Hart Engineering Corporation

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11316-02

PROJECT: 9950. - Veolia/Taunton WWTP Improvements Phase 2 **DATE: 03/10/2023**

SUBMITTAL: 11316-02 - Hyperbolic Mixer O&M Manual
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Item	Revision	Description	Status	Date Sent	Date Returned
11316-02	0	Hyperbolic Mixer O&M Manual	Eng	03/10/2023	
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: 03/10/2023

Operations and Maintenance Manual for

Taunton WWTP Re-Aeration Zones
Taunton, MA 02780
PO# 9950.117

Section 11316
Vertical Shaft Hyperbolic Mixer/Aerators

Provided to:
Hart Engineering Corporation
800 Scenic View Drive
Cumberland, RI 02864

Provided by:
INVENT Environmental Technologies, Inc.
218 Little Falls Rd, Units #7 & 8
Cedar Grove, NJ 07009
Phone No: 973-571-2223
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http: www.invent-et.com

Rev00 – February 2023

Table of content

1. Product Information

- 6 pcs. **HYPERCLASSIC**® Mixer Aerator HCMA/2500-26-12.5hp

Each mixer to include the following:

Mixer Configuration1	Number	Mixer Part	Material
	1	Drive Unit	Gear-box housing made from cast iron with: • Acrylic-coating ≥ 6 mills, RAL 5018 • Bearings radial reinforced 3-phase squirrel cage motor with: • Plastic fan wheel (self-ventilated) • Canopy • Protection against humidity and acid • Motor Protection IP55 • Thermal Protection PTC-F
	1	Mounting Base	Carbon steel with powder coating and rubber buffers
	1	Shaft with flanged connection	ASTM 316
	1	Hyperboloid Mixer Body with flanged connection	High quality FRP
	1 set	Assembly Material	ASTM 316
	1	Bottom Guiding	Bushing made from ASTM 316, with self-lubricating bearing composite
	1	Sparger Ring	HDPE

Spare parts:

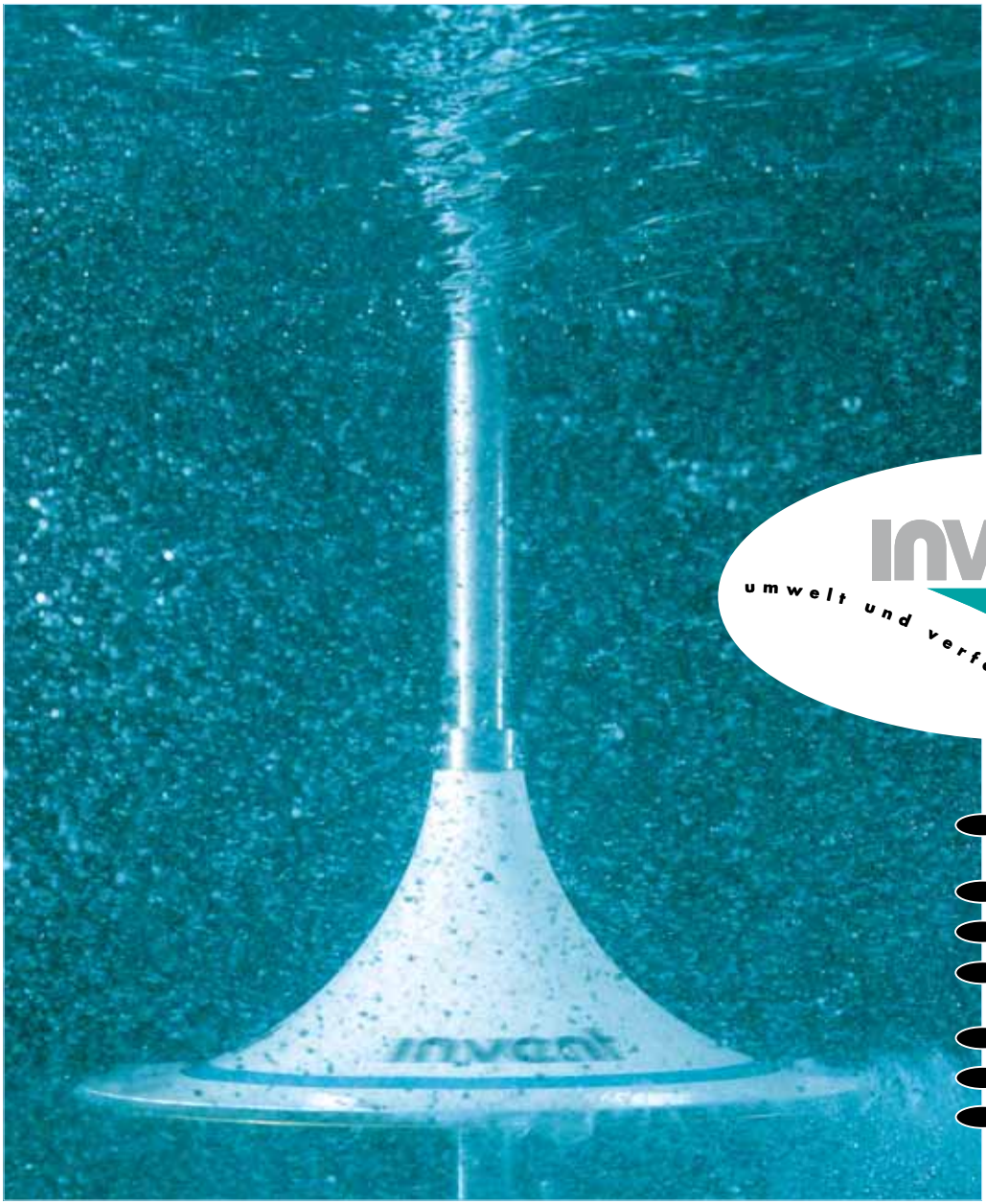
- 1 Shaft Clamp
- 1 sets Rubber Buffers

Services:

- Included services by INVENT personnel
  Installation inspection, start-up and training
  (9) visits of one technician, including travel and living expenses.
  6 visits for Installation supervision, each visit of 1 day
  3 visits for Installation supervision, each visit of 2 day

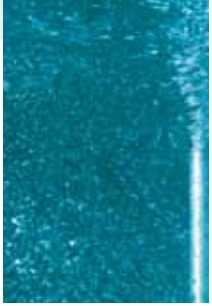
HYPERCLASSIC® - *Mixing- and Aeration System*

mixing and aeration technology



invent®
umwelt und verfahrenstechnik

- Fluid mechanically optimized
- High oxygen transfer
- Excellent mixing
- Low energy consumption
- Robust construction
- Low maintenance
- Easy to install



innovation for nature

The growing pollution of our environment is a problem which concerns all of us. For years water pollution, in particular, has continued to grow in threatening proportions. Water is turning into a more and more limited resource. As a consequence, forward-looking technologies are desperately needed for water and wastewater treatment. With great commitment **INVENT** *is dedicated to the development and implementation of such technologies, thus creating powerful products which contribute greatly to the preservation of the water quality of our groundwater, rivers and lakes.*

The protection, the preservation and, where necessary, the restoration of our environment will remain one of the most important tasks of our society in the future.

INVENT *takes on responsibility in this field, with innovative environmental and process engineering.*

HYPERCLASSIC®

The Classic Mixer

Leaders in Mixing and Aeration

INVENT develops, produces and globally implements innovative machines, plants and procedures for the treatment of water and wastewater.

In water and wastewater treatment usually several process steps are applied. In combination they merge to a complete plant.
One distinguishes between physical, physical/chemical and biological processes. The biological stage represents the heart of the plant. Here carbon and nitrogen compounds are biologically decomposed. The basis for this process is the effective mixing and the efficent transfer of oxygen, so that the biologically active bacteria can work effectively.

INVENT has specialized in exactly this field and, with its innovative products, is one of the world's leaders in the area of mixing and aeration technology for the water and wastewater treatment industry.

8 out of 22 **HYPERCLASSIC®***-Mixer/Aerators in a large municipal wwtp in São Paulo, Brazil*

The **HYPERCLASSIC®**-Mixing and Aeration System introduced at hand was developed and optimized especially for the tough application in industrial and municipal wastewater treatment plants. It caters for the efficient oxygen transfer and the optimal mixing during the biological stage.
Compared to conventional systems it possesses the following advantages:

- In addition to the task of introducing oxygen the important function of mixing and avoiding sedimentation is also fulfilled.
- Due to the mechanical aeration method, the oxygen transfer performance is nearly as high in wastewater as it is in pure water.

HyperClassic®

An Overview

- Even after many years the aeration performance is not diminished. The system's loss of pressure remains on a constant low.
- It does not create any aerosol or noise emissions.
- The system can be installed simply and quickly, even in a filled tank.

1 out of 9 **HYPERCLASSIC®***-Mixer/Aerators in an industrial wwtp in Belgium (Pulp & Paper Industry)*

There are multiple areas of application for the **HYPERCLASSIC®**-Mixing and Aeration System. Basically, it can be used for all aeration tasks, especially in all variations of the activated sludge process, such as:

- for BOD[1]/COD[2] reduction and nitrification in conventional activated sludge plants
- in MBR[3] plants
- in SBR[4] plants
- in swing zones with facultative denitrification/nitrification
- in pure oxygen plants
- for BOD[1]/COD[2] reduction as well as nitrification in carousel tanks, oxidation ditches or aerated ponds

The areas of application, the functionality, the construction and further technical details of the **HYPERCLASSIC®**-Mixing and Aeration System are described in the following paragraphs.

[1] BOD: Biological oxygen demand
[2] COD: Chemical oxygen demand
[3] MBR: Membrane Bio Reactor
[4] SBR: Sequencing Batch Reactor

The Task

The task of mixing and aeration systems for the biological wastewater treatment is to add large amounts of oxygen to the wastewater with the lowest possible energy consumption. At the same time the wastewater should be intensively mixed so that the oxygen concentration and the activated sludge flocs are always uniformly distributed throughout the complete reactor and sedimentation is avoided with certainty.

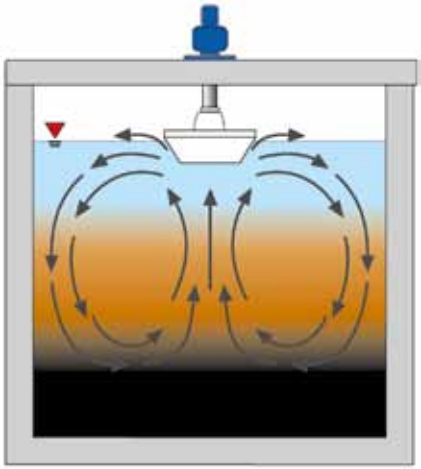
For the efficient oxygen supply, air or gas bubbles of optimum size must be generated. Only in this way the introduced oxygen amounts can be used in the best possible way. This optimal bubble size is dependent on the depth of the air introduction. In order to achieve long retention times of the bubbles in the tank, the depth of the air introduction should be as great as possible. The generation of bubbles should therefore take place close to the tank bottom rather than at the water surface.

Efficient and reliable

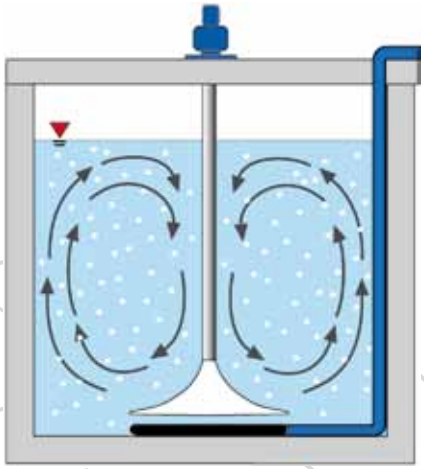
An intensive mixing is highly important for the optimal and safe operation of an activated sludge plant. The influence of mixing on the purification performance of a plant is quite often underestimated. However, it is easily understandable that e.g. sedimentation on the tank's bottom not only diminishes the available reactor volume, but also represents oxygen depression and a source for toxins due to the mostly anaerobic putrefaction. Beside reduced performance this leads to poor sedimentation qualities of the sludge flocs in the secondary sedimentation tank.

Poor mixing, however, also leads to oxygen gradients in the activated sludge tank. This on the other hand reduces the oxygen supply performance, as the driving concentration gradient decreases. Furthermore, such inhomogeneous occurrences create a problem for the usual single point oxygen measurements which are usually located in the upper part of the basin where the oxygen concentration tends to be higher than in the rest of the basin. In total the available basin volume is not used to the maximum.

All in all one wishes for a system which fulfills the above demands with regard to optimal bubble sizes and homogenous mixing and is furthermore flexibly applicable, of sturdy construction and resistant to wear and tear.



Oxygen distribution with insufficient mixing – poor purification performance



Oxygen distribution with good mixing & homogenization – excellent purification performance

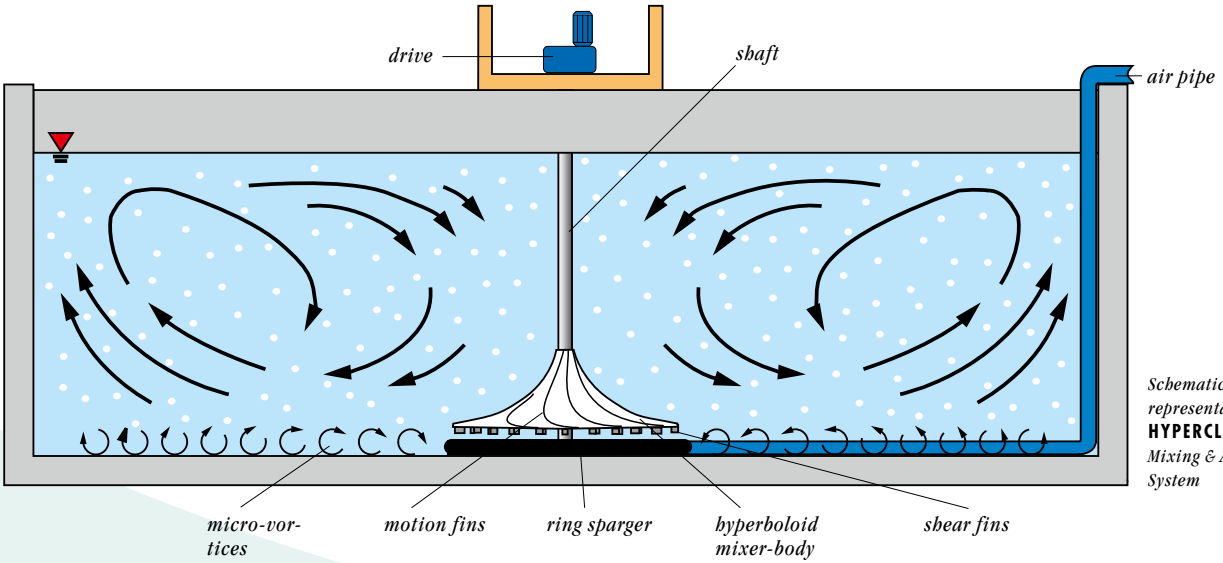
Highest efficiency through optimal design

The Solution

The **INVENT HYPERCLASSIC®**-Mixing and Aeration System is a fluid mechanically optimized mechanical aeration system with a hyperboloid-shaped mixer-body which is installed close to the bottom and a drive mounted on top of the tank in dry position. In contrast to other products it was developed not only for the purpose of oxygen transfer, but also for the task of mixing and is tailor-made especially for carrying out this double task.

The way the hyperboloid mixer/aerator functions can be seen in the illustration below. The hyperboloid mixer/aerator is pictured with its four main components, the drive, the shaft, the hyperboloid mixer-body, and the ring sparger in a typical activated sludge tank, which, depending on the type of treatment plant, can be rectangular or circular. Naturally, other shapes of tank are also possible, e. g. carousel tanks or aerated lagoons can be equipped with the **HYPERCLASSIC®**-Mixing and Aeration System.

The hyperboloid mixer/aerator rotates close to the bottom and its 8 integrated and specially optimized motion fins thus produce a bottom flow which is directed radially outwards. Particularly at the bottom, this flow is highly turbulent and thus effectively whirls up any depositions. Along the walls the flow rises upwards and transports all particles until they are just below the water surface. Due to the overall flow which forms in the activated sludge tank an intensive mixing of the activated sludge is achieved.

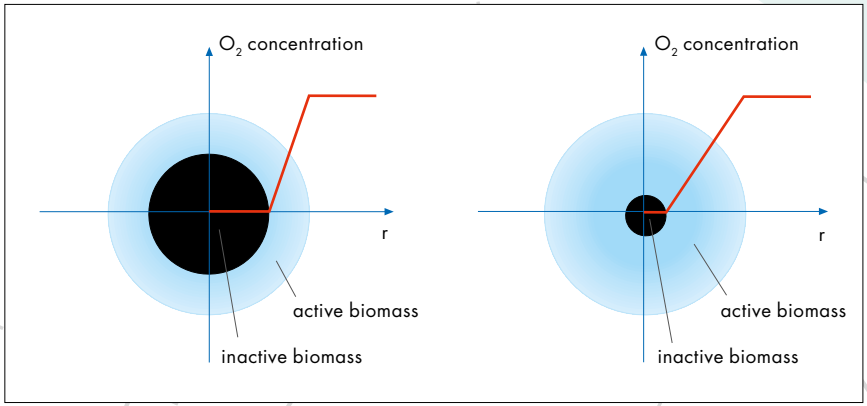


Schematical representation of the **HYPERCLASSIC®**-*Mixing & Aeration System*

During the aeration mode air or gas is blown under the hyperboloid mixer-body. This is realized via a separate pipeline which ends in a specially designed sparger system under the hyperboloid mixer-body. There the air escapes and meets the especially shaped underside of the hyperboloid mixer-body, which is equipped with so-called dispersing tunnels and special shear fins. As the hyperboloid mixer-body rotates, the air in the dispersing tunnels is mixed intensively with the waste-water and is torn into fine bubbles by the shear fins.
The main flow then transports these fine bubbles radially outwards and distributes them throughout the whole tank.

In summary, this optimized way of mechanical aeration with combined mixing possesses the following advantages:

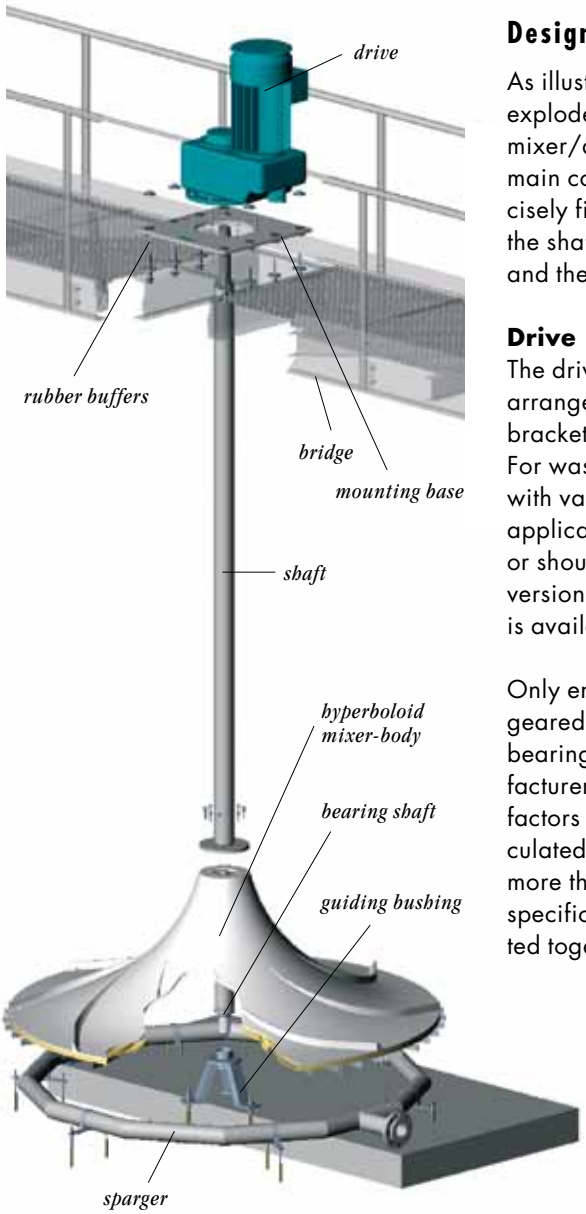
- Optimal bubble sizes are produced and particularly high detention times are achieved, because of the air introduction at the tank bottom with radial distribution.
- High oxygen transfer and yield levels are therefore achieved.



Anaerobic sludge floc (small amount of active biomass and poor sludge settleability)/ Aerobic sludge floc (large amount of active biomass excellent sludge settleability)

- The oxygen concentration is distributed homogeneously throughout the tank.
- The activated sludge flocs are optimally supplied with oxygen to their core (cf. diagram). This improves the sludge quality immensely – especially the sedimentation qualities in the secondary sedimentation tanks.
- The activated sludge flocs are distributed throughout the tank, sedimentation is avoided with certainty.
- Production of aerosol and its associated hygienic and aesthetic problems no longer exist. Protective covers are unnecessary.
- There is no noise emission worth mentioning. Sound covers are normally unnecessary.
- The energy, installation and maintenance costs and thus the operating costs are reduced to a minimum.
- The system is absolutely non-clogging, there is no wear of membranes and no increase in loss of pressure.

Design and Material Selection



Design and Material Selection

As illustrated in the accompanying exploded drawing, the hyperboloid mixer/aerator is made up of four main components which are precisely fitted to each other, the drive, the shaft, the hyperboloid mixer-body and the air diffuser.

Drive

The drive is assembled dry and is arranged on a bridge or mounting bracket where it is easily accessible. For wastewater ponds or SBR[1] plants with varying water levels or for all applications where bridges cannot or should not be realized, the cage version described on the next page is available.

Only energy-saving and robust geared motors with reinforced bearings from renowned manufacturers are used. High service factors are selected and the calculated bearing life expectancy is more than 100.000 h. The exact specifications are usually coordinated together with the customer.

The geared motor sits on a mounting base in a rubber buffer bearing. This absorbs starting jerks, the propagation of sound waves is avoided and the complete hyperboloid mixer/aerator is thereby galvanically separated from the bridge.

Shaft

The shaft provides the connection between the drive and the hyperboloid mixer-body. It transfers the required torque, which drives the hyperboloid mixer/aerator.

