the pump including:

- Tube type
- Tube installation date
- Tube run time & revolutions
- Current maximum tube flow rate

To View The Tube Info:

1
Tap on the **Tube Info** text in the top portion of the screen

2
Tube info will be displayed

3
Click “reset” to reset the tube hours and revolutions

11.2 Tube Calibration

This feature allows the user to calibrate the pump's indicated flow rate to the system

To Calibrate Your Tube:

1
On the home screen select the **Calibration Icon**

2
Enter values:
- Pump Speed (RPM)
- Run Time (seconds)

3
Select **Start** to begin

4
Select **Start**

5
Enter the measured flow rate into the field

6
Confirm by selecting **Save**

12.1 Pump Name

This is to change the name of the pump that is displayed on the home screen.

To Input Pump Name:

1 
Open the **App Drawer**

2 
Open **Settings**

3 
Open **System**

4
Select “**Pump Name**”

5
Enter desired **Pump Name**

6
Confirm by pressing **OK**

12.2 Unit of Volume

This is to change the units of volume that is displayed.

To Input Units of Volume:

1 
Open the **App Drawer**

2 
Open **Settings**

3 
Open **System**

4
Select **Unit of Volume**

5
Select desired **Units of Volume**
- Milliliters
- Ounces
- Liters
- Gallons

6
Confirm by pressing **OK**

12.3 Unit of Time

This will change the Unit of Time that is displayed for the flow rate

---

To Input Unit of Time:

1 
Open the **App Drawer**

2 
Open **Settings**

3 
Open **System**

4
Select **Unit of Time**

5
Select **Desired Time**
- Minutes (mL & ounces only)
- Hours
- Days (Gallons only)

6
Confirm by pressing **OK**

12.4 Chemical Name

This is used to change the Chemical Name that is displayed on the home screen.

To Input a Chemical Name:

1 
Open the **App Drawer**

2 
Open **Settings**

3 
Open **System**

4
Select “**Chemical Name**”

5
Enter desired **Chemical Name**

6
Confirm by pressing **OK**

12.5 Set Language

This setting is used to change the system language.

To Input a Language:

1 
Open the **App Drawer**

2 
Open **Settings**

3 
Open **System**

4
Select **Locale**

5
Select **Desired Language**
- English
- Deutch
- Español
- Français
- Portugues

6
Confirm by pressing **OK**

12.6 Pump Rotation Direction

This setting is used to change the rotational direction of pump. In most applications, the tube will fail by developing a small leak in the outlet side (pressure side) of the tube assembly. By reversing the roller rotation, the wear point in the tube is moved to the opposite side to the pump tube assembly, increasing the life of the tube.

Important! Changing the rotational direction of the pump reverses the inlet & outlet sides.

To Change The Direction Of The Pump Rotation

1 Open the **App Drawer**

2 Open **Settings**

3 Open **System**

4 Select **Pump Direction**

5 Select **Desired Rotation**

- Clockwise
- Counter Clockwise

6 Confirm by pressing **OK**

Disconnect power from the pump. Carefully purge any pressure in the discharge line of the pump. Disconnect the suction end tubing/piping and the discharge end tubing/piping from the pump head tubing.

IMPORTANT! Swap sides of the suction (inlet) and discharge (outlet) tubing/piping. There is no need to remove the pump head cover.

NOTE: The pump tube will form a natural U-shaped curve. Do not attempt to install the pump tube against the natural U-shape direction as damage to the tube can result.

12.7 System Time

This setting is used to change the local time that is displayed.

To Input The System Time:

1 

Select the **Time** in the upper right hand corner

2

Select **Desired Hour**

3

Select **Desired Minute**

4

Select **AM or PM**

5

Confirm by pressing **OK**

12.8 Passcode

This setting is used to enable/disable the passcode, adjust the passcode time out and set or change the User Passcode.

Default settings: Pump will lockout after 30 seconds

To Input a Passcode:

1 
Open the **App Drawer**

2 
Open **Settings**

3
Open **Passcode**

4
Enable Passcode

5
Select **User Passcode** and create new a six digit code.

6
Confirm by pressing **Save**

12.9 Factory Reset

This setting is used to factory reset the pump. This will erase all of the configurations and restore the pump to it's original configuration when it left Blue-White factory.

To Conduct A Factory Reset:

1 
Open the **App Drawer**

2 
Open **Settings**

3 
Open **System**

4
Select **Reset to Factory Defaults**

5
Confirm by pressing **Continue**

6
Pump will **Reboot** and run through the initial setup process

Lost password? Email customerservice@blue-white.com to have your password reset

13.1 SYSTEM INFORMATION

This is to view the System Information

Information to be displayed:

- Pump Name
- Chemical Name
- Firmware Version
- System Build
- Manufactured Data & Time
- Serial Number
- Model
- I/O Port Firmware Version
- Motor Firmware Version
- Industrial Protocol Firmware Version
- Lifetime Run Hours & Revolutions

To View The System Information:

1 
Open the **App Drawer**

2 
Select **System Information**

13.2 Firmware Update

To update the firmware for your pump you first need to download and install Blue-Central® which is available at:

https://www.blue-white.com/resources/

To Update The System Firmware:

1

Plug pump into a computer via USB and open Blue-Central® program

2

Select firmware tab and select “Start Upgrade”

3

The firmware upgrade box will appear showing the progress of the install.

4

Once the install is complete select “Close” to exit screen.

CAUTION

Always wear protective clothing, face shield, safety glasses and gloves when working on or near your metering pump. Additional precautions should be taken depending on solution being pumped. Refer to MSDS precautions from your solution supplier.

14.1 Routine Inspection and Maintenance

The pump requires very little maintenance. However, the pump and all accessories should be checked weekly. This is especially important when pumping aggressive chemicals. Inspect all components for signs of leaking, swelling, cracking, discoloration or corrosion. Replace worn or damaged components immediately.

Cracking, crazing, discoloration and the like during first week of operation are signs of severe chemical attack. If this occurs, immediately remove chemical from pump. Determine which parts are being attacked and replace them with parts that have been manufactured using more suitable materials.

14.2 How to Clean and Lubricate the Pump

When changing the pump tube assembly, the pump head chamber, roller assembly and pump head cover should be wiped free of any dirt and debris.

100% silicon lubrication may be used on the roller assembly. Refer to **www.blue-white.com/resources/videos** for roller assembly maintenance video instructions.

Periodically clean the back flow prevention check valve assembly, especially when injecting fluids that calcify such as sodium hypochlorite. These lime deposits and other build ups can clog the fitting, increasing the back pressure at the pump (reducing tube life) and interfering with check valve operation.

The motor does not require maintenance or lubrication.

14.3 Removing Pump Head and Tubing

The pump requires very little maintenance. However, the pump and all accessories should be checked weekly. This is especially important when pumping aggressive chemicals.

Remove the **Pump Head Cover** by unscrewing the four **Thumb Screws.** Pull out the **Pump Head Cover.**

The pump will detect that the **Pump Head Cover** is removed and enter MAINTENANCE MODE.

Rotor will rotate at a maximum of 6 RPM for your safety.

Pull out the suction side of **Tubing Assembly**.

Press the START button. While the rotor is rotating, pull out the old **Tube Assembly**.

TIP! Let the pump do the work for you. Just guide the tubing out between the two rollers located on the **Rotor**.

Press the STOP button at any time to stop the pump.

Pull out the suction line adapter from the Pump Head. Pull out the **Tubing Assembly** as the **Rotor** rotates around.

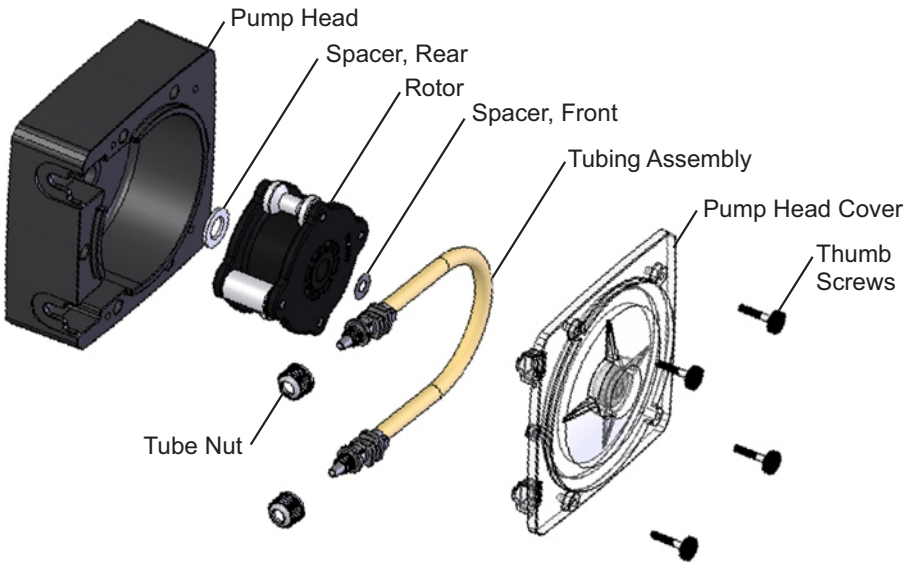
Stop the pump by pressing the STOP button.

Thoroughly clean the **Pump Head** and **Rotor**. The **Rotor** can be removed by pulling it straight out. After the cleaning process, push the **Rotor** back on the shaft. See the drawing above for proper assembly. Be sure the front and rear rotor spacers are in place. IMPORTANT! **Rotor** direction; the word “FRONT” on **Rotor** must face the front of the pump.

Locate your new tubing and Tube Installation Tool. See the next page to install new **Tube Assembly** into **Pump Head**.

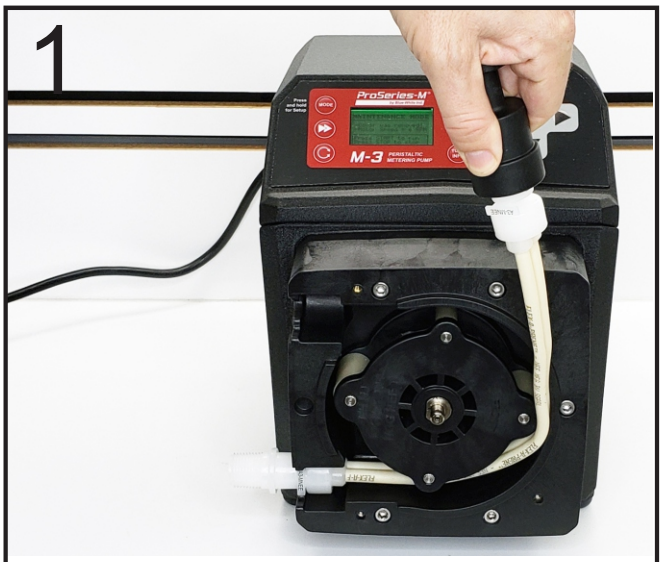
14.4 Pump Head Exploded View

Tube Installation Tool
90002-278

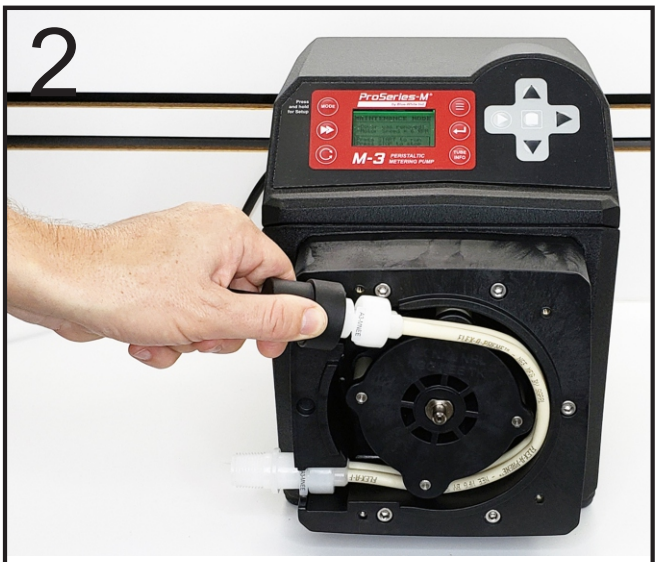


14.5 Tube Replacement

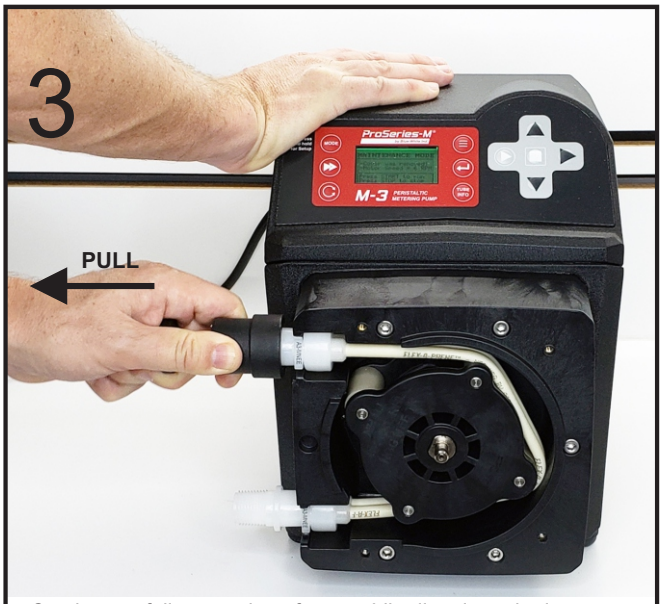
CAUTION ⚠	Prior to service, pump clean water through the pump and suction / discharge line to remove chemical.
CAUTION ⚠	Always wear protective clothing, face shield, safety glasses and gloves when working on or near your metering pump. Additional precautions should be taken depending on solution being pumped. Refer to MSDS precautions from your solution supplier.
CAUTION ⚠	Use provided Tube Installation Tool to leverage tubing into pump head, NOT YOUR FINGERS.
CAUTION ⚠	Use extreme caution when replacing pump tube. Be careful of your fingers and DO NOT place fingers near rollers.



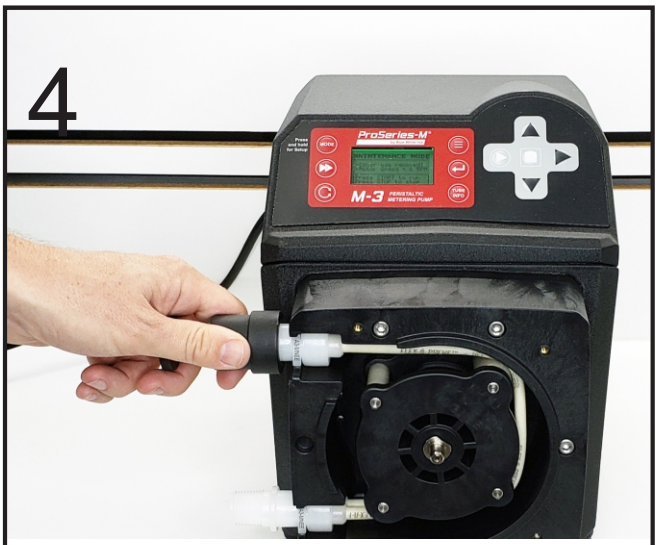
Insert suction fitting into pump head. Remove your fingers from pump head. Start pump by pressing START button. Grab hold of Tube Installation Tool and use it to leverage tubing into pump head.



Introduce tubing into pump head while the rotor is rotating. Avoid using fingers to guide the tubing. Stop pump at anytime by pressing STOP button. Start pump by pressing START button.



Continue to follow rotation of rotor while directing tube into pump head. At this point, you may need to pull Tube Installation Tool to stretch tubing into position. Let rotor spin a few rotations while pulling Installation tool so fitting can be properly installed.



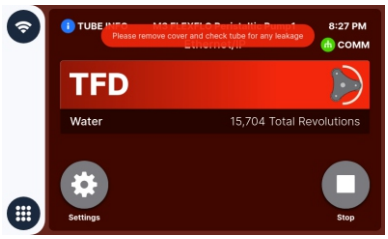
Continue to pull Tube Installation Tool to allow enough room to slide discharge fitting into pump head tongue and groove. Once discharge fitting is secured in pump head, stop pump by pressing STOP button. Replace pump head cover. Pump will ask you if the tube was replaced, select yes. Pump will then ask if you would like to reset REV counter, select yes. REV count will display for 5 seconds before resetting to zero.

14.6 TFD

This pump is equipped with a Tube Failure Detecting System which is designed to stop the pump and provide an output alarm (see Output menu) in the event pump the tube should rupture and chemical enters the pump head.

This patented system is capable of detecting the presence of a large number of chemicals including Sodium Hypochlorite (Chlorine), Hydrochloric (muriatic) Acid, Sodium Hydroxide, and many others. The system will not be triggered by water (rain, condensation, etc.) or silicone oil (roller and tubing lubricant).

If a TFD alarm occurs, the pump will stop and the screen will turn red with “TFD”



If TFD alarm occurs:

1 Remove the pump head cover, pump tube and roller assembly

2 Check for fluids at the bottom of the pump head

3 Carefully clean the chemical out of the pump head. Especially the sensor probes.

4 Replace the tubing

5 Reinstall only the pump head cover

6 Turn on the pump by pressing the START button

7 Reinstall the roller assembly and tubing.

8 Reinstall the pump head cover

9 Press the START button to clear the alarm condition

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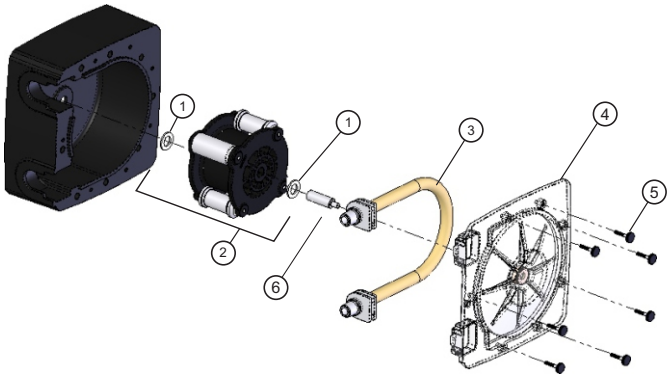
15.1 Replacement Parts

Pump Head Components

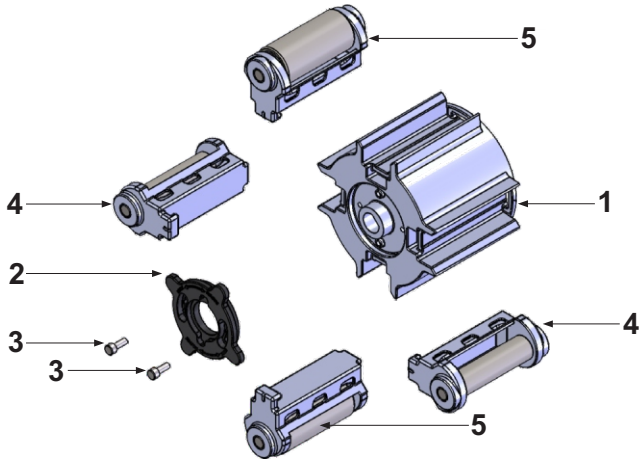
1	Spacer	90011-217	1
2	Complete Roller Assembly		1
	NL / NP	A4-MNL-R	
	TH / TK / TKL / THH	A4-MTH-R	
	NH / NK / NJ / NHH / NHL / NHHL	A4-MNH-R	
	NKL / NKKL	A4-MNKL-R	
	GH / GK / GKK	A4-MGH-R	
3	Tubing (Reference Tubing Matrix)		1
4	Pump Head Cover	A4-SXX-C	1
5	Thumb Screws	90011-183	8
6	Shaft Extension	90007-128	1



*Pump Head not for sale. For more information please contact a local sales representative.

Roller Assembly Component Parts

1	A4 ROTOR BODY	90002-716	1
2	SPIDER RING	76002-038	1
3	10-32 CAPTIVE SCREW	90011-267	2
4	ARM ROLLER GUIDE ASSY	71010-771	2
5*	ARM ROLLER A4 NL / NP ASSY	71010-766	2
5*	ARM ROLLER A4 TH / TK / TKL / THH ASSY	71010-767	2
5*	ARM ROLLER A4 NH / NK / NJ / NHH / NHL / NHHL ASSY	71010-768	2
5*	ARM ROLLER A4 NKL / NKKL ASSY	71010-769	2



Quick Disconnect Fittings (only available for Q tubes)

6	Quick Disconnect Fittings		1
	.50” M/NPT FKM	KIT-QMV	1
	.50” M/NPT EP	KIT-QME	1
	.50” Barb FKM	KIT-QBV	1
	.50” Barb EP	KIT-QBE	1

Miscellaneous Parts (Sold Separately)

A	Stainless Steel Mounting Bracket	72000-379	1
B	Stainless Steel Mounting Bracket (Extended)	72000-380	1
C	Rubber Feet	90003-561	1
D	Tube Installation Tool	90002-278	1


A


B


C


D

15.2 Tube Matrix

FLEXFLO® Model Number

A4 Tubing

Inlet/Outlet Connection Size, Connection Type, Connection Material

M	1/2” Male NPT Fitting, Natural PVDF (Kynar)
B	1/2” ID Tubing Barb Fitting, Natural PVDF (Kynar)
Q	Quick Disconnect, Natural PVDF (Kynar). NP flow rate reduced 16.5% with Quick Disconnect connections (Valves sold separately)
C	1/2” - 3/4” Tri-clamp connections, Natural PVDF (Kynar)
MB	1/2” Male BSPT Fitting, Natural PVDF (Kynar)

Pump Tube Material, Pump Tube Size

GH	Flex-A-Thane® .312 ID	**NKKL**	Flex-A-Prene® .500 ID (Dual Tube)
GHH	Flex-A-Thane® .312 ID (Dual Tube)	**NKL**	Flex-A-Prene® .375 ID (max PSI 30)
GK	Flex-A-Thane® .375 ID	**NL**	Flex-A-Prene® .500 ID
GKK	Flex-A-Thane® .375 ID (Dual Tube)	**NP**	Flex-A-Prene® .750 ID
NH	Flex-A-Prene® .250 ID	**TH**	Flex-A-Chem® .250 ID
NHL	Flex-A-Prene® .250 ID (max PSI 65)	**NHHL**	Flex-A-Prene® .250 ID (Dual Tube) (max PSI 65)
NHH	Flex-A-Prene® .250 ID (Dual Tube)	**TK**	Flex-A-Chem® .375 ID
NJ	Flex-A-Prene® .312 ID	**TKK**	Flex-A-Chem® .375 ID (Dual Tube)
NK	Flex-A-Prene® .375 ID		

A4 - M NL-T **Tube Sample Model Number**

Output Specifications

Tube Material / Size	Feed Rate			Max Speed	Max Pressure	Max Temperature
	GPH	LPH	mL/Min	RPM	PSI (bar)	°F (°C)
Flex-A-Thane® Tube						
GH	Up to 39.6	Up to 150	Up to 2500	125	65 (4.5)	130 (54)
GK	Up to 55.5	Up to 210	Up to 3500	125	65 (4.5)	130 (54)
GKK	Up to 100.0	Up to 378	Up to 6300	125	65 (4.5)	130 (54)
Flex-A-Prene® Tube						
NH	Up to 28.5	Up to 108	Up to 1800	125	125 (8.6)	185 (85)
NJ	Up to 44.4	Up to 168	Up to 2800	125	100 (6.9)	185 (85)
NHHL	Up to 54.4	Up to 204	Up to 3400	125	65 (4.5)	185 (85)
NK	Up to 50.7	Up to 192	Up to 3200	125	80 (5.5)	185 (85)
NHH	Up to 54.0	Up to 204	Up to 3400	125	100 (6.9)	185 (85)
NL	Up to 100.0	Up to 378	Up to 6300	125	50 (3.4)	185 (85)
NP**	Up to 158.5	Up to 600	Up to 10000	125	30 (2.1)	185 (85)
Flex-A-Chem® Tube						
TK	Up to 54.00	Up to 204	Up to 3400	125	30 (2.1)	130 (54)
TKK	Up to 126.0	Up to 477.0	Up to 8000	125	30 (2.1)	130 (54)

16.0 ACCESSORIES

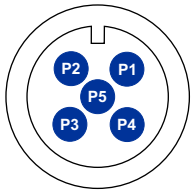
The following accessories are available for the M4 FLEXFLO® Peristaltic Metering Pump. Please visit Blue-white.com for more information. All accessories are sold separately.

KIT-M12
TWO M12 CABLES

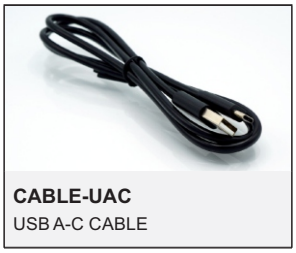
*KIT-M12-3 for 3 Cables

KIT-M12

Kit contains: Two M12 cables.

KIT-M12 WIRING INSTRUCTIONS		
DIAGRAM	PIN #	WIRE COLOR
	PIN 1	BROWN
	PIN 2	WHITE
	PIN 3	BLUE
	PIN 4	BLACK
	PIN 5	GRAY

NOTE: THIS DIAGRAM IS FOR THE PUMP'S M12 PORT



CABLE-UAC
USB A-C CABLE

CABLE-UAC

Kit contains: One 3' USB-A to USB-C cable.

KIT-PB3
One 3ft Profibus Cable

KIT-DP3

Kit contains: One 3' profibus cable.

KIT-QMV
.50" M/NPT QUICK CONNECT

*KIT-QME for EP O-rings

KIT-QMV

Kit contains: One Quick Connect Inlet with .50"M/NPT (assembled with FKM O-rings) and One Quick Connect Outlet with .50"M/NPT (assembled with FKM O-rings)

KIT-QBV
.50" BARB QUICK CONNECT

KIT-QBV

Kit contains: One Quick Connect Inlet with .50" hose barb connection (assembled with FKM O-rings), One Quick Connect Inlet with .50" hose barb connection (assembled with FKM O-rings) and two #5 Clamps.

KIT-MVM
M-TUBE FITTINGS KIT

KIT-MVM

Kit contains: One Tube Install Tool, One Foot Strainer, One injection valve

KIT-MTVB
B-TUBE FITTINGS KIT

KIT-MTVB

Kit contains: 10ft Suction Tube, 10ft Discharge tube, One Tube Install Tool, One Injector fitting, One Foot Strainer, and Two Stainless Steel Clamps #5

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17.0 WARRANTY

17.1 LIMITED WARRANTY

Your new FLEXFLO pump is a quality product and is warrantied for 60 months from date of purchase (proof of purchase is required). The pump will be repaired or replaced at our discretion. Failure must have occurred due to defect in material or workmanship and not as a result of operation of the product other than in normal operation as defined in the pump manual. Warranty status is determined by the pump's serial label and the sales invoice or receipt. The serial label must be on the pump and legible. The warranty status of the pump will be verified by Blue-White or a factory authorized service center.

Pump Head and roller assembly is warrantied against damage from chemical attack when proper TFD (Tube Failure Detection) system instructions and maintenance procedures are followed.

17.2 WHAT IS NOT COVERED

- Pump Tube Assemblies and rubber components – They are perishable and require periodic replacement.
- Pump removal, or re-installation, and any related labor charge.
- Freight to the factory, or service center.
- Pumps that have been tampered with, or in pieces.
- Damage to the pump that results from misuse, carelessness such as chemical spills on the enclosure, abuse, lack of maintenance, or alteration which is out of our control.
- Pumps damaged by faulty wiring, power surges or acts of nature.

17.3 PROCEDURE FOR IN WARRANTY REPAIR

Contact the factory to obtain a RMA (Return Material Authorization) number. Carefully pack the pump to be repaired. It is recommended to include foot strainer and injection/check valve fitting since these devices may be clogged and part of the problem. Please enclose a brief description of the problem as well as the original invoice or sales receipt, or copy showing the date of purchase. Prepay all shipping costs. COD shipments will not be accepted. Warranty service must be performed by the factory or an authorized service center. Damage caused by improper packaging is the responsibility of the sender. When In-Warranty repair or replacement is completed, the factory pays for return shipping to the dealer or customer.

17.4 PRODUCT USE WARNING

Blue-White products are manufactured to meet the highest quality standards in the industry. Each product instruction manual includes a description of the associated product warranty and provides the user with important safety information. Purchasers, installers, and operators of Blue-White products should take the time to inform themselves about the safe operation of these products. In addition, Customers are expected to do their own due diligence regarding which products and materials are best suited for their intended applications. Blue-White is pleased to assist in this effort but does not guarantee the suitability of any particular product for any specific application as Blue-White does not have the same degree of familiarity with the application that the customer/end user has. While Blue-White will honor all of its product warranties according to their terms and conditions, Blue-White shall only be obligated to repair or replace its defective parts or products in accordance with the associated product warranties. **BLUE-WHITE SHALL NOT BE LIABLE EITHER IN TORT OR IN CONTRACT FOR ANY LOSS OR DAMAGE WHETHER DIRECT, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL, ARISING OUT OF OR RELATED TO THE FAILURE OF ANY OF ITS PARTS OR PRODUCTS OR OF THEIR NONSUITABILITY FOR A GIVEN PURPOSE OR APPLICATION.**

17.5 CHEMICAL RESISTANCE WARNING

Blue-White offers a wide variety of wetted parts. Purchasers, installers, and operators of Blue-White products must be well informed and aware of the precautions to be taken when injecting or measuring various chemicals, especially those considered to be irritants, contaminants or hazardous. Customers are expected to do their own due diligence regarding which products and materials are best suited for their applications, particularly as it may relate to the potential effects of certain chemicals on Blue-White products and the potential for adverse chemical interactions. Blue-White tests its products with water only. The chemical resistance information included in this instruction manual was supplied to Blue-White by reputable sources, but Blue-White is not able to vouch for the accuracy or completeness thereof. While Blue-White will honor all of its product warranties according to their terms and conditions, Blue-White shall only be obligated to repair or replace its defective parts or products in accordance with the associated product warranties. **BLUE-WHITE SHALL NOT BE LIABLE EITHER IN TORT OR IN CONTRACT FOR ANY LOSS OR DAMAGE, WHETHER DIRECT, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL, ARISING OUT OF OR RELATED TO THE USE OF CHEMICALS IN CONNECTION WITH ANY BLUE-WHITE PRODUCTS.**

APPENDIX A: ACRONYMS

°C	Celsius
°F	Fahrenheit
AC	Alternating current
bar	Unit of pressure
CIP	Clean-in-place
cm	Centimeters
COD	Cash on Delivery
D	Depth
DC	Direct current
EEE	Electrical and electronic equipment
EP	Ethylene propylene
ETL	Electrical Testing Labs/Intertek
EU	European Union
FDA	Food and Drug Administration
FKM	Fluoroelastomer
FVS	Flow Verification Sensor
GF	Glass fiber
GPD	Gallons per day
GPH	Gallons per hour
H	Height
Hz	Hertz
ID	Inside diameter
IO	Input/Output
Kg	Kilogram
lb.	Pound
LLDPE	Linear low-density polyethylene
LPH	Liters per hour
mA	Milliampere
min	Minute
mL	Milliliters
MSDS	Material Safety Data Sheet
N.C.	Normally Close
N.O.	Normally Open
NPT	National Pipe Thread
NSF	National Sanitation Foundation
OD	Outside diameter
P.N.	Part Number
PBT	Polybutylene Terephthalate
PE	Polyethylene
PSI	Pounds per Square Inch
PVC	Polyvinyl chloride
PVDF	Polyvinylidene fluoride
RCD	Residual-current device
Rev.	Revision
RMA	Return Material Authorization
RPM	Revolutions per minute
SIP	Steam-in-place
SS	Solid state
TFD+	Enhanced Tube Failure Detection
TFE/P	Tetrafluoroethylene propylene
UL	Underwriters Laboratories
US	United States
V	Volt
W	Watt
W	Width
WEEE	Waste Electrical and Electronic Equipment

FLEXFLO® Model Number

M4	FLEXFLO® Peristaltic metering pump

Power Cord (operating voltage user selectable 115V/240 VAC 50/60Hz)

4	115V / 60Hz, power cord NEMA 5/15 plug (US)	**8**	240V / 50Hz, power cord AS 3112 plug (AU/New Zealand)
5	230V / 60Hz, power cord NEMA 6/15 plug (US)	**9**	230V / 50Hz, power cord BS 1363/A plug (UK)
6	220V / 50Hz, power cord CEE 7/VII plug (EU)	**X**	No Power Cord

Inlet/Outlet Connection Size, Connection Type, Connection Material

M	1/2” Male NPT Fitting, Natural PVDF (Kynar)
B	1/2” Hose Barb, Natural PVDF (Kynar) available for all tubes
C	1/2” - 3/4” Tri-clamp connections, Natural PVDF (Kynar), available for all tubes
Q	Quick Disconnect, Natural PVDF (Kynar), available for all tubes (valves sold seperately)
MB	1/2” Male BSPT Fitting, Natural PVDF (Kynar)

Pump Tube Material, Pump Tube Size, Output Range

NH	Flex-A-Prene® .250 ID | .0028–28.5 GPH | 125 PSI
NHH*	Flex-A-Prene® .250 ID | .0054–54.0 GPH | 100 PSI
NHHL*	Flex-A-Thane® .250 ID | .0054–54.4 GPH | 65 PSI
NHL	Flex-A-Prene® .250 ID | .02–54.0 GPH | 100 PSI
NJ	Flex-A-Prene® .312 ID | .0044–44.4 GPH | 100 PSI
NK	Flex-A-Prene® .375 ID | .0050–50.7 GPH | 80 PSI
NKL	Flex-A-Prene® .375 ID | .02–54.0 GPH | 100 PSI
NL	Flex-A-Prene® .500 ID | .010–100.0 GPH | 50 PSI
NP	Flex-A-Prene® .750 ID | .015–158.5 GPH | 30 PSI
GH	Flex-A-Thane® .312 ID | .0039–39.6 GPH | 65 PSI
GHH*	Flex-A-Thane® .312 ID | .03–71 GPH | 65 PSI
GK	Flex-A-Thane® .375 ID | .0055–55.5 GPH | 65 PSI
GKK*	Flex-A-Thane® .375 ID | .010–100.0 GPH | 65 PSI
TH	Flex-A-Chem® .250 ID | .01–25.4 GPH | 65 PSI
TK	Flex-A-Chem® .375 ID | .0054–54.00 GPH | 30 PSI
TKK*	Flex-A-Chem® .375 ID | .0126–126.0 GPH | 30 PSI

Options (leave this blank for standard model with left facing pump head inlet/outlet)

R	Right facing pump head, input / output (Left facing fluid input / output is standard)
D	Down facing pump head, input / output (Left facing fluid input / output is standard)

M4 S 2 4 M NL	**Sample Model Number**

NOTE: *Dual tube

Users of electrical and electronic equipment (EEE) with the WEEE marking per Annex IV of the WEEE Directive must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to them for the return, recycle, recovery of WEEE and minimize any potential effects of EEE on the environment and human health due to the presence of hazardous substances. The WEEE marking applies only to countries within the European Union (EU) and Norway. Appliances are labeled in accordance with European Directive 2002/96/EC.

Contact your local waste recovery agency for a *Designated Collection Facility* in your area.

Blue-White®

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customerservice@blue-white.com

P.N. 80000-617

Rev 1 20220202

CHEM-FEED®

Engineered Skid Systems

CFPS-3AV-AXBH-1 for Sodium Hypochlorite
CFPS-2AV-EXBG-1 for Sodium Bisulfite

ProSeries® *by Blue-White Ind.*

5300 Business Drive, Huntington Beach, CA 92649 USA
Phone: 714-893-8529 **FAX:** 714-894-9492
E mail: sales@blue-white.com **or** techsupport@blue-white.com **URL:** www.blue-white.com

3.0 Specifications

Items listed below are standard available items and ship with most configurations. Your system may be customized with components not listed below.

Skid
Chemically resistant polyethylene structure.

Pump (sold separately)
Flex-Pro model M-2, M-3 or M-4 peristaltic pumps or Chem-Pro model MC-2, MC-3, MD-3 diaphragm pumps. See page 6 for metering pump data.

Piping
PVC Schedule 80 (optional CPVC).

Seals
FKM seals (optional EPDM).

Tubing (T)
Reinforced braided PVC, 200 psi max, meets NSF std. 51. The pump inlet and outlet flexible tubing connections are terminated to half unions and secured to the barbed fitting with stainless steel clamps.

Tubing clamps
300 series SS band, 400 series SS screw

Unions (U)
PVC body, schedule 80

Ball valves (V)
True unions, PVC body, PTFE shaft bearings and seats

Pressure Relief Valve (PRV)
PVC body, PTFE primary diaphragm seal. Non-wetted components: EPDM secondary seal, zinc plated steel spring, stainless steel external hardware, HDPE pressure adjustment screw. Infinite adjustment from 10-150 psi.

Calibration Cylinder (CC)
PVC body, PVC end caps, 1/2" PVC pipe outlet vent.
Available volumes: 1.6 GPH (100ml), 4 GPH (250ml), 8 GPH (500ml), 16 GPH (1000ml), 32 GPH (2000ml), and 64 GPH (4000mL).

Pulsation Dampener (PD)
CPVC body,10 cubic inch volume

Gauge w/guard (G)
Gauge: liquid filled stainless steel with blowout plug, bottom mount, 1/4" NPT theads. Available pressure ranges: 0-30 psi, 0-100, psi, 0-200 psi.
Guard: PVC body, temperature compensated oil filled.

Check Valve (CV)
PVC body. Cracking pressure: 1.0-1.5 psi. Maximum working pressure: inlet = 150 psi, back = 100 psi.

Flow Indicator (F)
Machined cast acrylic, PVC connections, ceramic ball, PVDF ball stop, PVC half unions.

Y Strainer (S)
PVC body, 1/32" Mesh

Universal mounting blocks
PA 12

Pump extended mounting brackets
316 Stainless Steel

Skid mounting foot pads
316 Stainless Steel

Mounting hardware
18-8 Stainless Steel

Maximum working pressure
150 psig (10.3 bar)

Operating Temperature
14°F to 115°F (-10°C to 46°C)

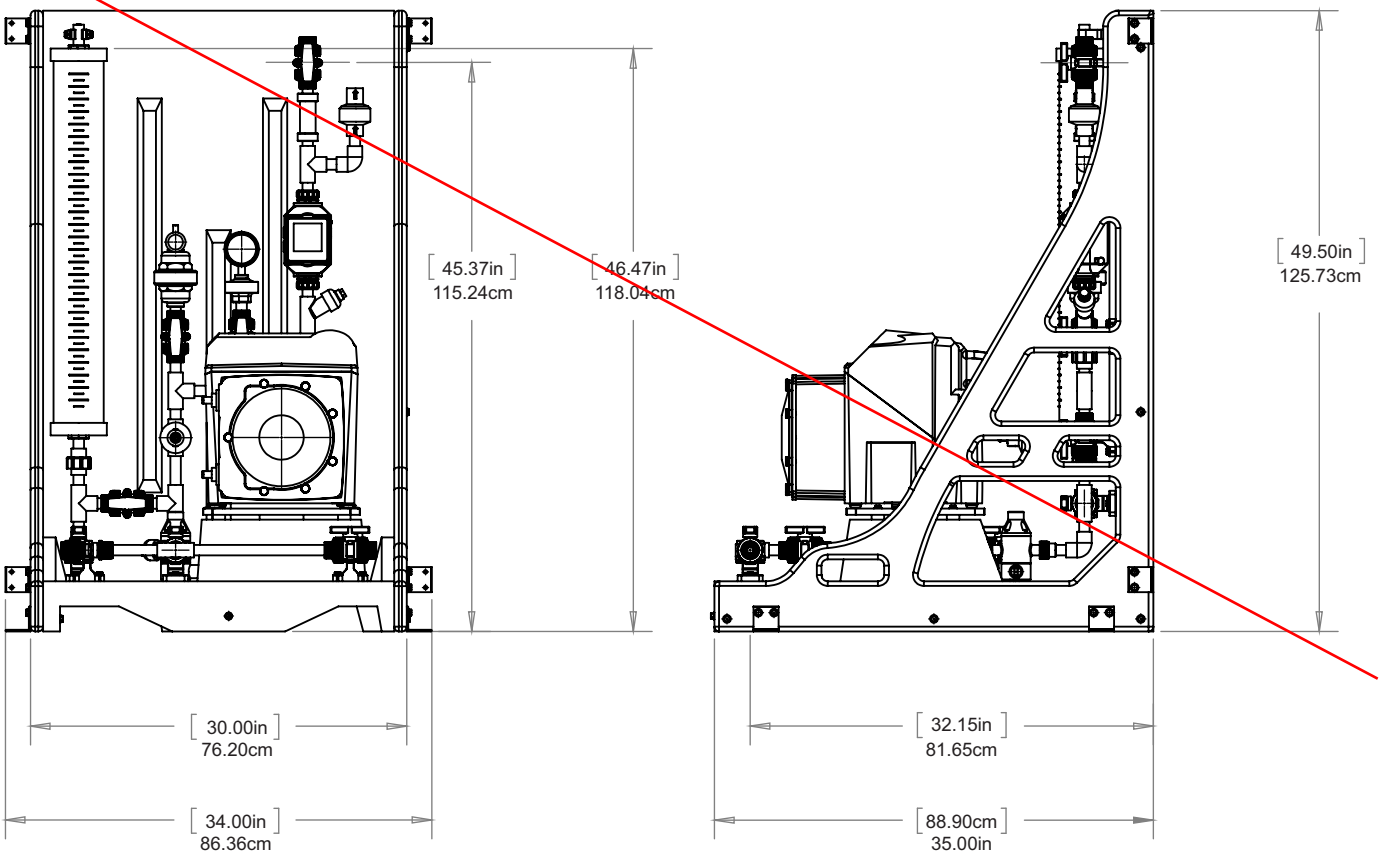
Approximate Shipping Weight
ingle Pump System
- Standard: 150 lb. (68 Kg)
- With Mounted Pump: 175 lb. (79 Kg)

Dual Pump System
- Standard: 200 lb. (90 Kg)
- With Mounted Pumps: 265 lbs (120 Kg)

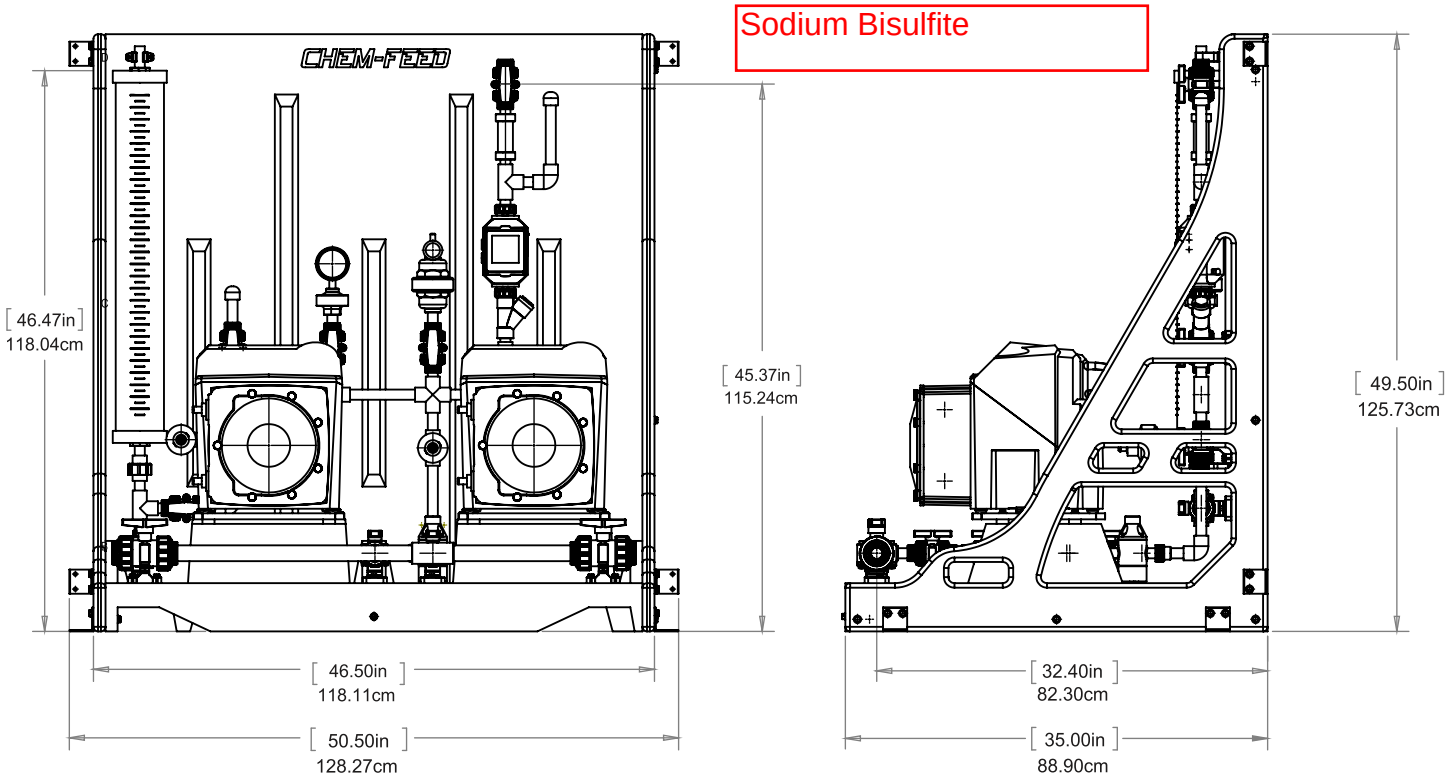
3.0 Dimensions

Your Chem-Feed System may be designed differently from drawings below. However, the dimensions shown below remain the same no matter your configuration.

Single Pump System:

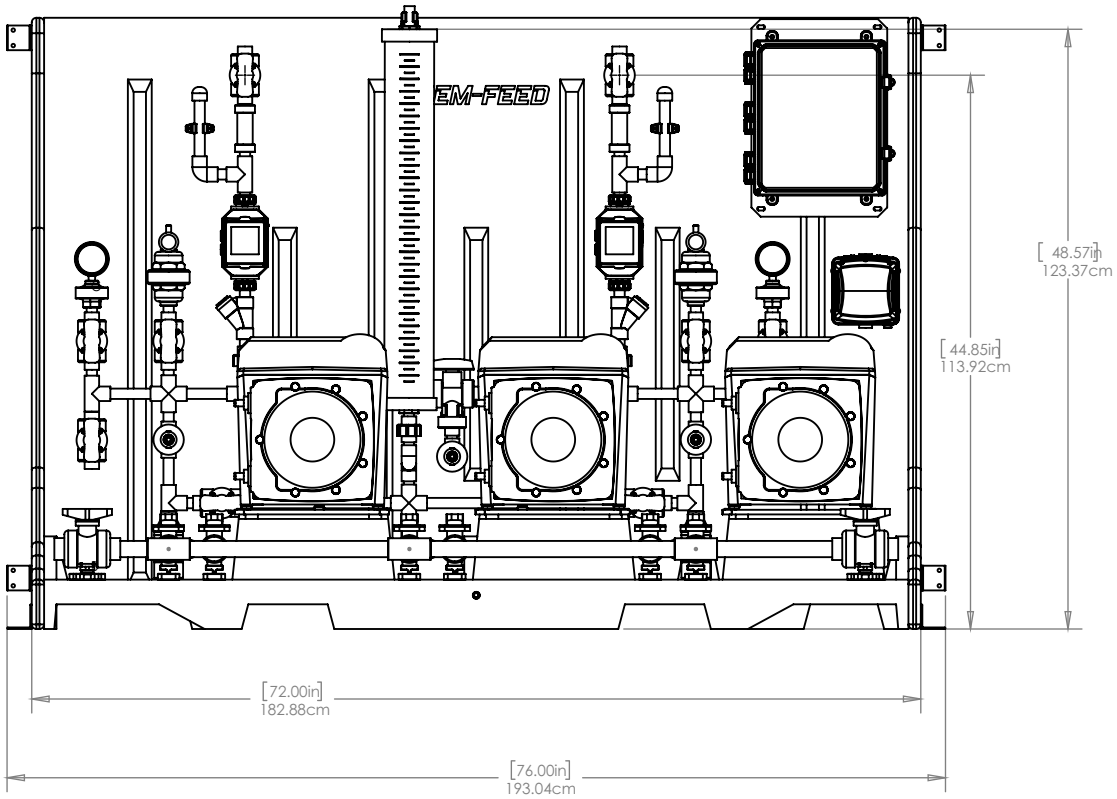


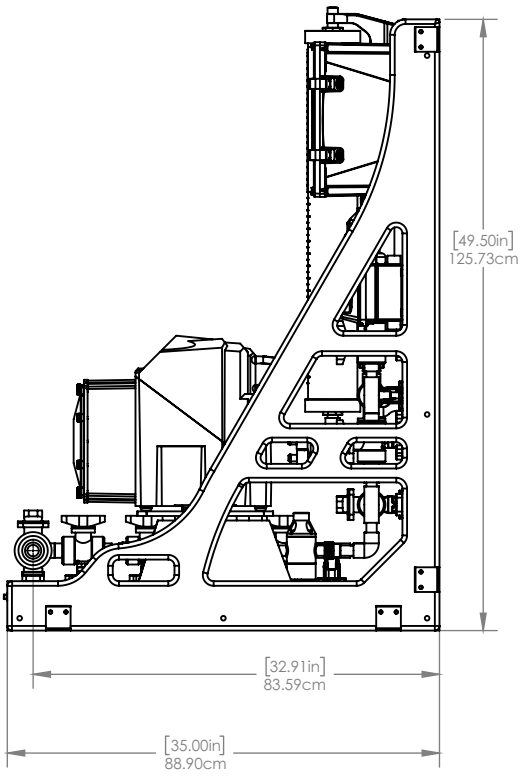
Dual Pump System:



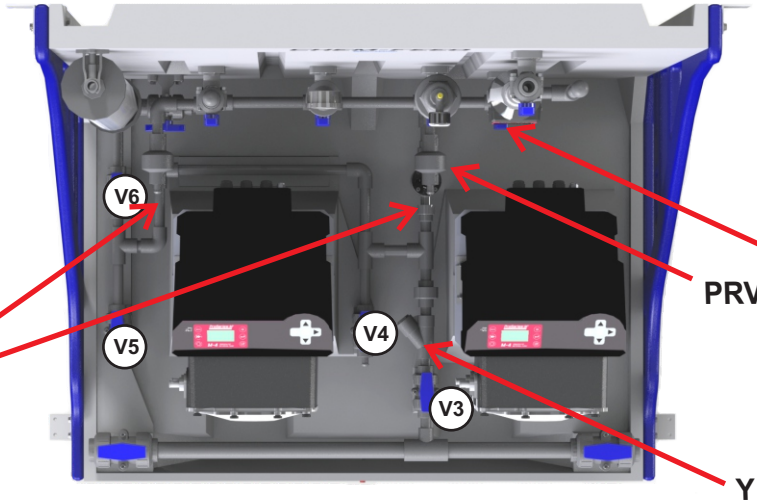
Sodium Hypochlorite

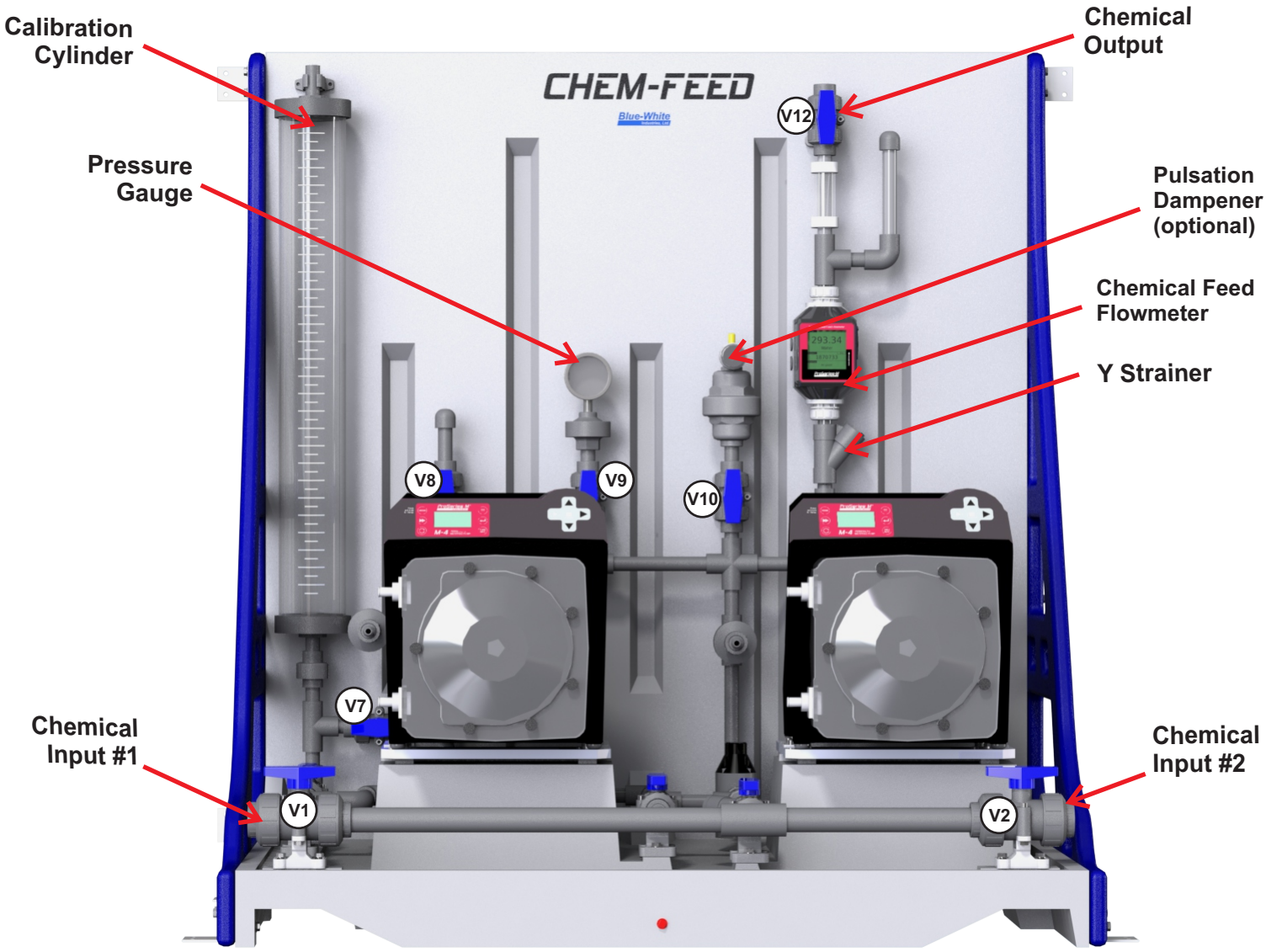
Triple Pump System:





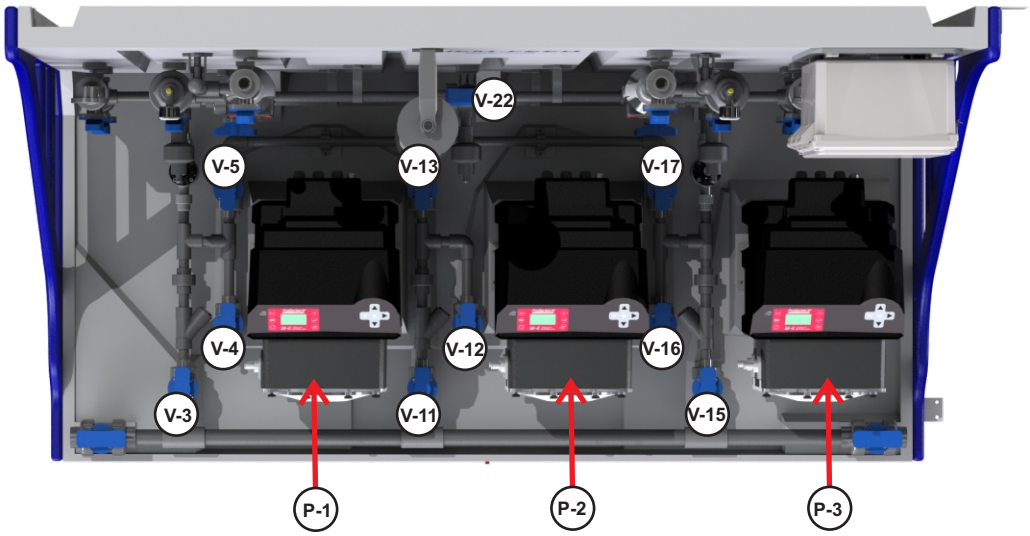
8.0 Component Identification and Typical Operation - Dual Pump Skid

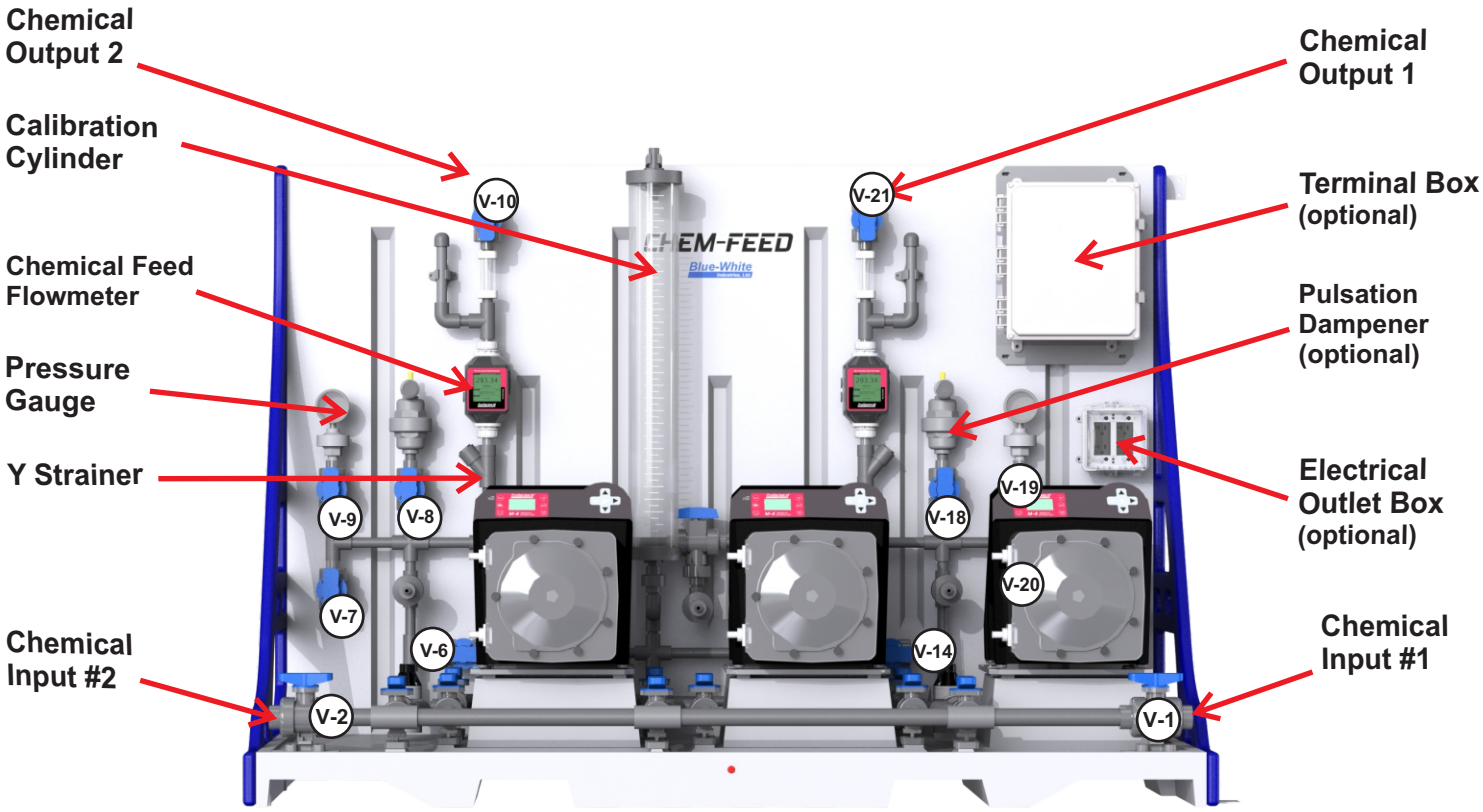




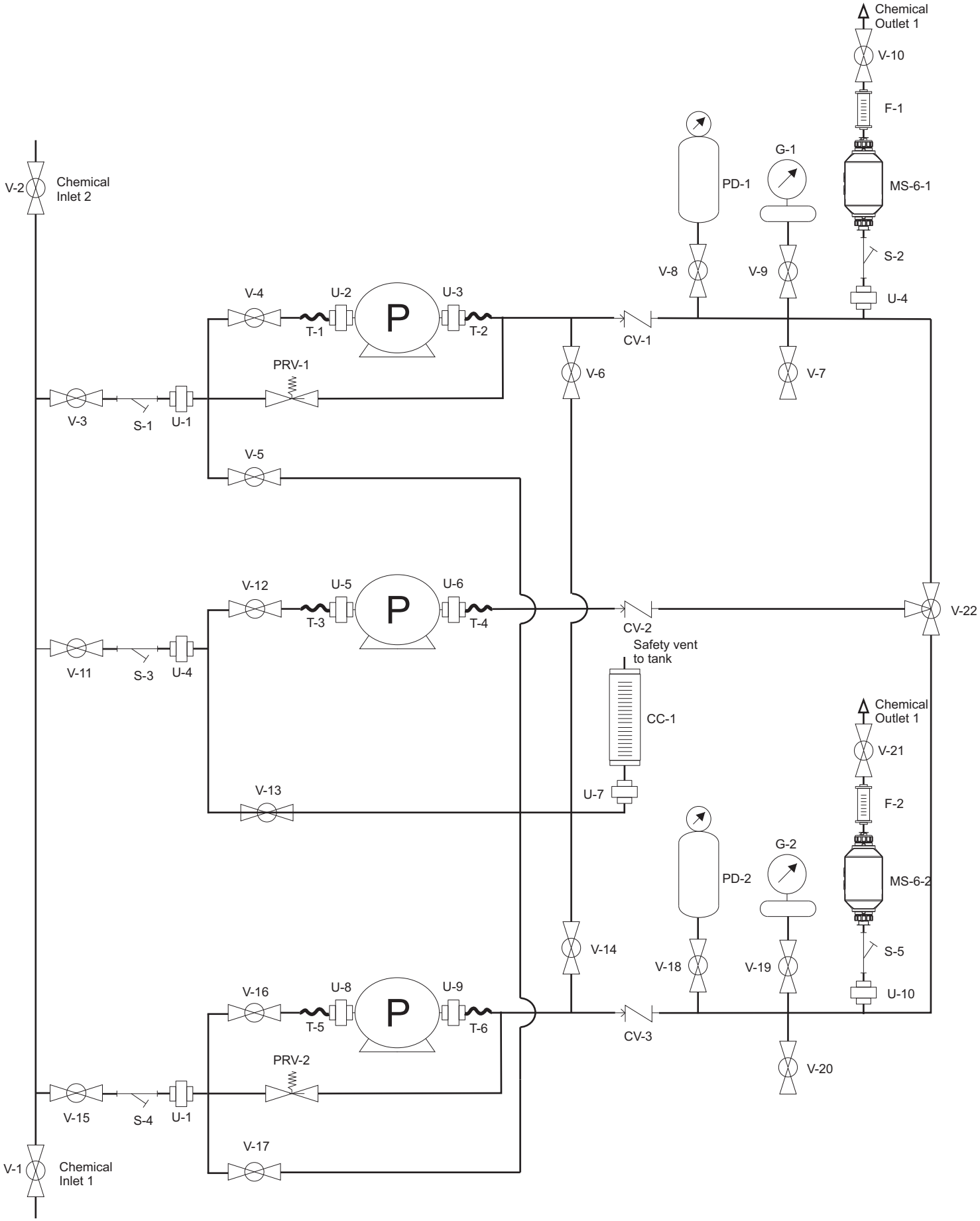
* PRV = Pressure Relief Valve preset at 50psi

8.0 Component Identification and Typical Operation - Triple Pump Skid





* PRV = Pressure Relief Valve preset at 50psi


Chemical Outlet 1
V-10
F-1
G-1
PD-1
MS-6-1
V-2
Chemical Inlet 2
V-8
V-9
S-2
U-4
V-4
U-2
U-3
P
T-1
T-2
CV-1
PRV-1
V-6
V-7
V-3
S-1
U-1
V-5
V-12
U-5
U-6
T-3
T-4
CV-2
V-22
Safety vent to tank
V-11
S-3
U-4
CC-1
U-7
Chemical Outlet 1
V-21
F-2
V-13
G-2
PD-2
MS-6-2
V-14
V-18
V-19
S-5
U-10
V-16
U-8
U-9
T-5
T-6
CV-3
PRV-2
V-20
V-15
S-4
U-1
V-17
V-1
Chemical Inlet 1

Chem-Feed® Engineered Plastic Skid System Matrix

System type

CFPS-1	Single pump system - single chemical / single outlet, PE structure
CFPS-2	Dual pump system - single chemical / single outlet, PE structure
CFPS-3	Dual pump system - single chemical / single outlet, PE structure

Piping / Valves / Unions / Seal Materials

A	PVC piping, 1/2” OD PVC braided tubing connections
B	CPVC piping, 1/2” OD PVC braided tubing connections
C	PVC piping, 1/4” ID Polyethylene tubing connections
D	CPVC piping, 1/4” ID Polyethylene tubing connections
X	Skid Frame only without piping

Seal Material

V	FKM
E	EPDM

Calibration Cylinder		PVC		Glass	
A	64 GPH (4000 ml)	A			
B	32 GPH (2000 ml)	B			
C	16 GPH (1000 ml)	C		P	
D	8 GPH (500 ml)	D		Q	
E	4 GPH (250 ml)	E		R	
F	1.6 GPH (100 ml)	F		S	
X	None				

Pulsation Dampener

A	10 cubic inch, CPVC body, PTFE diaphragm
X	None

Pressure Guage w/Guard

A	200 PSI gauge with guard, PTFE diaphragm
B	100 PSI gauge with guard, PTFE diaphragm
C	30 PSI gauge with guard, PTFE diaphragm
X	None

Flowmeter and Strainer

G	Model MS-612 Chemical Feed Flowmeter, 10-5,000 ml/min (0.158 - 79.2 GPH)
H	Model MS-622 Chemical Feed Flowmeter, 100-10,000 ml/min (1.58 - 158 GPH)
X	Inlet Strainer only

Miscellaneous Options - (leave blank if not specified)

1	Install with and ship with a specific pump model
2	Perform pressure and fluid testing with a specific pump model
3	Perform pressure, fluid testing, and ship with pump model installed
5	1/2” Intake manifold plumbing (Available on dual pump system only)
A	Isolation ball shut-off valves at check valves
T1	PTFE Tubing for Single Skid
T2	PTFE Tubing for Dual Skid
T3	PTFE Tubing for Triple Skid
C1	Terminal box and electrical outlet box (single skid only)
C2	Terminal box and electrical outlet box (duplex skid only)
C3	Terminal box and electrical outlet box (triplex skid only)

Note: When ordering pumps for skids, pump head orientation is standard LEFT facing only.

CFPS-1	A	V	-	A	A	A	X	-	3	Sample Chem-Feed Engineered Skid System Part Number

Blue-White®

Operating Manual

CHEM-FEED®

Municipal Skid Systems

CFPS-3AV-AXBH-1 for Sodium Hypochlorite
CFPS-2AV-EXBG-1 for Sodium Bisulfite

Series CFPS

READ THE INSTRUCTION MANUAL PRIOR TO INSTALLATION AND USE.


+1 (714) 893 - 8529


sales@blue-white.com


customerservice@blue-white.com


5300 Business Drive
Huntington Beach, CA 92649

1.0 Introduction

Congratulations on purchasing the Chem-Feed® Engineered Plastic Skid System. The system is designed with the necessary components to safely inject liquid chemical into a system.

Your Chem-Feed® Engineered Plastic Skid System is pre-configured based on your selections via the matrix or when designed with our engineering staff.

Please Note: Your new Chem-Feed® System has been pressure tested at the factory with clean water for a minimum of four hours before shipping. You may notice trace amounts of clean water in the system. This is part of our stringent quality assurance program at Blue-White Industries.

2.0 Features

Chem-Feed® Engineered Skid Systems were designed and engineered using solid modeling tools for superior piping installation and easy component maintenance. Custom engineered universal mounting blocks and pre-machined mounting slots provide for easy component servicing and replacement. Each factory built and tested system includes the following standard components:

- **Pressure Relief Valve -** Protects the system from over-pressurization, 5-150 psi setting range, 150 psi maximum system pressure. Ships on all systems.
- **Check Valve -** Protects the user from back-flow during pump maintenance. Ships on all systems.
- **Flow Verification Sensor -** MS6 accurately verifies chemical feed. Exclusive to Blue-White®.
- **Inlet Y Strainer -** Protects system components from damage cause by dirt or debris.
- **Calibration Cylinder -** Confirm pump output under system conditions. Specify cylinder volumes from 1.6 GPH to 64 GPH.
- **Pulsation Dampener -** Protect the system components from pulsation. Recommended for diaphragm pump systems. Not recommended for peristaltic pump systems.
- **Pressure Gage with Guard -** Isolate and protect the system pressure gage. Specify pressure ranges from 0-30 psi, 0-100 psi, or 0-200 psi.
- **Mounting Pads -** Stainless Steel mounting pads to secure Chem-Feed® System to a solid surface. Designed for floor mount or wall mount.
- **Corrosion Resistant -** Chem-Feed® frame constructed of chemically resistant polyethylene.
- **Drip Tray -** To collect chemicals and prevent spills.