The shaft is manufactured from a heavy duty stainless-steel tube designed for the loads which occur. The exact composition of the alloy metal (usually AISI 316 or AISI 304) essentially depends on the composition of the wastewater. Specially coated shafts can be delivered for very saline or aggressive wastewaters.

For easy installation and the connection to the hollow shaft of the drive, a special shaft extension is integrated at the top end of the shaft. The torque transmission is carried out via a feather key.

[1] SBR: Sequencing Batch Reactor

At the lower end, the shaft is connected to the hyperboloid mixer-body by means of a flange. This enables a simple and rapid assembly as well as a simple removal even after many years of operation.

Hyperboloid Mixer-Body
The hyperboloid mixer-body, developed out of the **INVENT** laboratory in accordance with the most up-to-date knowledge on the mechanics of fluids, is manufactured using high-quality fibre-reinforced plastic.
The use of the most modern fibre-reinforced composites makes the construction of a high-strength, corrosion-resistant and light component possible.

The complete hyperboloid mixer not just produces a favorable flow field but is also absolutely non-clogging because of the optimal shape and the motion fins which are seamlessly integrated in the mixer-body.

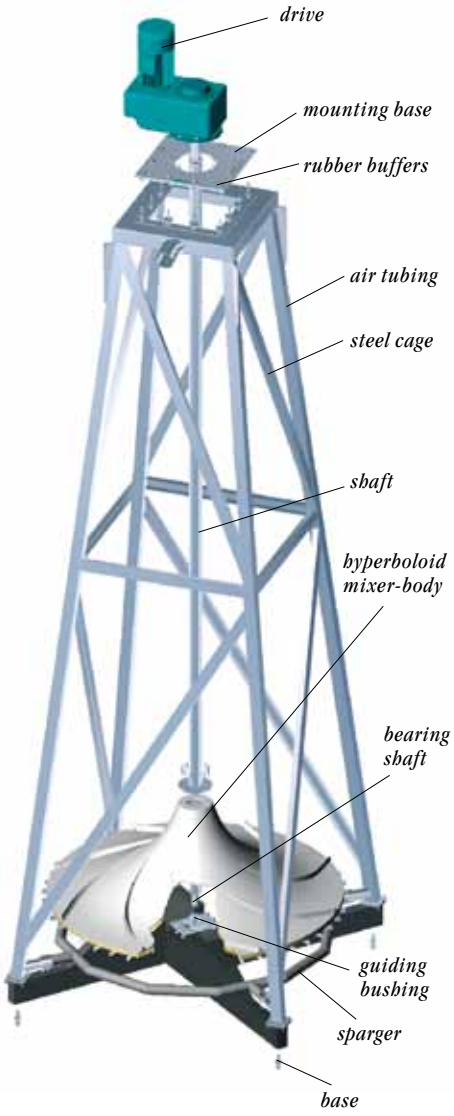
Fins are moulded not just on the upper side but also on the underside of the mixer-body. The ones on top serve to transport the fluid, and therefore the mixing, and those below the bubble generation. We call this **INVENT Double Fin Technology®**.

1 out of 9 **HYPERCLASSIC®***-Mixer/Aerators in an industrial wwtp in Belgium (Pulp & Paper Industry)*

Through the large amounts of air, which are guided beneath the hyperboloid mixer-body during operation and dispersed into fine air bubbles, a spectrum of dynamic forces and uplift forces act on the mixer-body. For this reason a guiding bushing is arranged under the hyperboloid mixer-body, which guides the mixer radially and prevents lateral motion. This bearing is lubricated by the wastewater and exclusively serves the radial guidance. It is therefore only lightly loaded and is subject to almost no wear during normal operation. For the operation in strongly abrasive media, there is a water flushed version of this bearing, which can also be used under the most adverse conditions.

Sparger System
The air is supplied via a pipeline made from HDPE[2] or stainless steel. This is guided below the hyperboloid mixer-body and ends there, always in a special sparger system.
The sparger system is made so as to prevent clogging. It is responsible for the pre-distribution of the air under the mixer-body. The pressurised air or gas which is used, must be supplied from outside by means of a suitable blower system.

[2]HDPE: High Density Polyethylen



The Cage-Solution

Combine the **HYPERCLASSIC®**-Mixing and Aeration system with the cage solution specially designed for this system. Then you can install and commission the complete system even in filled tanks and without removing the water so there is no need to interrupt the operation. The same also applies of course for the dismantling or the relocation of the system. The cage-solution **HYPERCAGE** thereby guarantees the greatest flexibility and security.

The **HYPERCLASSIC®/HYPERCAGE** combination can be completely premounted before delivery to the plant if requested by the customer.
This reduces the installation and commissioning time to a minimum.

The **HYPERCAGE** cage consists of a heavy base construction with a steel cage mounted upon it. The base construction is always made from a solid steel construction coated with epoxy-resin. This gives the **HYPERCAGE** weight, which guarantees that it always remains in its position.

Furthermore the base, through its shape, also supports the development of a current beneath the hyperboloid mixer-body which is favorable to the aeration and mixing. The bottom bearing is integrated into the base construction and is easy to install.

5 ***HYPERCLASSIC®****-Mixing & Aeration Systems in an industrial wwtp in Brazil (Chemical Industry)*

The cage construction can be made either from a steel construction coated with epoxy-resin like the base, or from stainless steel. In the latter case, the air supply can be carried out through the 4 main pipes (cf. adjoining exploded fiew). Otherwise the cage is equipped with a separate air pipe. Above the water surface, the air is introduced through a flexible pipe.

Easy, problem-free and quick

Low operational costs due to low energy consumption

The Installation

The **HYPERCLASSIC®**-Mixing and Aeration System is constructed in such a way that it can be easily and quickly installed. It is normally delivered to the construction site in a disassembled state. There the shaft is first of all connected to the drive unit by pulling the top end of the shaft into the hollow shaft of the drive. Next both drive and shaft are placed on top of the prepared stainless-steel thread bolts or adhesion anchors on the bridge or the mounting bracket. The drive is aligned and is ready for operation after the electrical connection and checking of the oil level. Inside the tank the guiding bushing and the ring sparger have to be mounted central underneath the shaft. The last step consists of screwing the hyperboloid mixerbody to the lower shaft flange. Just a short dry run and the mixer/aerator is ready for operation.

The installation is even quicker if the pre-mounted **HYPERCLASSIC®**/**HYPERCAGE** combination is selected. The system can be delivered to the plant in a completely pre-mounted state and unloaded there.

Just a short dry run, some safety checks, and the system can be installed and commissioned with a filled tank and without interruption of the operation.

The Operation

After a short dry run and a check of the direction of rotation the hyperboloid mixer/aerator can start operating without any further work. It is designed for permanent operation and does not require any severe maintenance work, except an occasional inspection of the oil level and a regular check of the guiding bushing.

INVENT *Sequencing Batch Reactor (***iSBR***) with* **HYPERCLASSIC®***-Mixing & Aeration System*

4 **HYPERCLASSIC®***-Mixing & Aeration Systems in an industrial wwtp in Belgium (Food Industry)*

Depending on the type of oil, an oil change is carried out once every 1 or 2 years. Due to the location and the excellent accessibility of the drive this is effortless. There are no work-intensive and unpleasant pulling and cleaning jobs, which for example, is generally the case with submerged drives. Expensive maintenance work, such as the regular exchange of mechanical seals, are unnecessary, because no expensive parts which are subject to wear are installed below water level.

Low maintenance costs

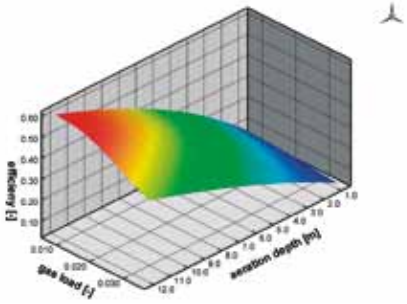
Competent and experienced

Lay-out and Design

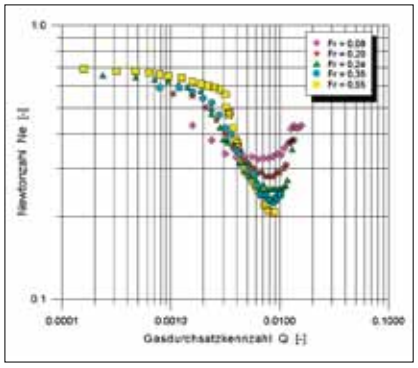
The lay-out and design of an optimum mixing and aeration system is a very complex task. It requires a large amount of competence, know-how and experience. Above all, it is important to consider the entire system and to understand the complete process in addition to the standard parameters, to incorporate this information and to integrate the aeration system optimally into the complete process. In the case of industrial plants e. g. in the paper and the petrochemical industry, in addition to this, it can be important to understand the production process to a certain degree, because this significantly influences the wastewater composition.

INVENT's approach is to focus on the customer and to always try and offer objectively the best solution. When strictly put into practice this means not just offering one single system but instead initially selecting the most suitable one for the application at hand from a range of mixing and aeration systems, membrane and further aeration systems. The selection of the suitable system is the first and most important step in the planning and designing of a plant. If the wrong system is chosen, it inevitably leads to a solution which is only partially suitable and thereby to a restricted performance of the plant and to increased costs.

Through many years of intensive research and development work in the field of mixing and aeration technology **INVENT** has been able to develop a range of products, which optimally cover every application. Therefore you can always rely on getting the best solution from **INVENT** and not just the only one available.



Typical characteristics of a **HYPERCLASSIC®** *-Mixing & Aeration System*



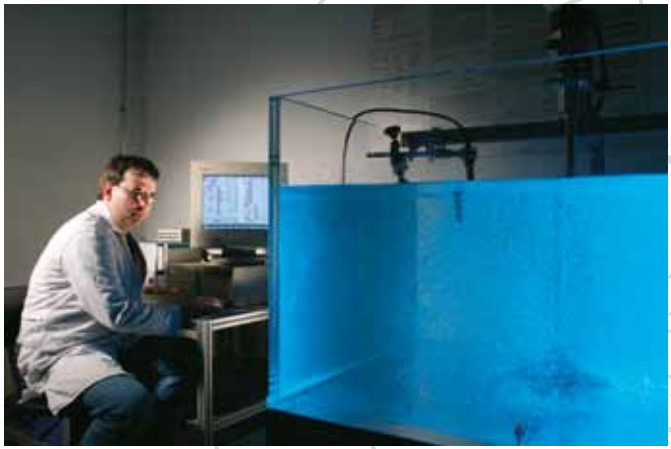
Typical gassed power characteristics

The Laboratory

In the **INVENT** laboratories in Erlangen all **INVENT** products are continuously developed and improved. The most modern equipment, measuring methods and analytical devices are available for this task. In order to determine fluid mechanical parameters scale models are examined and optimized with the help of laser and ultrasound measuring methods. Chemical analyses help to examine mixed processes on micro and macro scale.

Standard methods, recommended by DWA[1] oder ASCE[2] are used to measure the mass transport. Measuring instruments appropriate for taking measurements on large-scale plants are available. The parameter "bubble size", important for the lay-out of aeration systems, is determined with optical measuring methods.

Quality control



Oxygen testing in the **INVENT** *Laboratories*

The application of a characterization method developed by **INVENT** allows us to characterize and lay-out aeration systems with just a few measurements.
These high level quality control procedures provide an assurance of quality that you should expect from superior products for water and wastewater treatment.

Continuous improvement and quality control

[1] DWA: Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e. V.

[2] ASCE: American Society of Civil Engineers

HyperClassic®

INVENT Products worldwide

INVENT *Team meeting*

INVENT®, **HYPERCLASSIC**® and **Double Fin Technology**® are registered trademarks of **INVENT** Umwelt- and Verfahrenstechnik AG.

Chosen References:

Industrial:

- Dow Chemicals, Chemical Industry
- DSM, Chemical Industry
- Q8 Refinery, Petrochemical Industry
- Alpro Milk, Food Industry
- Arla Foods, Food Industry
- SAPPI, Pulp- and Paper Industry
- Jass Papier, Pulp- und Paper Industry
- Zucchi & Basetti, Textile Industry
- Mascioni, Textile Industry
- Dortmunder Union Brauerei, Beverage Industry

Municipal:

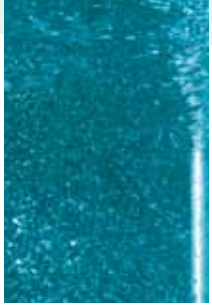
- Presidente Prudente, Brazil
- São José Dos Campos, Brazil
- Caleta Olivia, Argentina
- Yokohama, Japan
- ARA Feldkirch Meiningen, Austria
- KA Riedlingen, Germany
- KA Isny, Germany
- Biomüllvergärung Mühlheim an der Ruhr, Germany

Successful worldwide

The Service

How can we support you with the planning, optimization, modernization of your plant, or just generally with the realization of your ideas? Please ask us about it!

In close cooperation with you, the **INVENT** team will draw up a first draft and will, if necessary, develop it further together with you via numerous iteration steps, until all requirements are met. After the order has been placed an experienced team of engineers will see to it that your project is carried out on schedule.
In accordance with the agreement we will deliver and install the plant for you and will also carry out the commissioning. Our service team will reliably take care of all necessary maintenance work.



Professional and innovative

Beyond the delivery of components and plants we also offer you general advisory and engineering services in the field of stirring technology. This can be, for example, the lay-out or optimization of a stirrer, or the experimental examination of a stirring tank on a laboratory-scale or through numerical simulation.

Furthermore, we carry out large-scale acceptance tests, whereby usually the velocity field, the solid matter concentration distribution and the detention distribution are examined.

Other Products and Services

INVENT is the market leader for mixers, mixing and aeration systems and membrane aeration systems for the water and wastewater treatment. Please do not hesitate to ask for information about our additional product lines. We would also be happy to offer you complete system solutions for your plant, such as a carefully laid-out and adapted equipment package. We simulate and optimize your plant with the help of appropriate software packages, or else we optimize your plant or building with regard to fluid mechanics.

We are your competent partner for all questions on water and wastewater treatment.

engineering & consulting

aeration technology

software products

system solutions

research & development

locations

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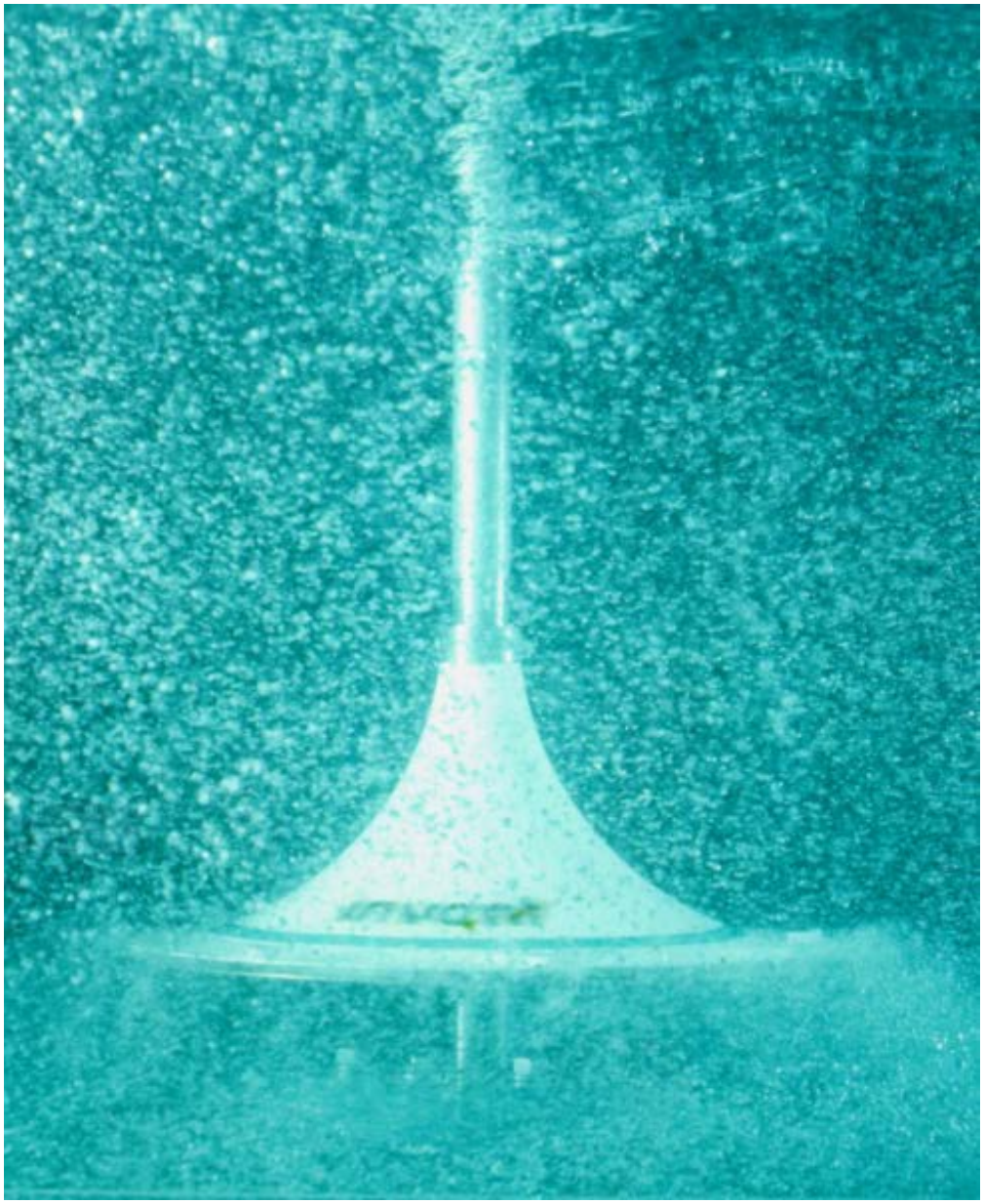
2. Operating Instructions

> Operating Instructions

HYPERCLASSIC® - *Mixer/Aerator*

mixing and aeration technology



invent® umwelt und verfahrenstechnik

Operating Instructions for:

INVENT HYPERCLASSIC®- Mixer/Aerator/Aerators

Valid for types HCMA/2500 GEN6, HCMA/2000 GEN7

Manufacturer:

INVENT Umwelt- und Verfahrenstechnik AG
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Authorized dealer:

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EC – Declaration of Conformance

According to the CE Machinery Directive 2006/42/EG from 17 May 2006, annex II A for machinery (MD).

HYPERCLASSIC®- Mixer/Aerator/Aerators GEN 6, GEN7

were developed, designed and manufactured under the sole responsibility of

Manufacturer: **INVENT** Umwelt- und Verfahrenstechnik AG

and complies with all the relevant provisions of the MD 2006/42/EG

Harmonized standards or parts of them used:

EN ISO 12100:2010
EN 60204-1:2006/A1:2009
EN 1037:1995 + A1 2008

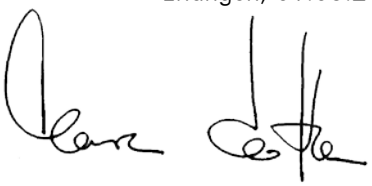
Further standards used:

EN 82079-1:2012
DIN technical report 146:2006

The technical documentation was created in accordance with annex VII A of the MD 2006/42/EG and is available for inspection by the competent authorities upon request.

The instructions for operation and installation are available.

Signed by: Dr.-Ing. Marcus Höfken
Function: Chairman of the Board of Directors
Place, date: Erlangen, 01.06.2013



Signature: _____

Version history of these Operating Instructions

Version	Date	History
Rev. 2.00	12/2011	GEN6

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Trademarks

INVENT®, HYPERCLASSIC®, **INVENT Safety Lock Technology®** and **INVENT Progressive Fin Technology®** are registered trademarks of **INVENT** Umwelt- und Verfahrenstechnik AG

Trademark rights

INVENT HYPERCLASSIC®- Mixer/Aerators and/or their accessories are protected by copyright laws and international agreements, as well as by various registered designs, patents and trademarks.

How to use these Operating Instructions

INVENT Umwelt- und Verfahrenstechnik AG is involved in the development, manufacture and operation of high-quality Mixer/Aerators, mixing systems and aeration systems, and of membrane aeration systems for water and wastewater treatment.

Our goal is that our products and services set constantly new standards for efficiency, function, reliability and safety. This is how we measure ourselves.

These Operating Instructions contain information about all relevant aspects of our **INVENT HYPERCLASSIC**® Mixer/Aerators. These aspects include safety instructions, a description of the system, operation, technical data, installation instructions, and information on maintenance and fault correction.

We have tried to illustrate these Operating Instructions as fully as possible, using 3D pictures, sketches and photographs. Please understand that illustrations should only be taken as examples, and cannot always represent the actual condition of the delivered product. The pictograms „Danger“, „Warning“ and „Caution“ are explained in the section „Safety”. Notes that are associated with these symbols have to be followed with care. They serve to avoid dangers and risks to the user thus strict adherence is mandatory.

If you have any questions about these Operating Instructions or the information in them, please consult your appointed dealer or our head office in Erlangen, Germany.

These Operating Instructions reflect the technical situation at the time of manufacture, and were compiled to the best of our knowledge and belief. Despite all the care we have taken, it is still possible that we have not covered all aspects that are of interest or importance to the user. We therefore do not make any claims of completeness, and would encourage you to notify us of any improvements you think could be made. Please direct any such suggestions to our head office in Erlangen.

The **INVENT**-Team

Customer Service

If you require any assistance from our Customer Support staff, please contact your authorized dealer or the **INVENT** head office. You can find the contact data on page 2.

1 Introduction

1.1 Contents of this Chapter

The "Introduction" chapter of these Operating Instructions begins with a short description of what an **INVENT HYPERCLASSIC**®- Mixer/Aerator is. This is followed by a descriptive diagram and an explanation of the most important functions. In addition, the application areas of the **HYPERCLASSIC**®-Mixer/Aerators are listed and defined.

1.2 The Product

The **INVENT HYPERCLASSIC**®- Mixer/Aerator is an energy-saving, low shear stress, bottom-acting Mixer/Aerator, with a vertical shaft and dry-mounted drive unit. It has applications in the suspension and homogenization of particles (solids) in liquid media (water, wastewater, sludge).

1.3 Construction

The construction of the **INVENT HYPERCLASSIC**®- Mixer/Aerator is shown in Figure 1.1. The hyperboloid Mixer/Aerator consists of three precisely integrated main components: the drive unit, including the mounting plate, the shaft, and the hyperboloid Mixer/Aerator body. It is usually mounted on a bridge or gantry, as shown in Figure 1.1.

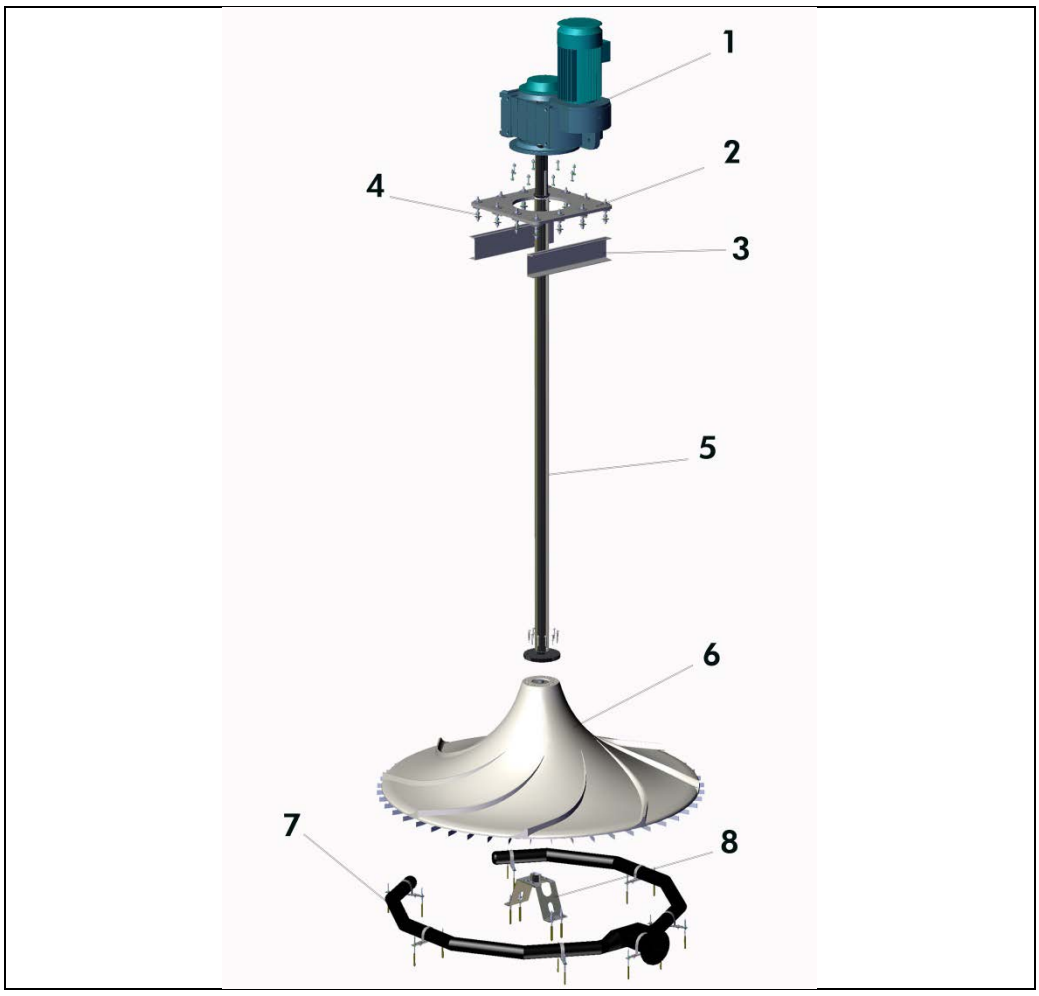


Figure 1.1: Exploded view of the **HYPERCLASSIC**® Mixer/Aerator

The item numbers in Figure 1.1 refer to the following components of the hyperboloid Mixer/Aerator:

- Item 1: Drive unit
- Item 2: Mounting plate
- Item 3:: Bridge/Gantry
- Item 4: Fixing set mounting plate/bridge
- Item 5: Shaft
- Item 6: Mixer body with bearing shaft
- Item 7: Ring Sparger
- Item 8: Bottom guide unit

1.4 Labels and markings

1.4.1 Control and Monitoring elements

INVENT HYPERCLASSIC® Mixer/Aerators are normally delivered without control elements, as these are usually constructed or supplied by the customer. We recommend that a small on-site switch-box with On and Off functions should be provided, plus an emergency Off switch. Details of the electrical connections can be found in section 3.8.

1.4.2 General and description

NOTE
All signage applied to the Mixer/Aerator, such as identification plates, arrows showing the direction of rotation etc., must be heeded. They must be kept clean of paint and dirt. Missing signs must be replaced.

The following labels are applied to each **HYPERCLASSIC**® Mixer/Aerator:

Label	Location	Purpose
Motor identification plate	Drive motor	Technical data
Gear unit identification plate	Gear unit	Technical data
Mixer/Aerator identification	Mounting plate	Technical data
Direction-of-rotation arrow	Mounting plate	Show direction of rotation
Check marking	Shaft	Check direction of rotation
Direction-of-rotation notice	Mixer/Aerator body	Show direction of rotation

Table 1.1: Labels on a **HYPERCLASSIC**®-Mixer/Aerator

These signs are individually described in the following sections.

Apart from the label, the main components of the **HYPERCLASSIC**® Mixer/Aerator bear markings that identify the parts. The markings contain the following information:

Description	Example	Information
Project Name:	ErlaInve12	Project Name
Project Number:	6068	Project Number
Description:	Gear Motor	Description
Part Number:	1	Part Number:
Type:	HCM/2500-23-2,2	Type:
Serial Number:	015	Serial Number:
Manufacturing Year	2011	Manufacturing Month/Year
Checked by:	fke	Checked by:

Table 1.2: Markings on a **HYPERCLASSIC**®-Mixer/Aerator

The **Project Name** identifies the project. The name is formed from the first four letters of the site, followed by the first four letters of the customer's name, and the month in which the order was placed (in the example, "ErlaInve12" would mean Erlangen/INVENT/December).

The **Project Number** is used for administration purposes, and is sequentially assigned. Like the Project Name, it should be quoted in all correspondence, to simplify communication.

The **Description** and the **Part Number** identify the component in question in more detail. They are distinguished as follows:

- Gear Motor: Part Number 1
- Mounting Base: Part Number 2
- Shaft: Part Number 3
- Mixer/Aerator Body: Part Number 4
- Ring Sparger: Part Number 5

Type gives the type description of the Mixer/Aerator. The type key is explained in section 1.4.4.

The **Serial Number** is a project related, consecutive number. Parts with identical serial number are attributed to one certain Mixer/Aerator. Thus parts with identical serial number must not be assembled in different Mixer/Aerators.

Manufacturing Year shows the year of manufacture in numerical format.

Checked by is an internal control field.

NOTE
During assembly, be extremely careful to ensure that all components used to assemble the Mixer/Aerator bear the same serial number

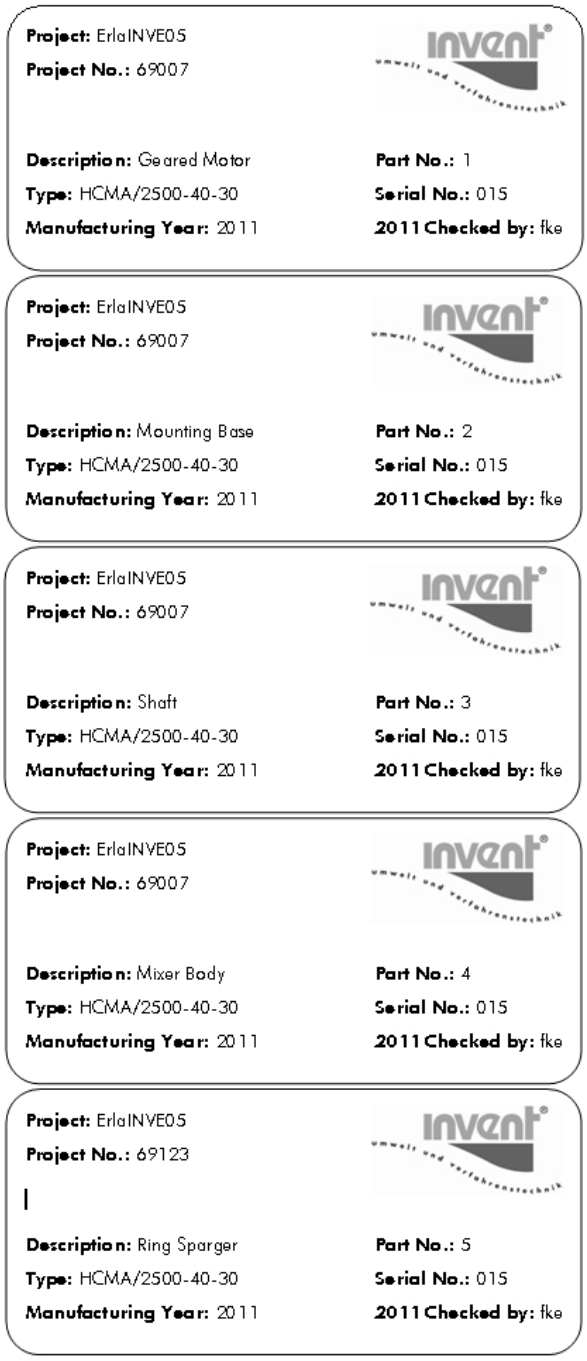


Figure 1.2: Markings for the main components of a **HYPERCLASSIC**® Mixer/Aerator

1.4.3 Part label for drive unit

Depending on the type of drive unit selected or specified, there will either be separate part labels on the motor and the gear unit, containing data about the part in question, or there will be a single label on the motor containing information about both. For further information, please consult the operating instructions supplied with the drive unit.

1.4.4 Part label for Mixer/Aerator

The part label for the **HYPERCLASSIC**® Mixer/Aerator is prominently displayed on the mounting plate. Its format is shown in Figure 1.3:

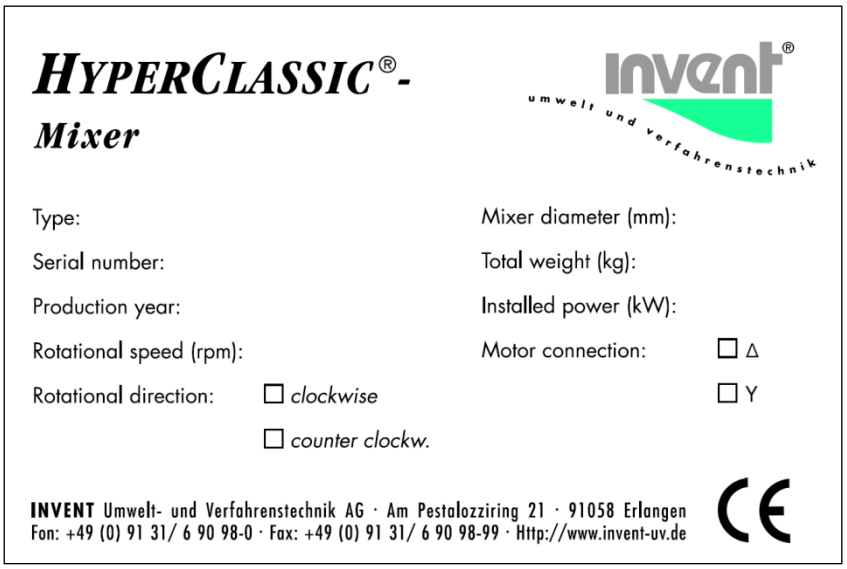
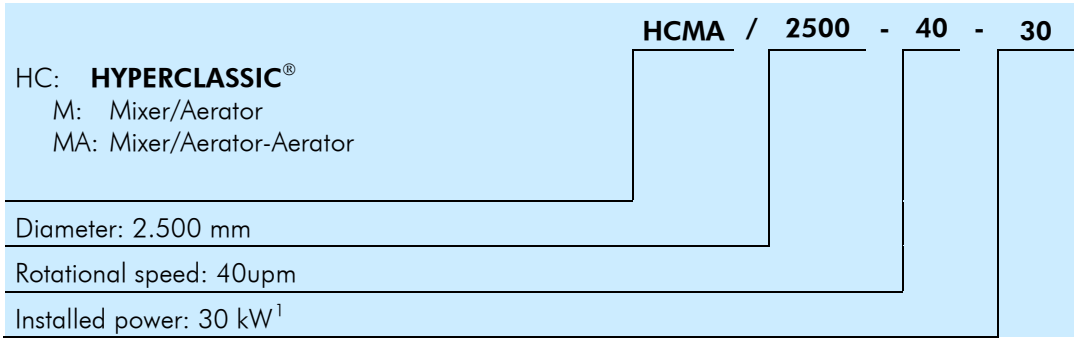


Figure 1.3:
Part label for a **HYPERCLASSIC**®-Mixer/Aerator

The type key is constructed as follows:



The part label is positioned on the mounting plate as shown in Figure 1.4:

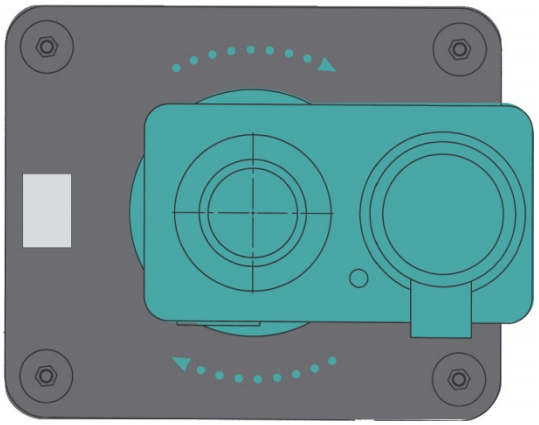


Figure 1.4:
Part label and direction-of-rotation marking on mounting plate

1.4.5 Checkmarks and notice on the shaft

On both sides of the shaft, there are markings that are intended to make it easier to check the direction of rotation when the basin is full. If these markings are used to check the speed of rotation, remember that the each marking shows half a rotation. This increases the precision of the measurement.

[1] For power capacities in Horsepower, the abbreviation “hp” is used

Figure 1.5: **HYPERCLASSIC**®-Mixer/Aerator shaft with control markings

In addition, on the lower end of the shaft, near the flange, there is a sticker with the following notice:

Figure 1.6: Information notice on **HYPERCLASSIC**®-Mixer/Aerator shaft regarding tightening screws

1.4.6 Signage on the Mixer/Aerator

On the outer edge of the Mixer/Aerator body are notices that show the correct direction of rotation.

1.5 Technical Data

1.5.1 INVENT HYPERCLASSIC® Mixer/Aerators HCMA/2500

Type	Mixer Diameter [mm]	Speed [rpm]	Nominal Power [kW]
HCMA/2500-27-7,5	2.500	27	7,5
HCMA/2500-27-9,2	2.500	27	9,2
HCMA/2500-29-11	2.500	29	11
HCMA/2500-32-15	2.500	32	15
HCMA/2500-35-22	2.500	35	22
HCMA/2500-38-22	2.500	48	22
HCMA/2500-40-30	2.500	40	30
HCMA/2500-40-37	2.500	40	37

Table 1.3: Technical Data for **HYPERCLASSIC® Mixer/Aerators**

1.5.2 INVENT HYPERCLASSIC® Mixer/Aerators HCMA/2000

Type	Mixer Diameter [mm]	Speed [rpm]	Nominal Power [kW]
HCMA/2000-	2.000	33	5.5
HCMA/2000	2.000	37	7.5

Table 1.4: Technical Data for **HYPERCLASSIC® Mixer/Aerators**

NOTE
The electrical design of the drives depends on the application, rated voltage and frequency on site. You will find the valid data for your motor on the project data sheet "Technical Data of the Plant".

The valid wiring diagram is attached to the motor

NOTE
The quantity of oil to be used depends on the mounting orientation of the drive! The type of oil, oil viscosity and required amount of oil, used for the initial filling, can be seen from the specification plate or can be requested from our service.

1.6 Environment

INVENT HYPERCLASSIC® Mixer/Aerators can essentially be installed with appropriate equipment in any common climatic conditions. However, unless otherwise agreed, the following operational limits apply as standard:

- Ambient temperature: -10°C to 40°C
- Altitude: 0 to 1.000 m above sea level

- Fluid: Wastewater / activated sludge
- Fluid temperature: 4° C to 40° C
- Solid content:: < 5.000 mg/l
- Sludge Volume Index (SVI): > 80 ml/g
- pH: 6 – 8
- Total Dissolved Solids (TDS): < 2.000 mg/l

1.7 Limitations for Storage

If a lengthy period of storage is required on site between delivery and installation, or if the Mixer/Aerator is removed from the basin in connection with a long-term decommissioning, it must be stored in separate parts: Mixer/Aerator body, shaft and drive unit.

It is best to store the Mixer/Aerator in the original, undamaged packaging, and in a dry, enclosed area. Protect drive units, Mixer/Aerator shafts and Mixer/Aerator bodies from effects of the weather, such as rain, snow and direct sunlight. When choosing a place of storage, make sure that it is protected from building-site traffic and other outside influences.

NOTE
During long periods of storage, long-term preservation for Mixer/Aerator drive units is required. Please consult the INVENT customer service organization.

For detailed storage instructions of **HYPERCLASSIC**®-Mixer/Aerators and Mixer/Aerator components please refer to chapter 3.

1.8 Accessories and Consumables

The **INVENT HYPERCLASSIC**® Mixer/Aerator is delivered with the following accessories:

- Drawing die for winding the drive shaft into the hollow shaft of the drive unit (see Figure 1.7)
- Grease for lubrication and protection of the upper shaft end before winding in (see Figure 1.8)
- Liquid-proof thread-locker (see Figure 1.9)

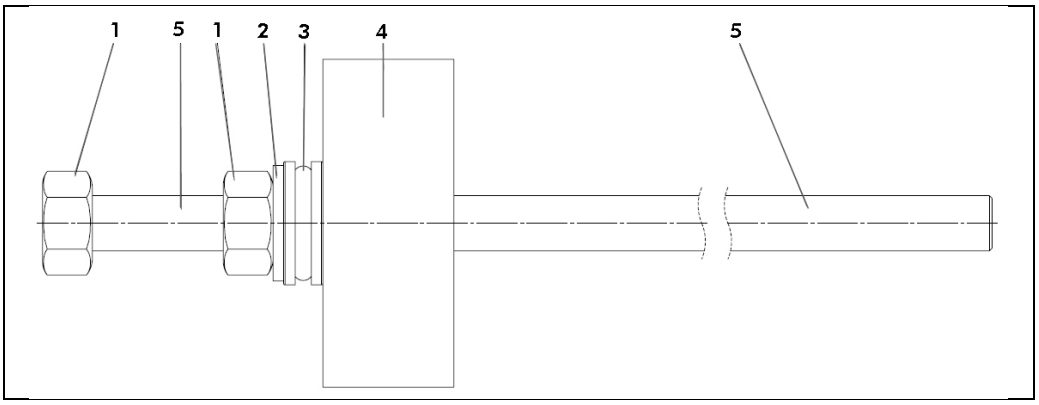


Figure 1.7:
Drawing die

The item numbers in Figure 1.7 refer to the following components of the drawing die:

- Position 1: Nut
- Position 2: Washer
- Position 3: Axial bearing
- Position 4: Spacer
- Position 5: Threaded rod

Figure 1.8:
Grease for lubrication and protection of the upper shaft end

Figure 1.9:
Thread locker

1.8.1 Optional Accessories

The following options are available on request for the **INVENT HYPERCLASSIC**® Mixer/Aerator:

- Drive options[2]
  - Protection to IP65
  - Temperature class F PTC thermistor
  - Bi-metallic switch as overload protection
  - IE2 construction with increased motor efficiency (IE3 on request)
  - Explosion-proof models
  - Electrical monitoring of oil level
  - Synthetic transmission lubricant for increased maintenance intervals
  - Oil drain tap
  - High-grade corrosion protection (C4/C5)
- Customized mounting plate (oversize, special material requirements)
- Shaft clamping device
- Stainless steel shaft
- „**HYPERPITCH**“ floating sludge paddle
- Bracket for lateral mounting on concrete bridges
- „**HYPERBRIDGE**“ bridge for mounting the Mixer/Aerator on a half- or full bridge
- „**HYPERCAGE**“ cage for mounting the Mixer/Aerator in large basins
- Consumables and parts subject to wear and tear

The **INVENT HYPERCLASSIC**® Mixer/Aerator does not use any materials apart from transmission lubricant, which should be checked, topped up and changed on a regular basis.

Parts subject to wear and tear include:

- Motor bearings
- Seals on the gear unit
- Bearings in the gear unit
- Gearwheels in the gear unit
- Rubber drive suspensions on the mounting plate
- Sliding bush (guide bushing)
- In addition, finishing and coatings are subject to the effects of Nature and other wear and tear

The condition of these parts must be checked regularly. If any parts are worn, they must be replaced.

[2] Not all combinations are mutually compatible.

1.9 Electricity supply

DANGER

Any work on the stationary machine must be performed by qualified personnel, with the machine isolated from the supply and secured so that it cannot be switched back on again. This also applies to auxiliary circuits (e.g. anti-condensation heating)

Check for isolation from supply!

The electricity supply should be connected by a trained professional and in accordance with the original wiring diagram of the motor manufacturer and the information given on the nameplate. The valid wiring diagram is attached to the motor.

NOTE
If the wiring diagram is missing, the motor must not be connected. Please contact our technical service to obtain the valid wiring diagram for your motor.

NOTE
Please refer for all electrical connections to the enclosed original instructions of the drive manufacturer.

If the drive unit is fitted with optional PTC thermistors, please connect the conductors for the external voltage.

If the drive unit is fitted with an optional anti-condensation heating, please connect the supply voltage for the anti-condensation heating.

Please refer to the identification plate for information about the options that are fitted.

If variable frequency drives are used, additionally the instructions of the inverter manufacturer have to be followed.

NOTE
Please make sure that no water can penetrate into the terminal box during the work. When the electrical supply has been connected, the terminal box must be made watertight, to a standard at least in accordance with IP55.

1.10 Applications

Depending on how it is set up, the **INVENT HYPERCLASSIC**®- Mixer/Aerator can perform the following functions:

- Intake of air at the bottom of the reactor and dispersing the air into fine bubbles for efficient dissolving of oxygen.
- Suspension of solids
- Homogenization (for example, equalization of differences in concentration)

1.11 Intended Uses

The **INVENT HYPERCLASSIC**®- Mixer/Aerator is designed to be used primarily for the suspension and homogenization of activated sludge flocs in anaerobic and anoxic tanks for Bio-P-Elimination and denitrification in biological wastewater treatment plants.
Further areas of application include mixing and equalization tanks, neutralization, precipitation and flocculation, and also sludge treatment plants.