  Single Skid Tray 2.22 Gal (8.4L)

  Dual Skid Tray 2.3 Gal (11.4L)

  Triplex Skid Tray 2.74 (12.46L)

3.0 Specifications

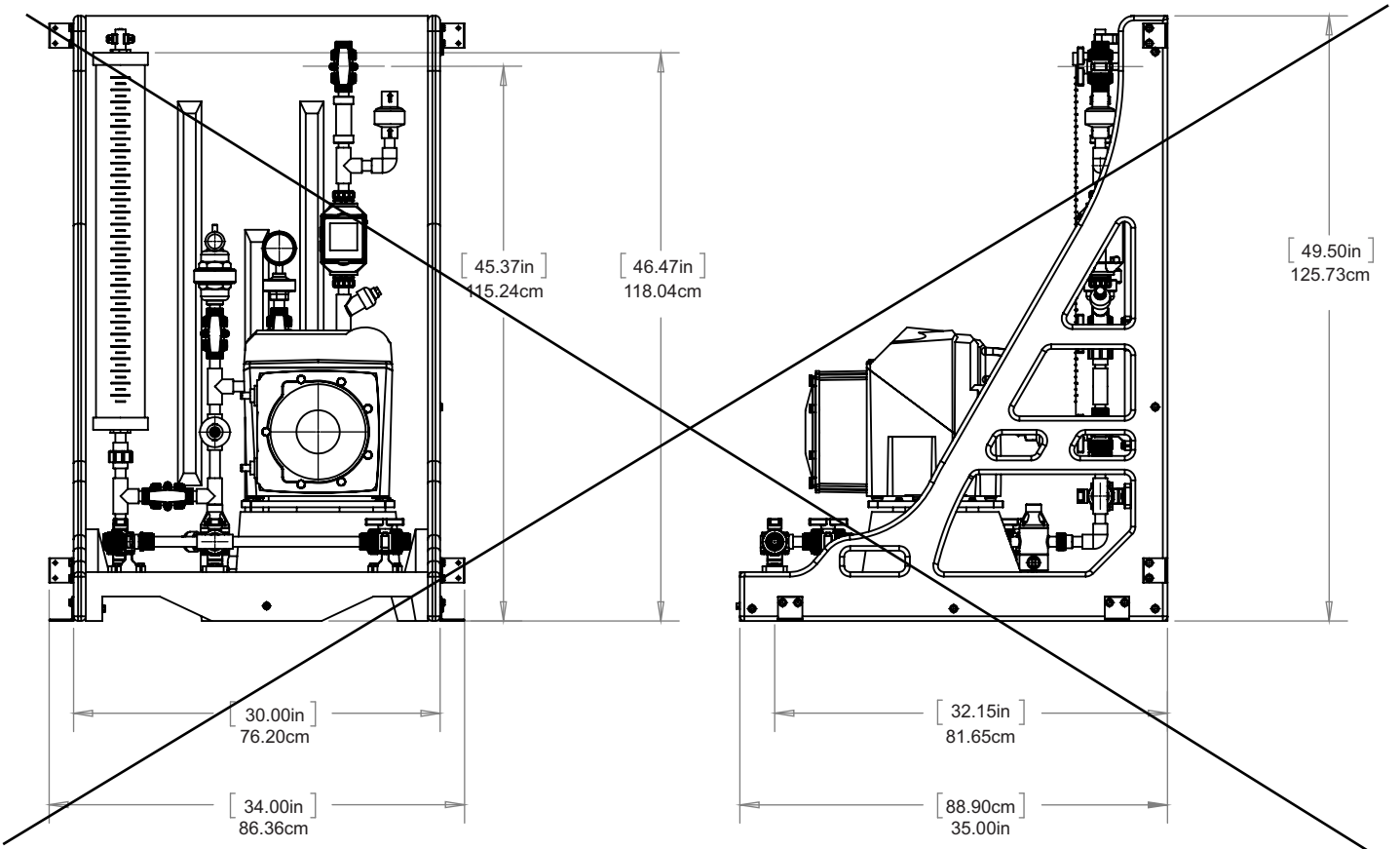
Items listed below are standard available items and ship with most configurations. Your system may be customized with components not listed below.

Skid	Chemically resistant polyethylene structure
Pump (sold separately)	FLEXFLO® M1, M2, M3 or M4 peristaltic pumps
	CHEM-FEED® MD1, MC-2, MC-3 or MD3 diaphragm pumps
Piping	1” Inlet & 1/2” outlet PVC schedule 80 (optional CPVC)
Seals	FKM seals (optional EPDM)
Tubing (T)	Reinforced braided PVC, 200 psi max, meets NSF std. 51. The pump inlet and outlet flexible tubing connections are terminated to half unions and secured to the barbed fitting with stainless steel clamps.
Tubing Clamps	300 series SS band, 400 series SS screw
Unions (U)	PVC body, schedule 80
Ball Valves (V)	True unions, PVC body, PTFE shaft bearings and seats
Pressure Relief Valve (PRV)	PVC body, PTFE primary diaphragm seal. Non-wetted components: EPDM secondary seal, zinc plated steel spring, stainless steel external hardware, HDPE pressure adjustment screw. Infinite adjustment from 10-150 psi.
Calibration Cylinder (CC)	PVC body, PVC end caps, 1/2” PVC pipe outlet vent Available volumes: 1.6 GPH (100ml), 4 GPH (250ml), 8 GPH (500ml), 16 GPH (1000ml), 32 GPH (2000ml), and 64 GPH (4000mL)
Pulsation Dampener (PD)	CPVC body,10 cubic inch volume
Gauge W/Guard (G)	Gauge: liquid filled stainless steel with blowout plug, bottom mount, 1/4” NPT theads. Available pressure ranges: 0-30 psi, 0-100, psi, 0-200 psi. Guard: PVC body, temperature compensated oil filled.
Check Valve (CV)	PVC body. Cracking pressure: 1.0-1.5 psi Maximum working pressure: inlet = 150 psi, back = 100 psi
Flow Indicator (F)	Machined cast acrylic, PVC connections, ceramic ball, PVDF ball stop, PVC half unions.
Y Strainer (S)	PVC body, 1/32” Mesh
Universal Mounting Blocks	PA 12
Pump Extended Mounting Brackets	316 Stainless Steel
Skid Mounting Foot Pads	316 Stainless Steel
Mounting Hardware	304 Stainless Steel - Wall or Floor mounting acceptable
Maximum Working Pressure	150 psig (10.3 bar)
Operating Temperature	14 °F to 115 °F (-10 °C to 46 °C)
Maximum Overall Dimensions	16-1/8”W x 15-1/4”H x 15-5/16”D (40.9W x 38.7H x 38.9D cm)
Approximate Shipping Weight	
Single Pump System	Standard: 80 lb. (36 Kg) - With Mounted Pump: 140 lb. (64 Kg)
Dual Pump System	Standard: 120 lb. (54 Kg) - With Mounted Pumps: 240 lbs (109 Kg)
Triplex Pump System	Standard: 200 lb. (91 Kg) - With Mounted Pumps: 380 lbs (172 Kg)

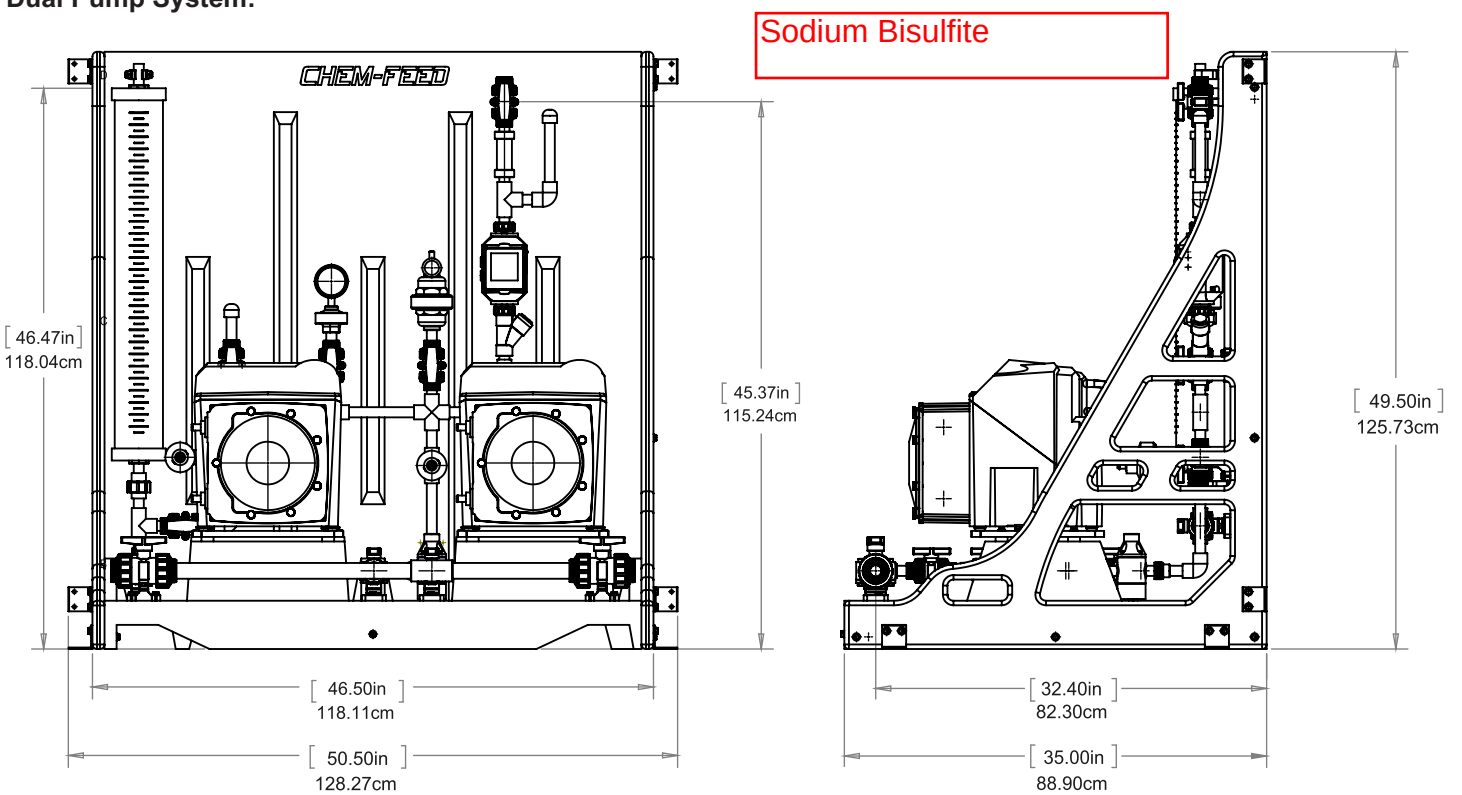
4.0 Dimensions

Your Chem-Feed System may be designed differently from drawings below. However, the dimensions shown below remain the same no matter your configuration.

Single Pump System:

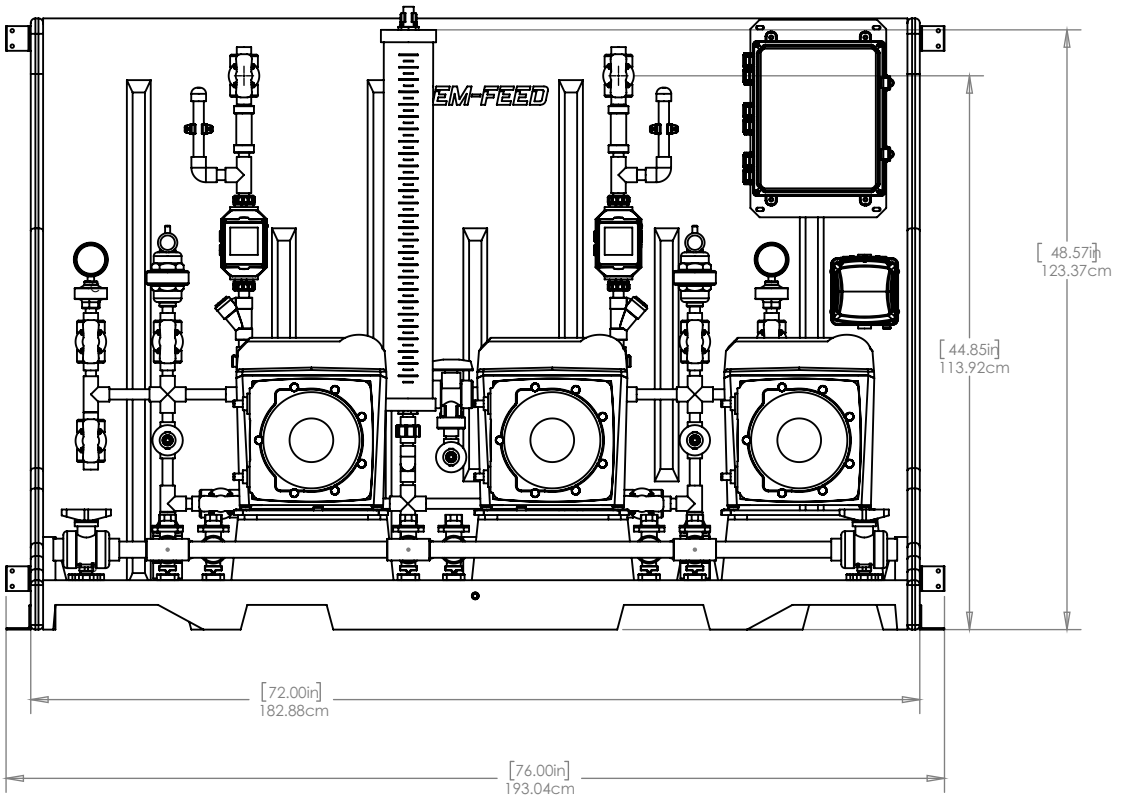


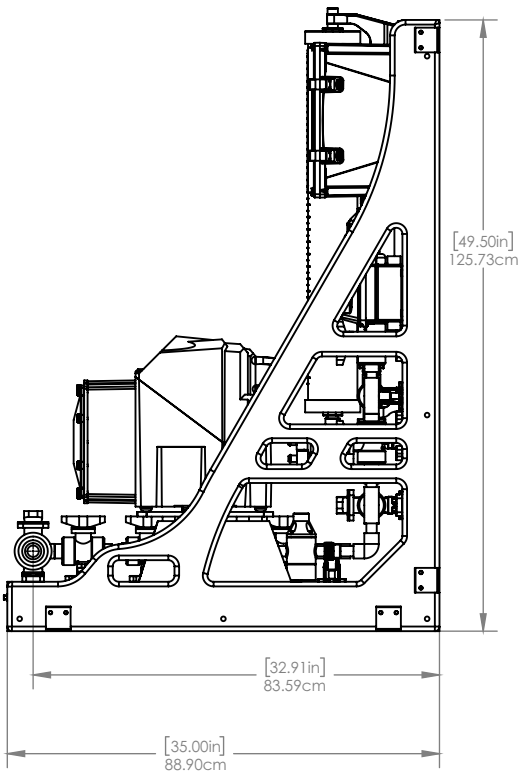
Dual Pump System:



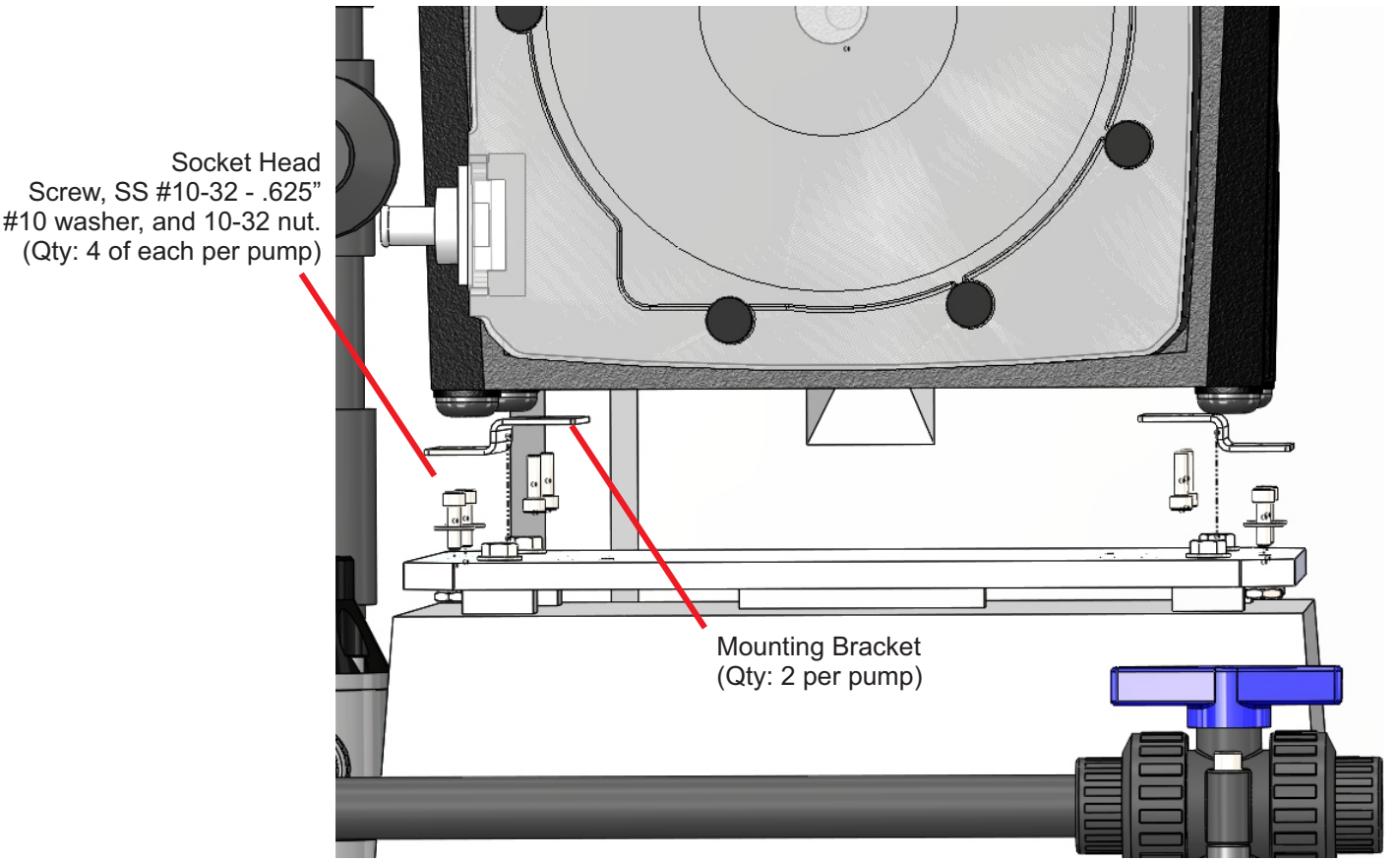
Triple Pump System:

Sodium Hypochlorite





5.0 Mounting Pump to the Chem-Feed® System - Single and Dual System



6.0 Mounting the Chem-Feed® System - Single and Dual System

FLOOR MOUNT

The Skid system is shipped with the mounting brackets ready for floor mounting. Mount the skid system to the floor using eight 1/4-20 Bolts (*see fig.* 1) through the mounting brackets.

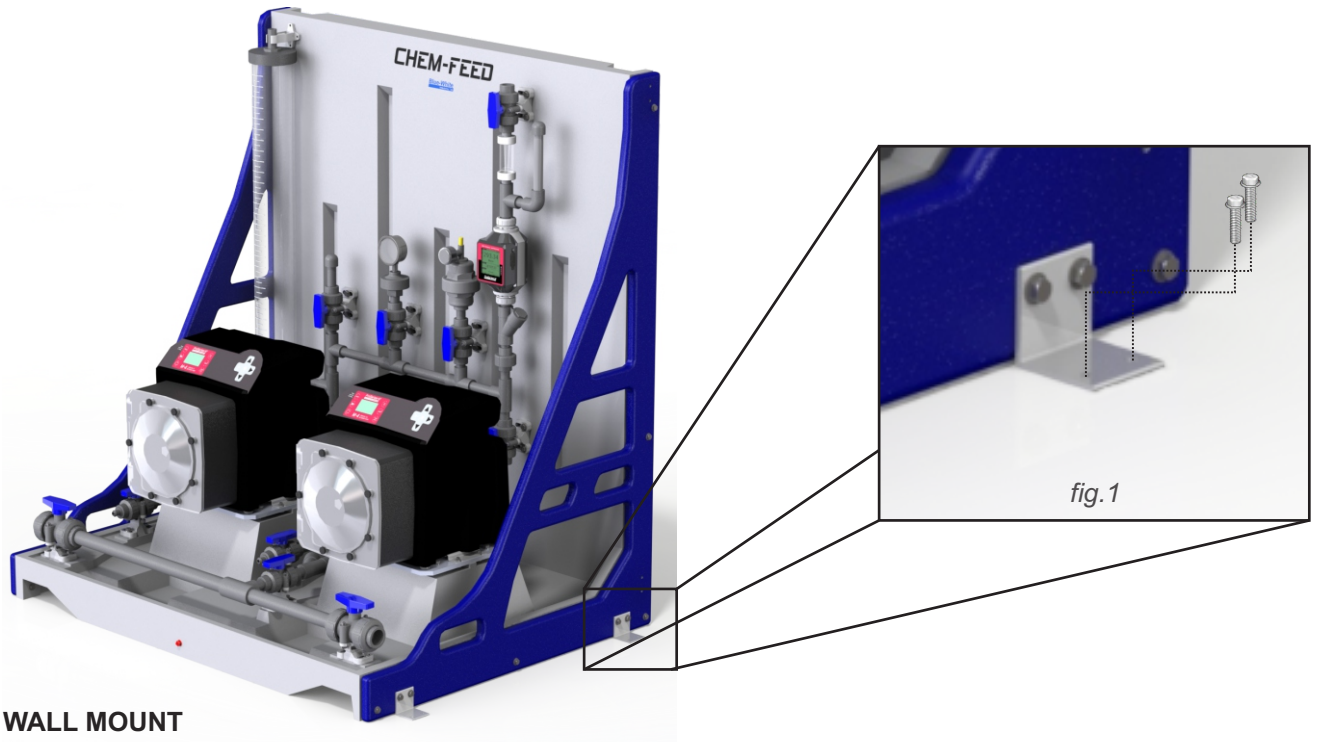


fig.1

WALL MOUNT

Remove the mounting brackets using a 1/4” wrench or socket. Install those same mounting brackets in the vertical position on the sides of the skid system. Mount the skid system to the wall using eight 1/4-20 Bolts (*see fig.* 2) through the mounting brackets.

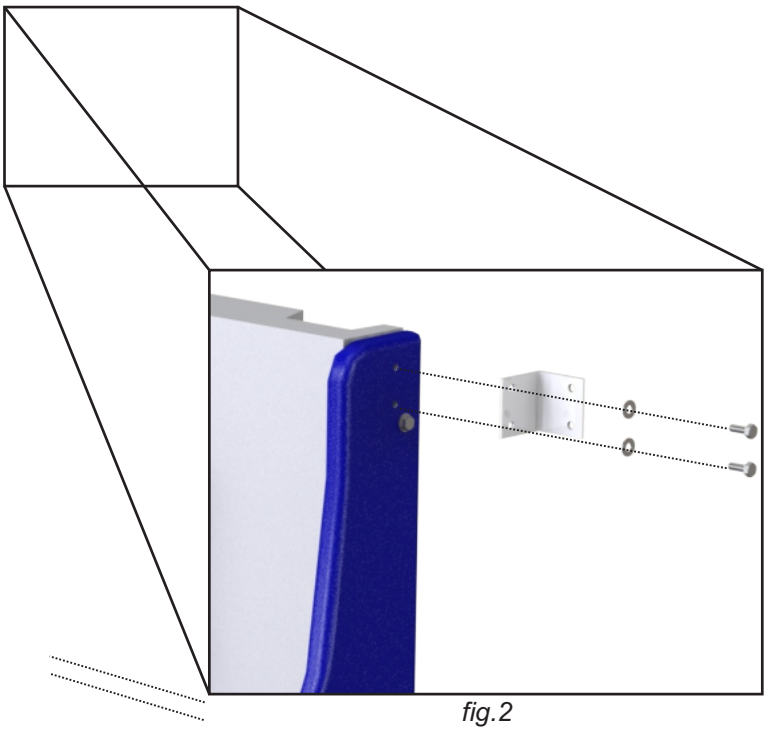
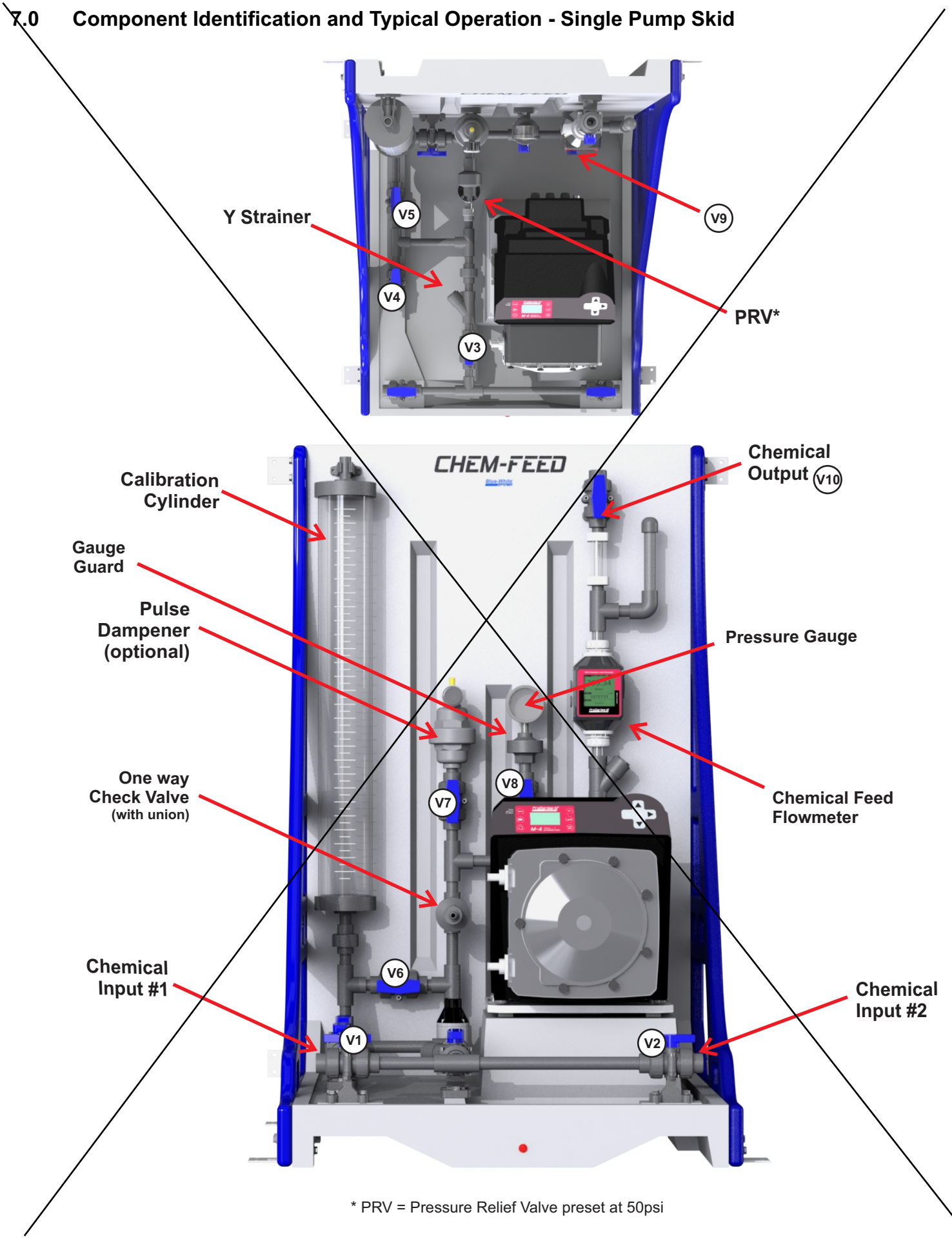


fig.2

7.0 Component Identification and Typical Operation - Single Pump Skid



* PRV = Pressure Relief Valve preset at 50psi

7.1 How To Operate the Chem-Feed® Skid System - Single Pump Skid

Connections:

Connect chemical solution into either Inlet 1 or inlet 2. (V-1 or V-2)

Connect chemical treated system to outlet. (V-10)

To Pump chemical solution into system.

Open ball valve V-1 or V-2, depending on your inlet side.

Open ball valve V-3 and V-4.

Close ball valve V-5, V-6, and V-9.

Open ball valve V-10 to inject chemical solution into your system.

Start pump.

To calibrate pump / system.

Open ball valve V-1 or V-2, depending on your inlet side.

Open ball valve V-3, V-4 , and V-6.

Close ball valve V-5, V-9, and V-10.

Start pump and run until calibration cylinder is filled to top calibration line. Do not leave pump unattended during this operation.

Stop pump once calibration cylinder is filled.

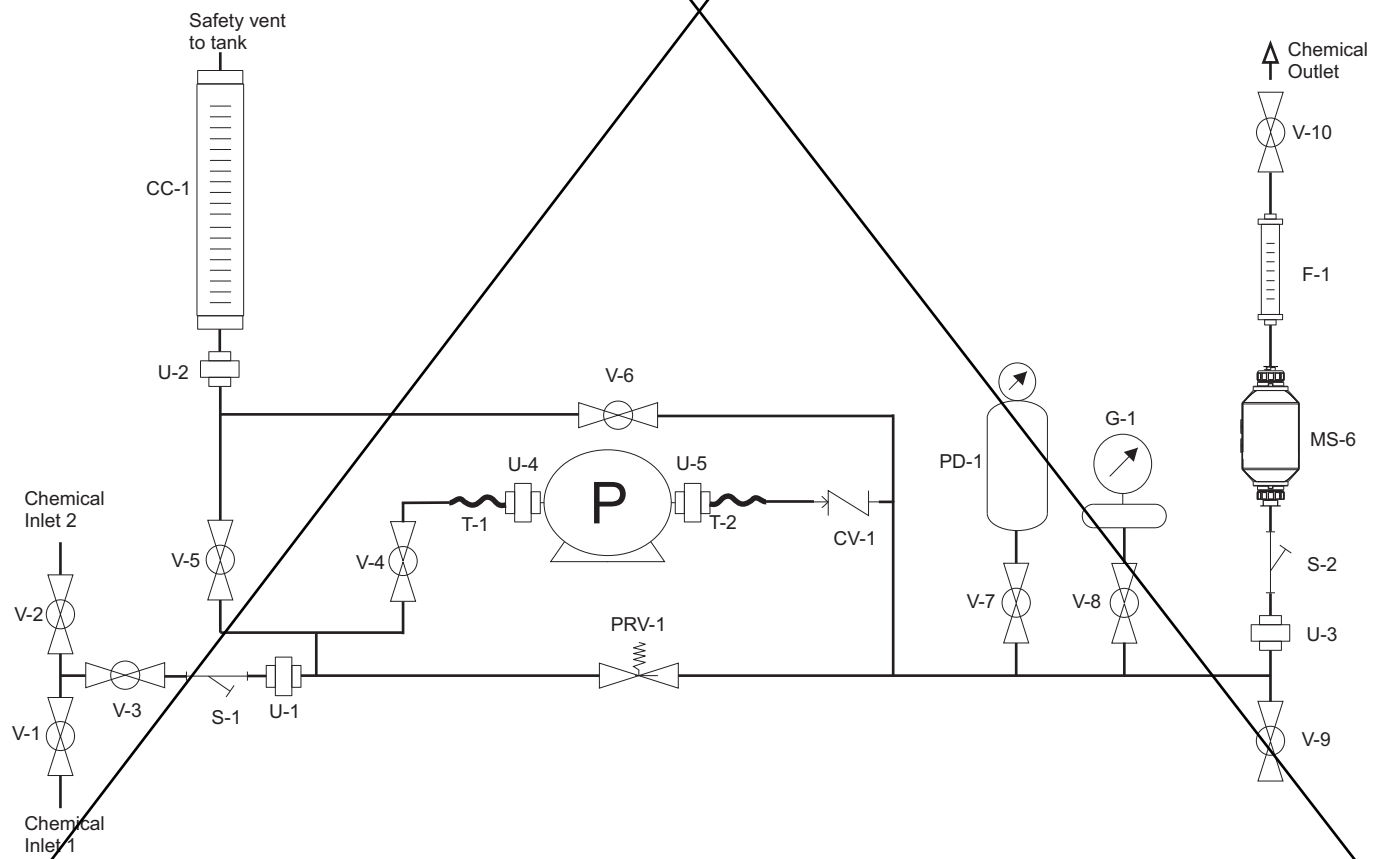
Close ball valves V-1, V-2, and V-6.

Open ball valve V-5 and V-10 to inject chemical solution into your system.

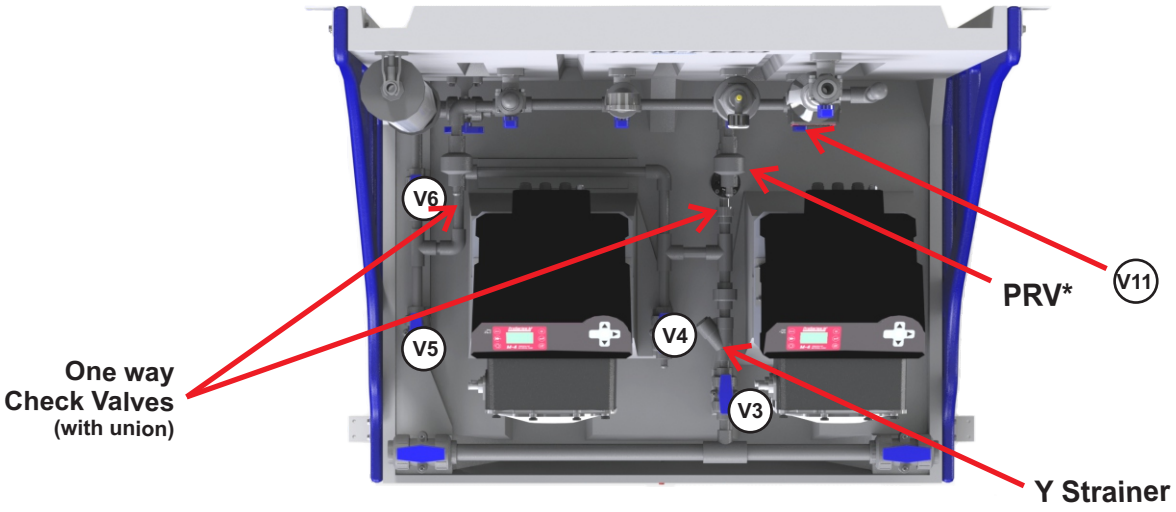
Note the chemical solution level in the calibration cylinder.

To calibrate pump at maximum speed into your system, Press the prime button on pump. The prime mode runs the pump at maximum speed for 60 seconds (1 minute) on all Blue-White® ProSeries-M pumps.

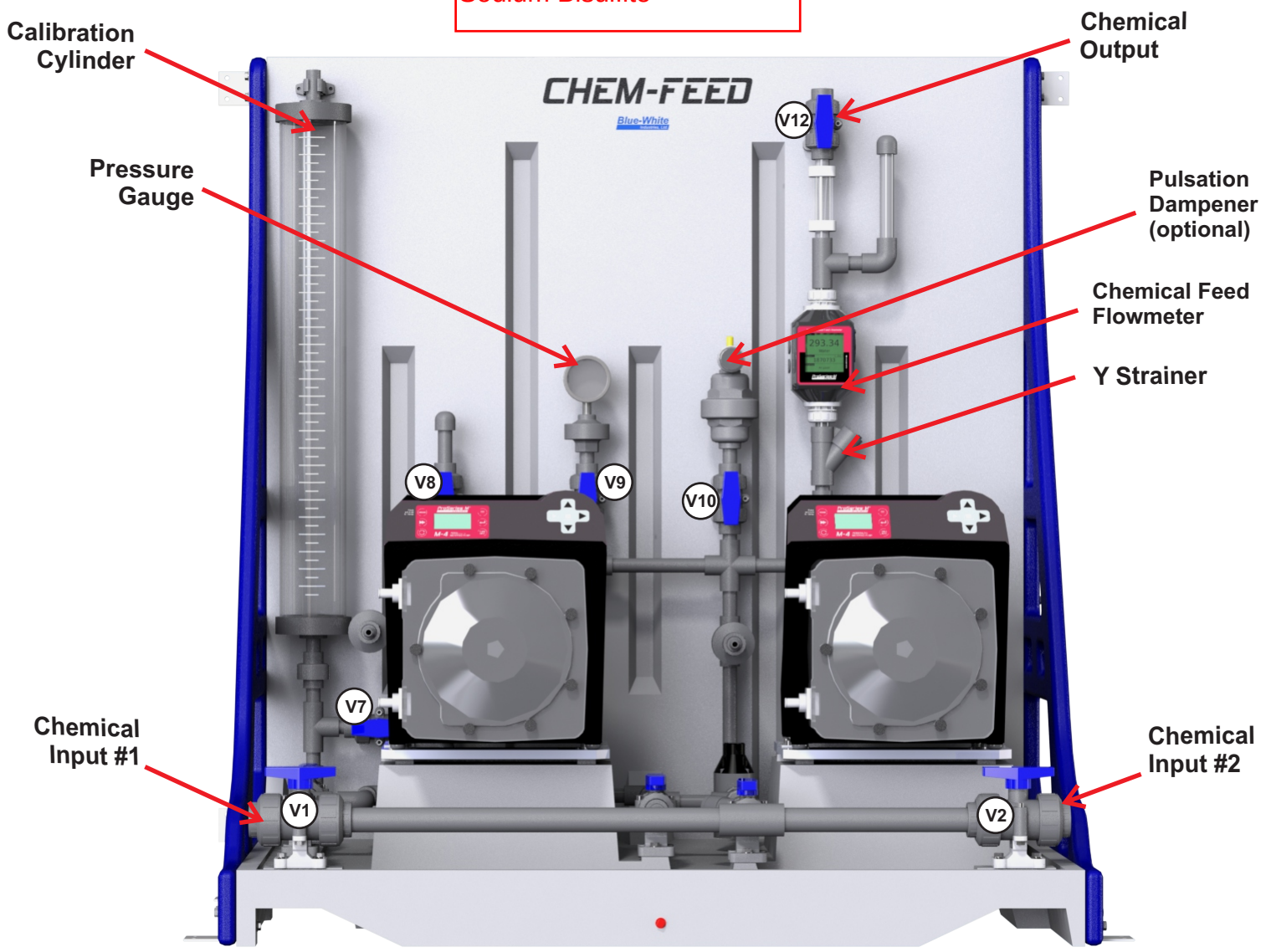
To calibrate pump at your desired feed rate, you must pre-program your pump speed before running this routine. Please refer to the instruction manual for your pump to adjust feed rate and additional calibration instructions.