Generally speaking, the **INVENT HYPERCLASSIC**®-Mixer/Aerator can – with the correct dimensioning – be used for any agitation application within water, wastewater and sludge treatment, provided that the fluids to be agitated have Newtonian properties. Use in non-Newtonian fluids is possible, but must always be agreed in advance with **INVENT** and approved by **INVENT** Examples of this are:

- Organic waste or food waste treatment plants
- Sludge with a dry matter content > 3%

1.12 Unauthorized Uses

Unless prior permission has been obtained, the **INVENT HYPERCLASSIC**®- Mixer/Aerator may not be used:

- In plants that have dimensions or that treat substances which are not in accordance with the agreed specification
- In plants in which inflows are directed at the Mixer/Aerator body
- In plants with highly variable fill levels
- In plants in which the Mixer/Aerator body is only partially immersed in the fluid
- In plants with abrasive substances
- In sewage tanks for gas extraction

1.13 Manufacturer's Liability

We assume liability in accordance with the prevailing legal stipulations. However, liability is explicitly excluded or restricted in the following cases:

- Unsuitable transport
- Unsuitable storage
- Unsuitable installation or disassembly
- Inadequate on-site construction works, in particular bridges
- Insufficiently secured building sites
- Failure to observe general legally applicable safety precautions and those prescribed in these operating instructions
- Use of our products in unauthorized applications

- Wrong lay out design as a result of missing, inadequate or incorrect information supplied by the operating authority or customer
- Lack of maintenance or inadequate maintenance
- Unsuitable repairs
- Chemical, electrochemical or electrical damage
- General wear and tear

Otherwise, the INVENT Umwelt- und Verfahrenstechnik AG General Terms and Conditions, shall apply exclusively.

1.14 Warranty

The warranty conditions are in general governed by individual contracts. These agreements as a rule have precedence over the general statements given here. Any warranty obligation on the part of the manufacturer is, however, dependent on the following conditions:

- The installation has been carried out by qualified personnel, and none of the exceptions in Section 1.13 applies.
- The product was being used for an approved application.
- Commissioning was notified in writing to the manufacturer.
- The fault occurred within the agreed warranty period and was reported in writing to the manufacturer.
- The fault concerns inferior quality of materials or was caused by a fault in production.
- The customer has paid in full for the product.

Otherwise, the INVENT Umwelt- und Verfahrenstechnik AG General Terms and Conditions, shall apply exclusively.

1.14.1 Warranty requirements

1.14.1.1 Pressure loss test

The normal pressure loss of the **HYPERCLASSIC** ®- Mixer/Aerator depends on the actual air loading rate and is within the range 5 – 20 mbar. In the case of pressure measurements, additional losses in the air supply line and fittings must be taken into account. The sewage plant personnel must carry out pressure measurements on a weekly basis and record this information in the operating log. In case the differential pressure on the system increases by more than 20 mbar relative to the condition as new, please contact our technical service.

1.14.1.2 Air loading rate

The loading with air must be limited to the maximum value given on the part label of the **HYPERCLASSIC** ®- Mixer/Aerator. Otherwise the system is exposed to increased vibration and wear.

1.14.1.3 Compressed air distribution

The air supply line must be dimensioned so that an even distribution of air between **HYPERCLASSIC** ®- Mixer/Aerators, that are using a common air supply line, is ensured. It is recommended to install a volume flow meter in the distributor line.

1.14.1.4 Solid particles, sand

A suitable screen or filter as well as sand trap must be provided for in order to prevent any deposits and abrasive particles entering the reactor. Sharp-edged objects such as nails, bolts, stones, glass shards etc. must be removed no later than after the installation of the **HYPERCLASSIC** ®- Mixer/Aerator and should not ingress into the basin during operation once they may damage the Mixer and bottom guide.

1.14.1.5 Standstill times

Following shutdowns and during extended downtimes the **HYPERCLASSIC** ®- Mixer/Aerator must be aerated from time to time. In winter the **HYPERCLASSIC** ®- Mixer/Aerator must be protected against freezing.

2 Safety

2.1 Introduction

This chapter contains a summary of important information that is essential for the safe transportation, storage, assembly, running and disassembly of **HYPERCLASSIC**®-Mixer/Aerators.

The chapter concerns the personal safety of all personnel who are responsible for and involved in the installation, running, maintenance or removal of the Mixer/Aerator, and the prevention of damage to the product. It is therefore essential that all the personnel in question read this chapter carefully and always follow the instructions in the chapter.

2.2 DANGER-sign in these operating instructions

This is a DANGER sign. The DANGER sign draws your attention to any hazards with a high degree of risk, which, if not avoided, cause death or serious injury.

2.3 WARNING-sign in these operating instructions

This is a WARNING sign. The WARNING sign draws your attention to any hazards with a medium degree of risk, which, if not avoided, may cause death or serious injury.

2.4 CAUTION-sign in these operating instructions

This is a CAUTION sign. The CAUTION sign draws your attention to any hazards with a low degree of risk, which, if not avoided, may cause minor or medium injury.

2.5 NOTE-sign in these operating instructions

NOTE
This is a NOTE sign. The Note-sign is used for supporting the user and ensuring compliance with the regulations and avoiding of damages to the product.

2.6 Responsibility of the user/operator

NOTE:

- The user or operator of the product is responsible for ensuring that all safety recommendations and the legally applicable accident prevention regulations, instructions etc. are followed during storage, transport, operation, maintenance, and any disassembly of the product, and that work is carried out only under legally approved conditions.
- The user must inform all personnel, companies and sub-contracting companies carrying out the work described above of these recommendations and instructions, and put them under an obligation to read and follow them.
- The Mixer/Aerator must only be used in a technically perfect condition, in accordance with its intended use, taking into account safety issues and possible dangers, and in compliance with these operating instructions. Any faults, particularly those that may affect safety, must be immediately dealt with.
- All personnel involved with the assembly, commissioning, operation or maintenance must have fully read and understood these operating instructions. During use it is too late. This applies especially to personnel who work on the machine only occasionally.
- The relevant accident prevention regulations and other generally acknowledged health and safety procedures must be followed.
- Responsibility for the various activities within the operation, servicing and maintenance of the machine must be clearly established and adhered to. This is the only way to avoid mistakes, especially in hazardous situations.
- The user/operator must ensure that operating personnel wear personal safety equipment. Special personal safety equipment may need to be used in certain situations or if specified by regulations. This applies particularly to the assembly of mixing systems, and connection of electrical power.
- First-aid facilities (first-aid boxes etc.) must be kept easily accessible.
- Personnel must know the locations of fire-fighting equipment, and how to use it. The possibility of fire alarms and the need for fire-fighting must be taken into account.
- During all work relating to the operation, modification and adjustment of the machine, the procedures for switching on and off described in the operating Instructions must be followed. Before work commences, it must be established who must be notified in the case of emergency. If necessary, a safety induction must be carried out before assembly.
- The manufacturer of any machine or installation into which this **HYPERCLASSIC**® Mixer/Aerator is incorporated is obliged to include the instructions, information and descriptions in these operating instructions in their own operating instructions.
- During transport, assembly and dismantling, operation, servicing and maintenance, the relevant occupational safety and environmental regulations must be observed.

2.7 User training

No special training is required for the operation of the **HYPERCLASSIC**®-Mixer/Aerator. It is, however, required that each operator has read and understood the operating instructions.

All work on the machine must be carried out only by reliable personnel. Only qualified or trained personnel must be used.

Personnel working on the Mixer/Aerator in the context of apprenticeship, work experience, induction or general education may only do so under the constant supervision of experienced and qualified staff.

The electrical drive unit may only be installed, commissioned, serviced and where necessary overhauled by authorized, qualified professional staff.

2.8 General safety precautions and potential risks

2.8.1 General

The **HYPERCLASSIC**®-Mixer/Aerator is constructed in accordance with the latest technology, and on delivery is safe to operate. Nevertheless, dangers to the user or third parties, or damage to the machine and other assets, can arise during use if it is:

- Not installed appropriately.
- Not serviced by qualified and trained personnel.
- Used in unauthorized applications.
- Unsatisfactorily serviced or maintained.

WARNING **Unauthorized alterations that affect operational safety are not permitted. This applies in particular to protections against contact.**

2.8.2 Safety information

The **HYPERCLASSIC**®-Mixer/Aerator may only be installed and operated in accordance with the conditions laid down in the supply contract and service level agreement (SLA). The operator must ensure that all personnel involved in assembly, operation, care and maintenance or repair work have read and understood the operating instructions, and follow them in every respect, in order to:

- Avoid physical danger to users and third parties.
- Prevent damage to the product.
- Ensure the operational safety of the product.
- Avoid downtimes and damage caused to environment through incorrect use.

NOTE
All work on the HYPERCLASSIC®-Mixer/Aerator must be carried out with care, and with safety in mind.

In particular, the following safety advice should be noted:

NOTES

- Do not work alone when installing or dismantling the **HYPERCLASSIC**®-Mixer/Aerator.
- The operator must receive training concerning the electrical supply to the product and how it can be switched off.
- The operator must immediately report any fault or irregularity that occurs, to the person responsible. This applies to all mechanical and electrical equipment.
- The operator must stop the machine as a matter of urgency in the event of any fault that could constitute a safety risk. These include:
  - Breakdown of safety or monitoring equipment;
  - Damage to important components;
  - Damage to electrical equipment, cables or insulation.
- All work on electrical connections, including modifications, must be carried out only by qualified professionals.
- When using mobile equipment to lift freely suspended (unguided) loads, measures must be taken to prevent it tipping over, becoming dislodged, sliding etc.
- The falling down of loads, which is caused by the failure of sling gear, constitutes high danger potential. Measures must be taken, that no persons stay in the area of risk related to suspended loads. Furthermore, suspended loads must not be moved above workplaces, where persons could stay. Areas of risk are:
  - Below the load.
  - Beside the load when lifting is started.
  - At elevated workplaces.
  - In swing distance to the load.
  - Between loads that are jointly lifted.
- When using mobile lifting equipment, a second person must, if necessary, be used for the purposes of coordination (for example, if sightlines are obstructed).
- The load to be lifted must be transported in such a way that no injuries occur in the event of a power failure. Furthermore, work of this type in the open-air must be suspended if weather conditions deteriorate.
- When working in enclosed spaces, make sure that sufficient breathable air is available. Adequate ventilation must be ensured.
- In the case of welding or other work with electrical equipment, ensure that no risk of explosion or fire arises.

2.9 Residual hazards

Even when all safety regulations are observed, certain risks remain when dealing with the machine. Everyone working on the machine must know of these dangers and follow the appropriate instructions to prevent these other risks leading to accidents or injury.

2.9.1 Safety clothing and equipment

When working on the **HYPERCLASSIC®**-Mixer/Aerator, it is essential to wear sufficient protective clothing in order to avoid injury. Specifically, this is:

- Safety helmet
- Safety goggles (when working with spray water)
- Safety gloves
- Earplugs or ear protectors (in the case of increased noise levels)
- Safety shoes
- Close-fitting overalls
- Long hair and/or beards should be put up or protected with a hairnet

NOTE
When assembling the Mixer/Aerator, the appropriate safety and protective equipment must be worn.

When carrying out assembly on a service bridge that extends over the basin, make sure that appropriate fall protection is used (belt, protective scaffold). If the assembly is taking place over a full basin, it is essential that a second person is present and that suitable swimming aids and rescue equipment (life-vests, lifebelts, rope, boat, …) are available in case of an emergency.

NOTE
Assembly on service bridges without railings and/or without floor covering is not permissible.

2.9.2 List of residual hazards

2.9.2.1 Hazard while staying at the product

- There is no need during installation and commissioning to be close to the rotating Mixer/Aerator, and this should therefore be avoided.

The rotating Mixer/Aerator body can cause injury.

- All work on the **HYPERCLASSIC®**-Mixer/Aerator (assembly, maintenance, dismantling) must only be carried out with the Mixer/Aerator switched off. The drive unit must be disconnected from the electricity supply system, and must be secured against unintentional switching on (for example, by shutting off the key switch and/or removing the

fuse or circuit-breaker from the power supply). A notice making it clear that work is being carried out on the mixing systems must be displayed at the point at which the power is switched on. All moving parts must have come to a complete standstill before work starts.

- The drive unit must be taken out of service immediately if changes in the drive are noticed during operation – for example, raised operating temperatures or different noises from the drive.

2.9.2.2 Loosing tilting stability/crushing hazard

- During transportation, unloading, unpacking and assembly there is a risk of tilting and shifting of package and Mixer/Aerator parts. All personnel involved have to wear protective clothing and safety equipment.
- During transportation the package has to be secures properly and all parts have to be transported in their original packaging.
- When selecting a storage location, a planar, load-bearing subsoil has to be provided.

2.9.2.3 Slip and trip hazard

- In the case of unsafe access possibilities to the installation site, there is a risk of sliding, stumbling or falling. The access possibilities to the installation site as well as the installation site itself must be secured correctly. If necessary, secure yourself (e.g. belt or fall protection devices).
- If railings have not yet been installed on the basins or catwalks, then the customer must provide suitable attachment points for attaching fall protection devices.
- If drilling must be carried out on the internal basin walls at a height of more than 2m or above one's head, then the customer must provide a scaffolding meeting the standard safety regulations.

2.9.2.4 Cutting hazard

- Several components of the Mixer/Aerator are made from fiber reinforced plastic (FRP). When broken, this material may cause cut injuries and skin irritation. Therefore, appropriate protective gloves must always be worn during working with FRP.
- Stainless steel shear fins show sharp edges. During assembly, protective gloves have to be worn and extra caution has to be exercised.

2.9.2.5 Entanglement hazard

- Drills are rotating machines. Long hair, beards and even fabrics hanging down from items of clothing may in unfavorable cases be caught by the drill or chuck and lead to serious injuries. Therefore, appropriate protective clothing preventing such occurrences must be worn at all times during all drilling work.

2.9.2.6 Thermal hazard

- When drilling into concrete or steel, the drill used can become very hot. There is a risk of burns.

2.9.2.7 Hazards generated by materials and substances

- During contact with wastewater or activated sludge a biological or microbiological hazard exists due to bacteria and viruses.
- It is strictly prohibited to eat, drink and smoke during work. After work hands must be thoroughly washed and disinfected if possible.

- Before carrying out any installation work, it is urgently recommended to comply with all relevant vaccination recommendations (vaccination protection in accordance with the guidelines for sewage plant personnel).
- There is a risk of eye injury when blowing out boreholes. Protective clothing preventing such occurrences must be worn at all times during all drilling work (goggles).
- When assembling the drive unit, oil can under unfavorable conditions leak out. To prevent further damage, any leaking oil must immediately be cleaned up with, for example, an oil binding agent or cleaning cloths. Dirty cloths or used oil binding agents must be disposed of correctly.
- During an oil-change, the old oil must be collected in a suitable receptacle. Any patches of oil must immediately be removed with an oil binding agent. Heavily stained or oil-soaked cleaning cloths must be stored in suitable containers. The old oil must be disposed of in accordance with current environmental protection regulations, as must the oil binding agent and cleaning cloths.

2.10 Emergency procedures

- Remove the person affected from the danger area. If necessary, call a doctor immediately.
- In an emergency, always keep calm and inform the relevant authority (site manager, safety representative).

2.11 Maintenance intervals

NOTE
It is vitally important for the safe running of the HYPERCLASSIC®-Mixer/Aerator to keep to the prescribed maintenance intervals.

All maintenance work and the associated maintenance intervals are described in chapter 5.

3 Installation

3.1 Introduction

The present chapter describes the preparation of the product for use, in particular delivery and transportation, unpacking, storage, preparation of the installation site as well as assembly and installation.

3.2 Transportation

Usually **INVENT HYPERCLASSIC**®-Mixer/Aerators are delivered to the site in individual component packs[3]. This results in the following individual packages:

1. The drive unit, which is usually shipped on a wooden pallet, protected by stretch film.
2. The shaft is supplied in a wooden container, either on its own or as one of several shafts.
3. The hyperboloid mixer body and the ring sparger are delivered on a wooden pallet.
4. In addition, the delivery includes a box of small components, plus any necessary accessories and special tools. Depending on the size of the project, this will either be included in one of the packages described above, or on an additional pallet.

3.2.1 Unloading the Mixer/Aerator

WARNING

During unloading there is the danger of injuries due to falling and slipping parts. Please wear you protective clothing and safety equipment and stay outside the area of risk. Please exercise care with regard to the center of gravity of the loads (do not lift heavy parts by muscle power - pay attention to the maximum lifting capacity).

3.3 Storing the Mixer/Aerator

If a lengthy period of storage is required on site between delivery and installation, or if the Mixer/Aerator is removed from the basin in connection with a long-term decommissioning, it must be stored in separate parts, Mixer/Aerator body, shaft and drive unit.

It is best to store the Mixer/Aerator in the original, undamaged packaging, and in a dry, enclosed area. Protect drive units, Mixer/Aerator shafts and Mixer/Aerator bodies from effects of the weather, such as rain, snow and direct sunlight. When choosing a place of storage, make sure that it is protected from building-site traffic and other outside influences.

WARNING

Stacking of packages can lead to tilting and tumbling and involves crushing hazards.

[3] In individual cases the type of packaging selected may deviate from the packaging described here

NOTE
Store the packages on planar, load-bearing subsoil. Stacking of packages is not permissible.

3.3.1 Special storage instructions for Mixer/Aerator drive units

Drive units should be stored only under cover in dry areas that are not subject to extreme fluctuations in temperature; they should be assembled and on a wooden base. The place of storage must be free of shaking and vibrations. Ensure that the coating is not damaged.

NOTE
Stacking of drive units is not permissible!

Free shaft ends and shaft flanges require corrosion protection; gear units require interior protection. New drive units are supplied with standard protection. If storage lasts longer than 6 months, special protection must be used.

NOTE
For safety and protection during periods of storage >6 months, special preservation for drive units is required. Please consult our INVENT customer service.

3.3.2 Special storage instructions for Mixer/Aerator shafts

Mixer/Aerator shafts should be stored clean, dry and protected from the weather. The following points should be taken into account during storage:

- The upper shaft end must be greased and protected from damage by a plastic net or similar.
- The lower flange should likewise be wrapped to prevent damage.
- If components are not stored in the original packaging, they should preferably be stored on a smooth, flat surface that is free of stones.
- Use squared timbers as supports, with a span not exceeding 1.5m.
- Shafts may be stacked.
- If Mixer/Aerator shafts are stacked during storage, they must be stacked alternately and the support span must not exceed 1.5m. In addition, the stack must be laterally secured (Figure 3.1). The maximum allowable height is 3 layers.

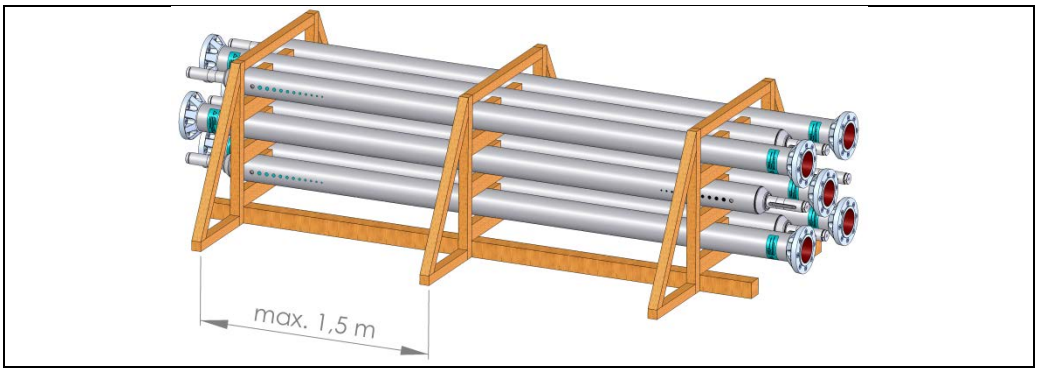


Figure 3.1: Storing Mixer/Aerator shafts in stacks

3.4 Unpacking the product

The following sections contain information about unpacking the individual components.

CAUTION

When cutting strain-loaded securing straps parts may be ejected. Furthermore packages can show sharp edges, rough surfaces, spiky nails and splinters. Please wear you protective clothing and safety equipment during unpacking.

3.4.1 Unpacking the drive unit

As stated above, drive units are usually delivered on a wooden pallet, protected by stretch film. Figure 3.2 and Figure 3.3 show an example:

Figure 3.2: Drive unit on wooden pallet – without stretch film

Figure 3.3: Drive unit on wooden pallet – with stretch film

Tips for unpacking

1. Position the pallet on a dry, flat surface – for convenience, where pre-assembly of the drive unit and the shaft will be carried out.
2. With a knife, carefully cut and remove the stretch film. Be careful not to damage the coating on the drive units.

WARNING

When removing the stretch film, take care that the drive unit does not tip over as a result of pulling too hard, or some similar action, and fall off the pallet. This may cause injuries

3. Any additional securing straps can now be cut with wire-cutters, and removed.
4. The motors are now standing free on the pallet.

3.4.2 Unpacking the shafts

The drive shafts are normally delivered packed in a wooden crate. Figure 3.4 shows the shafts in its stretch film.

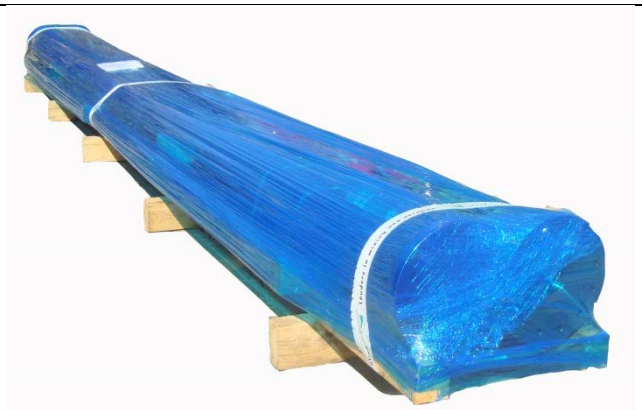


Figure 3.4: Shafts in wooden container – with stretch film

Tips for unpacking

1. Position the wooden crate on a dry, flat surface – for convenience, where pre-assembly of the shaft will be carried out.
2. With a knife, carefully cut and remove the stretch film.
3. Any additional securing straps can now be cut and removed.

WARNING

Please be careful not to allow the shaft to fall during unpacking. In particular, the upper end of the shaft is heavy and could cause injury if it falls down. Furthermore, the shaft itself could of course be damaged.

4. The shafts are now standing free on the wooden crate.

3.4.3 Unpacking the hyperboloid Mixer/Aerator body

The hyperboloid mixer bodies and ring spargers are delivered on a pallet. Depending on the number of Mixer/Aerators in the delivery, the pallet will contain either a single mixer body or a package of two (2) mixer bodies (see Figure 3.5 and Figure 3.6). To protect the mixer body, foam material covers are stuck to the edges and the head.

Figure 3.5: Hyperboloid Mixer body on a pallet for container shipment

Figure 3.6: Hyperboloid Mixer body on a rack for truck transport

Tips for unpacking

1. First cut the clamping straps and remove them.
2. Then remove the foam cover from the head. This gives access to two laminated threaded sleeves. Next remove two covering plugs from opposite sides of the head and screw in two suitable eye bolts.

NOTE
Please do not tread on the Mixer/Aerator body with your full body weight without protecting the Mixer/Aerator body (using a tarpaulin, rubber mat or similar)! This may damage the Mixer/Aerator body.

3. The remaining protectors should be left on the Mixer/Aerator until it is assembled or commissioned.
4. The Mixer body can now be lifted by the eye bolts, using suitable lifting gear, and taken to the installation site (basin, tank etc.).

WARNUNG

Please keep outside the danger area when lifting and slewing the mixer body. Make sure that the load is guided to avoid uncontrolled weaving.

3.4.4 Unpacking the small components

The small components and accessory parts that are required during assembly are delivered in a separate box. Please open this box carefully, and check that no parts are missing. If assembly is not carried out immediately, it is recommended that you keep the small components in a safe place until assembly commences, so that they do not get lost

3.5 Checking the parts

When the parts have been unpacked, they should immediately be checked to make sure that they are complete and undamaged; if any parts have been damaged or lost in transit, this should be reported straight away

NOTE
If this check is not carried out immediately after delivery, no damages can be claimed later.

The following components must be checked:

1. Drive unit, comprising the drive motor and the mounting plate
2. Shaft
3. Mixer/Aerator body
4. Bottom guide unit
5. Ring sparger
6. Small components

NOTE
On receipt of the delivery, please check it for possible damages in the presence of a representative of the carrier. If any damage is found, please make a note on the shipping documents and let them be countersigned by the driver. Report damages immediately to INVENT.

3.5.1 Checking the drive unit

The drive unit consists of the drive motor and the mounting plate (see Figure 3.7). Please check that the drive unit is:

1. **Complete**: check the number of drive motors and mounting plates that have been delivered. There must be a mounting plate for each motor.
2. **Correct**: compare the technical data of the drive units with the data on your order and **INVENTs** confirmation.
3. **Undamaged**: please carry out a visual check of the parts that have been delivered and report any obvious damage.

NOTE
We deliver small quantities of original paint with the drive unit, so that minor damage in transit can be repaired. If the Mixer/Aerator body or the shaft has been damaged, please consult our customer service.

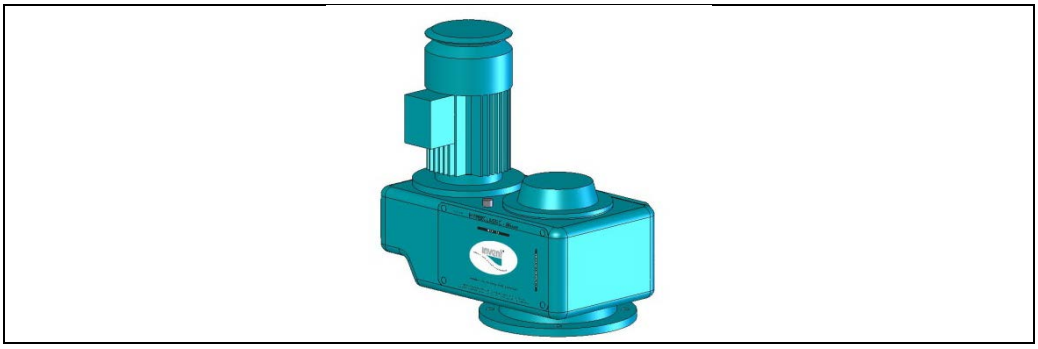


Figure 3.7: Drive motor

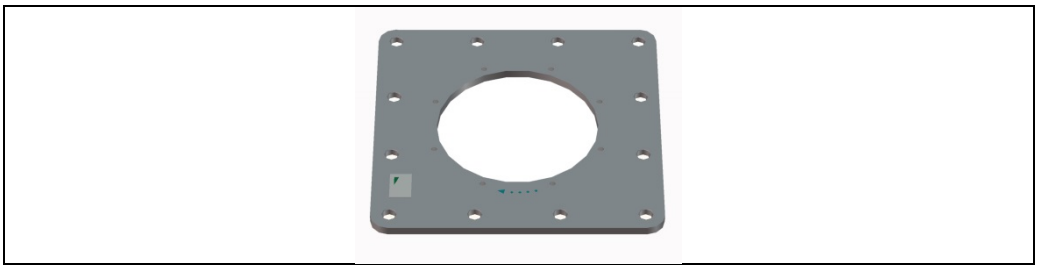


Figure 3.8: Mounting plate

3.5.2 Checking the shaft

The shaft consists of a single part (see Figure 3.9). Please check that the shaft is:

1. **Complete**: check the number of shafts that have been delivered. There must be a shaft for each Mixer/Aerator.
2. **Correct**: compare the serial numbers on the identification plates with **INVENT**'s confirmation.
3. **Undamaged**: please carry out a visual check of the shafts and report any obvious damage. In particular, please check the surface and the upper end of the shaft for scratches, dents or other damage.

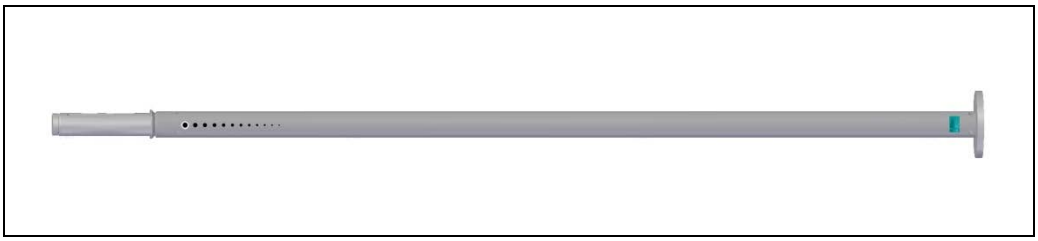


Figure 3.9:
Shaft

3.5.3 Checking the Mixer/Aerator body

The Mixer/Aerator body consists of a single part (see Figure 3.10).Please check that the Mixer/Aerator body is:

1. **Complete**: check the number of Mixer/Aerator bodies that have been delivered. There must be a Mixer/Aerator body for each Mixer/Aerator.
2. **Correct**: compare the serial numbers on the identification plates with **INVENT**'s confirmation.
3. **Undamaged**: please carry out a visual check of the Mixer/Aerator bodies and report any obvious damage. In particular, please check the surface for scratches, dents or other damage.

NOTE
Even minor damage to the surface of the Mixer/Aerator body must be professionally repaired before commissioning. An appropriate "Repair kit – Mixer/Aerator body" can be obtained from INVENT for this purpose.

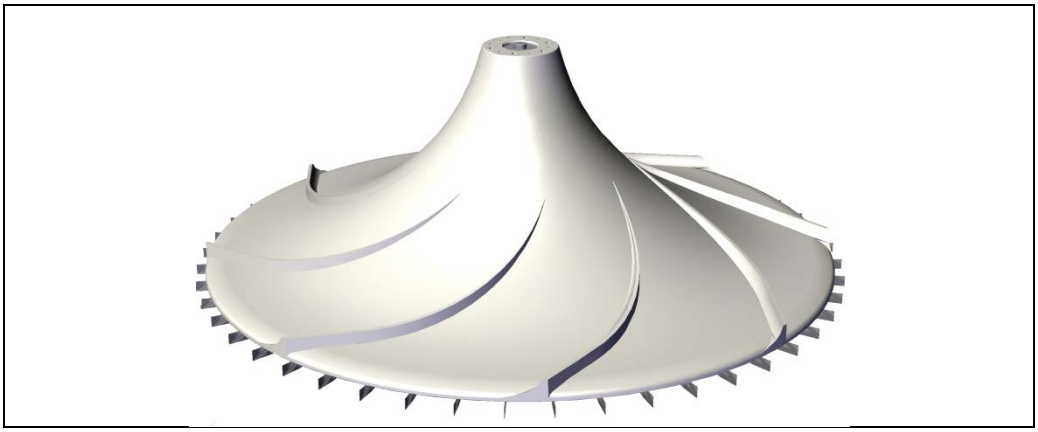


Figure 3.10:
Mixer Body

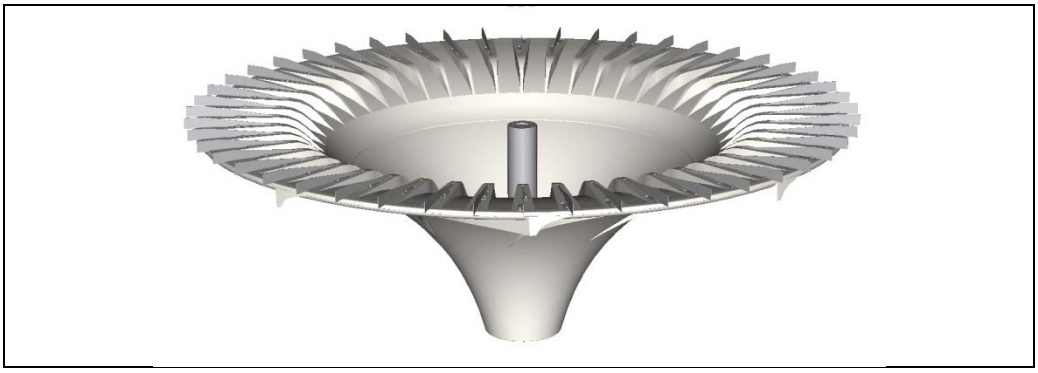


Figure 3.11:
Mixer Body bottom side with bearing shaft

NOTE
In condition as delivered, for safety reasons the stainless steel shear fins are not attached to the bottom side of the mixer body. The shear fins are separately packed together with the small components

3.5.4 Checking the bottom guide unit

The bottom guide consists of 3 Parts - guide bushing, bearing journal and base unit (foot). See also Figure 3.12. Please check that the bottom guide is:

1. **Complete**: check the number of guide units that have been delivered. There must be one for each Mixer/Aerator.
2. **Undamaged**: please carry out a visual check and report any obvious damage.

Figure 3.12: Bottom guide

3.5.5 Checking the ring sparger

The ring sparger consists of a single part and can be identified via serial number[4]. Please check that the ring sparger is:

1. **Complete**: check the number of ring spargers that have been delivered. There must be a ring sparger for each Mixer/Aerator.
2. **Correct**: compare the serial numbers on the identification plates with **INVENT**'s confirmation.
3. **Undamaged**: please carry out a visual check and report any obvious damage.

Figure 3.13: Ring sparger

[4] Special designs are possible - depending on the application

3.5.6 Checking the small components

The following small components are delivered for each Mixer/Aerator:

1. 1 x set of fasteners for the drive motor/mounting plate, consisting of:
   - 8 bolts)
   - 16 washers)
   - 8 nuts)

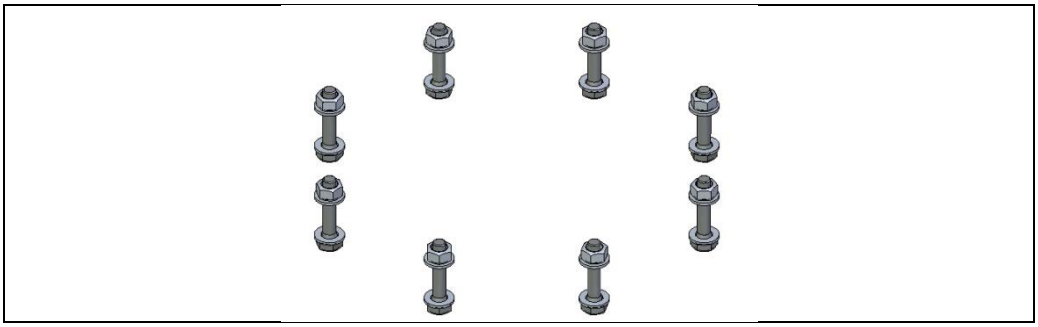


Figure 3.14: Fastening set for drive motor/mounting plate

2. 8 x set of fasteners for mounting plate/bridge for use with steel bridge (concrete bridge), consisting of:
   - 1 bolt (for concrete bridges, chemical anchors are supplied)
   - 2 washers (for concrete bridges, 4 special washers with a sealing function are supplied)
   - 1 key washer for steel bridges, made of continuous casting sections
   - 4 nuts
   - 1 washer for drive suspension (below)
   - 1 drive suspensions
   - 1 washer for drive suspension (above)

NOTE
Depending on the model of Mixer/Aerator and the output of the drive unit, 12 drive fixing sets may be used instead of 8. The number of individual parts will then increase accordingly.

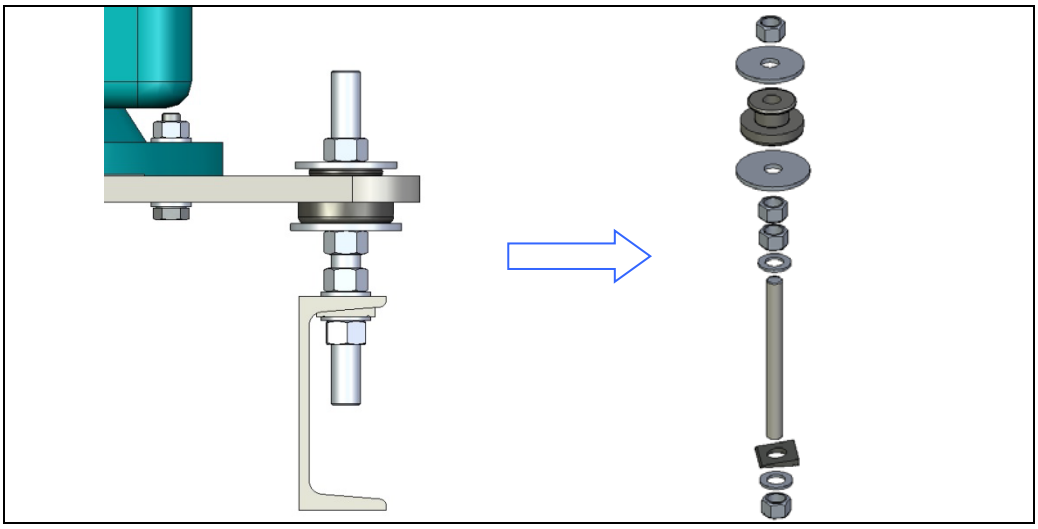


Figure 3.15: Fastening set for mounting plate/bridge, for use on steel bridge

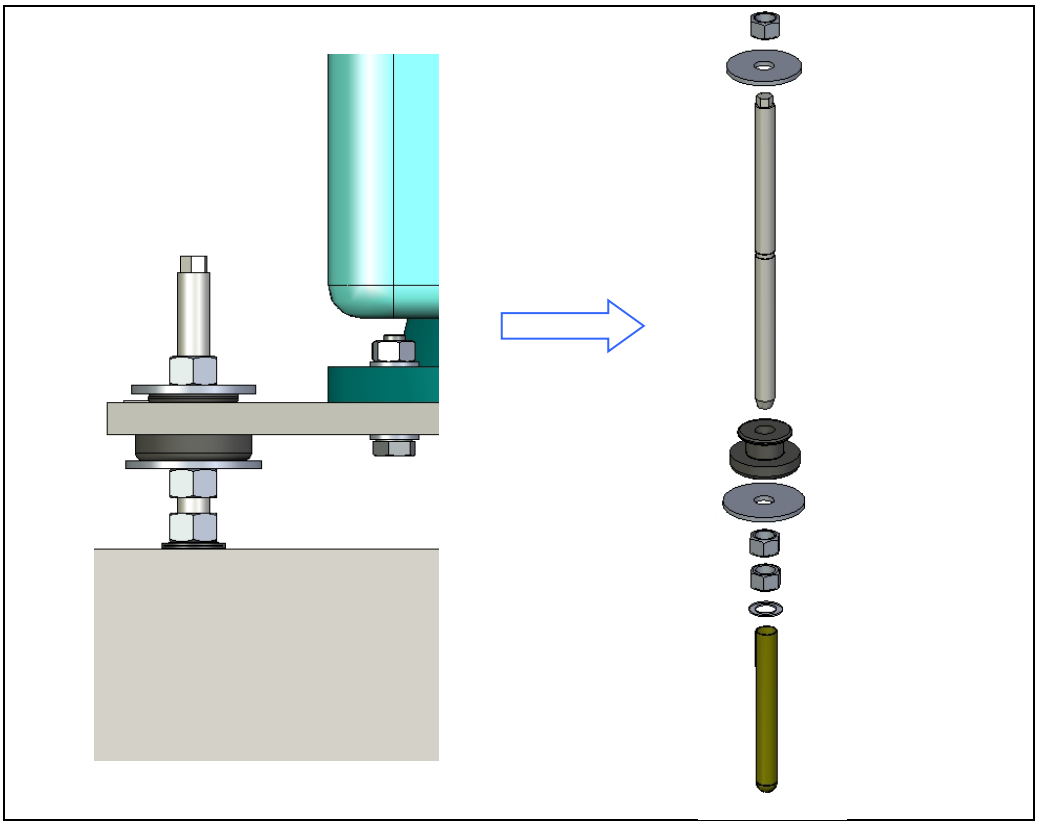


Figure 3.16:
Fastening set for (stainless steel) mounting plate/bridge, for use on stainless steel bridge

3. 1 x fastening set for drive motor/shaft, consisting of:
   - 1 shaft nut
   - 1 lock washer for shaft nut

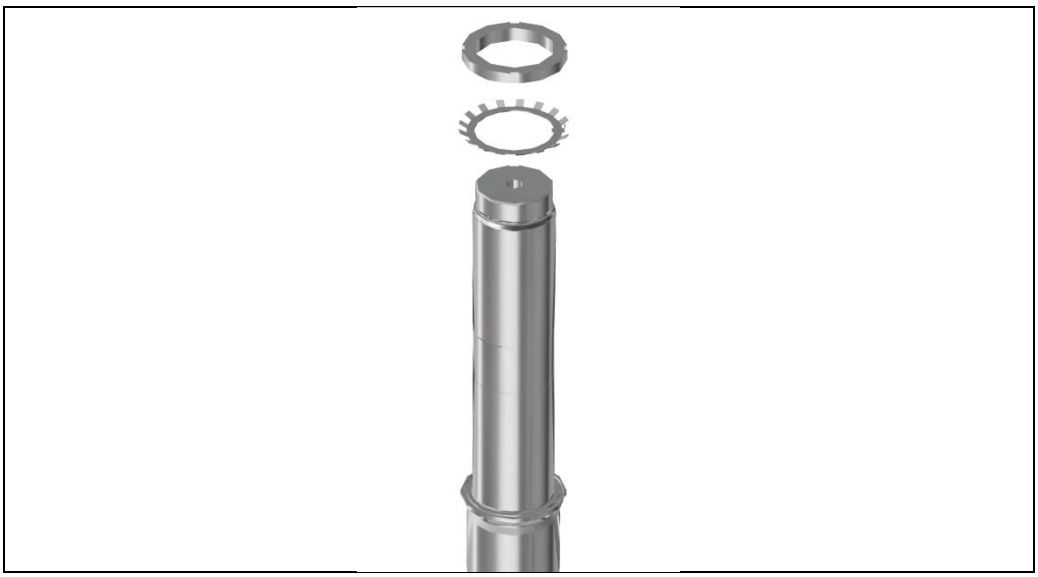


Figure 3.17:
Fastening set, drive motor/shaft

4. 1 x fastening set for shaft/Mixer/Aerator body, consisting of:

   - 12 Safety Lock®[5] bolts
   - 12 Safety Lock® lock washers

Figure 3.18: Fastening set, shaft/Mixer/Aerator body

5. 48 x Sets of shear fins, consisting of:

   - 1 x shear fin
   - 2 x bolt
   - 2 x washer

Figure 3.19: Shear fin set

6. 1 x Fastening set for the bottom guide, consisting of:

   - 6 x bolt (for shaft journal), cf. Figure 3.20
   - 4 x bolt/ nut/ washer (for guide bushing), cf. Figure 3.21
   - 4 x Anchor rod/ resin cartridge / 2x washer / 4x nut (for foot construction)

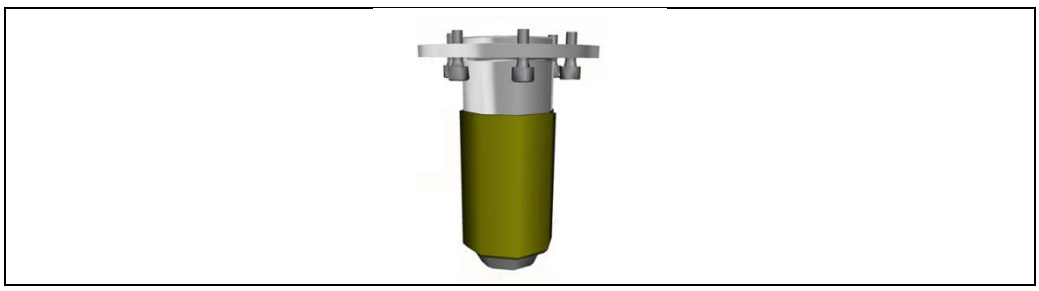


Figure 3.20: Fastening set for bearing journal

[5] **Safety Lock Technology** is a registered trademark of **INVENT** Umwelt- und Verfahrenstechnik AG