8.0 Component Identification and Typical Operation - Dual Pump Skid



Sodium Bisulfite



* PRV = Pressure Relief Valve preset at 50psi

8.1 How To Operate the Chem-Feed® Skid System - Dual Pump Skid

Connections:

Connect chemical solution into either Inlet 1 or inlet 2. (V-1 or V-2)

Connect chemical treated system to outlet. (V-11)

To Pump chemical solution into system.

Open ball valve V-1 or V-2, depending on your inlet side.

Open ball valve V-3

Close ball valve V-6, V-7, and V-11.

Open ball valve V-4 and / or V-5. Depending on your system design.

Open ball valve V-12 to inject chemical solution into your system.

Start pump(s).

To calibrate pump(s) / system.

Open ball valve V-1 or V-2, depending on your inlet side.

Open ball valve V-3.

Open ball valve V-4 or V-5, depending on which pump you're calibrating.

Close ball valve V-6, V-11, and V-12.

Open ball valve V-7. This open valve will direct chemical into calibration cylinder.

Start pump and run until calibration cylinder is filled to top calibration line. Do not leave pump unattended during this operation!

Stop pump once calibration cylinder is filled.

Close ball valves V-1, V-2, and V-7.

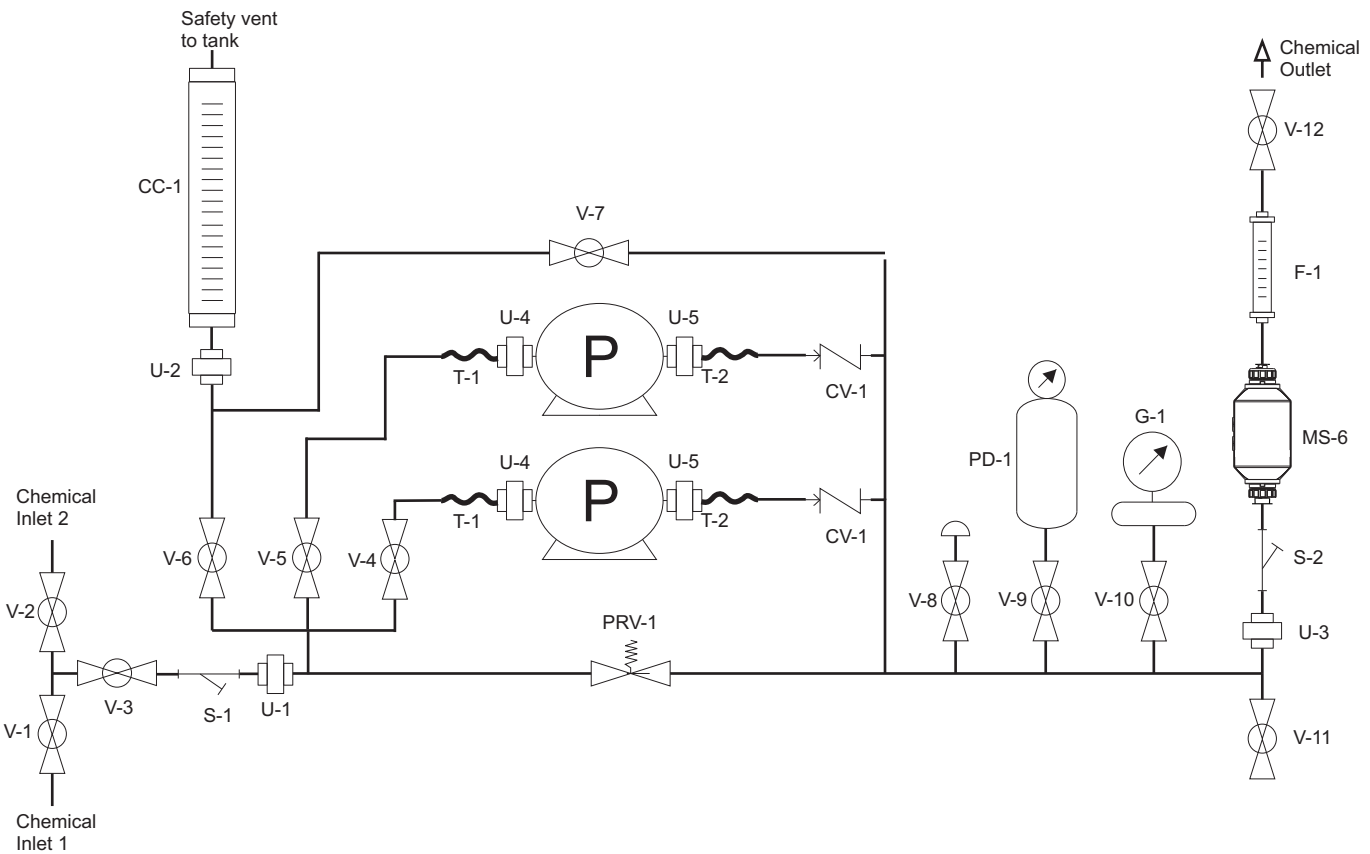
Open ball valve V-4 or V-5, depending on which pump you're calibrating.

Open ball valve V-6 and V-12 to inject chemical solution into your system.

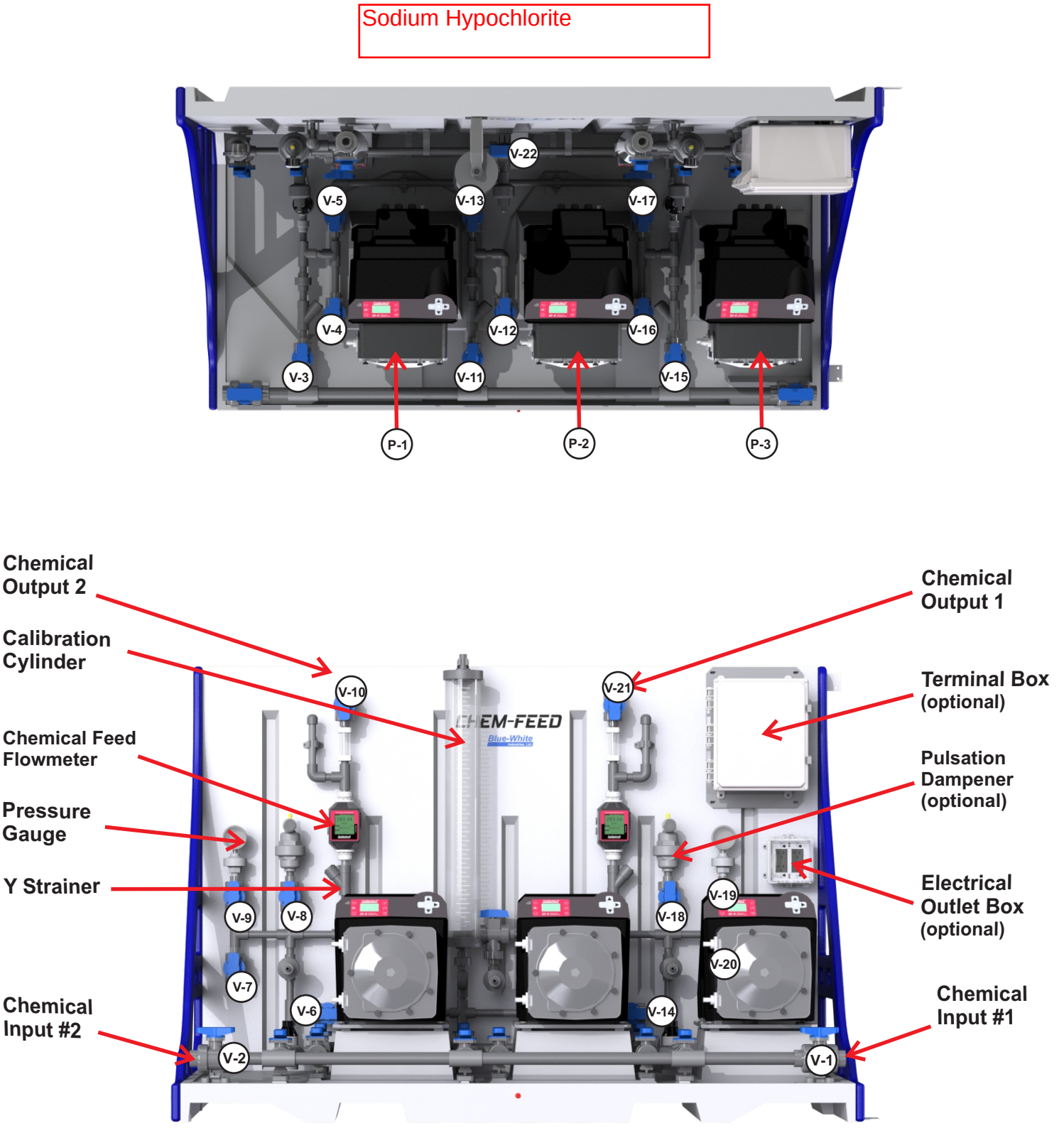
Note the chemical solution level in the calibration cylinder.

To calibrate pump at maximum speed into your system, Press the prime button on pump. The prime mode runs the pump at maximum speed for 60 seconds (1 minute) on all Blue-White® pumps.

To calibrate pump at your desired feed rate, you must pre-program your pump speed before running this routine. Please refer to the instruction manual for your pump to adjust feed rate and additional calibration instructions.



9.0 Component Identification and Typical Operation - Triple Pump Skid



* PRV = Pressure Relief Valve preset at 50psi

9.1 How To Operate the Chem-Feed® Skid System - Triple Pump Skid

Connections:

Connect chemical solution into either Inlet 1 or inlet 2. (V-1 or V-2)

Connect chemical treated system to outlet. (V-11)

To Pump chemical solution into system.

Open ball valve V-1 or V-2, depending on your outlet side.

Open ball valve V-3, V-11, and V-15

Close ball valve V-5, V-13, and V-17.

Open ball valve V-10 and V-21 to inject chemical solution into your system.

Start pump P-1 and P-3.

To calibrate Pump 1

Open ball valve V-1 or V-2, depending on your inlet side

Open ball valve V-3 and V-4

Close ball valves V-5, V-7, V-10, V-13, V-14, V-17, V-20, and V-21

Open ball valve V-6. This open valve will direct chemical into calibration cylinder

Start P-1 pump and run until calibration cylinder is filled to top calibration line.

Do not leave pump unattended during this operation!

Stop pump once calibration cylinder is filled.

Close ball valves V-1, V-2, and V-6.

Open ball valve V-5 and V-10.

Note chemical solution level in the calibration cylinder.

To calibrate pump at maximum speed into your system, Press the prime button on pump P-1. The prime mode runs the pump at maximum speed for 60 seconds (1 minute) on all Blue-White ProSeries pumps.

To calibrate pump at your desired feed rate, you must pre-program your pump speed before running this routine. Please refer to the instruction manual for your pump to adjust feed rate and additional calibration instructions.

To calibrate pump 2

Open ball valve V-1 or V-2, depending on your inlet side

Open ball valve V-11 and V-12

Close ball valves V-5, V-7, V-10, V-13, V-17, V-20, and V-21

Open ball valve V-6 or V-14. Close the ball valve that was not chosen to be open.

Open ball valve V-22 in the direction of the open ball valve V-6 or V-14. This open valve will direct chemical into calibration cylinder.

Start P-2 pump and run until calibration cylinder is filled to top calibration line.

Do not leave pump unattended during this operation!

Stop pump once calibration cylinder is filled.

Close ball valves V-1, and V-2.

Close the previously chosen ball valve V-6 or V-14.

Open ball valve V-12

Open ball valve V-22 in the direction of chemical outlet 1 or 2.

Open ball V-10 if ball valve V-22 was set to flow to chemical outlet 1. Open ball valve V-21 if ball valve V-22 was set to flow to chemical outlet 2

To calibrate pump at maximum speed into your system, Press the prime button on pump P-2. The prime mode runs the pump at maximum speed for 60 seconds (1 minute) on all Blue-White ProSeries pumps.

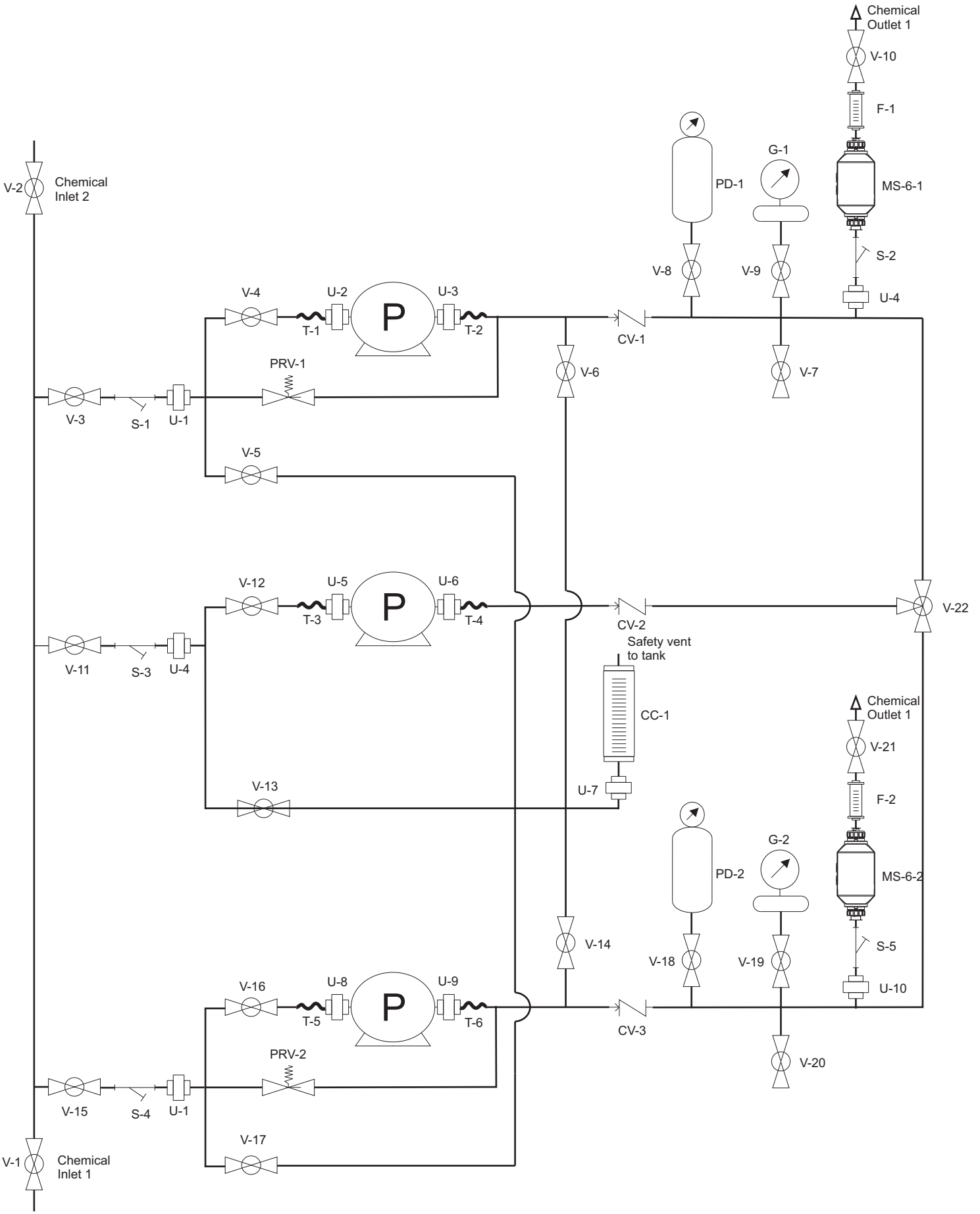
To calibrate pump at your desired feed rate, you must pre-program your pump speed before running this routine. Please refer to the instruction manual for your pump to adjust feed rate and additional calibration instructions.

To calibrate pump 3

Open ball valve V-1 or V-2, depending on your inlet side
Open ball valve V-15 and V-16
Close ball valves V-5, V-7, V-10, V-13, V-14, V-17, V-20, and V-21
Open ball valve V-14. This open valve will direct chemical into calibration cylinder
Start P-1 pump and run until calibration cylinder is filled to top calibration line.

Do not leave pump unattended during this operation!

Stop pump once calibration cylinder is filled.
Close ball valves V-1, V-2, and V-14.
Open ball valve V-17 and V-21.
Note chemical solution level in the calibration cylinder.
To calibrate pump at maximum speed into your system, Press the prime button on pump P-3. The prime mode runs the pump at maximum speed for 60 seconds (1 minute) on all Blue-White ProSeries pumps.
To calibrate pump at your desired feed rate, you must pre-program your pump speed before running this routine. Please refer to the instruction manual for your pump to adjust feed rate and additional calibration instructions.


Chemical Outlet 1
V-10
F-1
G-1
PD-1
MS-6-1
V-2
Chemical Inlet 2
V-8
V-9
S-2
U-4
V-4
U-2
U-3
P
T-1
T-2
CV-1
PRV-1
V-6
V-7
V-3
S-1
U-1
V-5
V-12
U-5
U-6
T-3
T-4
CV-2
V-22
Safety vent to tank
V-11
S-3
U-4
CC-1
Chemical Outlet 1
V-21
V-13
U-7
F-2
G-2
PD-2
MS-6-2
V-14
V-18
V-19
S-5
U-10
V-16
U-8
U-9
T-5
T-6
CV-3
PRV-2
V-20
V-15
S-4
U-1
V-17
V-1
Chemical Inlet 1

10.0 WARRANTY

10.1 Limited Warranty

The pump is a quality product and is warranted for 24 months from date of purchase (proof of purchase is required). The pump will be repaired or replaced at our discretion. The pump head and roller assembly are warranted against damage from a chemical attack when the proper Diaphragm Failure Detection(DFD) system instructions and maintenance procedures are followed.

10.2 What is not Covered

- **Pump diaphragm and rubber components - They are perishable and require periodic replacement**
- **Pump removal, or re-installation, and any related labor charge.**
- **Freight to the factory.**
- **Pumps that have been tampered with, or in pieces.**
- **Damage to the pump that results from misuse, carelessness (such as chemical spills) on the enclosure, abuse, lack of maintenance, or alteration that is out of Blue-White's control.**
- **Pumps damaged by faulty wiring, power surges, or acts of nature.**

Blue-White does not assume responsibility for any loss, damage, or expense directly or indirectly related to or arising out of the use of its products. Failure must have occurred due to defect in material or workmanship and not as a result of operation of the product other than in normal operation as defined in the pump operation manual.

The warranty status is determined by the pump's serial label and the sales invoice or receipt. The serial label must be on the pump and be legible. The warranty status of the pump will be verified by Blue-White or a factory authorized service center.

10.3 Obtaining In-Warranty Repair

Contact the factory to obtain a RMA (Return Material Authorization) number. Carefully pack the pump to be repaired. It is recommended to include foot strainer and injection/check valve fitting since these devices may be clogged and part of the problem. Please enclose a brief description of the problem as well as the original invoice or sales receipt, or copy showing the date of purchase. Prepay all shipping costs. COD shipments will not be accepted. Warranty service must be performed by the factory or an authorized service center. Damage caused by improper packaging is the responsibility of the sender. When In-Warranty repair or replacement is completed, the factory pays for return shipping to the dealer or customer.

10.4 Product Use Warning

Blue-White products are manufactured to meet the highest quality standards in the industry. Each product instruction manual includes a description of the associated product warranty and provides the user with important safety information. Purchasers, installers, and operators of Blue-White products should take the time to inform themselves about the safe operation of these products. In addition, Customers are expected to do their own due diligence regarding which products and materials are best suited for their intended applications. Blue-White is pleased to assist in this effort but does not guarantee the suitability of any particular product for any specific application as Blue-White does not have the same degree of familiarity with the application that the customer/end user has. While Blue-White will honor all of its product warranties according to their terms and conditions, Blue-White shall only be obligated to repair or replace its defective parts or products in accordance with the associated product warranties. **BLUE-WHITE SHALL NOT BE LIABLE EITHER IN TORT OR IN CONTRACT FOR ANY LOSS OR DAMAGE WHETHER DIRECT, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL, ARISING OUT OF OR RELATED TO THE FAILURE OF ANY OF ITS PARTS OR PRODUCTS OR OF THEIR NONSUITABILITY FOR A GIVEN PURPOSE OR APPLICATION.**

10.5 Chemical Resistance Warning

Blue-White offers a wide variety of wetted parts. Purchasers, installers, and operators of Blue-White products must be well informed and aware of the precautions to be taken when injecting or measuring various chemicals, especially those considered to be irritants, contaminants or hazardous. Customers are expected to do their own due diligence regarding which products and materials are best suited for their applications, particularly as it may relate to the potential effects of certain chemicals on Blue-White products and the potential for adverse chemical interactions.

Blue-White tests its products with water only. The chemical resistance information included in this instruction manual was supplied to Blue-White by reputable sources, but Blue-White is not able to vouch for the accuracy or completeness thereof. While Blue-White will honor all of its product warranties according to their terms and conditions, Blue-White shall only be obligated to repair or replace its defective parts or products in accordance with the associated product warranties.

BLUE-WHITE SHALL NOT BE LIABLE EITHER IN TORT OR IN CONTRACT FOR ANY LOSS OR DAMAGE, WHETHER DIRECT, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL, ARISING OUT OF OR RELATED TO THE USE OF CHEMICALS IN CONNECTION WITH ANY BLUE-WHITE PRODUCTS.

11.0 Chem-Feed® Skid System Matrix

CHEM-FEED® Engineered Plastic Skid System Model Number

CFPS-1	Single pump system - Single Pump - single chemical / single outlet, PE structure
CFPS-2	Duplex system - Dual Pump - single chemical / single outlet, PE structure
CFPS-3	Triplex pump system - Dual Pump - single chemical / single outlet, PE structure

Piping / Valves / Unions / Seal Materials

A	PVC piping, 1/2” OD PVC braided tubing connections	D	CPVC piping, 1/4” ID polyethylene tubing connections
B	CPVC piping, 1/2” OD PVC braided tubing connections	X	Skid frame only without piping
C	PVC piping, 1/4” ID polyethylene tubing connections		

Seal Material

V	FKM	E	EPDFM

Calibration Cylinder

		PVC		Glass
A	64 GPH (4000 ml)	A		
B	32 GPH (2000 ml)	B		
C	16 GPH (1000 ml)	C		P
D	8 GPH (500 ml)	D		Q
E	4 GPH (250 ml)	E		R
F	1.6 GPH (100 ml)	F		S
X	None			

Pulsation Dampener

A	10 cubic inch, CPVC body, PTFE diaphragm	X	None

Pressure Guage w/Guard

A	200 PSI gauge with guard, PTFE diaphragm	C	30 PSI gauge with guard, PTFE diaphragm
B	100 PSI gauge with guard, PTFE diaphragm	X	None

Flow Meter and Strainer

G	Model MS612 chemical feed flow meter, 10-5,000 ml/min (0.158 - 79.2 GPH)
H	Model MS622 chemical feed flow meter, 100-10,000 ml/min (1.58 - 158 GPH)
X	Inlet strainer only

Miscellaneous Options (leave blank if not specified)

1	Install and ship with a specific pump model
2	Perform pressure and fluid testing with a specific pump model
3	Perform pressure, fluid testing, and ship with pump model installed
5	1/2” Intake manifold plumbing (Dual Skid Only)
A	Isolation ball shut-off valves at check valves
T1	PTFE Tubing for Single Skid
T2	PTFE Tubing for Dual Skid
T3	PTFE tubing for Triplex Skid
C1	Terminal box and electrical outlet box for Single Skid
C2	Terminal box and electrical outlet box Duplex Skid
C3	Terminal box and electrical outlet box Triplex Skid

CFPS-1	A	V	-	A	A	A	G	1	**Sample Model Number**

Users of electrical and electronic equipment (EEE) with the WEEE marking per Annex IV of the WEEE Directive must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to them for the return, recycle, recovery of WEEE and minimize any potential effects of EEE on the environment and human health due to the presence of hazardous substances. The WEEE marking applies only to countries within the European Union (EU) and Norway. Appliances are labeled in accordance with European Directive 2002/96/EC.

Contact your local waste recovery agency for a *Designated Collection Facility* in your area.

Blue-White®

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Rev. 6 20211108

ProSeries-M®

by Blue-White Ind.

ProSeries-M® Peristaltic Metering Pumps

Engineering and Technical Data

FLEX-PRO® M-2

M-224-MND for Sodium Bisulfite

Feed Rates to 17.2 GPH (65.1 LPH)
Pressures to 125 PSI
4-20mA, Pulse Input and Manual Speed Control
200:1 Turndown ratio
Tube Failure Detection System
Tube life hour counter
Variable Speed DC Motor
NEMA 4X (IP 66) Washdown Duty
NSF Listed Std. 61
5 Year Warranty

Sold and serviced exclusively by highly skilled, factory authorized technicians.

TFD system Tube Failure Detection · NSF · CE · ETL · NEMA 4X

Patents: 4,496,295 7,001,153 and other patents pending

Applications:

- Municipal Water Treatment
- Municipal Wastewater Treatment
- Chemical Metering
- Chlorination
- Chloramination
- Fluoridation
- Polymer Injection
- Acid Injection
- Alum Injection
- PAC Injection
- Caustic Injection

Features:

- Peristaltic pump design does not have valves that can clog requiring maintenance.
- Self priming - even against maximum line pressure. By-pass valves are not required. Cannot vapor lock, or lose prime. Does not permit syphoning.
- Output rates to: 17.2 GPH (65.1 LPH) and pressures to 125 PSI (8.6 Bar).
- Variable speed DC motor.
- Specially engineered tubing for long life at high pressures. Meets FDA 21 CFR requirements for food contact applications.
- Patented Tube Failure Detection (TFD) system. Senses tube failure by detecting chemical in the pump head. No false triggering.
- 200:1 turndown ratio.
- Inputs: 4-20mA and pulse inputs for remote external speed control and either powered 6-24 VDC or non-powered dry contact closure for remote start/stop.
- Backlit LCD displays motor speed, input signal values, tube life timer, service and alarm status.
- Three Outputs: one 250V/3A relay to monitor TFD (Tube Failure System) and FVS (Flow Verification System), one 4-20mA analog signal scalable to the motor speed and one relay output for run status.
- Two molded squeeze rollers and two alignment rollers for optimum squeeze, unparalleled accuracy, and tube life.
- Heavy duty rotor - single piece plastic rotor means no flexing and increased accuracy with no metal springs or hinges to corrode.
- Inject at maximum pressure in either direction (clockwise and counter clockwise).
- Compatible with Blue-White's output Flow Verification Sensor (FVS) system. Sensor is sold separately.

Engineering Specifications:

Maximum working pressure (excluding pump tubes):
125 psig (8.6 bar)
Note: see individual pump tube assembly maximum pressure ratings.

Maximum Fluid temperature (excluding pump tubes):
3/8" OD x 1/4" ID tubing connections: 130° F (54° C)
M/NPT connections: 185° F (85° C)
Note: see individual pump tube assembly maximum temperature ratings.

Maximum fluid viscosity:
12,000 Centipoise

Maximum suction lift:
30 ft. of water at sea level (14.7 atm psi)

Ambient Operating Temperature
14°F to 115°F (-10°C to 46°C)

Ambient Storage Temperature
-40°F to 158°F (-40°C to 70°C)

Operating Voltage:
115VAC/60Hz, 1ph (1.5 Amp Maximum)
230VAC/60Hz, 1ph (0.7 Amp Maximum)
220VAC/50Hz, 1ph (1.0 Amp Maximum)
240VAC/50Hz, 1ph (1.0 Amp Maximum)

Power Cord Options:
115V60Hz = NEMA 5/15 (USA)
230V60Hz = NEMA 6/15 (USA)
220V50Hz = CEE 7/VII (EU)
240V50Hz = AS 3112 (Australia/New Zealand)

Motor:
Brushed DC, 1/8 H.P.

Duty cycle:
Continuous

Motor speed adjustment range 200:1:
0.5% - 100% motor speed (0.7 to 130 RPM)

Motor speed adjustment resolution:
0.1% increments

Display
Backlit LCD, UV resistant.

Keypad
Eight button positive action tactile switch keypad.

Enclosure:
NEMA 4X (IP66), Polyester powder coated aluminum.
Maximum Overall Dimensions:
7-1/2" W x 10-1/4" H x 14" D (19 W x 26 H x 35.6 D cm)

Product weight:
28.4lb. (12.9 Kg)

Approximate shipping wt:
35 lb. (15.9 Kg)

Materials of Construction:

Wetted components:

Pump Tube Assembly (Model Specific - 2 provided):
Tubing: . . . . . Flex-A-Prene® or Flex-A-Chem® Flex-A-Thane®
Adapter fittings: .PVDF

Recommended Ancillary Items Sold Separately:

Injection / Back-flow Check valve:
Body & insert: . . . . . PVDF
Check Ball: . . . . . Ceramic
Spring: . . . . . Hastelloy C-276
Ball Seat O-ring: . . . . . FKM (optional EP)
Static Seal O-ring: . . . . FKM (optional EP)

For "S" tubing type connections only:
Suction Tubing: . . . . . 3/8" OD x 1/4" ID x 10' Clear PVC
Discharge Tubing: . . . . 3/8" OD x 1/4" ID x 10' Polyethylene (LLDPE)
Suction Strainer: . . . . . Polypropylene

For "M" M/NPT connections only:
Suction Strainer:
Body: . . . . . PVDF
Check Ball: . . . . . Ceramic
Ball Seat O-ring: . . . . . FKM (optional EP)

For "C" Tri-clamp and "Q" Quick Disconnect connections* only:
(Available for ND, NEE, NGG, and G2G only)
Suction Strainer: . . . . . Polypropylene

***Quick Disconnect Valves sold separately**

Non-Wetted components:

Enclosure:
413 Aluminum (Polyester powder coated)

Pump Head:
Valox® (PBT) thermoplastic

Pump Head Cover:
Polycarbonate for added strength and chemical resistance.
Permanently lubricated sealed motor shaft support ball bearing.

Cover Screws:
Stainless Steel

Roller Assembly:
Rotor: .....Valox® (PBT)
Rollers: .....Molded Nylon
Roller Bearings: .....SS Ball Bearings
Roller Shaft: .....316 Stainless Steel

Motor Shaft:
Chrome plated steel

TFD System Sensor pins:
Hastelloy C-276

Power Cord:
3 conductor, SJTW-A Water-resistant

Tube Installation Tool:
Glass Filled Nylon

Mounting Brackets and Hardware:
316 Stainless Steel

Output Specifications:

Feed Rate			Max Speed	Max Pressure	Max Temperature	M-2 Model Numbers		
Flex-A-Prene® M-2 Tube Pumps								
Meets FDA criteria for food | Excellent chemical resistance | CIP | SIP								
GPH	**LPH**	**ML/Min**	**RPM**	**PSI (bar)**	**F (C)**	**115V AC**	**230V AC**	**220V AC**
.01 - 1.7	.03 - 6.5	.54 - 108	130	125 (8.6)	185 (85)	M-224-*ND	M-225-*ND	M-226-*ND
Flex-A-Prene® M-2 Tube Pumps								
Meets FDA criteria for food | Excellent chemical resistance | CIP | SIP								
GPH	**LPH**	**ML/Min**	**RPM**	**PSI (bar)**	**F(C)**	**115V AC**	**230V AC**	**220V AC**
.022 - 4.44	.084 - 16.8	1.4 - 280	130	110 (7.6)	185 (85)	M-224-*NEE	M-225-*NEE	M-226-*NEE
.086 - 17.2	.325 - 65.1	5.4 - 1085	130	110 (7.6)	185 (85)	M-224-*NGG	M-225-*NGG	M-226-*NGG
Flex-A-Chem® M-2 Tube Pumps								
Meets FDA criteria for food | Superb chemical resistance								
GPH	**LPH**	**ML/Min**	**RPM**	**PSI (bar)**	**F (C)**	**115V AC**	**230V AC**	**220V AC**
.07 - 14.3	.27 - 54	4.5 - 900	130	50 (3.4)	130 (54)	M-224-*TH	M-225-*TH	M-226-*TH
Flex-A-Thane® M-2 Tube Pumps								
Meets FDA criteria for food | Resistant to oils, greases and fuels								
GPH	**LPH**	**ML/Min**	**RPM**	**PSI (bar)**	**F (C)**	**115V AC**	**230V AC**	**220V AC**
.02 - 4.0	.08 - 15.2	1 - 253	130	65 (4.5)	130 (54)	M-224-*GE	M-225-*GE	M-226-*GE
.05 - 9.3	.17 - 35.2	3 - 587	130	65 (4.5)	130 (54)	M-224-*GG	M-225-*GG	M-226-*GG
.07 - 14.98	.03 - 56.7	4.7 - 945	130	65 (4.5)	130 (54)	M-224-*G2G	M-225-*G2G	M-226-*G2G

* Inlet/outlet connection type
S = 3/8” OD x 1/4” ID tubing compressions type connections
M = 1/2” male NPT
MB = 1/2” male BSPT
B = 1/2” Hose barb, Natural PVDF (Kynar), (ND, NEE, NGG, and G2G only)
C = 1/2” - 3/4” tri-clamp connections (ND, NEE, NGG, and G2G only)
Q = Quick Disconnect (ND, NEE, NGG, and G2G only) **(Valves sold separately)**

- The Flex-Pro Pump’s motor speed is linear over the entire 0.5% to 100% adjustment range.
- Output versus pressure is nearly linear in all models. Larger tubes exhibit greater losses.
- For optimum tube life, specify the pump to operate at the lowest possible RPM and pressure.