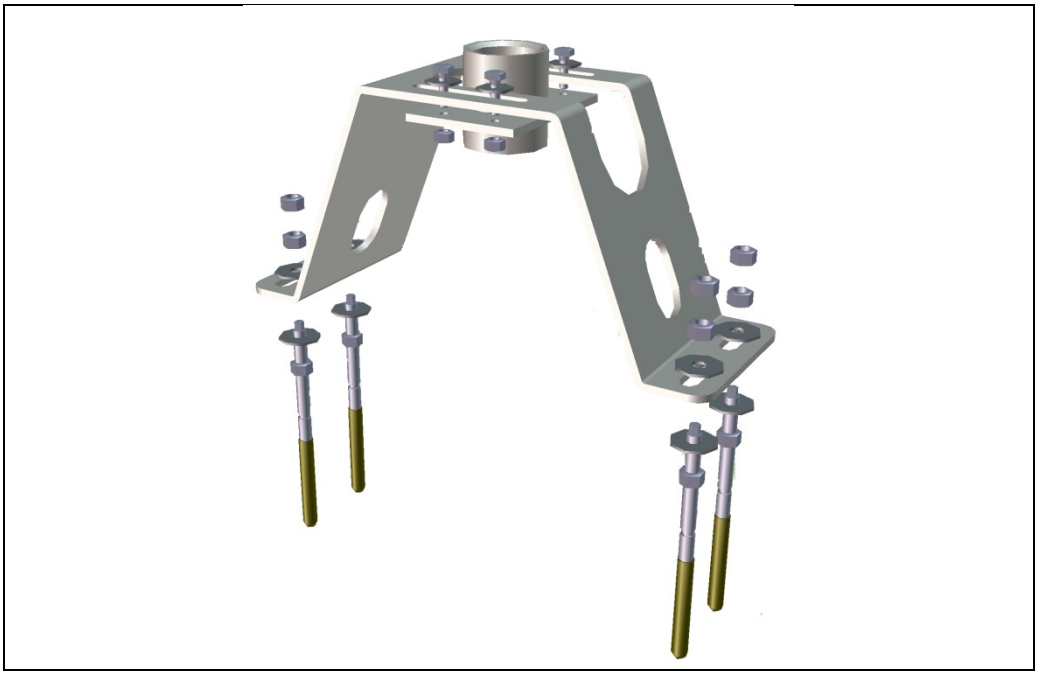


Figure 3.21:
Fastening set for guide bushing and foot

7. Fastening set for the ring sparger, consisting of[6] (cf. Figure 3.22):

- 2 x Anchor rod
- 2 x resin cartridge — **Retaining plate**
- 4 x washer
- 4 x nut

- 2 x bolt
- 4 x washer — **Pipe clamp**
- 2 x nut

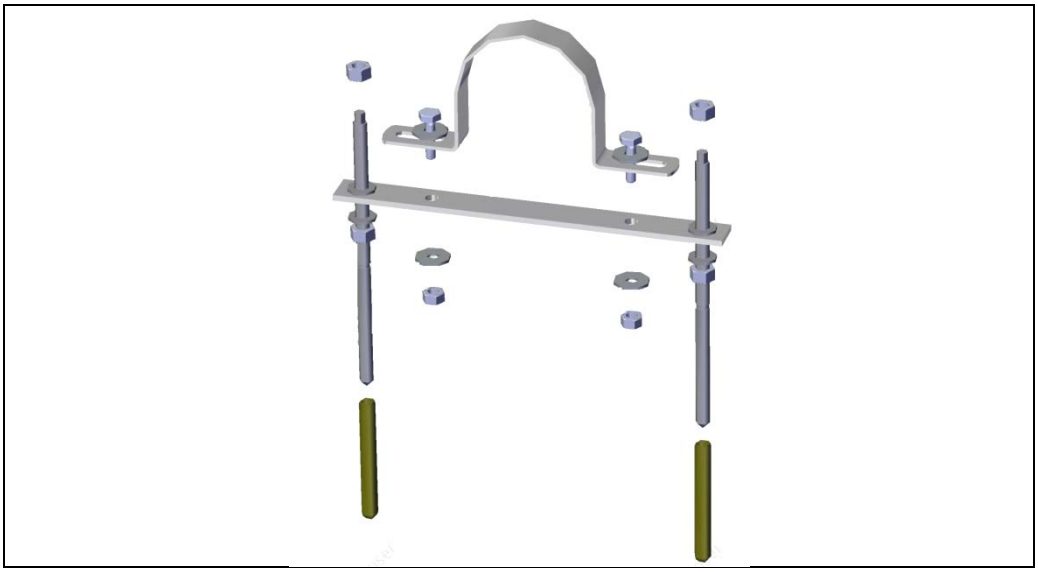


Figure 3.22:
Fastening set for the ring sparger

[6] The number of fastening sets and nominal diameter is depending on the HCMA model. Please refer to the installation drawing

Please use the enclosed Mixer/Aerator drawing for proper identification of parts. The drawings part list is subdivided into the main components and fixing sets.

With exception of the main components Mixer body, shaft, ring sparger and drive, each single package shows a stick-on label, an example is shown in Figure 3.23.

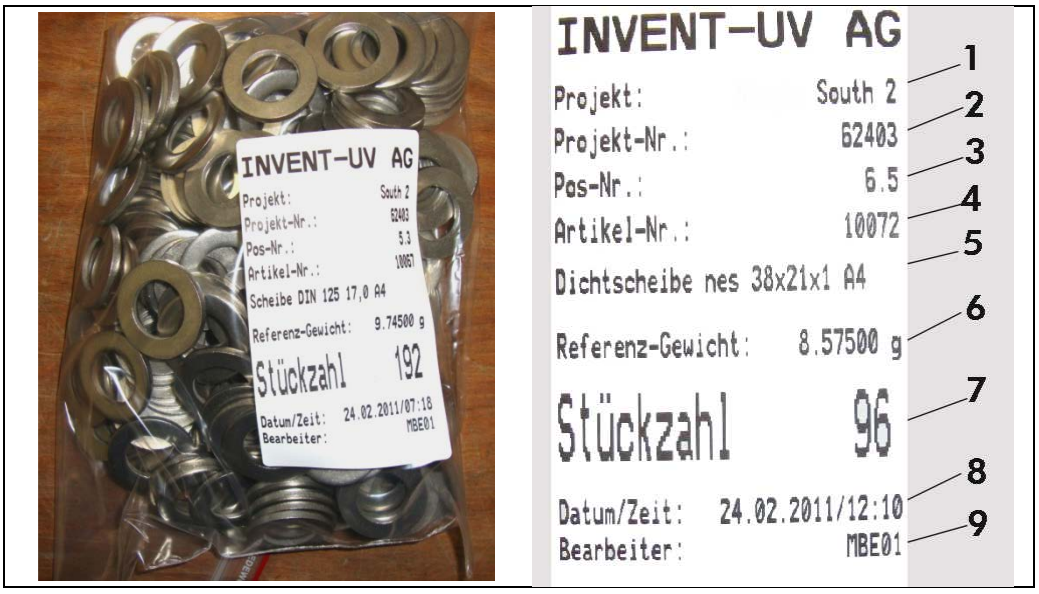


Figure 3.23: Packing label for small parts

The item numbers in Figure 3.23 include the following information:

- Position 1: Project name
- Position 2: Project number
- Position 3: Item number in the Mixer/Aerator drawing
- Position 4: Internal item code
- Position 5: Description of the part
- Position 6: Reference weight
- Position 7: Packed quantity
- Position 8: Date and time
- Position 9: Responsible employee

Every delivery also contains the following:

1 x operating instructions

1 x assembly pack for winding the shaft into the hollow shaft gear unit (Figure 1.7)

3.6 Prepare installation site

For a safe and trouble free installation of **INVENT HYPERCLASSIC**®-Mixer/Aerators, it must be ensured that the installation site is prepared accordingly before the start of installation work. In most cases **INVENT HYPERCLASSIC**®-Mixer/Aerators will be installed into an open or covered concrete basin or into an open or closed steel vessel. Depending on the location and size of the construction site, different preparations must be made. However, some generally valid information about the preparation of the installation site shall still be given below.

- The access paths should be sufficiently load-bearing for access by trucks or similar transport vehicles that may possibly be required.
- If lifting gear such as e.g. mobile cranes is required for installation, then the availability of suitable installation sites with sufficient load bearing capability must be assured.
- For larger deliveries a sufficiently large and, if necessary, secured storage area must be provided.
- If it is necessary or prescribed to set up a construction site, suitable and sufficiently large areas must also be provided.
- A sufficiently large, easily accessible, level and dry surface area is required for the preassembly of components. A sufficiently large workbench must be provided for the assembly of the module frames.
- The customer must provide a safe power supply and water supply at the installation site. If pneumatic tools are used, then a compressed air supply or a site compressor will be additionally required.
- The basins must have been emptied, dried and cleaned by the customer before the start of any installation work.
- In the case of covered tanks it must be ensured that there are no longer any gases or vapors hazardous to health in the tanks.
- The application of composite anchors requires a minimum surrounding temperature. If temperature falls bellow this minimum limit, a suitable heat source has to be provided. Please also refer to the enclosed installation instructions of the supplied anchor system.

NOTE
All bridgework or cantilevers, where INVENT HYPERCLASSIC®-Mixer/Aerators are supposed to be installed, have to be examined for sufficient load capacity. As long as the required load capacity is not provided for, Installation must not be started.

3.7 Installing the product

NOTE
Please read the installation instructions before starting the installation.

3.7.1 General procedure

The following sections describe the installation procedure for **HYPERCLASSIC**® Mixer/Aerators. The individual components to be installed are the drive, consisting of geared motor, gear plate and rubber dampers, the shaft and the mixer body, bottom guide unit and ring sparger.

The assembly steps are as follows:

1. Checking the installation conditions
2. Check all components for completeness.
3. Mount the anchor for installing the mixer assembly on a steel or concrete bridge
4. Mount the gear plate to the motor
5. Install the drive shaft in the geared motor
6. Lift and place the drive with shaft into the bridge
7. Align the drive and the gear plate
8. Install the bottom guide
9. Install the ring sparger
10. Mount the mixer body to the lower shaft end
11. Align the bottom guide
12. Install the shear fins

If you should be unsure with regard to the execution of individual tasks, please contact our technical service.

3.7.2 Safety

NOTE
During installation, please comply with all safety notes in the text and the valid accident prevention regulations.

3.7.2.1 Protection facilities and protective equipment

It is mandatory to wear adequate protective clothing when working on the mixer to prevent injuries. In detail, such protective clothing consists of:

- Safety helmet
- Safety goggles
- Protective gloves
- Ear plugs or ear defenders (in the case of any additional noise pollution)
- Safety shoes
- Breathing apparatus in closed containers with poor ventilation, where applicable
- Tight-fitting clothing suitable for installation operations
- Long hair and/or beards should be pinned up or protected by hair nets

In the section below we refer to hazards and risks that may occur during the assembly and installation of the mixer. All sources of danger and residual risks are detailed in the Chapter "Safety" in these Operating Instructions.

WARNING

Viruses and bacteria present a health hazard in the case of basins and containers which have not been cleaned completely and which previously have been filled with waste water or activated sludge. During installation, personal protective equipment must be worn (Wellington boots, gloves, if necessary breathing protection in the case of closed tanks). We recommend you to observe the relevant vaccination recommendations for sewage plant personnel.

Operating drilling machines involves the following risks:

WARNING

Risk of electric shock:
Only use approved and tested drilling machines and power supply lines suited for operations in the open.

WARNING

Risk resulting from rotating drills:
Long hair, beards and even fabrics hanging down from items of clothing may in unfavorable cases be caught by the drill or chuck and lead to serious injuries. Therefore, appropriate protective clothing preventing such occurrences must be worn at all times during all drilling work.

CAUTION

There is a risk caused by drilling dust ejected when the boreholes are cleaned: Please provide and wear personal protective equipment (safety goggles).

CAUTION

When drilling into concrete or steel, the drill used can become very hot. There is a risk of burns.

3.7.3 Checking the installation conditions

Before the start of any installation work, please check whether the basin, the tank or the vessels meets the required and documented conditions. Any deviations or changes must be recorded, documented and communicated immediately to **INVENT**. Please check in particular:

- The actual basin dimensions
- the correct position of the bridge (mixer position)
- the stability of the bridge
- The position and location of the inflows and outflows
- The position and location of any existing installations
- the existence of other inserts or obstacles to the flow

CAUTION

In the case of unsafe access possibilities to the installation site, there is a risk of sliding, stumbling or falling. The access possibilities to the installation site as well as the installation site itself must be secured correctly. If necessary, secure yourself (e.g. belt or fall protection device)

NOTE

If railings have not yet been installed on the basins or catwalks, then the customer must provide suitable attachment points for attaching fall protection devices.

NOTE

If drilling must be carried out on the internal basin walls at a height of more than 2m or above one's head, then the client must provide a scaffolding meeting the standard safety regulations.

3.7.4 Installation of the anchors for mounting the mixer (concrete bridge)

You need the following components to install the floor anchors in a concrete bridge:

- Floor anchor with resin cartridge
- Washers with plastic coating
- Nuts

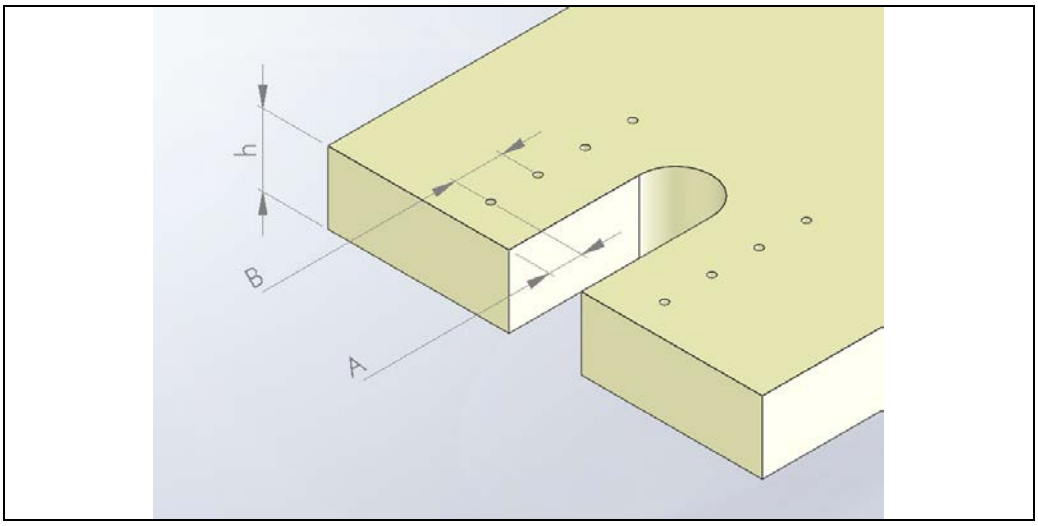
The following tools and aids are required for installing the floor anchors into a concrete bridge:

- Drill (we recommend the use of core removing hole drills)
- Blowout device and brush for cleaning the boreholes
- Wrench and ring wrench for tightening the nuts
- Torque wrench
- Screw locking paste
- Water connection for cooling and lubricating the drill bits (only if the core removing hole drills are used)

NOTE

For detailed instructions and specific installation parameters for the anchor system (composite anchor or injection mortar) please refer to the annex of these Operating Instructions. The following quick guide applies to the use of composite anchors.

The installation is carried out in the following steps:

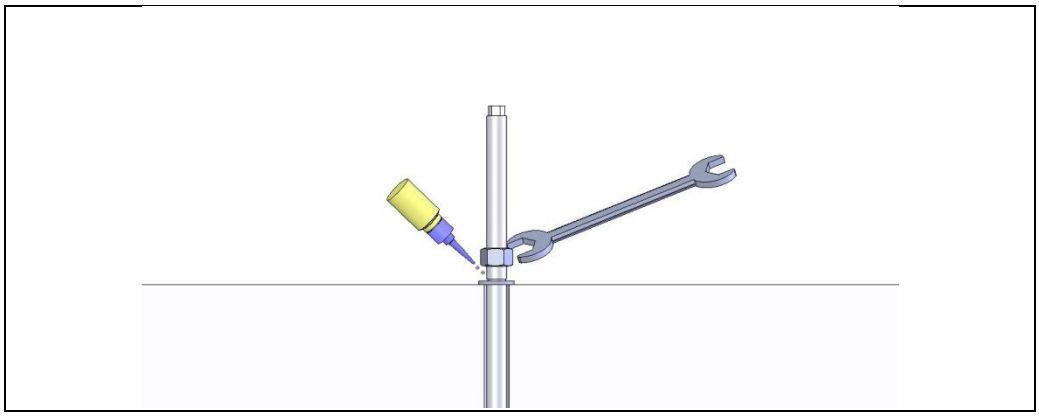


1. Please mark the position of the boreholes first. To this end, use the borehole pattern indicated in the detailed drawing. Care must be exercised to strictly comply with the necessary minimum edge distances for the anchor rods (cf. instructions on anchor systems in the annex).
2. Now drill the holes consecutively such that they have the corresponding diameter and the necessary borehole depth.
3. Thoroughly clean the boreholes with a wire brush and a blowout device.
4. Now press the composite anchor cartridge into the hole.

CAUTION

Never strike the composite anchor cartridge with the palm of your hand. The cartridge could fracture and cause serious cutting injuries. Contact with the substances in the composite anchor cartridge may cause chemical and thermal burns.

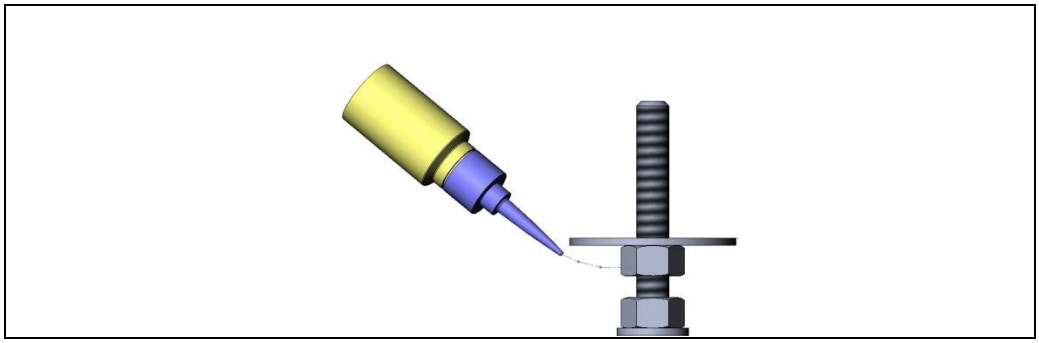
5. Then, drive in the anchor rod by hammer rotation using the enclosed adapter and a slow-running drill. Please drive in the anchor only up to the drive-in marking.
6. Now the chemical reaction occurs. During its hardening time the composite anchor must neither be moved nor subjected to any load. For curing times please refer to the detailed instructions in the annex.
7. After the curing time has expired, place the supplied washers with plastic coating on the anchors with the coated side facing downwards. The sealing washer protects the immediate surrounding of the composite anchor against water and, first of all, prevents the ingress of water through micro-cracks in the concrete, if any.



8. After the sealing washer has been placed, apply some few drops of the supplied screw locking paste to the anchor shortly above the sealing washer, screw on a nut and tighten it.

The maximum tightening torque is 40 Nm.

NOTE
The reference values for the tightening torques for screw connections at the mixer exclusively apply to stainless steel screws if a medium-strength screw locking paste is used. Therefore, care must be exercised to ensure that all screw connections are screwed with screw locking paste. Finally, this also prevents seizing of stainless screws.



9. Now apply a few more drops of the screw locking paste to the anchor rod and screw on another nut on the anchor rod. Then place the special washer for rubber buffers (bottom) on the nut. The clearance between the upper edge of the washer and the end of the anchor rod shall be read from the installation drawing.

10. Follow the same steps for all composite anchor rods.

11. Finally, adjust the position of the washers by means of a spirit level to ensure that they are absolutely identical in height. This step will make it easier later to align the drive unit.

Now, all preparatory operations for mounting the mixing and aeration system are completed.

3.7.5 Installation of the screws for mounting the mixer (steel bridge)

You need the following components to install the screws in a steel bridge:

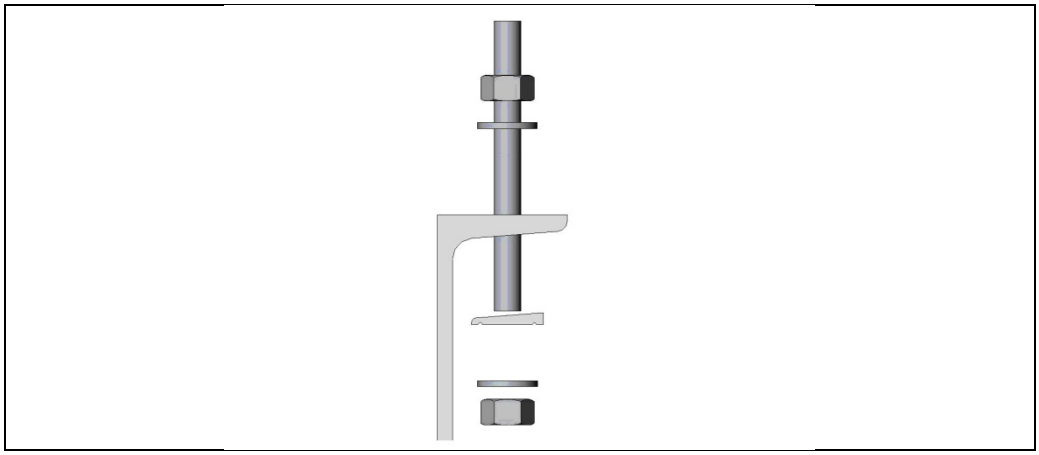
- Bolts
- Washers
- Wedges (for steel bridges of continuously cast profiles)
- Nuts

You need the following tools and auxiliaries to install the screws in a steel bridge:

- Wrench and ring wrench for tightening the nuts
- Torque wrench
- Screw locking paste

The installation is carried out in the following steps:

▼



1. Insert the appropriate screws in the steel bridge using the prepared holes and fasten them by means of a nut. Please make sure that you also use the provided washers or wedges as well as the locking paste. Tighten the nuts.

   The tightening torque is 200 to 250 Nm

2. To the extent possible, also secure the screw and the nut by providing two additional spot welds each.

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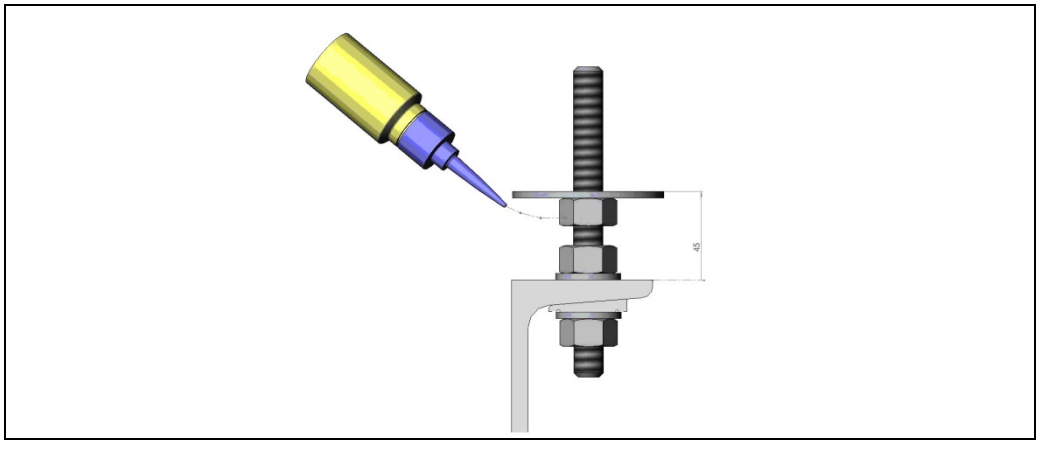


3. Apply a few drops of the locking paste to the screw, screw another nut on the screw and place the special washer for rubber buffers (bottom) on the nut. The clearance between the washer and the upper end of the screw should be about **45 mm**.
4. Follow the same steps for all screws.
5. Finally, adjust the position of the washers by means of a spirit level to ensure that they are absolutely identical in height. This step will make it easier later to align the drive unit.

Now, all preparatory tasks for mounting the mixing and aeration system are completed.

3.7.6 Mounting the gear plate to the drive motor

You need the following components to mount the gear plate to the drive unit:

- Drive motor
- Gear plate
- Drive motor / gear plate connecting set
- Rubber buffer

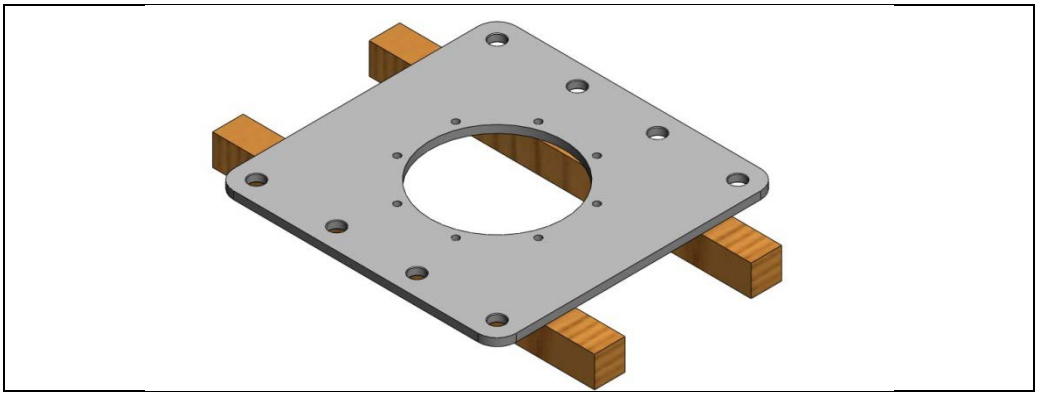
You need the following tools and accessories to mount the gear plate to the drive unit:

- Support for drive motor
- Suitable hoist for drive motor and gear plate
- Wrench and ring wrench for tightening the bolts and nuts
- Torque wrench
- Screw locking paste for securing the nuts
- Soap sud and brush to wet the rubber buffers before they are pressed in place

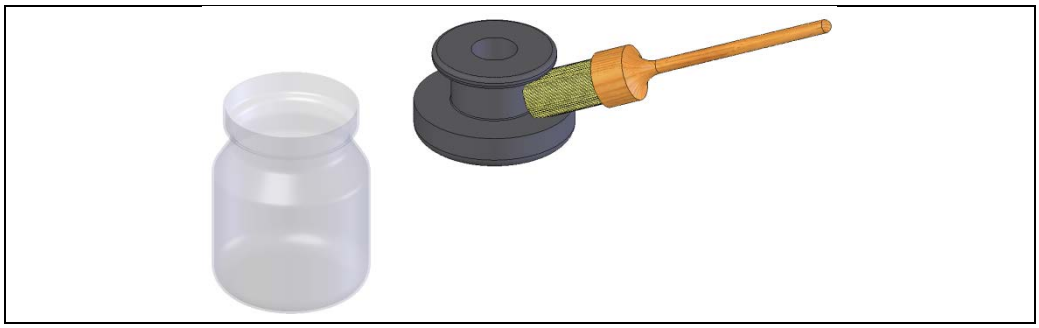
WARNING

Please use suitable hoisting / slinging equipment and exercise care with regard to the center of gravity of the loads (do not lift heavy parts by muscle power - pay attention to the maximum lifting capacity!)

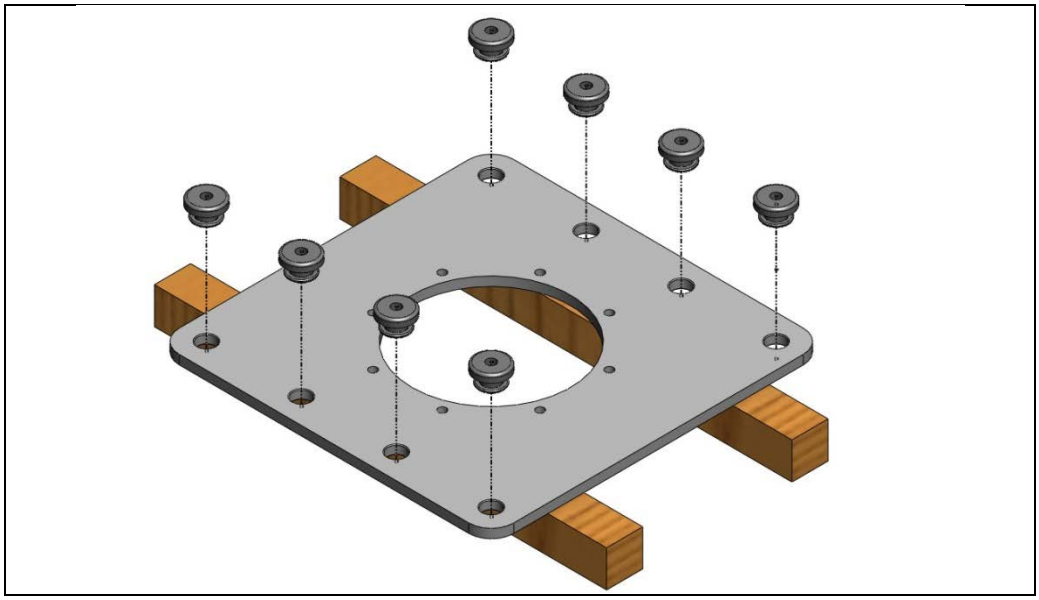
The installation is carried out in the following steps:



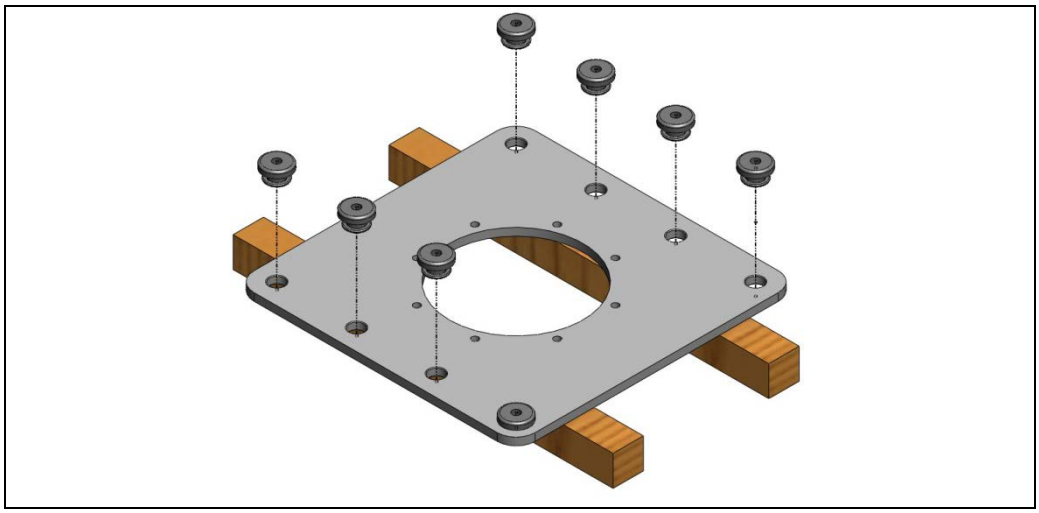
1. Now place the gear plate on a wooden pallet or two squared lumbers with the upper side of the plate facing downwards



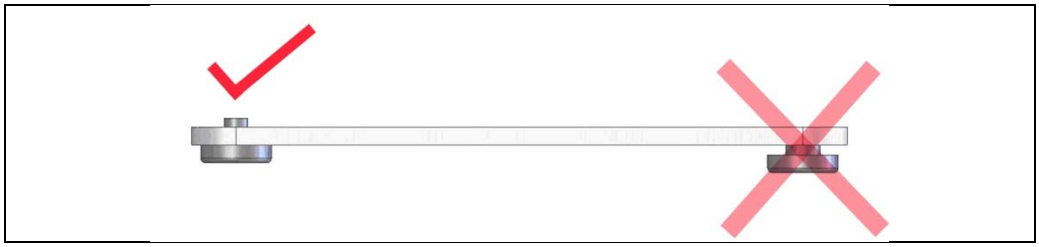
2. Take one of the rubber buffers and wet it with the soap sod. Use a brush to this end.



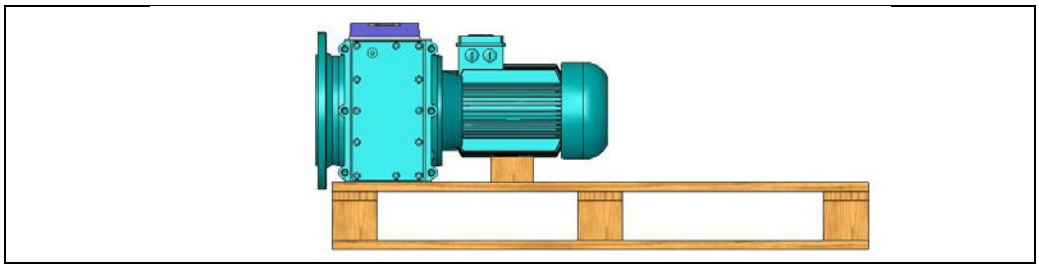
3. Press the rubber buffer manually into the hole provided to this end in the gear plate.



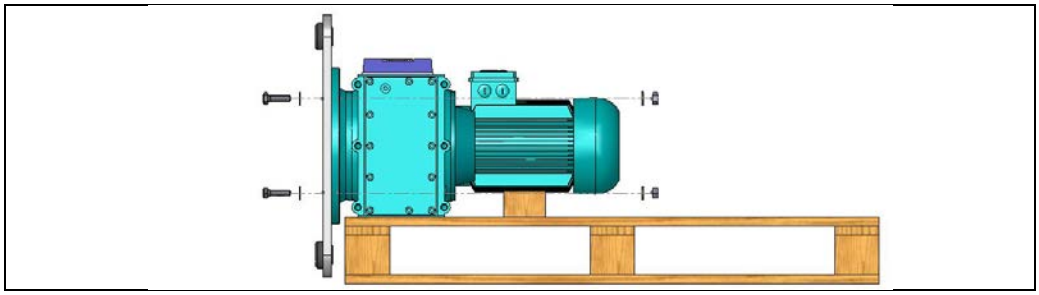
4. Repeat this procedure for the remaining rubber buffers until all rubber buffers are pressed into the gear plate.



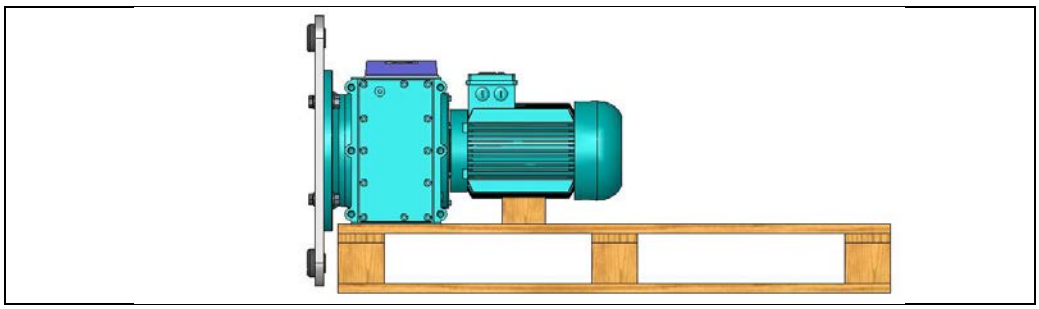
5. Please check all rubber buffers for their correct fit before you continue with the installation. Position 1 of the rubber buffer (left) is correct; position 2 of the rubber buffer (right) is not correct.



6. Now, place the parallel shaft gear motor on a pallet or lumbers such that the gear flange is on one side and freely accessible. The hollow shaft should be in a horizontal position.



7. Take the gear plate and place it on the guide groove of the gear flange. Care must be exercised to ensure the correct aligning of the gear plate and the drive. This alignment depends on the later installation situation. Care should be exercised to ensure that the machine plates and rotation arrows are legible and the oil drain screws of the gear as well as the terminal box of the motor are easily accessible.



8. Fasten the gear plate with the help of the hexagon screws, washers and hexagon nuts supplied with the connecting set.

The tightening torque is 200 to 250 Nm

3.7.7 Installing the drive shaft in the geared motor

You need the following components to install the shaft in the drive motor:

- Drive motor with mounted gear plate
- Shaft
- Drive motor / shaft connecting set

You need the following tools and accessories to mount the shaft to the drive unit:

- Support for drive motor
- Support for shaft (e.g. roll stand, squared lumbers)
- Suitable hoist for drive motor
- Pull-in tool to pull in the shaft
- Lubricant
- Medium-sized mallet
- Hook wrench

The installation is carried out in the following steps:

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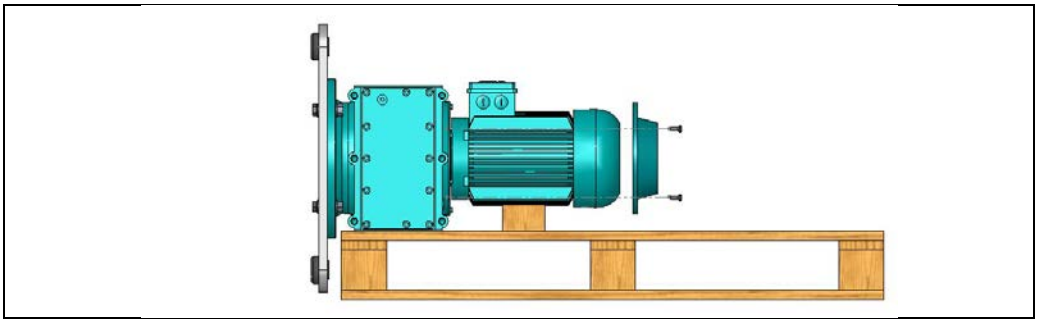


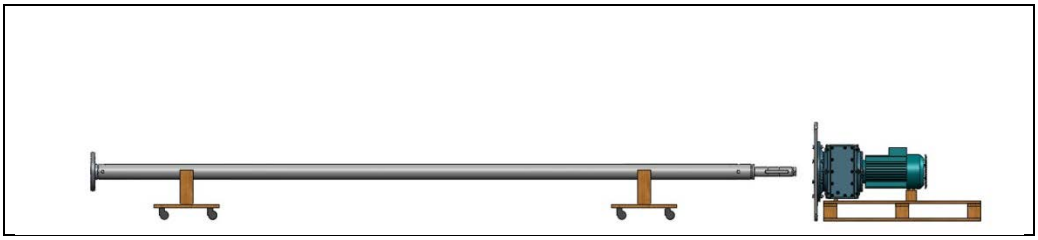
1. First the hollow shaft cover cap is removed by loosening the hexagon screws.
2. Then, the drive motor lying on a pallet is horizontally aligned again.

WARNING

Risk due to stability loss:

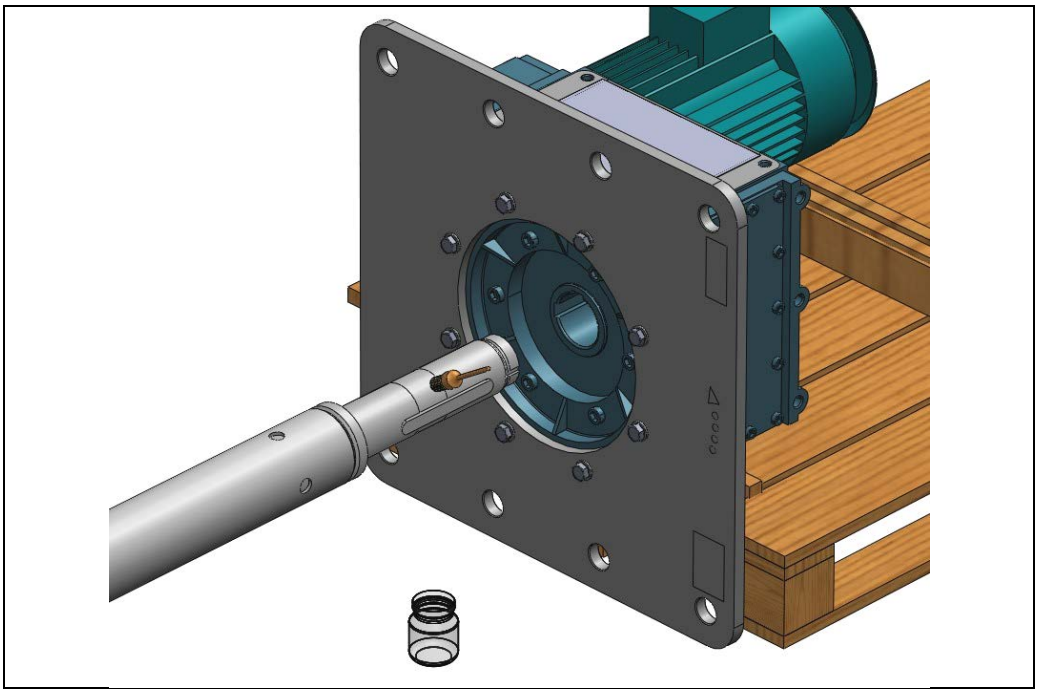
Use a suitable support for the shaft (roll stands or squared lumbers) and secure it against rolling to the side.

▼

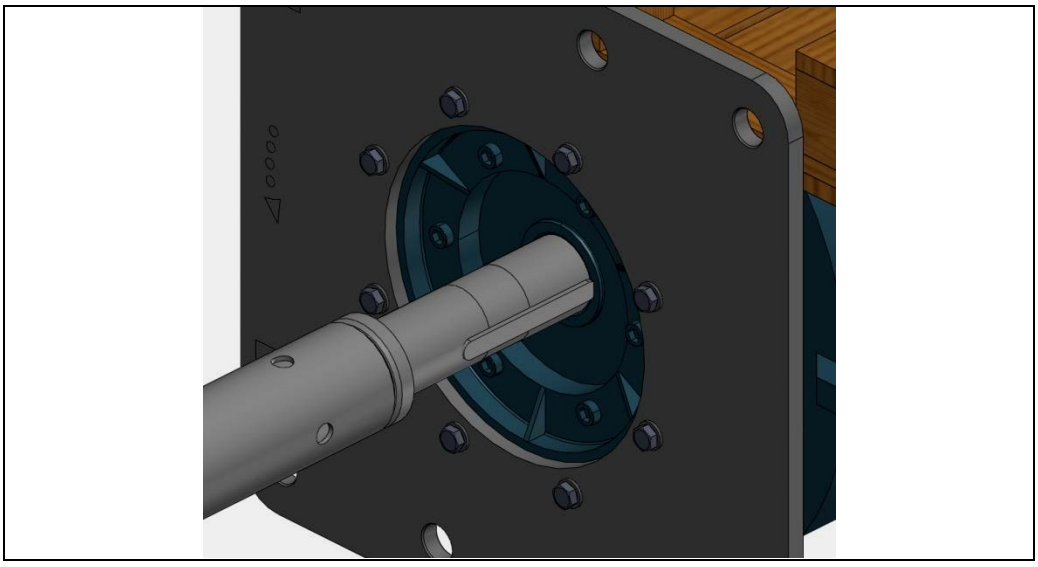


3. The shaft is placed expediently on two roll stands, brought to the same height as the gear and horizontally aligned. Alternatively, also squared lumbers may be used to support the shaft.

4. In the next step the protective net protecting the upper shaft end from being damaged is removed.
5. Then carefully clean the shaft end and the hollow shaft. The shaft end and the hollow shaft must be free from any particles and residual dirt.



6. Then, the supplied lubricant is generously applied to the shaft end either by means of a brush or manually. The hollow shaft should be lightly greased from the bottom. The grease serves as a lubricant during the pull-in process and reduces the seizing in place during the run time of the mixing and aeration system.



7. Please align the shaft again exactly to the hollow shaft and also check the correct alignment of the feather key to the groove.
8. Now pull the shaft into the direction of the hollow shaft and insert it into the hollow shaft. Use the supplied pull-in tool which makes this work easier (cf. Figure 3.24). This

tool (item 1) is supplied together with a thrust ball bearing (item 2), a washer (item 3) with a hexagon nut (item 4) and a threaded rod (item 5).