Quick-Disconnect Valve Kits (Sold Separately)

For use with the Quick-Disconnect Flex-A-Prene Tube Assembly

⅜” OD, ¼” Tubing

Part #	O-ring
KIT-QSV	FKM
KIT-QSE	EP

½” Hose Barb

Part #	O-ring
KIT-QBV	FKM
KIT-QBE	EP

½” M/NPT

Part #	O-ring
KIT-QMV	FKM
KIT-QME	EP

Chemical Resistance of Tubing:

Flex-A-Prene® Tubing

Meets FDA criteria for food | Excellent chemical resistance | CIP | SIP

Alcohol general	Ethylene glycol	Hydrochloric acid 33%	Potassium hydroxide
Aluminum Sulfate (Alum)	Ferric chloride	Hydrocyanic acid	Propylene glycol
Ammonium chloride	Ferric nitrate	Hydrogen peroxide	Sodium hydroxide 50%
Ammonium hydroxide	Ferric sulfate	Hypochlorous acid	Sodium Bisulfite
Ammonium Sulfate (LAS)	Ferrous chloride - 43% in water	Iodine	Sodium Hypochlorite 12.5%
Benzyl alcohol	Ferrous sulfate	Magnesium chloride	Sodium sulfide
Bleach	Fluosilicic Acid (up to 25%)	Magnesium sulfate	Sulfuric acid up to 50%
Brine solutions	Formic acid	Phosphoric acid	Tannic acid
Calcium hypochlorite 20%	Glucose	Plating solutions	

Flex-A-Chem® Tubing - Ultra smooth plasticizer-free bore (inner liner)

Meets FDA criteria for food | Superb chemical resistance

Ferrous Chloride (up to 40%)	Phosphoric Acid (up to 85%)	Bases	Applications:
Fluoboric Acid (up to 48%)	Potassium Hypochlorite (up to 70%)	Salts	Ink and solvent production
Fluosilicic Acid (up to 25%)	Potassium permanganate (up to 6%)	Ketones	Battery acid filling
Hydrofluoric Acid (up to 48%)	Sodium Phosphate (up to 30%)	Alcohols	Specialty chemical production / processing
Nitric Acid (up to 71%)	Sulfuric Acid (up to 98%)	Isobutyl Alcohol	Sensitive fluid transfer

Flex-A-Thane® Tubing

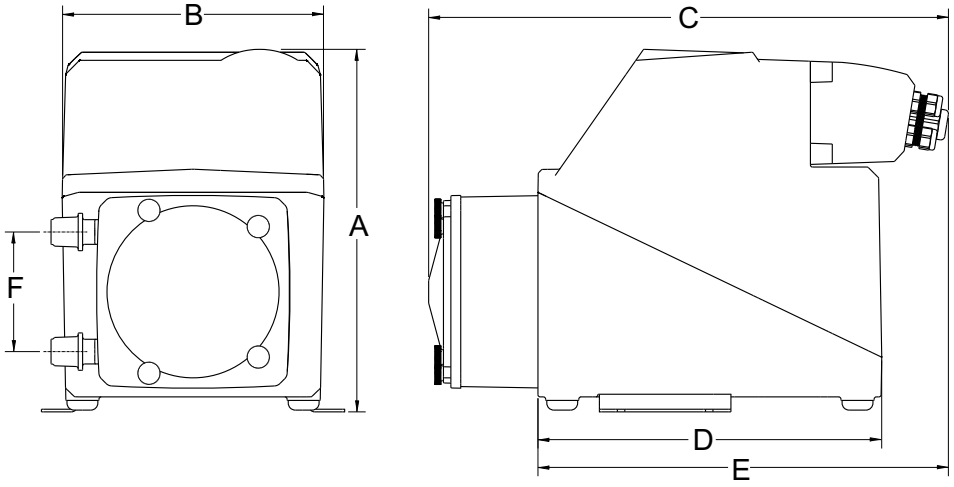
Meets FDA criteria for food | Resistant to oils, greases and fuels

Cyclohexane	Kerosene	Oils:	Oils:
Diesel Fuel	Lard	ASTM reference No.1,2,3	Linseed
Fatty acids	Mineral spirits	Castor	Lubricating
Gasoline	Soap solutions	Coconut	Mineral
Heptane	Turpentine	Fuel	
Hexane	Polymers		

Note: Data shown at 72 degrees F.

Engineering and Technical Data

Dimensions:



Dim	M-2 Series	
	Inches	cm
A	10-1/4”	26
B	7-1/2”	19
C	14”	35.6
D	9-1/2”	24.1
E	11”	27.9
F	3-3/8”	8.6

Model Number Matrix:

M	**Flex-Pro ProSeries-M Model Number**
	Maximum Output Range
2	Flex-Pro M-2
	Maximum Motor Speed
2	130 RPM (maximum rotor rotation speed)
	Power Cord (operating voltage user selectable 115V/240 Vac 50/60Hz)
4	115V / 60Hz, power cord NEMA 5/15 plug (US)
5	230V / 60Hz, power cord NEMA 6/15 plug (US)
6	220V / 50HZ, power cord CEE 7/VII plug (EU)
8	240V / 50HZ, power cord AS 3112 plug (Australia/New Zealand)
9	230V / 50HZ, power cord BS 1363 plug (UK)
X	No Power Cord
	Inlet/Outlet Connection Size, Connection Type, Connection Material
S	3/8” OD x 1/4” ID Tube Compression Fitting, Natural PVDF (Kynar)
M	1/2” Male NPT Fitting, Natural PVDF (Kynar)
B	1/2” Hose Barb, Natural PVDF (Kynar), available for ND, NEE, NGG, and G2G only
C	1/2” - 3/4” Tri-clamp connections, Natural PVDF (Kynar), available for ND, NEE, NGG, and G2G only
Q	Quick Disconnect, Natural PVDF (Kynar), available for NDD, NEE, NGG, and G2G only (valves sold seperately)
MB	1/2” Male BSPT Fitting, Natural PVDF (Kynar)

Pump Tube Material, Pump Tube Size, Output Range			
ND	Flex-A-Prene® .078 ID, 0.01 to 1.7 GPH	**GE**	Flex-A-Thane® .125 ID, 0.02 to 4.0 GPH
NEE	Flex-A-Prene® .093 ID, 0.022 to 4.44 GPH	**GG**	Flex-A-Thane® .187 ID, 0.05 to 9.3 GPH
NGG	Flex-A-Prene® .187 ID, 0.086 to 17.2 GPH	**TH**	Flex-A-Chem® .250 ID, 0.08 to 14.9 GPH
G2G	Flex-A-Thane® .187 ID, 0.07 - 14.98 GPH		

Options (leave this blank for standard model with left facing pump head inlet/outlet)	
R	Right facing pump head, input / output (Left facing fluid input / output is standard)
D	Down facing pump head, input / output (Left facing fluid input / output is standard)

M	-	2	2	4	-	S	N H	-	R	Sample Model Number

Features list:

Features:
TFD (Tube Failure Detection) System Alarm
FVS (Flow Verification System) Alarm *
Motor reverse (rotor reversible)
Three position pump head rotation
Output: One, 3 amp alarm relay, 1 amp motor run status
Output: Analog 4-20mA
Input: One, dry contact closure 6-24 Vdc powered loop for remote start / stop
Input: Remote speed control via 4-20mA, 0-10VDC, high speed digital pulse, contact closure pulse
Display: Motor speed, Input signal values, Tube life timer, Tube Failure Detection (TFD) system and Flow Verification System (FVS) alarm status

* Requires Micro-Flo Sensor sold separately

Available Operating Modes:
Manual (local): speed adjustment
Remote input: 4-20mA
Remote input: high speed frequency (pulse) input
Remote input: pulse triggered batch dispensing

Factory Authorized Representative:

ProSeries-M® by Blue-White Ind.
5300 Business Drive, Huntington Beach, CA 92649
Tel: 714-893-8529 **Fax:** 714-894-9492
www.ProSeries-M.com **Email:** sales@blue-white.com

Blue-White Industries, Ltd.

M-224-MND for Sodium Bisulfite

Operating Manual

FLEXFLO®

Peristaltic Metering Pump

Series M2

READ THE ENTIRE OPERATING MANUAL PRIOR TO INSTALLATION AND USE.


+1 (714) 893 - 8529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5300 Business Drive
Huntington Beach, CA 92649

1.0 Introduction

Congratulations on purchasing Flex-Pro variable speed Peristaltic Metering Pump. A peristaltic pump is a type of positive displacement pump used for pumping a variety of fluids.

Your Flex-Pro pump is pre-configured for tubing that shipped with your metering pump. Tubing assembly has an Identification number printed on tube for easy re-order; such as ND, NH, etc.

Please Note: Your new pump has been pressure tested at factory with clean water before shipping. You may notice trace amounts of clean water in pre-installed tube assembly. This is part of our stringent quality assurance program at Blue-White Industries.

1.1 Available Models

Flex-A-Prene® M2 Tube Pumps

Meets FDA criteria for food | Excellent chemical resistance | CIP | SIP

GPH	LPH	ML/Min	RPM	PSI (bar)	F (C)	115V AC	230V AC	220V AC
.01 - 1.7	.03 - 6.5	.54 - 108	130	125 (8.6)	185 (85)	M-224-*ND	M-225-*ND	M-226-*ND

Flex-A-Prene® M2 Tube Pumps

Meets FDA criteria for food | Excellent chemical resistance | Extra long tube life

GPH	LPH	ML/Min	RPM	PSI (bar)	F (C)	115V AC	230V AC	220V AC
.07 - 4.44	.084 - 16.8	1.4 - 280	130	110 (7.6)	185 (85)	M-224-*NEE	M-225-*NEE	M-226-*NEE
.086 - 17.2	.325 - 65.1	5.4 - 1085	130	110 (7.6)	185 (85)	M-224-*NGG	M-225-*NGG	M-226-*NGG

Flex-A-Chem® M2 Tube Pumps

Meets FDA criteria for food | Superb chemical resistance

GPH	LPH	ML/Min	RPM	PSI (bar)	F (C)	115V AC	230V AC	220V AC
.07 - 14.3	.27 - 54	4.5 - 900	130	50 (3.4)	130 (54)	M-224-*TH	M-225-*TH	M-226-*TH

Flex-A-Thane® M2 Tube Pumps

Meets FDA criteria for food | Resistant to oils, greases and fuels

GPH	LPH	ML/Min	RPM	PSI (bar)	F (C)	115V AC	230V AC	220V AC
.02 - 4.0	.08 - 15.2	1 - 253	130	65 (4.5)	130 (54)	M-224-*GE	M-225-*GE	M-226-*GE
.05 - 9.3	.17 - 35.2	3 - 587	130	65 (4.5)	130 (54)	M-224-*GG	M-225*GG	M-226-*GG
.07 - 14.98	.03 - 56.7	4.7 - 945	130	65 (4.5)	130 (54)	M-224-*G2G	M-225*G2G	M-226-*G2G

* Inlet/outlet connection type
S = 3/8" OD x 1/4" ID tubing compressions type connections
M = 1/²" male NPT
B = 1/²" Hose barb, Natural PVDF (Kynar), (ND, NEE, NGG, and G2G only)
C = 1/²" - 3/4" tri-clamp connections (ND, NEE, NGG, and G2G only)
Q = Quick Disconnect (ND, NEE, NGG, and G2G only) **(Valves sold separately)**

- Flex-Pro Pumps motor speed is linear over entire 1% to 100% adjustment range.
- Output versus pressure is nearly linear in all models. Larger tubes exhibit greater losses.
- For optimum tube life, specify pump to operate at lowest possible RPM and pressure.
- Feed rates taken in laboratory environment with clean water after 20 minute tube break-in period with a 3 foot (1 meter) suction lift.

Optional Extended Brackets

Stainless Steel extended brackets allow pump to be securely mounted to most any surface; floor, shelf, or skid. Brackets lift pump up 4-1/2 inches (11.43 cm), for easy pump access in hard to reach areas.

- Raise metering pump 4-1/2 inches (11.43 cm) off ground or a surface.
- Made out of tough Stainless Steel.
- Provides a stable mounting surface.

Model #	Description
72000-380	Extended Mounting Bracket, 1 Pair, SS, 4 SS Screws

2.0 Specifications

Maximum working pressure (excluding pump tubes):
125 psig (8.6 bar)
Note: see individual pump tube assembly maximum pressure ratings.

Maximum Fluid temperature (excluding pump tubes):
3/8" OD x 1/4" ID tubing connections: 130° F (54° C)
M/NPT connections: 185° F (85° C)
Note: see individual pump tube assembly maximum temperature ratings.

Maximum fluid viscosity:
12,000 Centipoise

Maximum suction lift:
30 ft. Water, 0 psig (14.7 m, 0 bar)

Ambient Operating Temperature
14°F to 115°F (-10°C to 46°C)

Ambient Storage Temperature
-40°F to 158°F (-40°C to 70°C)

Operating Voltage:
115VAC/60Hz, 1ph (1.5 Amp Maximum)
230VAC/60Hz, 1ph (0.7 Amp Maximum)
220VAC/50Hz, 1ph (1.0 Amp Maximum)
240VAC/50Hz, 1ph (1.0 Amp Maximum)

Power Cord Options:
115V60Hz = NEMA 5/15 (USA)
230V60Hz = NEMA 6/15 (USA)
220V50Hz = CEE 7/VII (EU)
240V50Hz = AS 3112 (Australia/New Zealand)

Motor:
Brushed DC, 1/8 H.P.

Duty cycle:
Continuous

Motor speed adjustment range 200:1:
0.5% - 100% motor speed (0.7 to 130 RPM)

Motor speed adjustment resolution:
0.1% increments

Display
Backlit LCD, UV resistant.

Keypad
Eight button positive action tactile switch keypad.

Enclosure:
NEMA 4X (IP66), Polyester powder coated aluminum.
Maximum Overall Dimensions:
7-1/2" W x 10-1/4" H x 14" D (19 W x 26 H x 35.6 D cm)

Approximate shipping wt:
25 lb. (12.0 Kg)

2.1 Materials of construction

Wetted components:

Pump Tube Assembly (Model Specific - 2 provided):
Tubing: . . . . . Flex-A-Prene® or Flex-A-Chem® or Flex-A-Thane®
Adapter fittings: .PVDF

Injection / Back-flow Check valve (sold seperately):
Body & insert: .....PVDF
Check Ball: .....Ceramic
Spring: .....Hastelloy C-276
Ball Seat O-ring:.....TFE/P (optional EPDM)
Static Seal O-ring:.....TFE/P (optional EPDM)

Recommended Ancillary Items (sold seperately):

With "S" tubing type connections only:
Suction Tubing: . . . . . 3/8" OD x 1/4" ID x 10' Clear PVC
Discharge Tubing: . . . . 3/8" OD x 1/4" ID x 10' Polyethylene (LLDPE)
Suction Strainer: . . . . . PVDF

Suction Strainer:
Body:. . . . . PVDF
Check Ball: . . . . . Ceramic
Ball Seat O-ring: . . . . . TFE/P (optional EPDM)

With "B" tubing and "M" M/NPT connections only:
Suction Strainer:
Body: . . . . . PVDF
Check Ball: . . . . . Ceramic
Ball Seat O-ring: . . . . . TFE/P (optional EPDM)

For "C" Tri-clamp and "Q" Quick Disconnect connections only:
(Available for ND, NEE, NGG, and G2G only)
Suction Strainer: . . . . . PVDF

***Quick Disconnect Valves sold separately**

Non-Wetted components:

Enclosure:
413 Aluminum (Polyester powder coated)

Pump Head:
Valox® (PBT) thermoplastic

Pump Head Cover:
Polycarbonate for added strength and chemical resistance.
Permanently lubricated sealed motor shaft support ball bearing.

Cover Screws:
Stainless Steel

Roller Assembly:
Rotor:.....Valox® (PBT)
Rollers: .....PVDF/Nylon
Roller Bearings: .....SS Ball Bearings

Motor Shaft:
Chrome plated steel

TFD System Sensor pins:
Hastelloy C-276

Power Cord:
3 conductor, SJTW-A Water-resistant

Tube Installation Tool:
GF Nylon

Mounting Brackets and Hardware:
316 Stainless Steel

3.0 Features

Peristaltic pump design does not have valves that can clog requiring maintenance.

Self priming - even against maximum line pressure. By-pass valves are not required. Cannot vapor lock or lose prime.

Variable speed DC motor.

Rated for continuous duty (24X7).

Specially engineered tubing for long life at high pressures. Meets FDA 21 CFR requirements for food contact applications.

Patented Tube Failure Detection (TFD) system. Senses tube failure by detecting chemical in pump head.

Backlit LCD displays motor speed, input signal values, service and alarm status.

Precision molded squeeze and alignment rollers for optimum squeeze, unparalleled accuracy, and tube life.

Heavy duty rotor - single piece plastic rotor means no flexing and increased accuracy with no metal springs or hinges to corrode.

Inject at maximum pressure in either direction (clockwise and counter clockwise).

Compatible with Blue-White's output Flow Verification Sensor (FVS) system.

3.1 Agency Listings

This pump is certified to NSF/ANSI Standard 61 - Drinking Water System Components - Health Effects

This pump is ETL listed to conforms to the following: UL Standard 778 as a motor operated water pump CSA Standard C22.2 as process control equipment

This pump complies to the Machinery Directive 2006/42/EC, BS, EN 60204-1, Low Voltage Directive 2014/35/EU BS EN 61010-1, EMC Directive 2014/30/EU, BS EN 50081-1/BS EN 50082-1.

Symbol	Explanation
	WARNING, risk of electric shock
	CAUTION, refer to users' guide
	GROUND, PROTECTIVE CONDUCTOR TERMINAL

Enclosure Rating:

NEMA 4X: Constructed for either indoor or outdoor use to provide a degree of protection to personnel against incidental contact with enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, and hose-directed water; and that will be undamaged by external formation of ice on enclosure.

IP66: No ingress of dust; complete protection against contact. Water projected in powerful jets against enclosure from any direction shall have no harmful effects.

4.0 Installation

CAUTION ⚠	Risk of chemical overdose. Be certain pump does not overdose chemical during backwash and periods of no flow in circulation system.
CAUTION ⚠	Always wear protective clothing, face shield, safety glasses and gloves when working on or near your metering pump. Additional precautions should be taken depending on solution being pumped. Refer to MSDS precautions from your solution supplier.
CAUTION ⚠	All diagrams are strictly for guideline purposes only. Always consult an expert before installing metering pump on specialized systems. Metering pump should be serviced by qualified persons only.

4.1 Mounting Location

Choose an area located near chemical supply tank, chemical injection point, and electrical supply. Install pump where it can be easily serviced.

316SS Mounting brackets are included. Mount pump to a secure surface using enclosed mounting hardware.

Mount pump close to injection point. Keep inlet (suction) and outlet (discharge) tubing as short as possible. Longer discharge tubing increases back pressure at pump head.

Important! Install a back flow prevention check valve at discharge side of pump to prevent system fluid from flowing back through pump during tube replacement or if tube should rupture. **Important!**

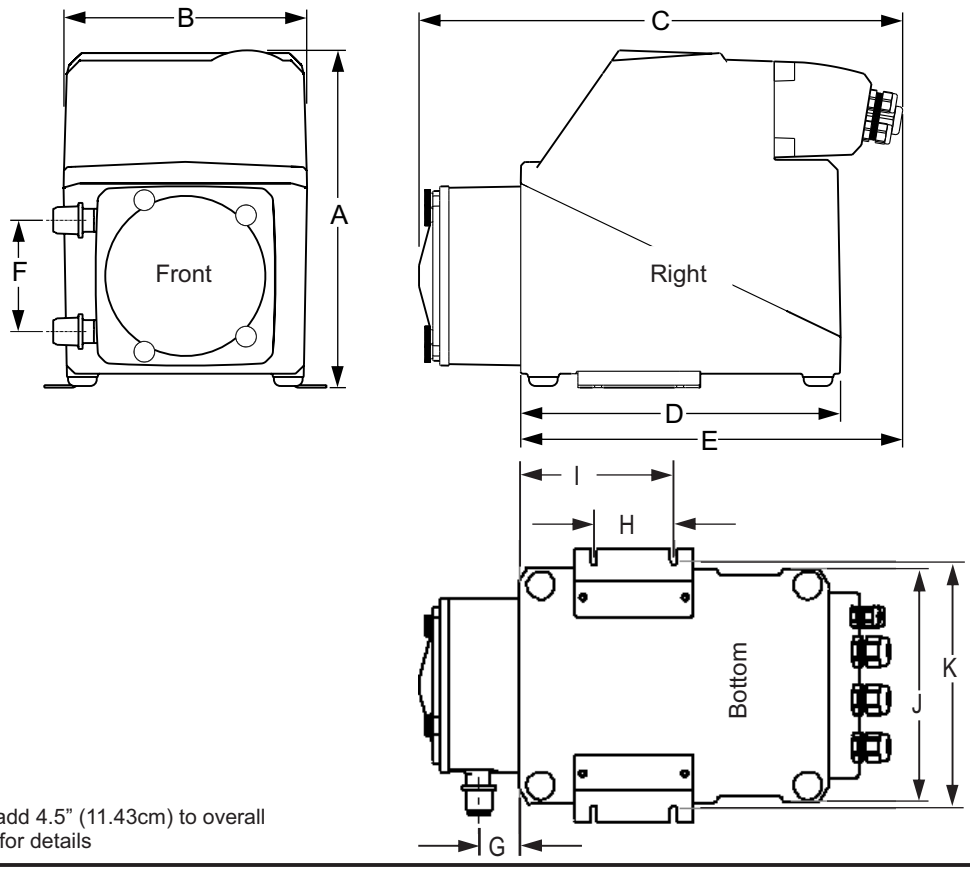
A pressure relief valve is recommended at discharge of pump to prevent premature wear and damage to pump tube in event discharge line becomes blocked.

Flex-Pro pump does not require back pressure. Keep discharge pressure as low as possible to maximize tube life.

4.2 Dimensions

M2 Dimensions

Dim	Inches	cm
A	10-1/4”	26
B	7-1/2”	19
C	14”	35.6
D	9-1/2”	24.1
E	11”	27.9
F	3-3/8”	8.6
G	1-1/4”	3.2
H	2-1/2”	6.4
I	4-7/8”	12.3
J	7-1/4”	18.5
K	7-3/4”	19.7



Note: Optional Extended Bracket add 4.5” (11.43cm) to overall height (dimension A). See page 3 for details

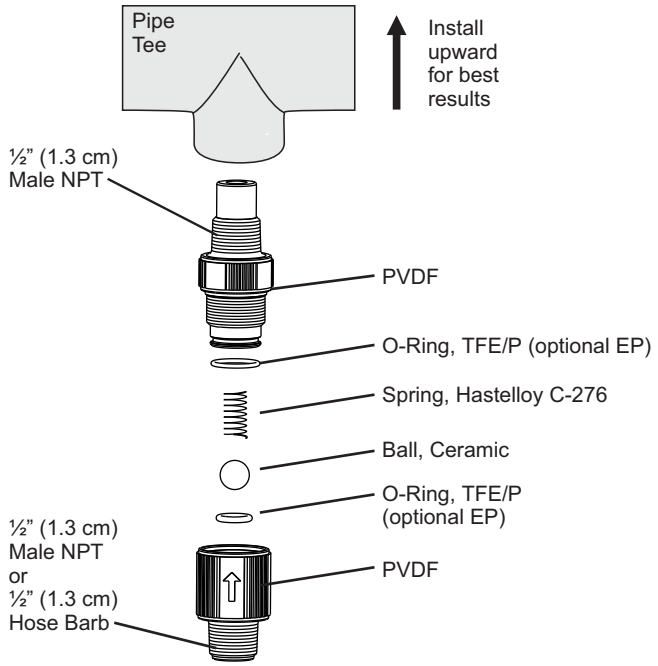
4.3 Installing Blue-White Injection Fitting and Strainer (not included)

CAUTION Proper eye and skin protection must be worn when installing and servicing pump.

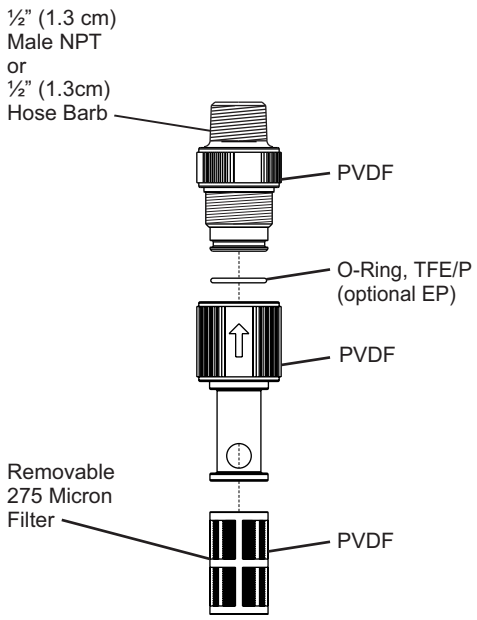
CAUTION This Pump Has Been Evaluated for Use with Water Only.

Injection Fitting and Strainer for ½" (1.3cm) I.D. Connection End Models (not included)

Discharge Injection Fitting / Check Valve)

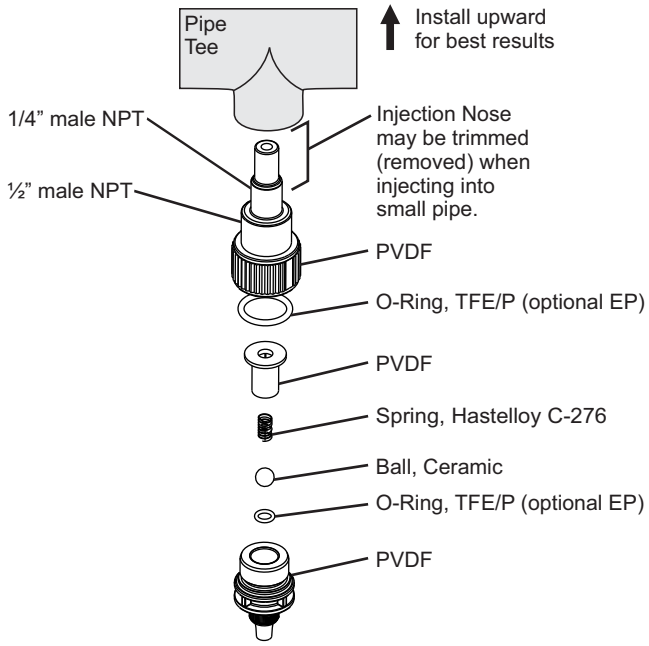


Suction Strainer

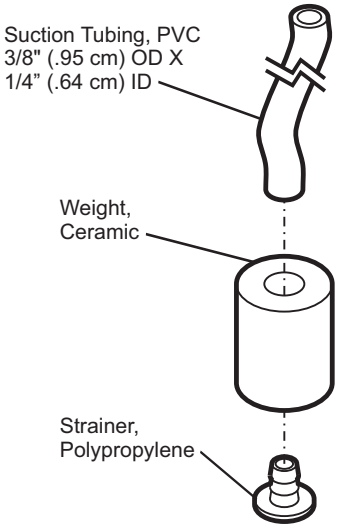


Injection Fitting and Strainer for 1/4" (.64cm) I.D. Connection End Models (not included)

Discharge Injection Fitting / Check Valve



Suction Tubing and Strainer



5.0 Power Connections

WARNING	Risk of electric shock – cord connected models are supplied with a grounding conductor and grounding-type attachment plug. To reduce risk of electric shock, be certain that it is connected only to a properly grounded, grounding-type receptacle.
WARNING	Electrical connections and grounding (earthing) must conform to local wiring codes. Be certain that a grounding conductor is connected to terminal T11-1 located in wiring compartment.
WARNING	Risk of electric shock - Disconnect electricity before removing wiring compartment cover.

Be certain to connect pump to proper supply voltage. Using incorrect voltage will damage pump and may result in injury. Voltage requirement is printed on pump serial label.

Input power: 115VAC 50/60 Hz 1.5 amp or 230/240VAC 50/60 Hz 0.7 amp.

Power switch located in Junction Box.

Use voltage your power cord is rated for.

Cord connected models are supplied with a ground wire conductor and a grounding type attachment plug (power cord). To reduce risk of electric shock, be certain that power cord is connected only to a properly grounded, grounding type receptacle.

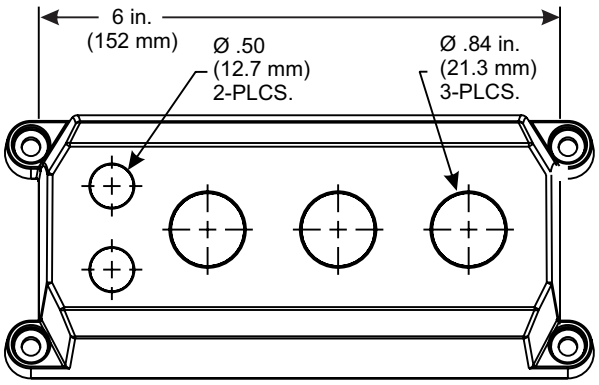
Permanently connected models must be properly grounded. Be certain that a grounding conductor is connected to terminal T11-1 located in wiring compartment.

Never strap control (input / output) cables and power cables together.

Power Interruption: This pump has an auto-restart feature which will restore pump to operating state it was in when power was lost.

Note: *When in doubt regarding your electrical installation, contact a licensed electrician.*

WIRING COMPARTMENT COVER



POWER CORD OPTIONS

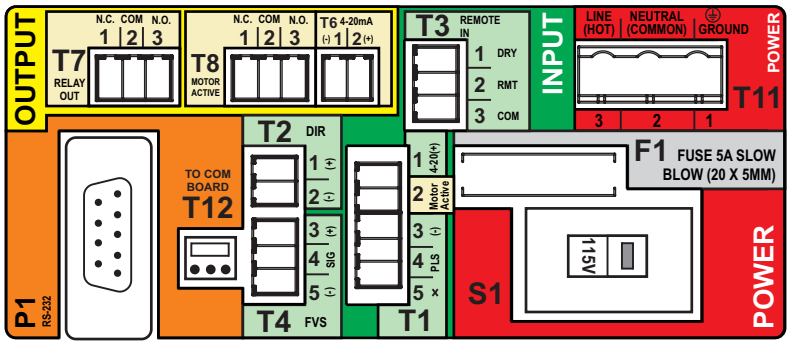
Three power cord plug types available.
Power cord length is 6 feet (3.83 meters)

115V 60Hz	230V 60Hz	240V 50Hz
NEMA 5/15 (USA)	NEMA 6/15 (USA)	CEE 7/VII (EU)
max: 125V AC	max: 250V AC	max: 250V AC

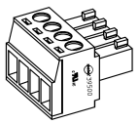
Included cable and conduit connectors:

QTY.	DESCRIPTION
Qty: 2	.50 Inch (12.7 Mm) Liq-tight Hole Plugs (mat'l = Neoprene), Pre-installed
Qty: 3	.875 Inch (22.2 Mm) Liq-tight Hole Plugs (mat'l = Neoprene), 2 Pre-installed
Qty: 2	.50 Inch (12.7 Mm) Liq-tight Connectors For Pass Thru Cords (mat'l = Nylon) Acceptable Cable Diameter .12 To .26 Inch (3.0 To 6.5 Mm), Not Installed
Qty: 3	.875 Inch (22.2 Mm) Liq-tight Connectors For Pass Thru Cords (mat'l = Nylon) Acceptable Cable Diameter .20 To .40 Inch (5.1 To =10.0 Mm), 1 Pre-installed W/ Power Cord Models
Qty: 2	Metallic Liq-tight Connectors For .50 Inch Flexible Conduit (mat'l = Die Cast Zinc), Not Installed

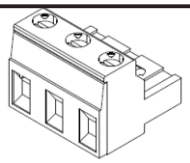
5.1 Wiring Terminals and I/O Schematics



WARNING Risk of electric shock - All wiring must be insulated and rated 300V minimum.



Terminals T1 Thru T8
Plug type
16 - 24 AWG



Power Input Terminal T11
Plug type
14 - 30 AWG

Shielded cables should be used on all input signal wires.

FUNCTION	TERM	PIN #	RATING	ELECTRICAL SP.	BLOCK DIAGRAM
INPUT: 4-20 mA	T1	1	(+) POSITIVE	120 OHM IMPEDANCE, NON POWERED LOOP	**Single or dual pump (series) input. Loop voltage must not exceed 24 Volts.** ACTIVE 4-20mA TRANSMITTER SOURCE + - 4-20(+) GND (-) T1
	T1	3	(-) NEGATIVE		
INPUT: FREQUENCY, AC SINE WAVE, TTL, CMOS	T1	3	(-) NEGATIVE	0-1000 HZ MAX.	FREQUENCY TRANSMITTER SOURCE - + GND (-) PULSE T1
	T1	4	(+) POSITIVE		
INPUT: FVS SYSTEM (FLOW VERIFICATION SENSOR) FV SENSOR ONLY	T4	3	(+) POSITIVE		BLUE-WHITE FVS SENSOR RED (+) BARE BLACK (-) PWR (+) SIGNAL GND (-) T4 FVS
	T4	4	SIGNAL		
	T4	5	(-) NEGATIVE		
INPUT: FVS SYSTEM (FLOW VERIFICATION SENSOR) FS or FP MICRO-FLO FLOW METER ONLY					BLUE-WHITE MICRO-FLO FLOWMETER PULSE OUTPUT SIGNAL NEGATIVE (-) PWR (+) SIGNAL GND (-) T4 FVS
	T4	4	SIGNAL		
	T4	5	(-) NEGATIVE		
INPUT: REMOTE START / STOP (DRY CONTACT C.)	T3	1	(+) POSITIVE	NO VOLTAGE	**NOTE: USE ONLY DRY CONTACT FOR REMOTE S/S WHEN USING 4-20mA INPUT** OPEN CIRCUIT IMPEDANCE MUST BE GREATER THAN 50K OHM (-) (+) T3 REMOTE IN 1 DRY 2 RMT 3 COM
	T3	2	(-) NEGATIVE		
INPUT: REMOTE START / STOP (WET CONTACT C.)	T3	2	(+) POSITIVE	6 TO 30 VOLT DC 1 AMP MAX.	EXTERNAL DEVICE 6 TO 30V DC (+) (-) T3 REMOTE IN 1 DRY 2 RMT 3 COM
	T3	3	(-) NEGATIVE		
OUTPUT: 4-20 mA	T6	2	(+) POSITIVE	120 OHM RESISTANCE ACTIVE LOOP	4-20mA RECEIVER 600 OHM LOAD MAX. (-) (+) T6 4-20 (-) 1 2 (+)
	T6	1	(-) NEGATIVE		
OUTPUT: RELAY, 3 AMP	T7	1	NORM. CLOSED	Form C 3 AMP MAX AT 250 VAC, 3 AMP MAX AT 30 VOLT DC	SWITCH LOAD 3 AMP MAX @ 250V AC 3 AMP MAX @ 30V DC NC C NO T7 RELAY OUT N.C. COM N.O. 1 2 3
	T7	2	COMMON		
	T7	3	NORM. OPEN		
OUTPUT: OPEN COLLECTOR MOTOR ACTIVE	T1	2	SIGNAL	5 TO 24 VDC	**CLOSED WHILE MOTOR IS ENERGIZED** 4.7K OHM SIGNAL OUT NEGATIVE (-) MOTOR ACTIVE GND (-) T1
	T1	3	COMMON		
OUTPUT: MOTOR ACTIVE (CONTACT CLOSURE)	T8	1	NORM. CLOSED	Form C 1 AMP MAX AT 125 VAC, 0.8 AMP MAX AT 30 VOLT DC	SWITCH LOAD 1 AMP MAX @ 125V AC 0.8 AMP MAX @ 30V DC NC C NO T8 MOTOR ACTIVE N.C. COM N.O. 1 2 3
	T8	2	COMMON		
	T8	3	NORM. OPEN		
INPUT: POWER	T11	1	GROUND	115V OR 230V AC MANUAL SWITCH 50 / 60 HZ 100W	AC VOLTAGE LINE (HOT) NEUTRAL (COMMON) GROUND T11 POWER SWITCH FROM 115V TO 230V S1 POWER VOLTAGE SWITCH
	T11	2	NEUTRAL		
	T11	3	LINE (HOT)		
FUSE	F1	N/A	5 AMP	5A SLOW BLOW (20 X 5MM)	

6.0 How to Operate FLEXFLO® - Control Pad

Press and release
To select Run Mode
- Mode 1: Manual
- Mode 2: 4-20mA input
- Mode 3: Frequency input
- Mode 4: Pulse / Batch

Press and Hold
To configure selected Mode
- Mode 0: Setup
- Mode 1: Manual
- Mode 2: 4-20mA input
- Mode 3: Frequency input
- Mode 4: Pulse / Batch

Press and release
To prime pump (60 seconds)

Press and hold
To change rotor direction clockwise or counterclockwise

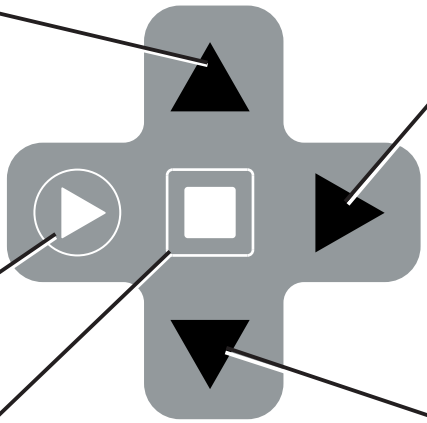
Important: Hold button down to trigger rotor reversal

Press and release
To view tube life timer in hours.

Press and release
To scroll through menu options in Setup mode.
To increase value while in programming mode.
Press UP arrow to increase pump speed (output) in Manual mode (Mode 1).

Press and release
To Start pump.
To begin listening (reacting) to external signals.

Press and release
To Stop pump.



Press and release
To scroll through menu options in Setup mode.
To scroll through pump speed (output) and current incoming signals in run modes:
Mode 2, Mode 3, & Mode 4

Press and release
To scroll through menu options in Setup mode.
To decrease value while in programming mode.
Press DOWN arrow to decrease pump speed (output) in Manual mode (Mode 1).

6.1 Mode Descriptions

Mode 0 - Setup

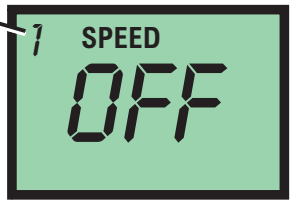
Mode 0

Press and Hold to configure:

- Remote Start / Stop
- TFD (Tube Failure Detection) sensitivity
- FVS (Flow Verification Sensor) time delay - requires sensor
- 4-20 mA output

Mode 1 - Manual

Mode 1

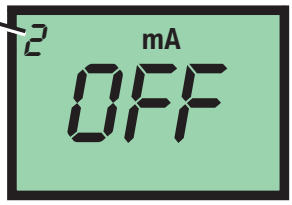


Run pump locally by selecting pump speed (1 - 100%).

- Control speed by using up or down arrows after start button is pressed.
- Control speed by entering Mode 1 setup and selecting desired pump speed (1 - 100%)

Mode 2 - 4-20 mA Input Signal

Mode 2

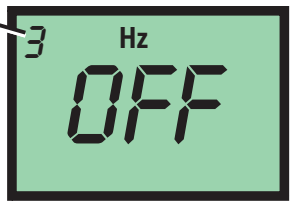


Run pump remotely via external 4-20 mA signal.

- Press and Hold “Select Run Mode” button with Mode 2 selected to configure settings.
- Select Mode 2 and press START button to allow pump to be controlled by external 4-20mA signal.

Mode 3 - Frequency (Hz) Input Signal

Mode 3

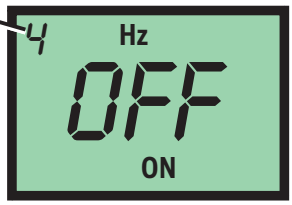


Run pump remotely via external high frequency (Hz) signal.

- Press and Hold “Select Run Mode” button with Mode 3 selected to configure settings.
- Select Mode 3 and press START button to allow pump to be controlled by external frequency (Hz) signal.

Mode 4 - Pulse Batch Input Signal (low speed pulse)

Mode 4



Run pump remotely via external low speed pulse signal.

- Press and Hold “Select Run Mode” button with Mode 4 selected to configure settings.
- Select Mode 4 and press START button to allow pump to be controlled by external low speed pulse signal.

7.0 Mode 0 - Set Remote Start / Stop

Used to remotely start and stop pump using a dry contact closure signal.
When activated; CLOSE = START and OPEN = STOP.

Set to NO = Remote Start / Stop is disabled
Set to Yes = Remote Start / Stop is enabled

Can be used with external foot pedal, PLC, contact closure or other similar external devices.

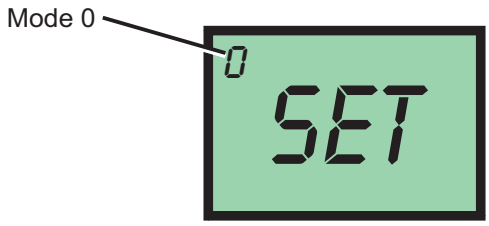
Default setting = No (disabled)

Step 1

Press and release STOP button

Note: Mode cannot be changed while pump is in running.

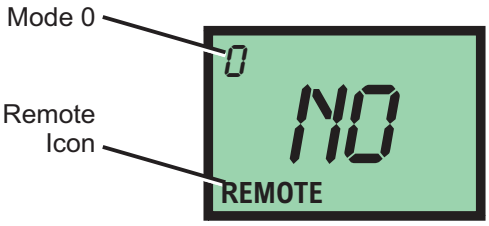
Press and release SELECT RUN MODE button multiple times until Mode 0 is selected.



Step 2

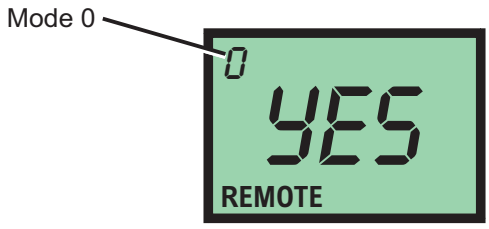
With Mode 0 selected, press and hold SELECT RUN MODE button until 'Remote' icon begins flashing.
Default setting 'NO' will also be visible when entering remote start / stop setup.

Note: If 'YES' had been selected previously, then 'YES' will be displayed on screen.



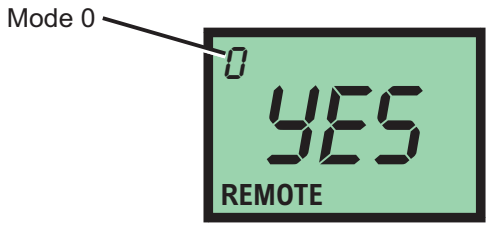
Step 3

Press and release DOWN arrow to change setting to 'YES.'
To change setting back to 'NO' press and release UP arrow.



Step 4

After you've made your selection, press and release RIGHT arrow button. This saves your setting.
You can now modify other settings in Mode 0 or you can exit Setup by pressing and holding SELECT RUN MODE button for a few seconds until you return to Run screen.



Running pump with Remote Start / Stop enabled, 'REMOTE' icon will always be visible on lower left side of screen.
Pump will display 'STBY' (standby) if pump is in stop mode via contact closure signal. **Please use caution in this mode, pump can start at anytime. If you must perform maintenance to pump, press and release STOP button.**

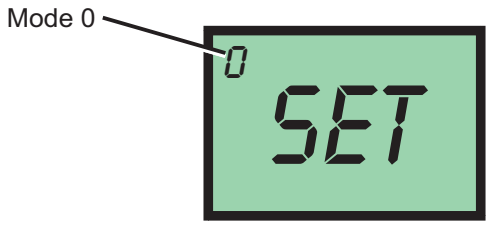
7.1 Mode 0 - Set TFD Sensitivity

Flex-Pro pump is equipped with a Tube Failure Detection (TFD) system which is designed to stop pump in event pump tube should rupture and chemical enters pump head. This patented system is capable of detection presence of a large number of chemicals including Sodium Hypochlorite (chlorine), Hydrochloric (muriatic) Acid, Sodium Hydroxide, and many others.

Minimum and Maximum setting = 75 % to 100%
Default Setting = 75% (75% is recommended; triggers with most water treatment chemicals without false alarms)
Important: 100% sensitivity setting may trigger false alarm by washdown or rain. 100% setting is only recommended when absolutely necessary.

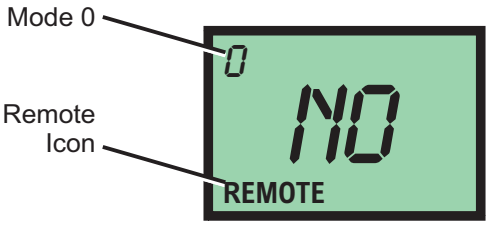
Step 1

Press and release STOP button
Note: Mode cannot be changed while pump is in running.
Press and release SELECT RUN MODE button multiple times until Mode 0 is selected.



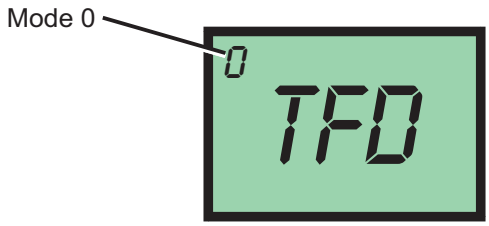
Step 2

With Mode 0 selected, press and hold SELECT RUN MODE button until 'Remote' icon begins flashing.
This indicates that you've entered Setup menu.



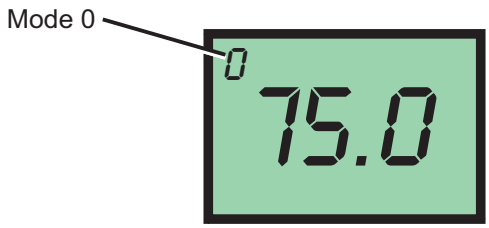
Step 3

Press and release RIGHT arrow button to scroll through menu until you see TFD icon.
If you pass TFD screen, continue to press and release RIGHT arrow button until TFD icon appears.



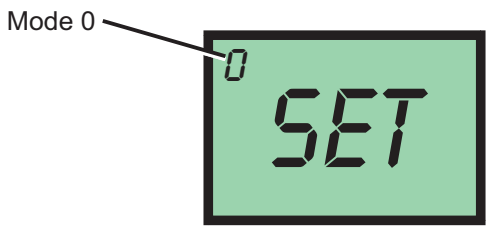
Step 4

TFD icon will appear for 1 second, followed by numbers.
Numbers indicate sensitivity value of TFD.
Press and release UP arrow button to increase sensitivity value.
Press and release DOWN arrow button to decrease sensitivity value.



Step 5

After you've made your selection, press and release RIGHT arrow button. This saves your setting.
You can now modify other settings in Mode 0 or you can exit Setup by; press and hold SELECT RUN MODE button for a few seconds until you return to Run screen.



Confirm chemical detection - To determine if your chemical will be detected by system, remove pump tube and rotor. Place a small amount of chemical in bottom of pump head - just enough to cover sensors. Turn on pump. If TFD system detects chemical, pump will stop after two seconds and TFD alarm screen will display. Press STOP button to clear alarm.

7.2 Mode 0 - Set FVS (flow verification system)

Flow verification sensor sold separately.

Flow verification system is designed to stop pump in an event sensor does not detect flow during pump operation. Indicating an empty chemical tank, clogged injection fitting, loose tubing connection, etc.

To allow pump to clear any gasses that may have accumulated over time, an alarm delay time value from 1 to 255 seconds must be programmed.

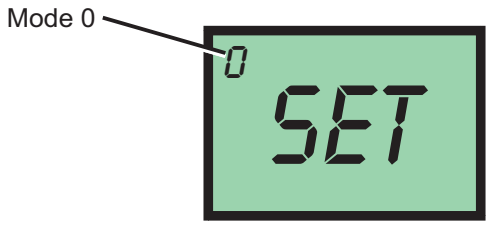
Note: An alarm delay of 000 seconds disables FVS system.

Step 1

Press and release STOP button

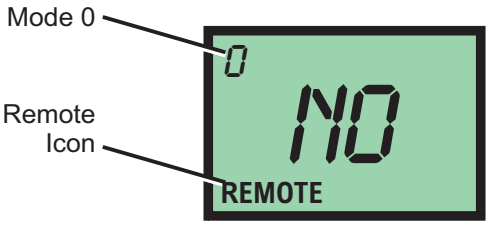
Note: Mode cannot be changed while pump is in running.

Press and release SELECT RUN MODE button multiple times until Mode 0 is selected.



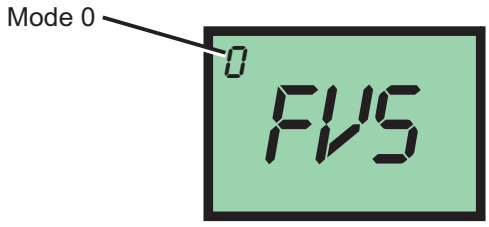
Step 2

With Mode 0 selected, press and hold SELECT RUN MODE button until 'Remote' icon begins flashing.
This indicates that you've entered Setup menu.



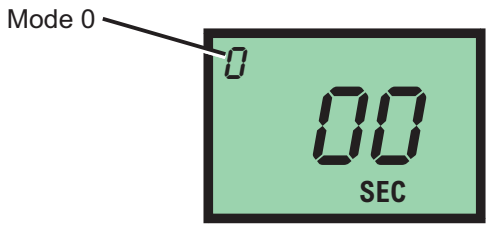
Step 3

Press and release RIGHT arrow to scroll through menu until you see FVS icon.
If you pass FVS screen, continue to press and release RIGHT arrow button until FVS icon appears.



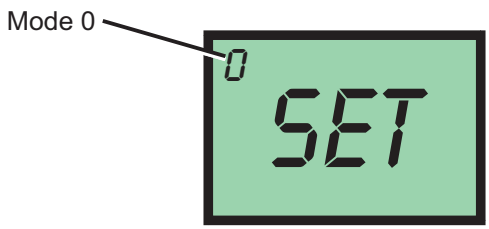
Step 4

FVS icon will appear for 1 second, followed by numbers.
These numbers indicate delay time setting for FVS.
Select a delay time in seconds. Delay time is amount of time pump will wait to receive a pulse from sensor until an alarm it triggered.
A delay time of 00 deactivates FVS feature.



Step 5

After you've made your selection, press and release RIGHT arrow button. This saves your setting.
You can now modify other settings in Mode 0 or you can exit Setup by; press and hold SELECT RUN MODE button for a few seconds until you return to Run screen.



Time-out - Flex-Pro pumps have a time-out setting of 20 seconds while in configuration menus. If built-in timer exceeds 20 seconds without a button being pressed, then pump will exit configuration menu. Changes will only be saved after RIGHT arrow button is pressed and released.

7.2 Mode 0 - Set FVS (flow verification system) - Continued

Flow Verification Sensor is designed to give you two installation options.

Sensor can be installed:

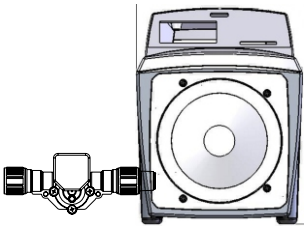
- Directly on pumphead of M2 pump, suction side.
- Anywhere on suction side of M2 pump.

Wiring for sensor can be connected directly to an M2 pump. Pump will stop pumping if sensor detects no flow. A relay will then close allowing for remote alarm indication or initiation of a back-up injector pump. **Install FVS Flow Sensor -** Flow Verification Sensor should be installed on inlet (suction) side of pump tube. Sensor includes a PVC tubing insert, located inside sensors female thread connection, that is designed to seal sensor onto pump tube inlet adapter. Thread sensor onto pump tube until tubing insert is snug against pump tube inlet fitting - do not over-tighten.

Sensor Model Number	Published Flow Range	Actual Working Range with Flex-Pro Pump
	ML/Min	ML/Min
FV-100	30-300	30-200
FV-200	100-1000	50-900
FV-300	200-2000	100-1800
FV-400	300-3000	300-3000
FV-500	500-5000	500-5000
FV-600	700-7000	700-7000

Confirm FVS flow range - Flow Verification Sensor (FVS) will only function within its operating range. See chart for available ranges.

Example: Sensor model FV-100 has an operation range of 30-300 ml/min when used as a flowmeter. However, due to pressure drop across sensor, pump's suction capability is limited to 14.7 psi. When used as a Flow Verification Sensor with a peristaltic pump, effective operating range is reduced to 30-200 ml/min.



NOTE: If pump output is less than 30 ml/min, sensor will not detect chemical and a signal will not be sent to pump, resulting in an alarm condition.

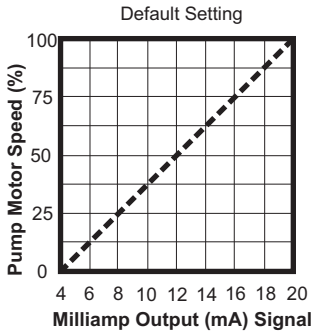
NOTE: For low viscosity (water-like) fluids only. Consult factory if attempting to use with viscous fluids.

7.3 Mode 0 - Set 4-20mA Output

Sends a configurable 4-20 mA signal, based on pump rotor speed, to an external device. This feature can be used to control other pumps (in sync / proportionally), data logging systems, and other external devices for plant automation.

Default setting: Minimum Speed = 4 mA signal output
Maximum Speed = 20 mA signal output

Set to NO = disabled
Set to Yes = enabled

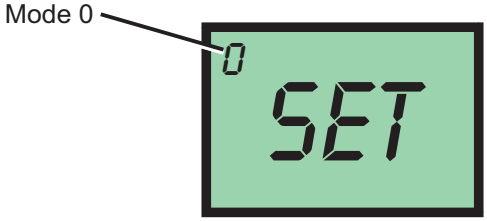


Step 1

Press and release STOP button

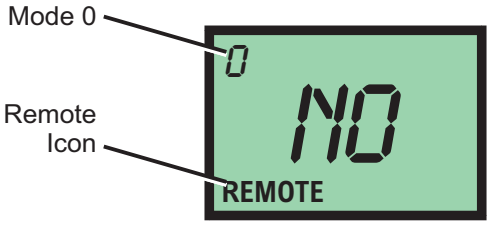
Note: Mode cannot be changed while pump is in running.

Press and release SELECT RUN MODE button multiple times until Mode 0 is selected.



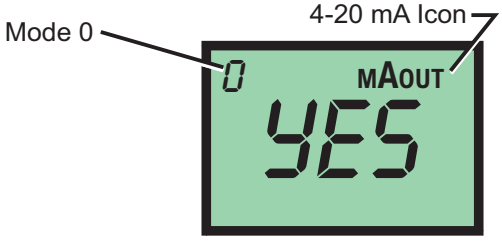
Step 2

With Mode 0 selected, press and hold SELECT RUN MODE button until 'Remote' icon begins flashing.
This indicates that you've entered Setup menu.



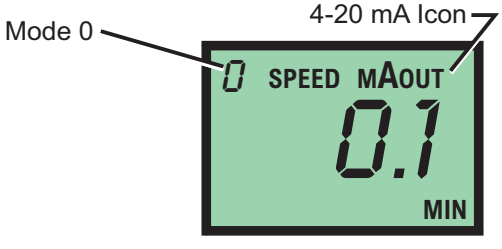
Step 3

Press and release RIGHT arrow to scroll through menu until you see 4-20 mA icon.
To select Yes, press and release DOWN arrow.
To select No, press and release UP arrow.
To begin configuring values, select Yes.
Then press and release RIGHT arrow.



Step 4

Minimum pump speed will be displayed.
To increase value, press and release UP arrow.
To decrease value, press and release DOWN arrow.
To save value, press and release RIGHT arrow.

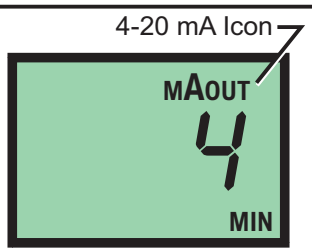


Time-out - Flex-Pro pumps have a time-out setting of 20 seconds while in configuration menus. If built-in timer exceeds 20 seconds without a button being pressed, then pump will exit configuration menu. Changes will only be saved after RIGHT arrow button is pressed and released.

7.3 Mode 0 - Set 4-20mA Output - Continued

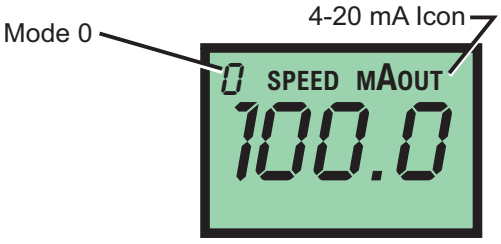
Step 5

Output signal at minimum speed will now be displayed.
To increase value, press and release UP arrow.
To decrease value, press and release DOWN arrow.
To save value, press and release RIGHT arrow.



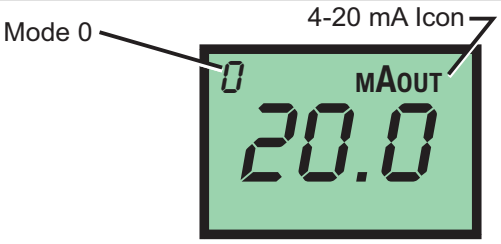
Step 6

Maximum pump speed will be displayed.
To increase value, press and release UP arrow.
To decrease value, press and release DOWN arrow.
To save value, press and release RIGHT arrow.



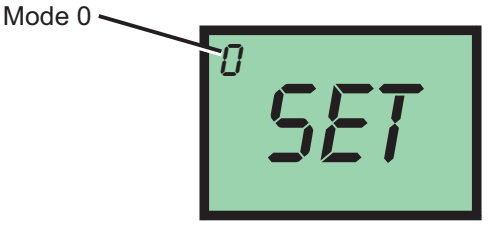
Step 7

Output signal at maximum speed will now be displayed.
To increase value, press and release UP arrow.
To decrease value, press and release DOWN arrow.
To save value, press and release RIGHT arrow.

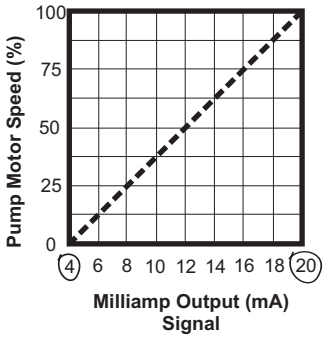


Step 8

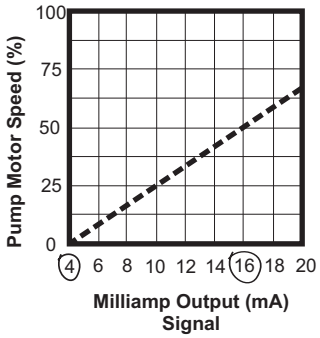
You can now modify other settings in Mode 0 or you can exit Setup by; press and hold SELECT RUN MODE button for a few seconds until you return to Run screen.



Example 1
0% Pump Output = 4 mA
100 % Pump Output = 20 mA



Example 2
0% Pump Output = 4 mA
50% Pump Output = 16 mA



7.4 Mode 0 - Set Flow Rate Display

Display pump output Flow Rate. Default setting: mL/m (Milliliter per minute)

Available settings: none, mL/m, Oz/m, L/h, G/h

Before you begin configuring your Flow Rate, please perform a volumetric test on your pump. Please see section 20.0 Volumetric Test - Calibration (page 36)

Log your Flow Rate using Milliliters Per Minute here _____ mL/m.

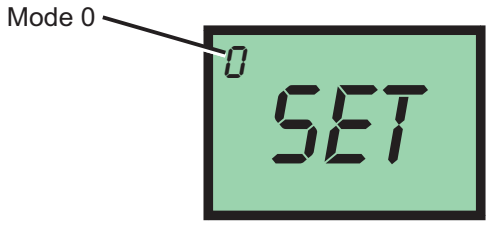
Step 1

Ensure pump is stopped and LCD reads “OFF.”

Note: Mode cannot be changed while pump is in running.

Press and release STOP button if pump is running.

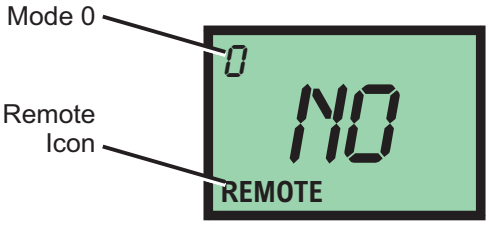
Press and release MODE button multiple times until Mode 0 is selected.



Step 2

With Mode 0 selected, press and hold MODE button until ‘Remote’ icon begins flashing.

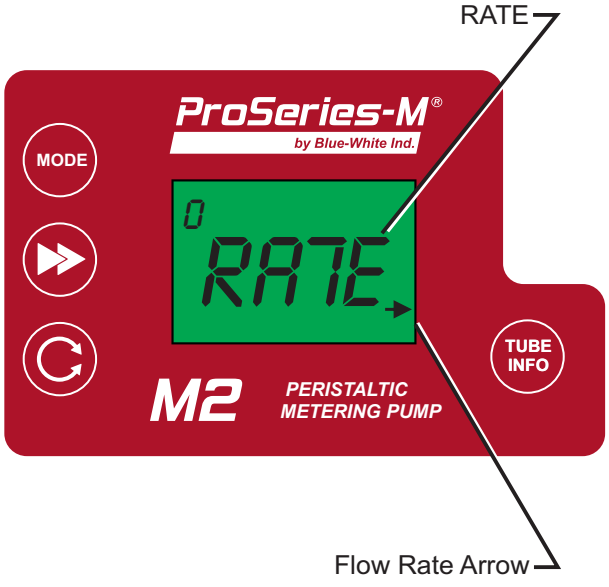
This indicates that you’ve entered Setup menu.



Step 3

Press and release RIGHT ARROW button to scroll through menu until you see RATE display for 2 seconds.

Arrow pointing at Flow Rate will begin flashing.



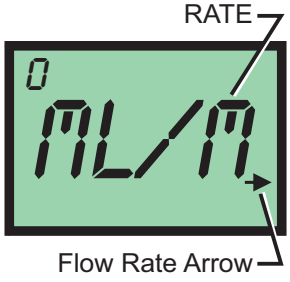
Step 4

Press and release UP button or DOWN button to scroll through Flow Rate units.

Available Flow Rate units:

- None, mL/m, Oz/m, L/h, G/h

Select desired Flow Rate unit. Then press and release RIGHT ARROW button to save selection.



7.4 Mode 0 - Set Flow Rate Display - Continued

Step 5

LCD will flash “FLOW” then “MAX” then “mL/m” (or your selected Flow Rate unit), each for 2 seconds.

Displayed 2 sec. Displayed 2 sec. Displayed 2 sec.

Step 6

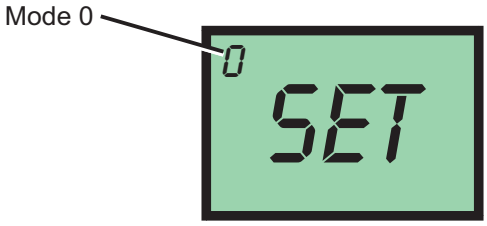
LCD will show four digits (default is 2650 mL/m).
Use this screen to input maximum Flow Rate for your pump in Milliliters Per Minute.
To increase value, press and release UP arrow.
To decrease value, press and release DOWN arrow.
To save value, press and release RIGHT ARROW button.

Default: 2650 mL/m

Important Note: At this step, you are going to input your pumps max Flow Rate in mL/m. While pump is in normal operation, Flow Rate unit you’ve selected in Step 4 will be displayed on LCD.

Step 7

You can now modify other settings in Mode 0 or you can exit Setup by; press and hold MODE button for a few seconds until you return to Run screen.



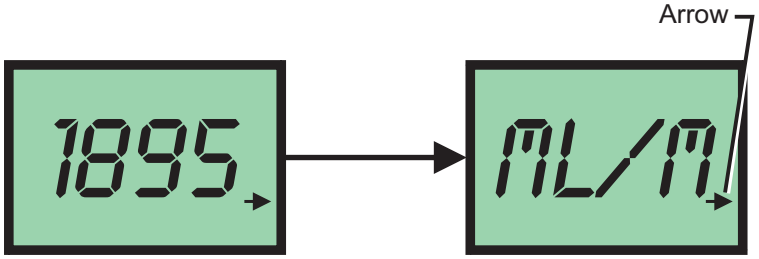
7.4.1 Operation Screens Displaying Flow Rate

Runtime Screen Shot 1

While pump is running, press and release RIGHT ARROW button repeatedly until Flow Rate arrow is displayed pointing at Flow Rate.

LCD will automatically scroll (loop) between actual Flow Rate and units of measure.

Flow value displayed for 4 seconds. Units of measure displayed for 2.5 seconds.



Displayed 4 sec. Displayed 2.5 sec.

8.0 Mode 1 - Manual Operation

Used to manually control speed of pump.

Use UP and DOWN arrows to adjust speed while pump is running.

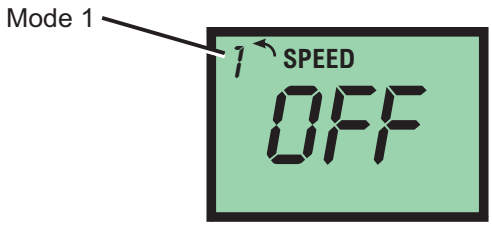
To select exact run speed, follow steps below.

Step 1

Press and release STOP button

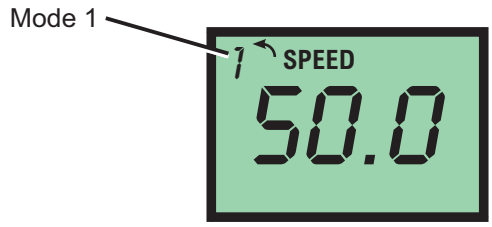
Note: Mode cannot be changed while pump is in running.

Press and release SELECT RUN MODE button multiple times until Mode 1 is selected.



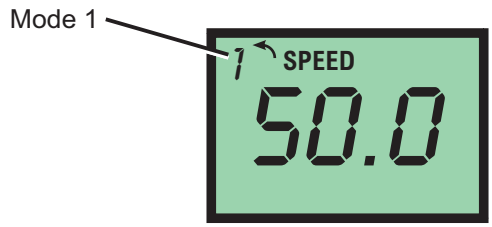
Step 2

With Mode 1 selected, press and hold SELECT RUN MODE button until 'Speed' icon begins flashing.
This indicates that you've entered Setup menu.



Step 3

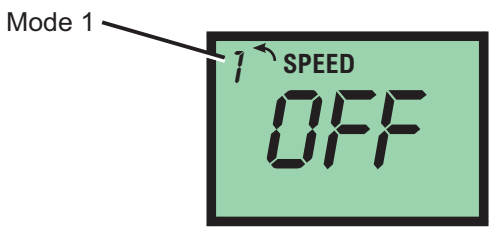
Current pump speed will be displayed.
To increase value, press and release UP arrow.
To decrease value, press and release DOWN arrow.
To save value, press and release SELECT RUN MODE button until 'Speed' icon stop flashing.



Step 4

Pump will now operate at your pre-configured speed.
Press and release START button to start pump.

Press and release STOP button at anytime to stop pump.

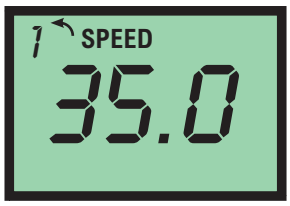


With pump operating in manual mode (Mode 1), pump speed can be changed at anytime by using UP or DOWN arrows during operation.

8.1 Mode 1 - Manual Operation Screen Shots

Runtime Screen Shot 1

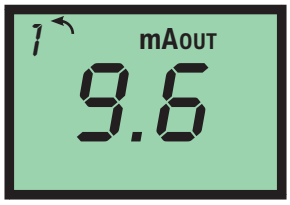
Display motor speed percentage.
Pump Running in Manual Operation



Runtime Screen Shot 2

Display 4-20mA output
Press and release RIGHT arrow to view mA output value in real-time.

Please note: 4-20mA output must be enabled in Mode 0 (see page 16).



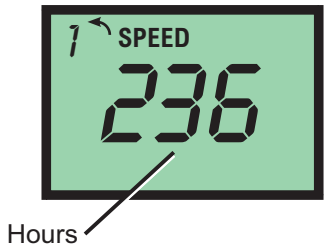
Runtime Screen Shot 3

Display motor speed percentage.
Press and release RIGHT arrow to view percentage of motor speed.

Runtime Screen Shot 4

Display tube life timer.
Press and release TUBE INFO button.

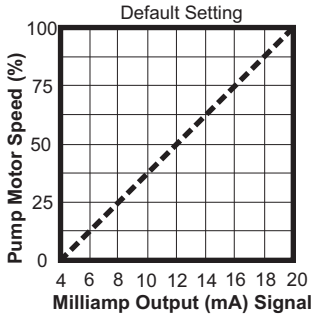
Displays amount of total runtime hours on currently installed tube.
Time will be displayed in hours.
Timer will be display for approximately 5 seconds before returning to previous runtime screen.



9.0 Mode 2 - 4-20mA Input Operation

Used to remotely control pump with an incoming 4-20 mA signal.

Default setting: 4 mA signal = 0.1% motor speed
20 mA signal = 100.0% motor speed

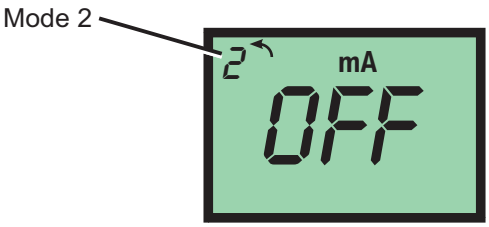


Step 1

Press and release STOP button

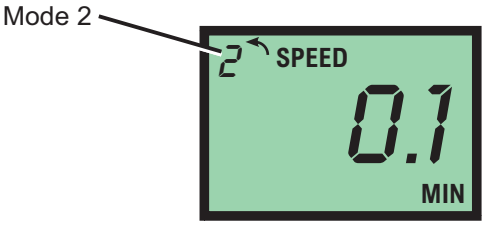
Note: Mode cannot be changed while pump is in running.

Press and release SELECT RUN MODE button multiple times until Mode 2 is selected.



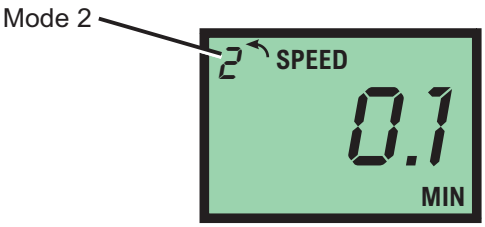
Step 2

With Mode 2 selected, press and hold SELECT RUN MODE button until 'Speed' icon begins flashing.
This indicates that you've entered Setup menu.



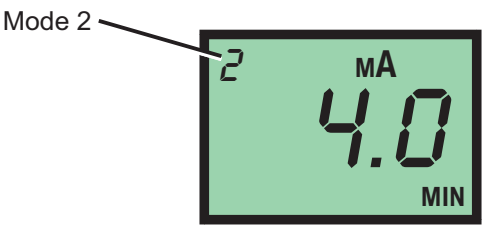
Step 3

Minimum pump speed will be displayed.
To increase value, press and release UP arrow.
To decrease value, press and release DOWN arrow.
To save value, press and release RIGHT arrow.



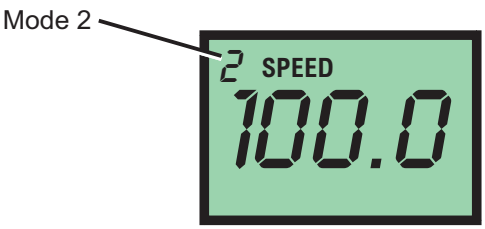
Step 4

mA value linked to minimum pump speed will be displayed.
To increase value, press and release UP arrow.
To decrease value, press and release DOWN arrow.
To save value, press and release RIGHT arrow.



Step 5

Maximum pump speed will be displayed.
To increase value, press and release UP arrow.
To decrease value, press and release DOWN arrow.
To save value, press and release RIGHT arrow.

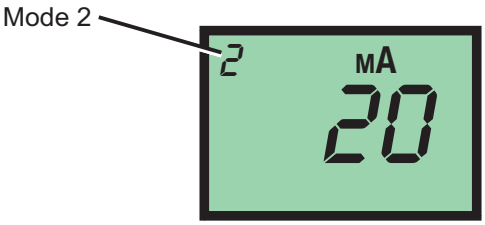


Time-out - Flex-Pro pumps have a time-out setting of 20 seconds while in configuration menus. If built-in timer exceeds 20 seconds without a button being pressed, then pump will exit configuration menu. Changes will only be saved after RIGHT arrow button is pressed and released.

9.0 Mode 2 - 4-20mA Input Operation - Continued

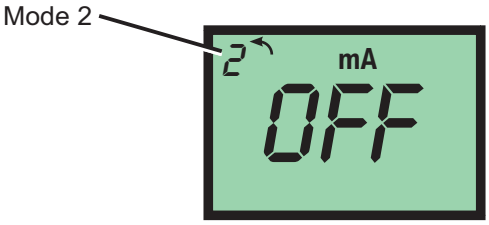
Step 6

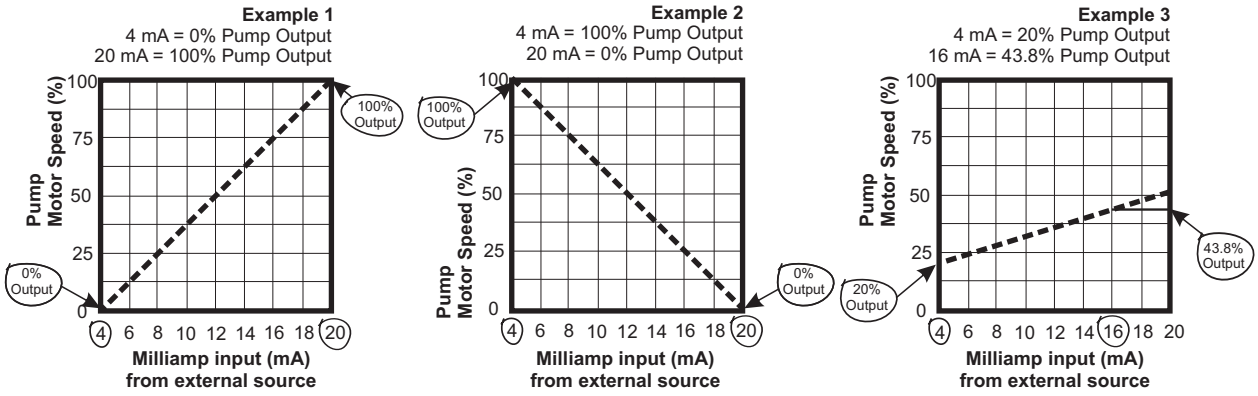
mA value linked to minimum pump speed will now be displayed.
To increase value, press and release UP arrow.
To decrease value, press and release DOWN arrow.
To save value, press and release RIGHT arrow.



Step 7

To exit Setup, press and hold SELECT RUN MODE button for a few seconds until you return to Run screen.

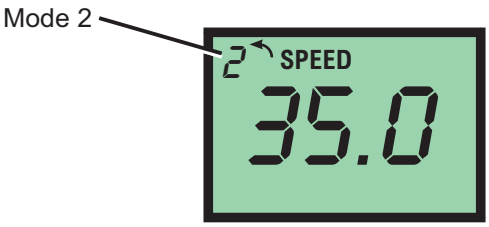




9.1 Mode 2 - 4-20mA Input Screen Shots

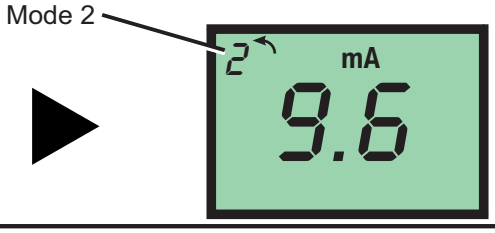
Runtime Screen Shot 1

Display **motor speed percentage.**
Pump Running in 4-20mA Input Operation



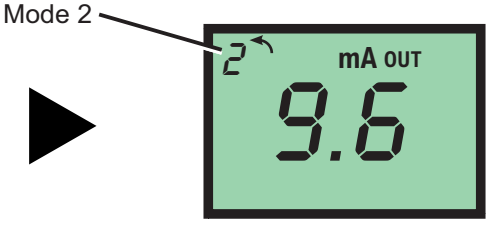
Runtime Screen Shot 2

Display current 4-20mA input signal
Press and release RIGHT arrow to view **mA input** value in real-time.



Runtime Screen Shot 3

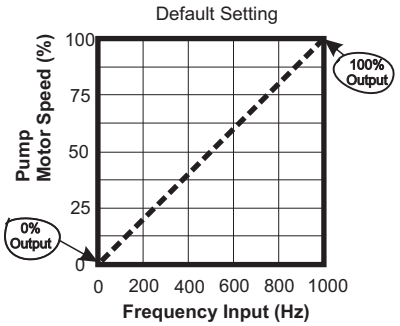
Press and release RIGHT arrow again to view **mA output** value in real-time.
Press and release RIGHT arrow again to view **motor speed percentage**, as in Screen Shot 1.



10.0 Mode 3 - Frequency Input (Hz) Operation

Used to remotely control pump with an incoming high speed frequency signal. Typically used with flow meters or other external devices.

Default setting: 0 Frequency (Hz) = 0% motor speed
1000 Frequency (Hz) = 100% motor speed

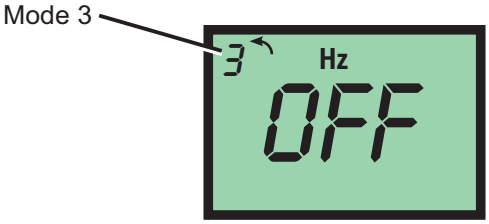


Step 1

Press and release STOP button

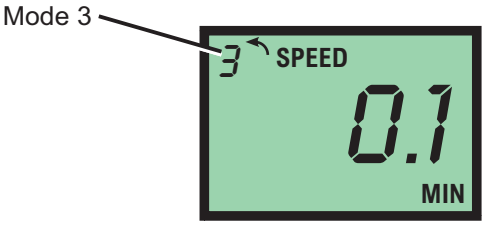
Note: Mode cannot be changed while pump is in running.

Press and release SELECT RUN MODE button multiple times until Mode 3 is selected.



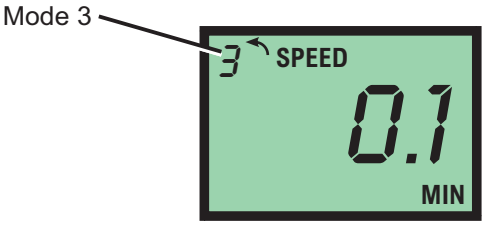
Step 2

With Mode 3 selected, press and hold SELECT RUN MODE button until 'Speed' icon begins flashing.
This indicates that you've entered Setup menu.



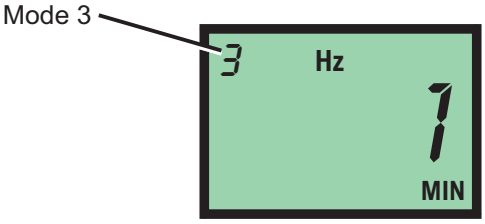
Step 3

Pump speed at minimum Frequency will be displayed.
To increase value, press and release UP arrow.
To decrease value, press and release DOWN arrow.
To save value, press and release RIGHT arrow.



Step 4

Minimum Frequency (Hz) value will be displayed.
To increase value, press and release UP arrow.
To decrease value, press and release DOWN arrow.
To save value, press and release RIGHT arrow.

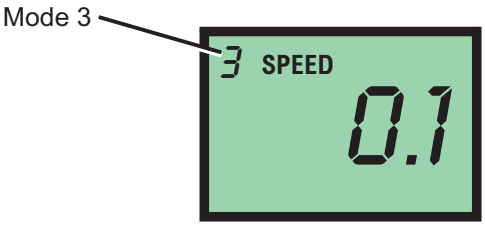


Time-out - Flex-Pro pumps have a time-out setting of 20 seconds while in configuration menus. If built-in timer exceeds 20 seconds without a button being pressed, then pump will exit configuration menu. Changes will only be saved after RIGHT arrow button is pressed and released.

10.0 Mode 3 - Frequency Input (Hz) Operation - Continued

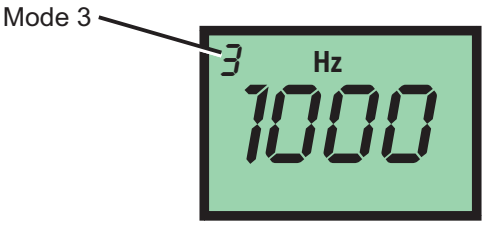
Step 5

Pump speed at maximum Frequency will be displayed.
To increase value, press and release UP arrow.
To decrease value, press and release DOWN arrow.
To save value, press and release RIGHT arrow.



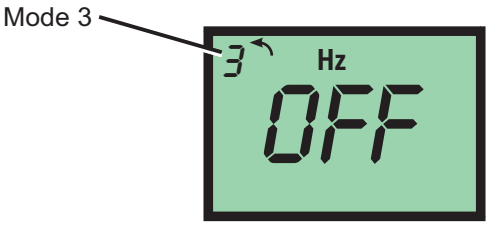
Step 6

Maximum Frequency value will now be displayed.
To increase value, press and release UP arrow.
To decrease value, press and release DOWN arrow.
To save value, press and release RIGHT arrow.

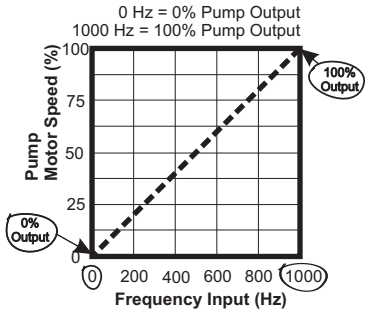


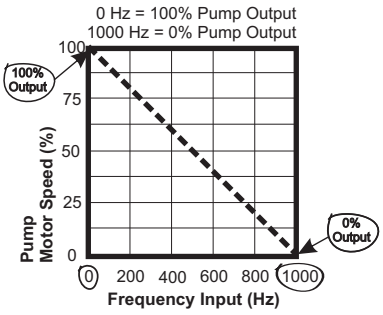
Step 7

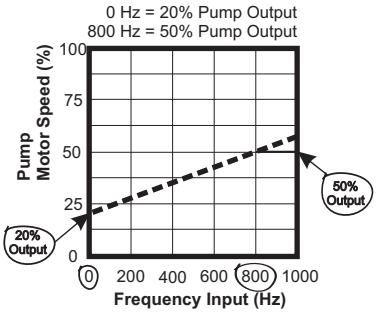
To exit Setup, press and hold SELECT RUN MODE button for a few seconds until you return to Run screen.



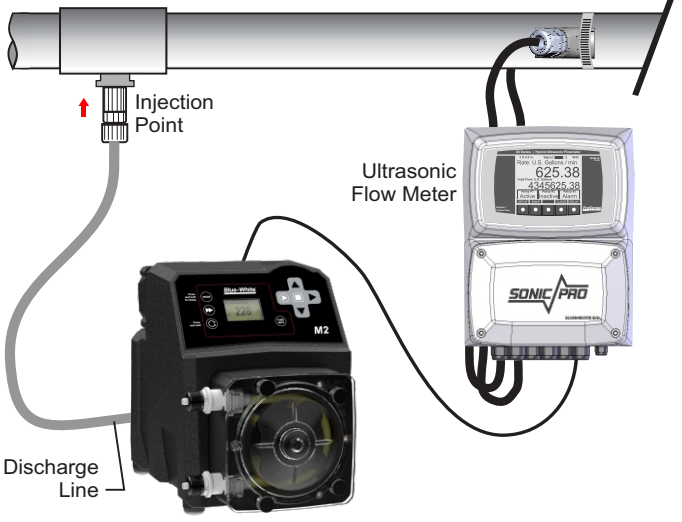
Examples:





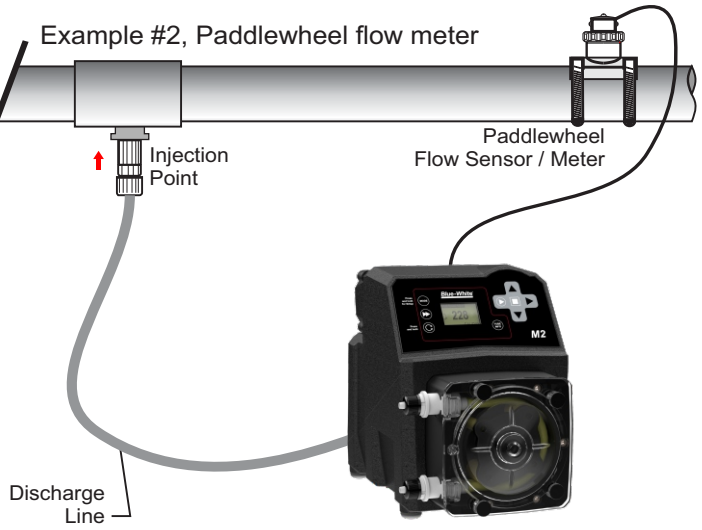


Example #1, Ultrasonic flow meter



or

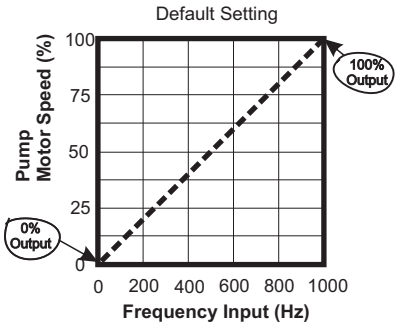
Example #2, Paddlewheel flow meter



11.0 Mode 4 - Pulse Batch (low speed pulse) Operation

Used to remotely control pump with an incoming pulse signal. Can be used with an external foot pedal, a water meter, a PLC, contact closure, or other low speed pulse devices.

Default setting: 1 Pulse = 100% motor speed for 2.5 seconds

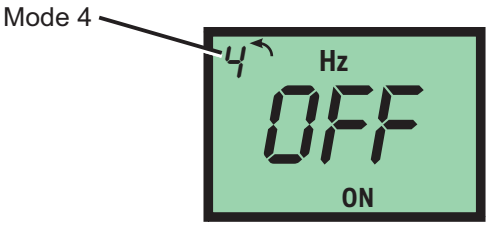


Step 1

Press and release STOP button

Note: Mode cannot be changed while pump is in running.

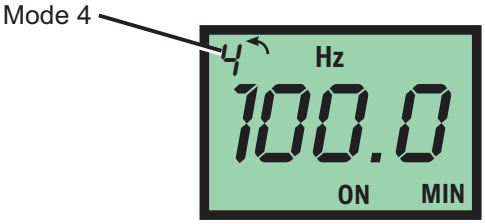
Press and release SELECT RUN MODE button multiple times until Mode 2 is selected.



Step 2

With Mode 2 selected, press and hold SELECT RUN MODE button until 'On' icon begins flashing.

This indicates that you've entered Setup menu.



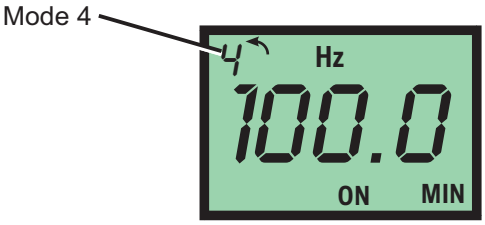
Step 3

Pump on-time will be displayed in either MIN (minutes) or SEC (seconds).

To increase value, press and release UP arrow.

To decrease value, press and release DOWN arrow.

To save value, press and release RIGHT arrow.

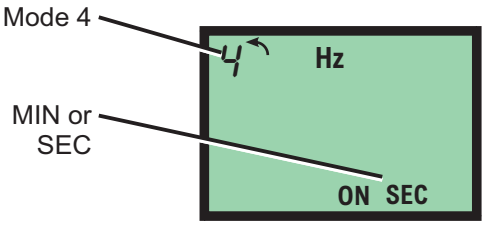


Step 4

MIN (minutes) or SEC (seconds) will be displayed in lower right hand corner. This value will be linked to Pump on-time number in previous screen.

To change this setting, press and release either UP arrow or DOWN arrow.

To save value, press and release RIGHT arrow.

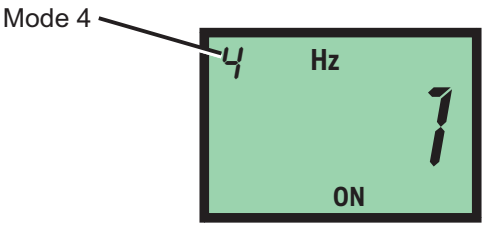


Time-out - Flex-Pro pumps have a time-out setting of 20 seconds while in configuration menus. If built-in timer exceeds 20 seconds without a button being pressed, then pump will exit configuration menu. Changes will only be saved after RIGHT arrow button is pressed and released.

11.0 Mode 4 - Pulse Batch (low speed pulse) Operation - Continued

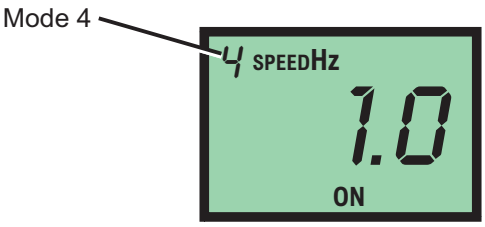
Step 5

Number of pulses to trigger pump start will be displayed.
To increase value, press and release UP arrow.
To decrease value, press and release DOWN arrow.
To save value, press and release RIGHT arrow.



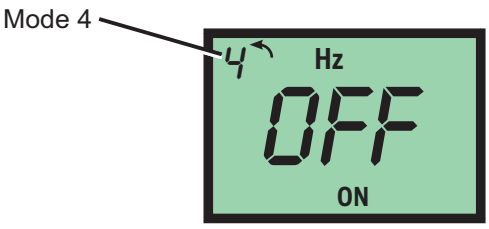
Step 6

Pump speed during on-time will now be displayed.
Pump will run at this speed after selected number of pulses is reached from previous menu.
To increase value, press and release UP arrow.
To decrease value, press and release DOWN arrow.
To save value, press and release RIGHT arrow.



Step 7

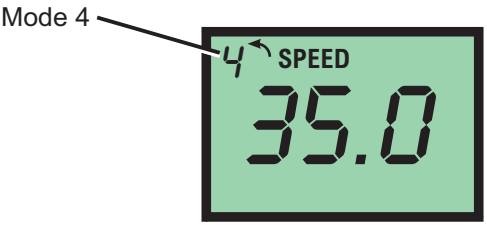
To exit Setup, press and hold SELECT RUN MODE button for a few seconds until you return to Run screen.



11.1 Mode 4 - Pulse Batch Operation Screen Shots

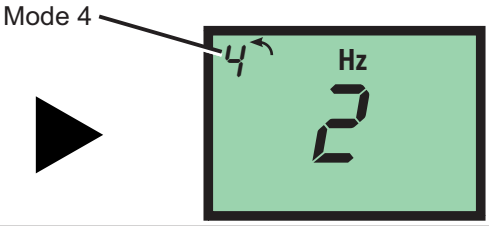
Runtime Screen Shot 1

Display **motor speed percentage.**
Pump Running in Pulse Batch Operation



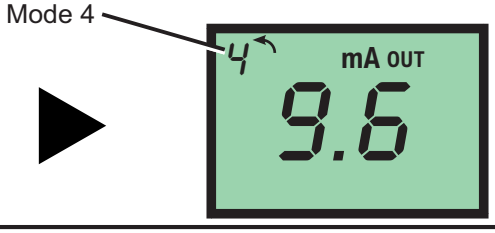
Runtime Screen Shot 2

Display current number of pulses received
Press and release RIGHT arrow to view number of **pulses received** in real-time.



Runtime Screen Shot 3

Press and release RIGHT arrow again to view **mA output** value in real-time.
Press and release RIGHT arrow again to view **motor speed percentage**, as in Screen Shot 1.



12.0 Pump Tube Timer

Flex-Pro has a built in Pump Tube Timer. Timer starts when rotor is rotating and stops when rotor is idle.

To view current Pump Tube Timer value, press and hold START button, then press and release DOWN arrow.

Tube Timer screen will appear. Screen will display current Pump Tube Time in run-time hours. Tube Timer screen will display for 5 seconds and then switch back to previous operating display screen.

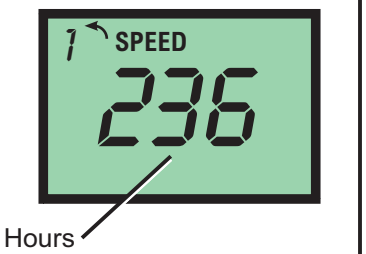
While displayed, press START button twice to reset Pump Tube Timer to zero.

When replacing pump tube, pump will ask you if you'd like to reset Pump Tube Timer. If you choose YES, screen will display current Pump Tube Time for 5 seconds before timer is reset to zero.

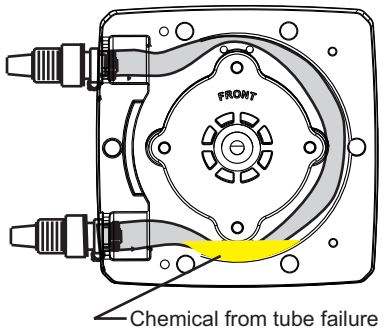
Tube Life Timer

Display tube life timer.
Press and release TUBE INFO button.

Displays amount of total runtime hours on currently installed tube.
Time will be displayed in hours.
Timer will be display for approximately 5 seconds before returning to previous runtime screen.



13.0 TFD (Tube Failure Detection)



Flex-Pro is equipped with a *Tube Failure Detection* System which is designed to stop pump and provide an output alarm in event pump tube should rupture and chemical enters pump head. Pump will detect a chemical with a conductivity reading greater than 500 microsiemens. Chemicals with a conductivity of less than 500 microsiemens will not be detected.

This patented system is capable of detecting presence of a large number of chemicals including Sodium Hypochlorite (Chlorine), Hydrochloric (muriatic) Acid, Sodium Hydroxide, and many others. System will not be triggered by water (rain, condensation, etc.) or silicone oil (roller and tubing lubricant).

If system has detected chemical, pump tube must be replaced and pump head and roller assembly must be thoroughly cleaned. Failure to clean roller assembly will void warranty.

If TFD alarm occurs, pump will stop, close an alarm output, and screen will flash TFD with an alarm icon.

Confirm Chemical Detection

To determine if your chemical will be detected by system, remove pump head cover and pump tube and roller assembly.

Place a small amount of chemical in bottom of pump head - just enough to cover sensors. Replace pump head cover only.

Turn on pump (press START). If TFD system detects chemical, pump will stop after a two second confirmation period and TFD Alarm screen will display. If TFD system does not detect chemical, pump will continue to run after confirmation period.

Carefully clean chemical out of pump head being sure to remove all traces of chemical from sensor probes. Replace roller assembly and tubing. Replace pump head cover. Press START button to clear alarm condition and restart pump.

14.0 Alarm Relay

Pump has a built in 3 amp alarm output relay. Relay is pre-configured to energize on tube failure detection (TFD) and on Flow Verification Sensor (FVS).

A Flow Verification Sensor must be installed and configured for relay to trigger on no-flow conditions.

15.0 Reverse Rotor Rotation

CAUTION ⚠	Prior to service, pump clean water through pump and suction / discharge line to remove chemical.

CAUTION ⚠	Always wear protective clothing, face shield, safety glasses and gloves when working on or near your metering pump. Additional precautions should be taken depending on solution being pumped. Refer to MSDS precautions from your solution supplier.

Reverse rotation of pump; press and hold REVERSE ROTATION button until rotor begins rotating in opposite direction. This process can be used for many reasons throughout various industries.

Two reasons for reversing current rotor rotation; to purge chemical from tubing and to extend tube life.

Plan ahead before reversing rotor rotation. If check valves are installed, make necessary arrangements to allow back flow.

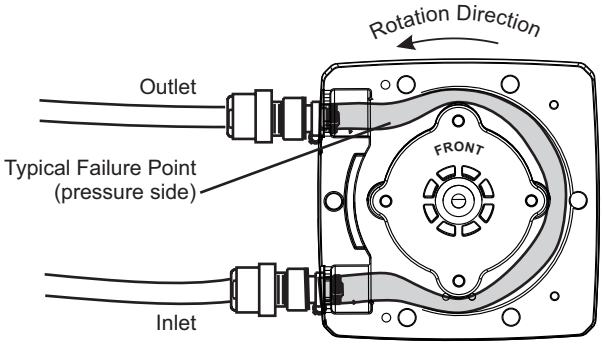
CAUTION ⚠	Failure to install check valves in their proper flow direction can cause excess pressure (PSIg) build up in system and can result in tube rupture. Always use extreme caution and ensure proper connections when using this feature.

If your desire is to simply extend tube life:

Typically tubing fails on outlet side (pressure side) of tube assembly in pump head.

Reversing rotation, moves outlet side (pressure side) to opposite side of tube assembly, greatly increasing tube life.

Stop pump before tube failure occurs.

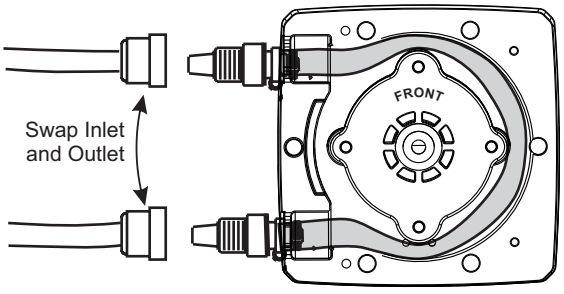


⚠

Disconnect power from pump. Carefully purge any pressure in discharge line of pump. Disconnect suction end tubing and discharge end tubing from pump head tubing.

IMPORTANT! Swap sides of suction (inlet) and discharge (outlet) tubing. No need to remove Pump Head Cover.

Double check all connections before starting pump.



16.0 Tube Replacement

CAUTION ⚠	Prior to service, pump clean water through pump and suction / discharge line to remove chemical.
CAUTION ⚠	Always wear protective clothing, face shield, safety glasses and gloves when working on or near your metering pump. Additional precautions should be taken depending on solution being pumped. Refer to MSDS precautions from your solution supplier.
CAUTION ⚠	Use provided Tube Installation Tool to leverage tubing into pump head, NOT YOUR FINGERS.
CAUTION ⚠	Use extreme caution when replacing pump tube. Be careful of your fingers and DO NOT place fingers near rollers.

16.1 Tube Removal

Step 1

Wear protective clothing, face shield, safety glasses and gloves during tube replacement.

CAUTION ⚠

Relieve (remove) system pressure on discharge and suction side of pump. Failure to do so will cause solution to squirt when disconnecting tube connections. **SAFETY FIRST, REMOVE PRESSURE...**

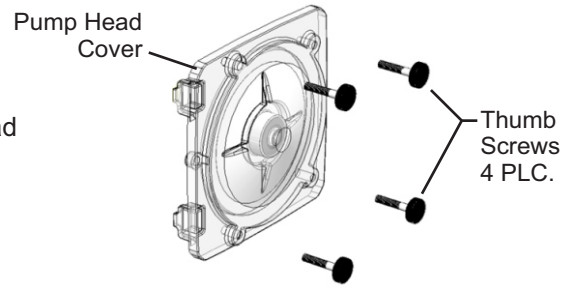
Disconnect system plumbing from pump tube adapters.

Step 2

Press and release STOP button.

Remove four black thumb screws from front of pump head cover. Turn screws counterclockwise to remove.

Remove pump head cover by pulling straight out.



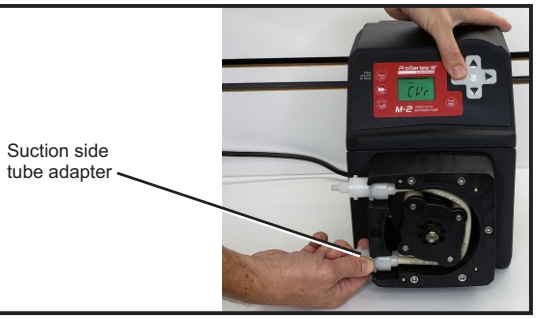
Step 3

With pump stopped, securely grab hold of suction side of tube adapter.

CAUTION! Keep fingers away from rollers and rotor.

Press and release START button to allow rotation of rotor.

Gently pull suction side tube adapter out, away from pump.



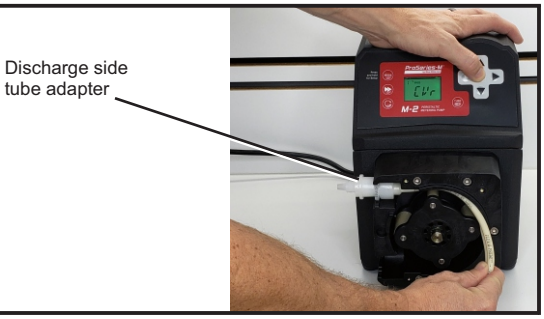
Step 4

Continue to pull suction side adapter out of pump head while rotor is in rotation.

Press and release STOP button.

Carefully pull discharge side of tube adapter out of pump head.

Dispose of used tubing properly.



16.2 Tube Installation

Before you begin. Thoroughly clean Pump Head and Rotor. Rotor can be removed by pulling straight out. After cleaning process, push Rotor back on shaft. See drawing below for proper assembly. IMPORTANT! Rotor direction; word “FRONT” on Rotor must face forward (front of pump).

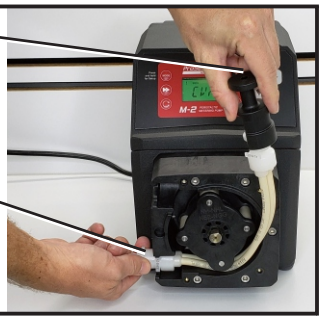
Step 1

Press and release stop button to ensure pump is stopped.

With pump stopped, press suction side of tube adapter securely into pump head.

Clip Tube Installation Tool to discharge side of tube adapter.

Always keep fingers away from rollers and rotor.



Step 2

Your hand should only come in contact with installation tool.

Press and release START button.

Use installation tool to leverage tubing into pump head while rotor is rotating.

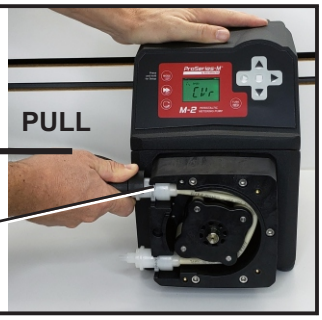
Step 3

Continue to hold onto installation tool.

Allow rotor to rotate a few times, this will stretch tubing out.

After a few rotations, pull installation tool and tubing in direction of rotation.

Press discharge side of tube adapter securely into pump head.

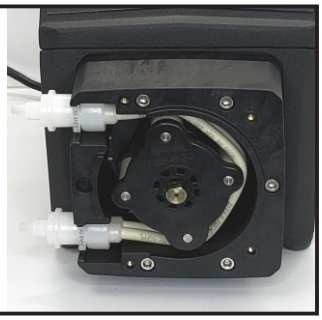


Step 4

Press and release STOP button on pump.

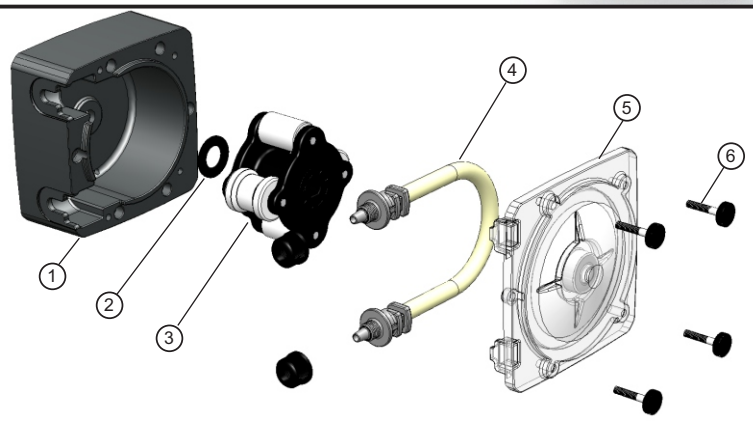
Suction and discharge tube adapter ends should be securely held in place on pump head as illustrated in photo.

Secure pump head cover to pump head using four black thumb screws.



Tip! Apply silicone oil to outside of Flex-A-Thane tube for longer life.

Tube Installation Tool
90002-278



17.0 Pump Maintenance

CAUTION	Always wear protective clothing, face shield, safety glasses and gloves when working on or near your metering pump. Additional precautions should be taken depending on solution being pumped. Refer to MSDS precautions from your solution supplier.

Routine Inspection and Maintenance

Pump requires very little maintenance. However, pump and all accessories should be checked weekly. This is especially important when pumping chemicals. Inspect all components for signs of leaking, swelling, cracking, discoloration or corrosion. Replace worn or damaged components immediately.

Cracking, crazing, discoloration during first week of operation are signs of severe chemical attack. If this occurs, immediately remove chemical from pump. Determine which parts are being attacked and replace them with parts that have been manufactured using more suitable materials. Manufacturer does not assume responsibility for damage to pump that has been caused by chemical attack.

How to Clean and Lubricate Pump

Pump will require occasional cleaning. Amount will depend on severity of service.

- When changing pump tube assembly, pump head chamber, roller assembly and pump head cover should be wiped free of any dirt and debris.

- When changing pump tube assembly, wipe motor shaft with clean towel. Apply a small amount of grease to shaft. This will help prevent possibility of rotor sticking to motor shaft.

- Pump head cover bearing may require grease periodically. Apply a small amount of grease (Aeroshell aviation grease #5 or equivalent) when necessary.

- Although not necessary, 100% silicone lubrication may be used on roller assembly.

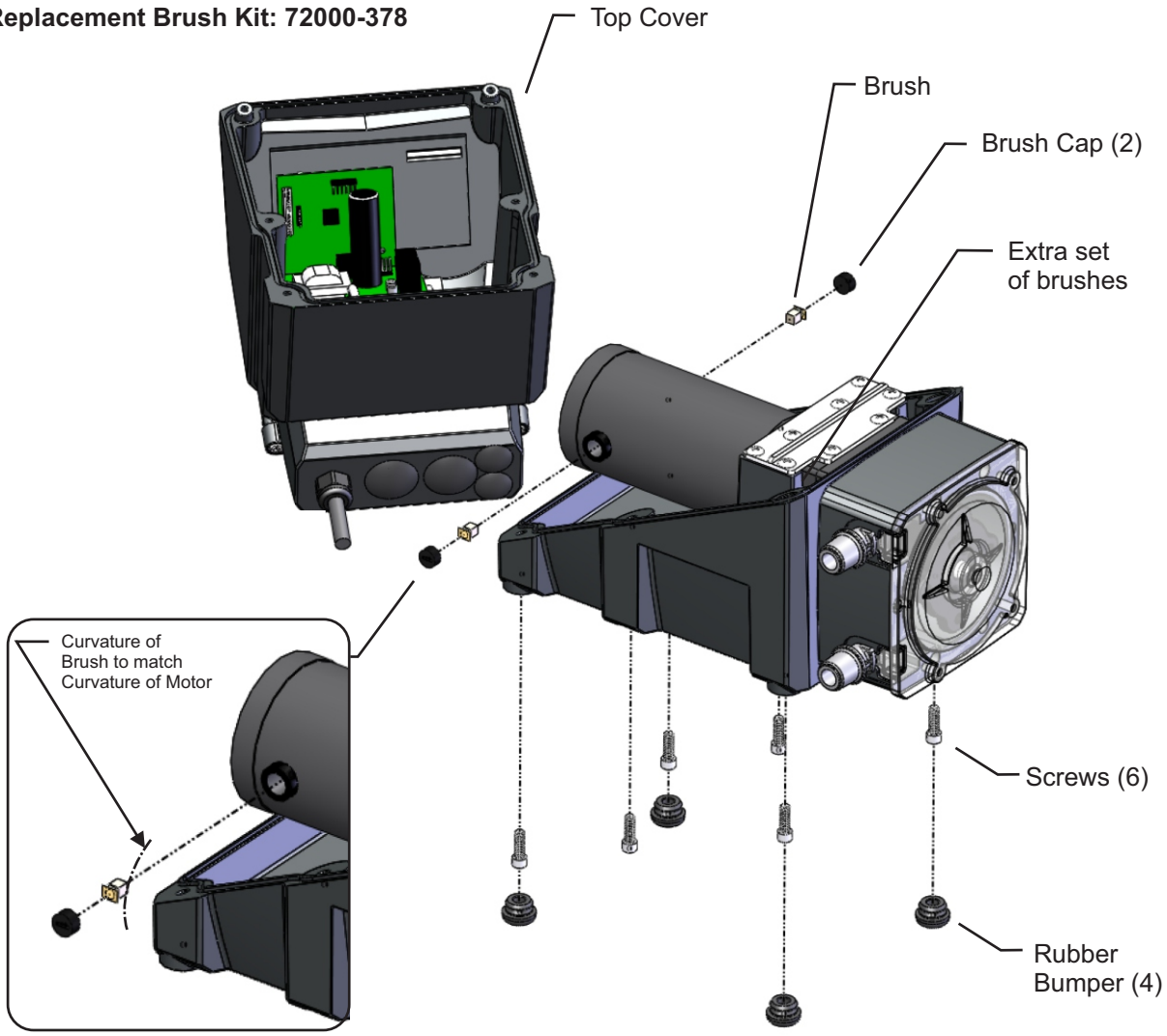
- Periodically clean injection/check valve assembly, especially when injecting fluids that calcify such as sodium hypochlorite. These lime deposits and other build ups can clog fitting, increase back pressure and interfere with check valve operation.

- Periodically clean suction strainer.

17.1 Motor Brush Replacement

Brushes wear differently on each side of motor. It is recommended to replace both brushes at the same time.

Replacement Brush Kit: 72000-378



Step 1
Remove 4 black rubber bumpers from bottom frame.

Step 2
Remove 6 screws from underneath side of bottom frame.

Step 4
Lift off top cover from bottom frame carefully. Place top cover close to bottom frame.
Please Note: Wires connecting top and bottom may become unplugged if pulled too far apart.

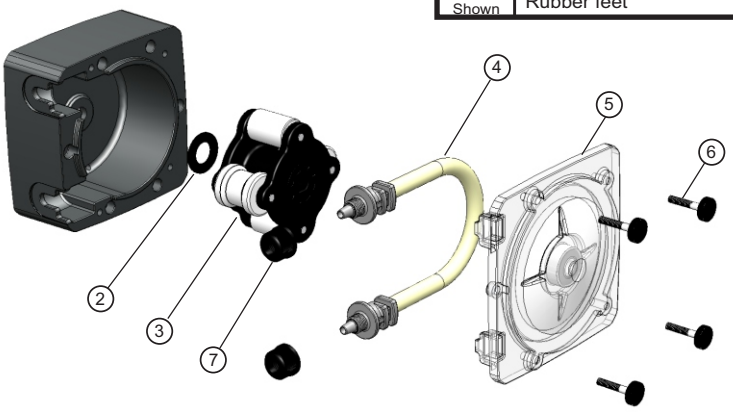
Step 5
Unscrew and remove brush caps by turning counter-clockwise.

Step 6
Remove used brushes and discard properly.

Step 7
Insert new brushes. Be sure to install brushes to that curvature of brush is concentric to curvature of motor.
Please note: One extra set of brushes are provided inside frame.

18.0 Pump Head Replacement Parts List

		Item	Description	Part Number	QTY
		2	Spacer, Back	90011-217	1
→	Flex-A-prene® Tubing in this group are interchangeable with single roller assembly (rotor).	3	Roller Assembly Complete (Rotor), For ND Tubes	A2-SND-R	1
		4	Tube Assembly, 3/8" tube connect, Flex-A-Prene® ND (.075 ID)	A2-SND-T	1
		4	Tube Assembly, 1/2" Male NPT connect, Flex-A-Prene® ND (.075 ID)	A2-MND-T	1
		4	Tube Assembly, 3/4" tri-clamp (Sanitary Fitting), Flex-A-Prene® ND (.075 ID)	A2-CND-T	1
	Flex-A-Prene® Tubing in this group are interchangeable with single roller assembly (rotor).	3	Roller Assembly Complete (Rotor), For NEE and NGG Tubes	A2-SNGG-R	1
		4	Tube Assembly, Quick Disconnect, Flex-A-Prene® NEE (0.093 ID)*	A2-QNEE-T	1
		4	Tube Assembly, 1/4" Tube Compression, Flex-A-Prene® NEE (0.093 ID)	A2-SNEE-T	1
		4	Tube Assembly, 1/2" Male NPT, Flex-A-Prene® NEE (0.093 ID)	A2-MNEE-T	1
		4	Tube Assembly, 1/2" Hose Barb, Flex-A-Prene® NEE (0.093 ID)	A2-BNEE-T	1
		4	Tube Assembly, 1/2" - 3/4" tri-clamp (Sanitary Fitting), Flex-A-Prene® NEE (0.093 ID)	A2-CNEE-T	1
		4	Tube Assembly, Quick Disconnect, Flex-A-Prene® NGG (0.187 ID)*	A2-QNGG-T	1
		4	Tube Assembly, 1/4" Tube Compression, Flex-A-Prene® NGG (0.187 ID)	A2-SNGG-T	1
		4	Tube Assembly, 1/2" Male NPT, Flex-A-Prene® NGG (0.187 ID)	A2-MNGG-T	1
		4	Tube Assembly, 1/2" Hose Barb, Flex-A-Prene® NGG (0.187 ID)	A2-BNGG-T	1
		4	Tube Assembly, 1/2" - 3/4" tri-clamp (Sanitary Fitting), Flex-A-Prene® NGG (0.187 ID)	A2-CNGG-T	1
	Flex-A-Chem® Tubing in this group are interchangeable with single roller assembly (rotor).	3	Roller Assembly Complete (Rotor), For TH Tubes	A2-STH-R	1
		4	Tube Assembly, 3/8" tube connect, Flex-A-Chem® TH (.250 ID)	A2-STH-T	1
		4	Tube Assembly, 1/2" Male NPT, Flex-A-Chem® TH (.250 ID)	A2-MTH-T	1
		4	Tube Assembly, 3/4" tri-clamp (Sanitary Fitting), Flex-A-Chem® TH (.250 ID)	A2-CTH-T	1
	Flex-A-Thane® Tubing in this group are interchangeable with single roller assembly (rotor).	3	Roller Assembly Complete (Rotor), For GE and GG Tubes	A2-SGE-R	1
		4	Tube Assembly, 3/8" tube connect, Flex-A-Thane® GE (.125 ID)	A2-SGE-T	1
		4	Tube Assembly, 1/2" Male NPT connect, Flex-A-Thane® GE (.125 ID)	A2-MGE-T	1
		4	Tube Assembly, 3/4" tri-clamp (Sanitary Fitting), Flex-A-Thane® GE (.125 ID)	A2-CGE-T	1
		4	Tube Assembly, 3/8" tube connect, Flex-A-Thane® GG (.187 ID)	A2-SGG-T	1
		4	Tube Assembly, 1/2" Male NPT connect, Flex-A-Thane® GG (.187 ID)	A2-MGG-T	1
		4	Tube Assembly, 3/4" tri-clamp (Sanitary Fitting), Flex-A-Thane® GG (.187 ID)	A2-CGG-T	1
		4	Tube Assembly, 3/8" tube connect, Flex-A-Thane® G2G (.187 ID)	A2-SG2G-T	1
		4	Tube Assembly, 1/2" Male NPT connect, Flex-A-Thane® G2G (.187 ID)	A2-MG2G-T	1
		5	Pump Head Cover, Polycarbonate - New design, backwards compatible	A2-SXX-C	1
		6	Thumb Screw	90011-183	4
		7	Tube Nut, Compression, For 3/8" Tubing	C-330-6	2
		Not Shown	Stainless Steel mounting bracket kit (pair)	72000-379	1
		Not Shown	Stainless Steel extended mounting bracket kit (pair)	72000-380	1
		Not Shown	Rubber feet	90003-561	4



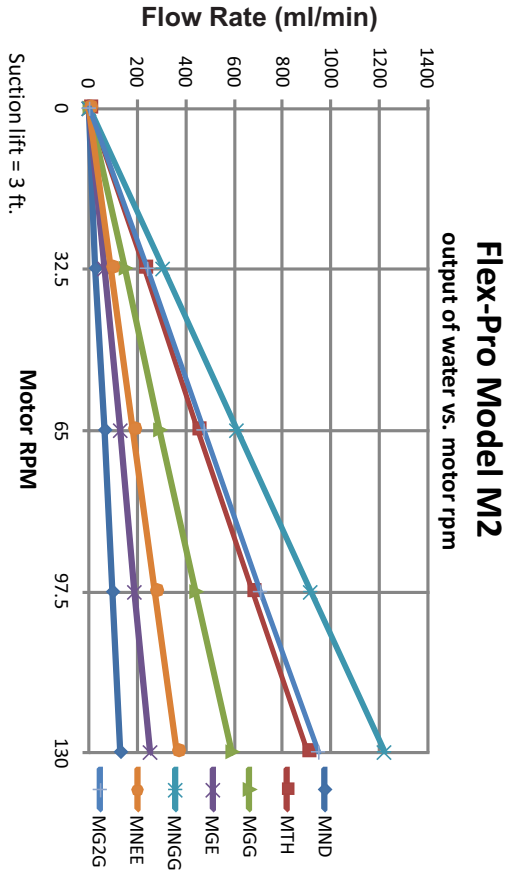
Quick Disconnect Valve Kits

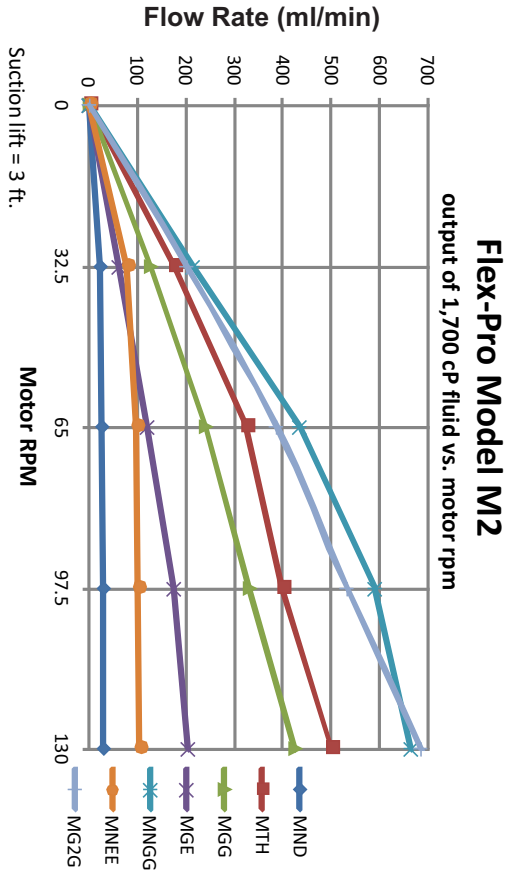
Model #	Description
KIT-QBV	1/2' Barb, FKM O-rings
KIT-QBE	1/2" Barb, EP O-rings
KIT-QMV	1/2" M/MPT, FKM O-rings
KIT-QME	1/2" M/MPT, EP O-rings
KIT-QSV	3/8" OD, 1/4" ID Tube Compression, FKM O-rings
KIT-QSE	3/8" OD, 1/4" ID Tube Compression, EP O-rings

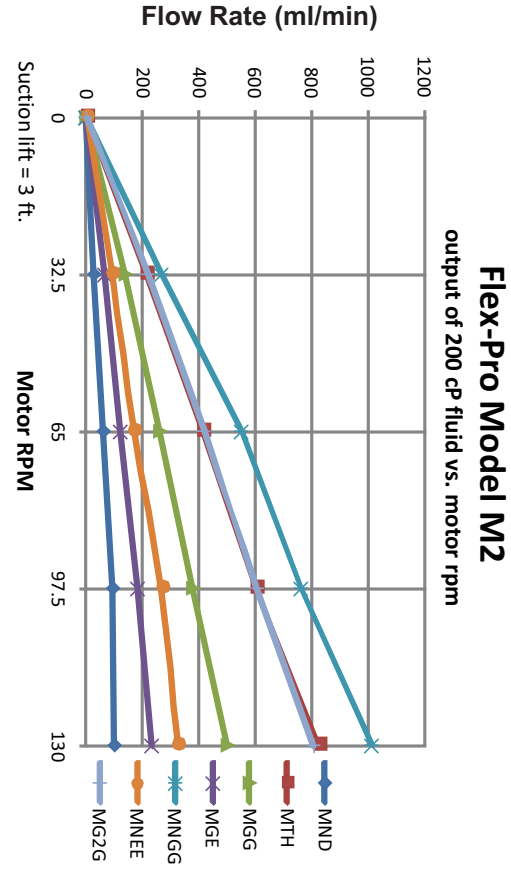
*Quick Disconnect valves sold separately

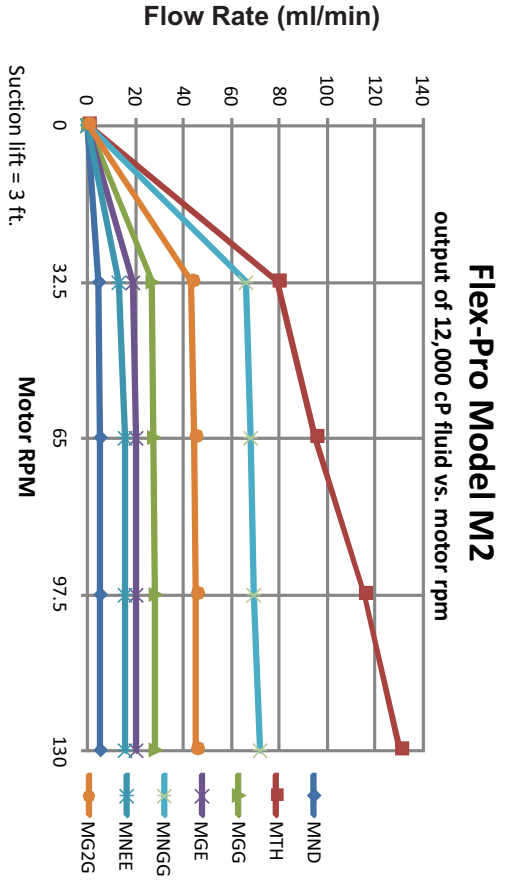
Note: ND and G2G tube assemblies are also available in "B", "C" and "Q" connection types.

19.0 Output Versus Fluid Viscosity









20.0 Volumetric Test - Calibration

The Max Flowrate value is equal to the pump's measured fluid output in milliliters per minute, at the 100% motor speed adjustment setting.

Each Flex-Pro pump is calibrated at the factory and shipped with a calibrated pump tube assembly installed. The Max flow rate value can be adjusted at any time. To achieve high accuracy, a field calibration under the actual operating conditions should be performed and the Max Flowrate value changed to reflect the calibrated amount. Multiply the **Max Flowrate** value by the percentage of error at your calibrated flow rate to obtain the new **Max Flowrate** value.

Every pump tube assembly model number has a published maximum flow rate value which is based on laboratory tests pumping water at room temperature at 36" suction lift against 0 psi back pressure. Your actual output may vary due to fluid viscosity, fluid temperature, suction lift height, piping system layout, manufacturing tolerances and to a lesser degree, variations in system pressure and tubing wear.

To achieve high accuracy, the pump's output should be measured (calibrated), and the MAX Flowrate value (in milliliters per minute) updated, whenever any of the following conditions exist:

- At the initial pump start up.
- When a new tube assembly is installed. *Run the pump with or without fluid for approximately 30 minutes prior to calibration.*
- When the piping system configuration is changed.
- When the suction lift height is changed.
- Periodically during the life of the tube. *Output variances are most noticeable prior to tube failure.*

To calculate the Max Flowrate:

To determine the amount of error at your output setting, divide the actual output amount by the indicated output. Then multiply the resulting percentage of error by the **Max Flowrate** value currently showing in the pump.

Example: If the pump display indicates the output is 170 ml/min but the actual measured output is 160 ml/min, calculate the percentage of error by: 160/170 = 0.941. Multiply the **Max Flowrate** value by 0.941 and enter this new value.

21.0 WARRANTY

21.1 LIMITED WARRANTY

Your new FLEXFLO pump is a quality product and is warrantied for 60 months from date of purchase (proof of purchase is required). The pump will be repaired or replaced at our discretion. Failure must have occurred due to defect in material or workmanship and not as a result of operation of the product other than in normal operation as defined in the pump manual. Warranty status is determined by the pump's serial label and the sales invoice or receipt. The serial label must be on the pump and legible. The warranty status of the pump will be verified by Blue-White or a factory authorized service center.

Pump Head and roller assembly is warrantied against damage from chemical attack when proper TFD (Tube Failure Detection) system instructions and maintenance procedures are followed.

21.2 WHAT IS NOT COVERED

- Pump Tube Assemblies and rubber components – They are perishable and require periodic replacement.
- Pump removal, or re-installation, and any related labor charge.
- Freight to the factory, or service center.
- Pumps that have been tampered with, or in pieces.
- Damage to the pump that results from misuse, carelessness such as chemical spills on the enclosure, abuse, lack of maintenance, or alteration which is out of our control.
- Pumps damaged by faulty wiring, power surges or acts of nature.

21.3 PROCEDURE FOR IN WARRANTY REPAIR

Contact the factory to obtain a RMA (Return Material Authorization) number. Carefully pack the pump to be repaired. It is recommended to include foot strainer and injection/check valve fitting since these devices may be clogged and part of the problem. Please enclose a brief description of the problem as well as the original invoice or sales receipt, or copy showing the date of purchase. Prepay all shipping costs. COD shipments will not be accepted. Warranty service must be performed by the factory or an authorized service center. Damage caused by improper packaging is the responsibility of the sender. When In-Warranty repair or replacement is completed, the factory pays for return shipping to the dealer or customer.

21.4 PRODUCT USE WARNING

Blue-White products are manufactured to meet the highest quality standards in the industry. Each product instruction manual includes a description of the associated product warranty and provides the user with important safety information. Purchasers, installers, and operators of Blue-White products should take the time to inform themselves about the safe operation of these products. In addition, Customers are expected to do their own due diligence regarding which products and materials are best suited for their intended applications. Blue-White is pleased to assist in this effort but does not guarantee the suitability of any particular product for any specific application as Blue-White does not have the same degree of familiarity with the application that the customer/end user has. While Blue-White will honor all of its product warranties according to their terms and conditions, Blue-White shall only be obligated to repair or replace its defective parts or products in accordance with the associated product warranties. **BLUE-WHITE SHALL NOT BE LIABLE EITHER IN TORT OR IN CONTRACT FOR ANY LOSS OR DAMAGE WHETHER DIRECT, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL, ARISING OUT OF OR RELATED TO THE FAILURE OF ANY OF ITS PARTS OR PRODUCTS OR OF THEIR NONSUITABILITY FOR A GIVEN PURPOSE OR APPLICATION.**

21.5 CHEMICAL RESISTANCE WARNING

Blue-White offers a wide variety of wetted parts. Purchasers, installers, and operators of Blue-White products must be well informed and aware of the precautions to be taken when injecting or measuring various chemicals, especially those considered to be irritants, contaminants or hazardous. Customers are expected to do their own due diligence regarding which products and materials are best suited for their applications, particularly as it may relate to the potential effects of certain chemicals on Blue-White products and the potential for adverse chemical interactions. Blue-White tests its products with water only. The chemical resistance information included in this instruction manual was supplied to Blue-White by reputable sources, but Blue-White is not able to vouch for the accuracy or completeness thereof. While Blue-White will honor all of its product warranties according to their terms and conditions, Blue-White shall only be obligated to repair or replace its defective parts or products in accordance with the associated product warranties. **BLUE-WHITE SHALL NOT BE LIABLE EITHER IN TORT OR IN CONTRACT FOR ANY LOSS OR DAMAGE, WHETHER DIRECT, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL, ARISING OUT OF OR RELATED TO THE USE OF CHEMICALS IN CONNECTION WITH ANY BLUE-WHITE PRODUCTS.**

FLEXFLO® Model Number

M2	FLEXFLO® Peristaltic metering pump model number

Power Cord (operating voltage user selectable 115V/240 Vac 50/60Hz)

4	115V / 60Hz, power cord NEMA 5/15 plug (US)	**8**	240V / 50HZ, power cord AS 3112 plug (AU/New Zealand)
5	230V / 60Hz, power cord NEMA 6/15 plug (US)	**9**	230V / 50HZ, power cord BS 1363/A plug (United Kingdom)
6	220V / 50HZ, power cord CEE 7/VII plug (EU)	**X**	No Power Cord

Inlet/Outlet Connection Size, Connection Type, Connection Material

S	3/8” OD x 1/4” ID Tube Compression Fitting, Natural PVDF (Kynar)	**C**	1/2” - 3/4” Tri-clamp connections, Natural PVDF (Kynar), available for ND, NEE, NGG, and G2G only
M	1/2” Male NPT Fitting, Natural PVDF (Kynar)	**Q**	Quick Disconnect, Natural PVDF (Kynar), available for NDD, NEE, NGG, and G2G only (valve Ns sold seperately)
B	1/2” Hose Barb, Natural PVDF (Kynar), available for ND, NEE, NGG, and G2G only	**MB**	1/2” Male BSPT Fitting, Natural PVDF (Kynar)

Pump Tube Material, Pump Tube Size, Output Range

ND	Flex-A-Prene® .075 ID | 0.01-1.7 GPH | 125 PSI
NEE	Flex-A-Prene® .093 ID | 0.022-4.44 GPH | 110 PSI
NGG	Flex-A-Prene® .187 ID | 0.086-17.2 GPH | 110 PSI
G2G	Flex-A-Thane® .187 ID | 0.07-14.98 GPH | 65 PSI
GE	Flex-A-Thane® .125 ID | 0.02-4.0 GPH | 65 PSI
GG	Flex-A-Thane® .187 ID | 0.05-9.3 GPH | 65 PSI
TH	Flex-A-Chem® .250 ID | 0.07-14.3 GPH | 50 PSI

Options (leave this blank for standard model with left facing pump head inlet/outlet)

R	Right facing pump head, input / output (Left facing fluid input / output is standard)
D	Down facing pump head, input / output (Left facing fluid input / output is standard)

M2 2 4 M ND	**Sample Model Number**

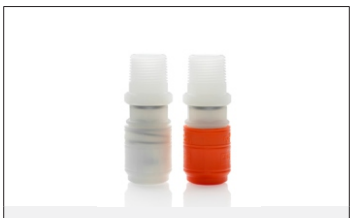
Quick Disconnect Valve Kits

3/8” OD, 1/4” TUBING

*KIT-QSV FKM O-RINGS
*KIT-QSE EP O-RINGS

1/2” HOSE BARB

*KIT-QBV FKM O-RINGS
*KIT-QBE EP O-RINGS



1/2” M/NPT

*KIT-QMV FKM O-RINGS
*KIT-QME EP O-RINGS

NOTE: For use with the Quick Disconnect Flex-A-Prene® Tube Assembly. Kits sold separately.

Users of electrical and electronic equipment (EEE) with the WEEE marking per Annex IV of the WEEE Directive must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to them for the return, recycle, recovery of WEEE and minimize any potential effects of EEE on the environment and human health due to the presence of hazardous substances. The WEEE marking applies only to countries within the European Union (EU) and Norway. Appliances are labeled in accordance with European Directive 2002/96/EC.

Contact your local waste recovery agency for a *Designated Collection Facility* in your area.

Blue-White® Industries, Ltd.

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Huntington Beach, CA 92649
USA

TEL: 714-893-8529
FAX: 714-894-9492

www.blue-white.com
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customerservice@blue-white.com

P.N. 80000-492

Rev. 34 20220202

EB-146-B-P-6-0-E

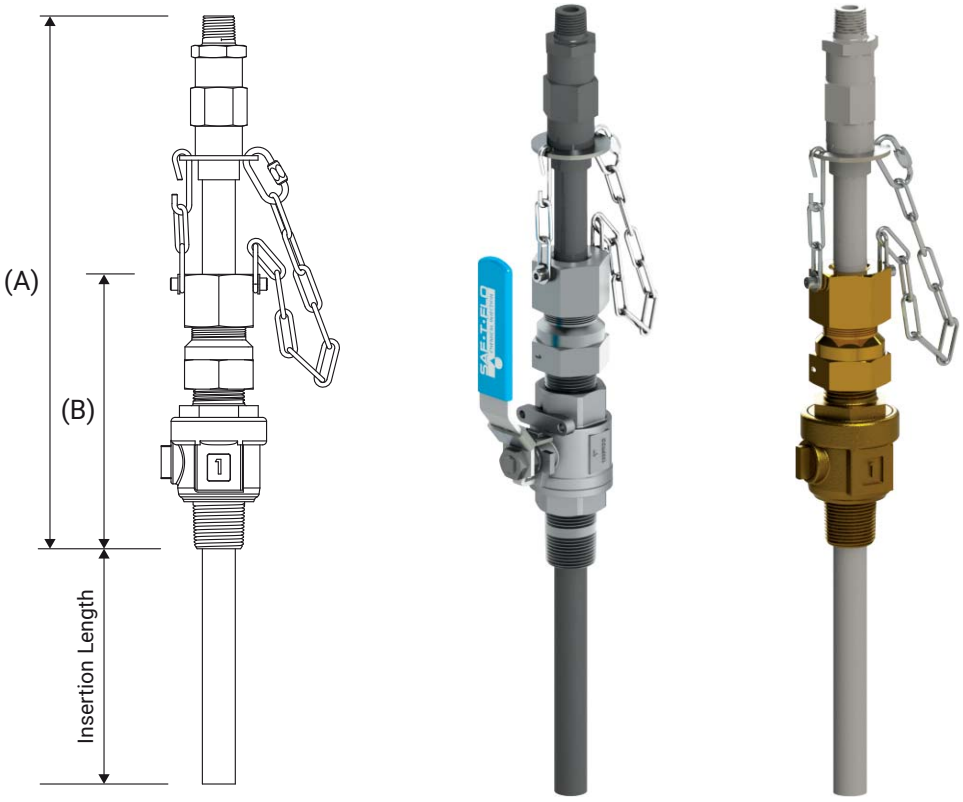
EB-146

Standard Service Retractable Injection Quill

1” Valve x 1/2” Tube with Integrated Check Valve

SPECIFICATIONS

SAFETY RATING	150 PSI
CHECK VALVE	INTEGRATED SPRING LOADED BALL CHECK VALVE
SAF-T-SEAL TIP	OPTIONAL
QUICK DISCONNECT	N/A
VALVE/PROCESS CONNECTION SIZE	1” MNPT
INLET CONNECTION SIZE	1/2” MNPT
SOLUTION TUBE SIZE	1/2”
SOLUTION TUBE ID (PVC, CPVC & ALLOY W/SAF-T-SEAL)	0.546”
SOLUTION TUBE ID (ALLOY W/O SAF-T-SEAL)	0.622”
SOLUTION TUBE OD	0.840”
(A) OPERATING HEIGHT	13.75” - BRASS 15” - STAINLESS STEEL
(B) VALVE/GLAND LENGTH	7” - BRASS 8.25” - STAINLESS STEEL
EXTRACTION LENGTH	A + B + INSERTION LENGTH



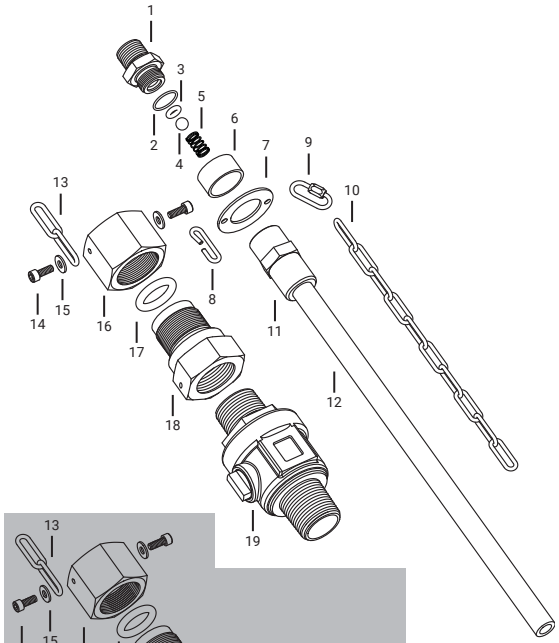
ORDERING INFORMATION

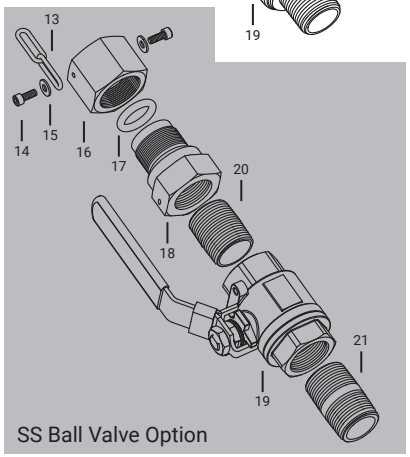
SERIES	VALVE MATERIAL	SOLUTION TUBE MATERIAL	INSERTION LENGTH	TIP CONFIGURATION	CHECK VALVE SEAL
EB-146 -	[ ]	- [ ]	- [ ]	- [ ]	- [ ]
	B = Brass **S** = Stainless Steel	**P** = PVC **C** = CPVC **H** = Alloy C276 **S** = 316SS **A** = Alloy 20 **T** = Titanium Gr.2	**2** = 2” **4** = 4” **6** = 6” Alloy Tubes Only **8** = 8” **10** = 10” **12** = 12” **18** = 18” **24** = 24”	**0** = Standard **B** = 45° Bevel **CV** = SAF-T-Seal, FKM **CE** = SAF-T-Seal, EPDM *SAF-T-Seal Tip not available with Titanium Solution Tubes	**V** = FKM **E** = EPDM **K** = KALREZ 6375

TECH NOTES

1. Check valve spring cracking pressure is 5 PSI.
2. Main connection thread type is NPT by default. CC (AWWA) also available. Consult factory for details.
3. Maximum insertion length for 1/2” PVC and CPVC solution tubes is 6”. PVC and CPVC solution tubes are not covered by warranty when used in process flows with velocities 6 fps or greater.
4. Availability of SAF-T-Seal tip with selection of Titanium solution tube material subject to change. Consult factory prior to selecting.

COMPONENT LISTING





SS Ball Valve Option

ID	Name
Solution Tube Assembly	
1	Upper Housing (Inlet)
2	Check Valve Seal
3	Check Valve Seat
4	Check Ball
5	Check Spring
6	Spacing Collar
7	Chain Plate
8	Restraint Hook
9	Threaded Connector
10	Limit Chain
11	Check Valve Lower Housing
12	Solution Tube

ID	Name
Main Connection Assembly	
13	Restraint Chain
14	Restraint Screws (x2)
15	Washers (x2)
16	Packing Nut
17	Compression O-ring
18	Solution Tube Adapter
19	Isolation Valve
20	Upper Nipple*
21	Lower Nipple* (process connection)

*Stainless steel ball valve equipped quills.

EB-146-B-P-6-0-E

WARRANTY

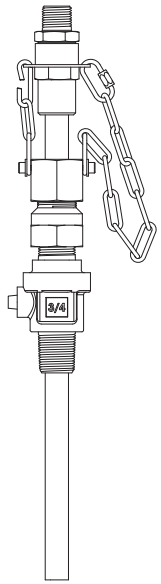
All merchandise is warranted to be free from defects in material and factory workmanship. We will provide free of charge new products in equal quantities for any that prove defective within one year from date of shipment from our factory. Manufacturer shall not be liable for any loss, damage, or injury, direct or consequential, arising out of the use of or the inability to use the product. Before using, user shall determine the suitability of the product for its intended use and user assumes all risk and liability whatever in connection therewith. No claims for labor or consequential damage will be allowed. The foregoing may not be changed except by agreement signed by an officer of the manufacturer.

SAF-T-FLO Chemical Injection
4091-U East La Palma Avenue
Anaheim, CA 92807
714-632-3013 | www.saftflo.com

SAF•T•FLO CHEMICAL INJECTION

INSTALLATION AND OPERATION MANUAL

Standard Service Retractable Injection Quills with Check Valve
EB-120, EB-145, EB-162, EB-146, EB-164



2018-05

INSTALLATION

BEFORE INSTALLING

- Quills are shipped in their operating configuration. Installation may require that the solution tube be removed.
- Hot tapping is not recommended. If planning on hot tapping, please refer to the technical references available at www.saftflo.com or contact SAF-T-FLO technical assistance.
- It is recommended that you do not disassemble the packing gland for installation of the quill. The threads of the gland will not be protected and may become damaged. Such damage is not covered under warranty.

INSTALLING WITH SOLUTION TUBE INSERTED

1. Apply suitable thread sealant to the process connection thread.
2. Install the quill onto the process line by threading the main connection valve to the tap on the process line.
3. Connect the chemical feed line to the inlet of the quill.

INSTALLING WITH SOLUTION TUBE REMOVED

1. With the valve in the closed position. Apply suitable thread sealant to the process connection thread.
2. Install the main connection valve onto the tap of the process line.
3. Insert the solution tube following the solution tube insertion instructions in this manual.
4. Connect the chemical feed to the inlet of the quill.

AFTER INSTALLING / PRIOR TO OPERATING

1. Inspect the restraint system to ensure that it is properly in place and ready for operation. Check to verify that:
   a. Restraint and limit chains are connected to the packing nut using the supplied screws and washers.
   b. Restraint chain is hooked off onto the restraint hook and both chain and hook are fully extended.
   c. Limit chain is connected the threaded connector and the jaw of the connector is closed.
2. Ensure all connections have been made prior to pressurizing.

OPERATION

PRECAUTIONS

- Process pressure should be reduced as much as possible prior to inserting or retracting the solution tube.
- Inspect restraint hardware to ensure it is in proper condition.
- Do not stand directly in line with the quill when operating.
- Take all necessary precautions to protect against possible chemical exposure when working with the quill.
- Do not use a wrench to tighten the packing nut. Hand tighten only.

INSERTING THE SOLUTION TUBE

1. Inspect restraint hardware to ensure it is suitable for use.
2. Insert the solution tube into the valve assembly until the tip seats against the ball of the closed isolation valve.
3. Lock off the limit chain to the threaded connector and close the jaw. Chain should be extended with no kinks and minimal slack.
4. Hand tighten packing nut until resistance is felt.
5. Slowly open the isolation valve. Allow the limit chain to take up the pressure. Tighten packing nut to seal against any leaks.
6. Once the valve is fully open, slide the solution tube through the valve assembly until the restraint chain can be secured to the restraint hook. The hook and chain should be taut - restraining the solution tube.
7. Connect the chemical feed to the inlet of the solution tube.

RETRACTING THE SOLUTION TUBE

1. Shutdown and isolate the chemical feed from the quill. Detach chemical piping as needed to ensure the tube can retract unobstructed.
2. Maintain a firm grasp on the solution tube and push down into the valve assembly to remove tension from the restraint hook/chain.
3. Disconnect the restraint chain from hook and slowly back out the tube until the limit chain is fully extended.
4. With the limit chain fully extended. Close the valve, isolating from the process pressure.
5. Slowly back off the packing nut to bleed off any residual pressure.
6. With the quill isolated from the process pressure and residual pressure bled off, detach the limit chain from the threaded connector.
7. Remove the tube from the valve assembly.

MAINTENANCE

VISUAL INSPECTION

Periodic visual inspections should be done to examine the overall integrity of the quill and to verify that no leaks (chemical or process side) have developed.

SOLUTION TUBE MAINTENANCE

Solution tubes may clog due to deposit formation. The rate and severity will depend on the chemistry of the application. After the quill is put into operation it should be periodically retracted to determine the rate at which the deposit formation is occuring. Maintenance cycles can then be based on observations.

Deposits can typically be removed by soaking the tube in warm water and then brushing the deposits off. In other cases a weak acid solution may be utilized.

CHECK VALVE MAINTENANCE

Deposits can also impact the operation of the spring loaded check valve. With the tube removed, the internals of the check valve can be accessed by unthreading the upper housing from the lower check valve body.

Ensure that no deposits are impeding the operation of the ball and spring. Inspect seals to ensure they are in good condition. Check Valve Repair Kits, which include the spring, ball, and o-rings, are available.

REPLACEMENT PARTS

The following sub-assemblies and kits are available for replacement:

- Solution Tube Assembly
- Main Connection Assembly
- Check Valve Repair Kit

NEED ASSISTANCE?

CUSTOMER SERVICE
800-957-2383
M-F (7am - 4pm Pacific)

INSTRUCTIONAL VIDEOS
https://saftflo.com/videos

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MANUFACTURER'S REPRESENTATIVES

Included Spare Parts

Blue-White Spare Tubes- A4-MNL-T

Blue-White Spare Tubes- A2-MND-T

Other Recommended Spare Parts

Blue-White Spare Roller- A2-SND-R