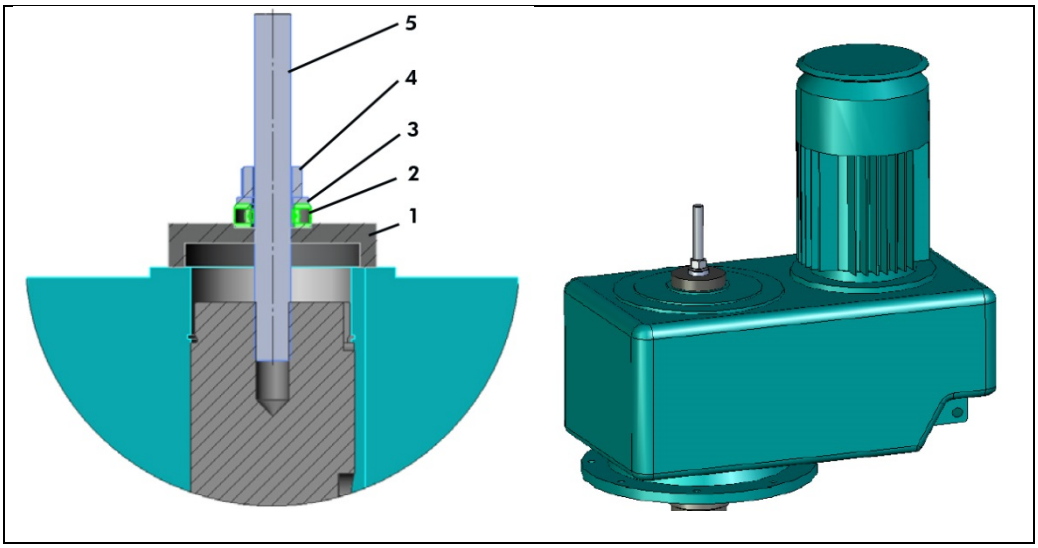


Figure 3.24:
Pull-in tool

NOTE
It is important to prevent the shaft from canting and/or chipping and seizing in place. Therefore, please be very careful when pulling in the shaft.

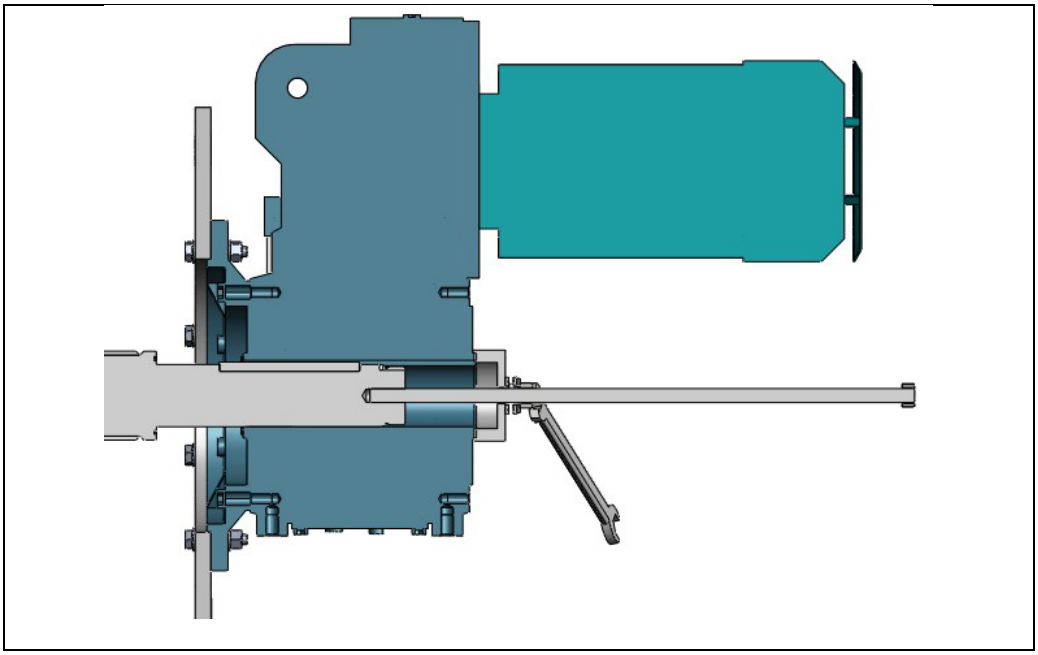
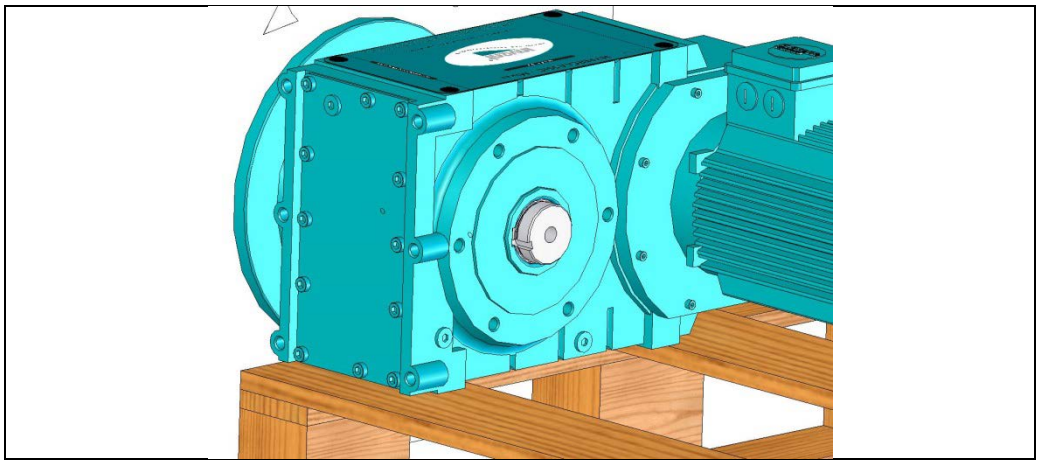
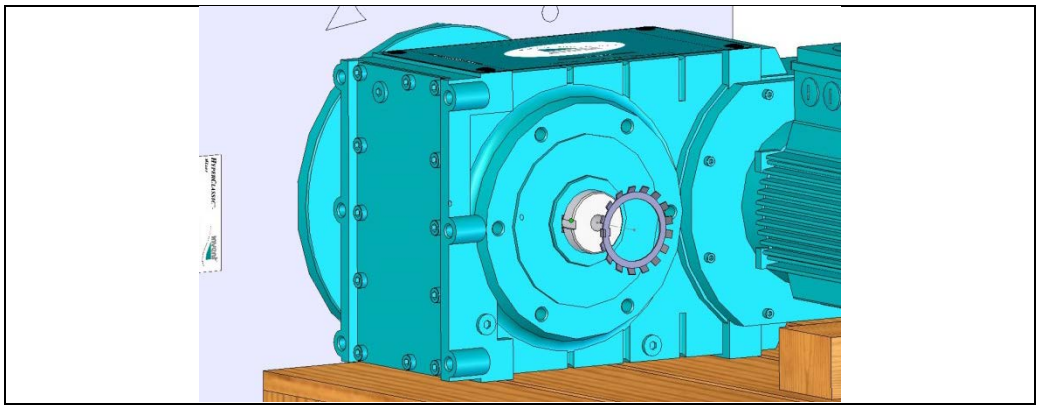


Figure 3.25:
Pull-in operation

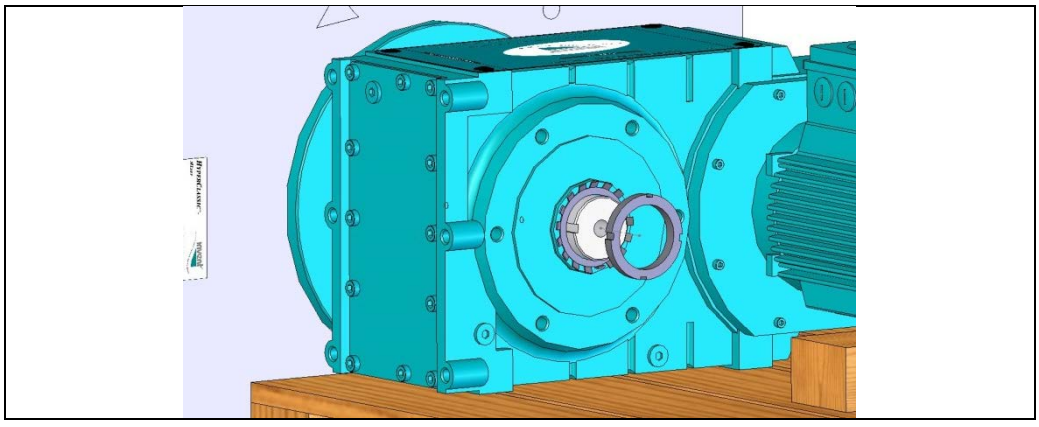
9. Pull the shaft into the hollow shaft as far as it will go as shown in Figure 3.25.



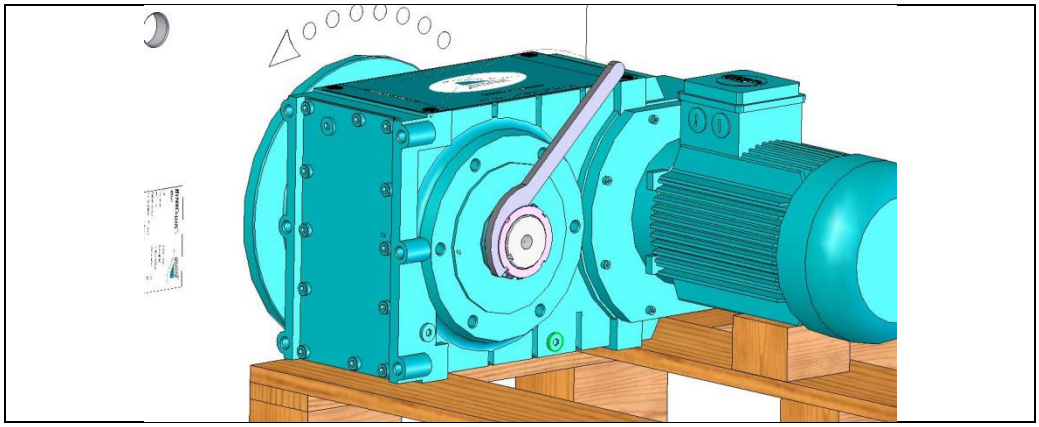
10. Remove the pull-in tool. The upper shaft end should protrude a few centimeters beyond the edge of the hollow shaft.



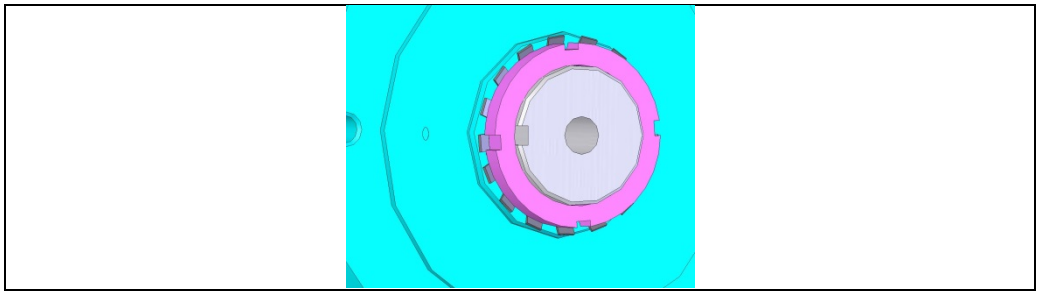
11. Apply sufficient grease to the thread again and position the supplied retaining ring.



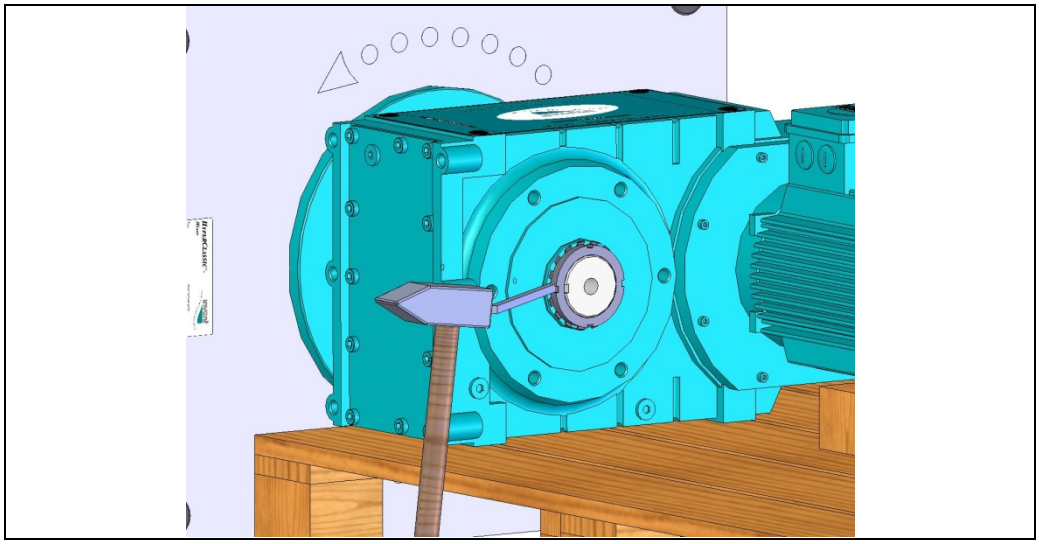
12. Then manually screw the supplied shaft nut on the shaft end.



13. Use a commercial special wrench for groove nuts (hook wrench) for tightening the nut. To this end, hold the hook wrench with one hand and support yourself with the other hand on the gear. Tighten the shaft nut as much as you can.



NOTE
Care must be exercised as to ensure that the groove nut is brought into a position where it is possible to press a nose of the retaining ring into a groove of the groove nut.



14. Use a chisel to bend a nose of the retaining ring into the groove of the groove nut to prevent it from accidentally coming undone.

3.7.8 Lifting and placing the drive with the shaft into the bridge

You need the following components to lift and place the drive unit with shaft into the bridge:

- Drive motor with preassembled gear plate and shaft
- Prepared installation site (all anchors and screws are fitted)
- Gear plate / bridge connecting set

In addition, you need the following tools and accessories:

- Slinging and hoisting equipment for lifting and placing the drive with shaft
- Open-end wrench
- Plastic mallet

We recommend using lifting straps to lift the mixer. For the use of lifting lugs please follow the relevant information in the operating instructions of the geared motor manufacturer.

WARNING **Do not use the cast lugs provided at the motor for lifting since they may break!**

WARNING **The slinging points for the lifting lugs at the motor are only to be used for the transport of the disassembled or non-assembled motor!**

NOTE

Do not use the front threads in the shaft ends to attach lifting lugs for lifting the mixer!

WARNING **When using multi-legged slings, care must be exercised to ensure that the legs of the slings cannot get out of their place under load!**

WARNING **Sling ropes must not be pulled over sharp edges. Use edge protectors for loads with sharp edges!**

NOTE

When using crane accessories comply with the current regulations of the employer's liability insurance associations. Lifting accessories must be used in a manner that loads are prevented from falling. Comply with regular testing requirements. Damaged crane accessories must not be used. Hoists without lifting capacity specifications must not be used.

The installation is carried out in the following steps:

1. Fix slinging means properly.

Before you lift the drive with shaft please check and make sure that:

- the crane straps are in their correct place and the lifting rope is properly fastened
- all persons involved wear the necessary personal protective equipment
- the overhead space is clear of obstacles
- the drive with the shaft is lifted exactly vertically (consider the rope alignment and the center of gravity of the geared motor with shaft)

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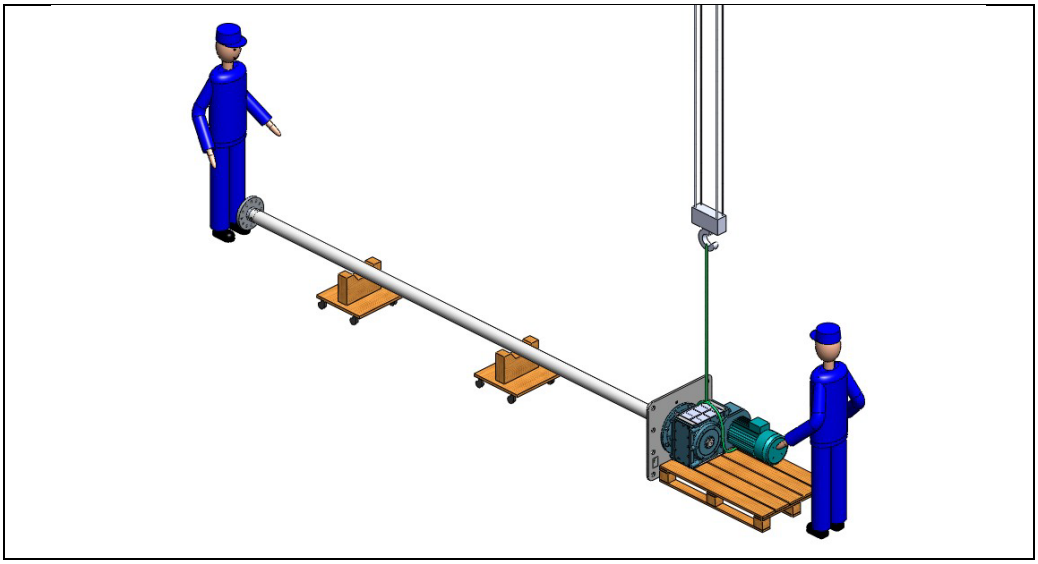

2. Position one person each at the shaft end (1) and at the drive (2). Person (1) at the shaft end ensures that the bottom end is not damaged by being dragged on the ground. Person (2) at the drive supervises the lifting operation and directs the crane operator.

WARNING

Please keep outside the danger area when lifting and slewing the load. Wear your personal protective equipment and keep the overhead space free from obstacles.

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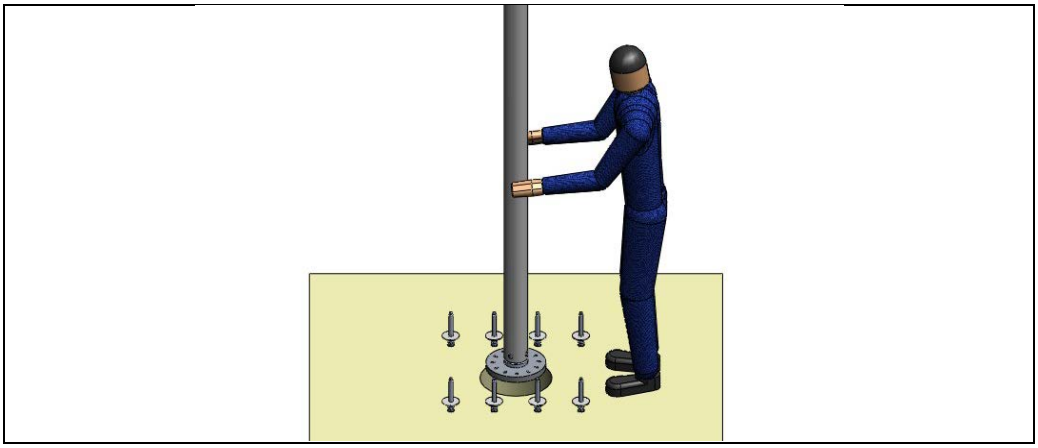
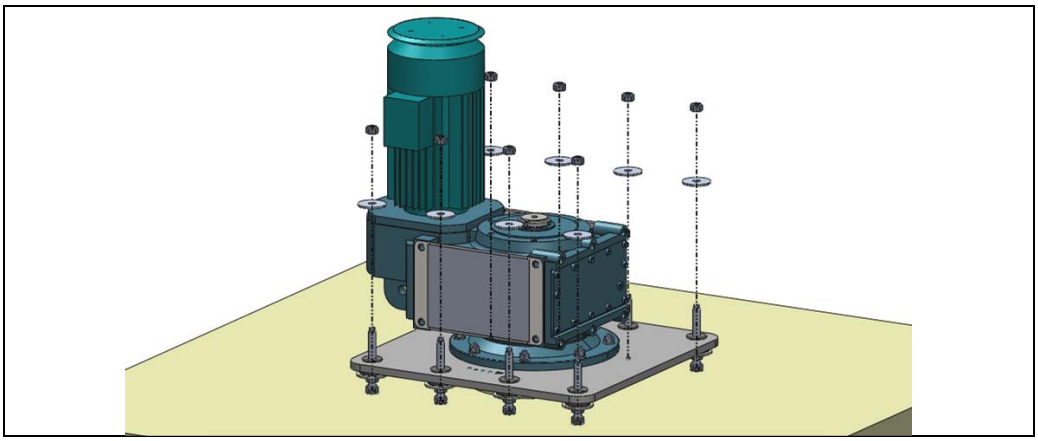


3. As soon as the drive with shaft hangs freely, person (1) moves to the installation site and waits for the arrival of the drive with shaft. As soon as the shaft end can be reached, person (1) inserts the shaft end into the bridge hole and pays attention to avoid any bumping or dragging of the shaft.
4. Finally, the gear plate reaches the floor anchors and both persons (1+2) together place the gear plate on the floor anchor.



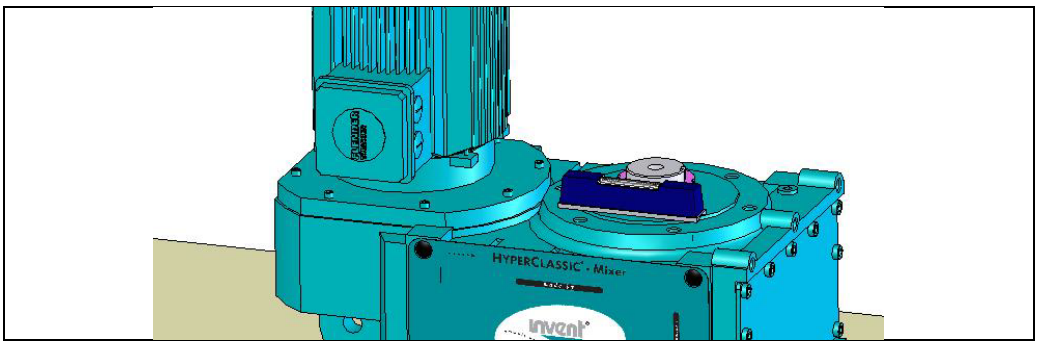
5. After the drive with shaft has been placed on the anchor rods, the upper special washers for rubber buffers are placed on the rods and screwed on with the appropriate nuts. The rubber buffers are compressed when the nuts on the upper side of the gear plate are tightened. The nuts need to be tightened until the special washers rest on the bushings vulcanized in the rubber buffers.

3.7.9 Aligning the drive and the gear plate

After the drive has been mounted to the gear plate and before the hollow shaft cover is mounted, the drive needs to be aligned with an accuracy of not less than 0.4 mm/m in both directions by means of a spirit level.

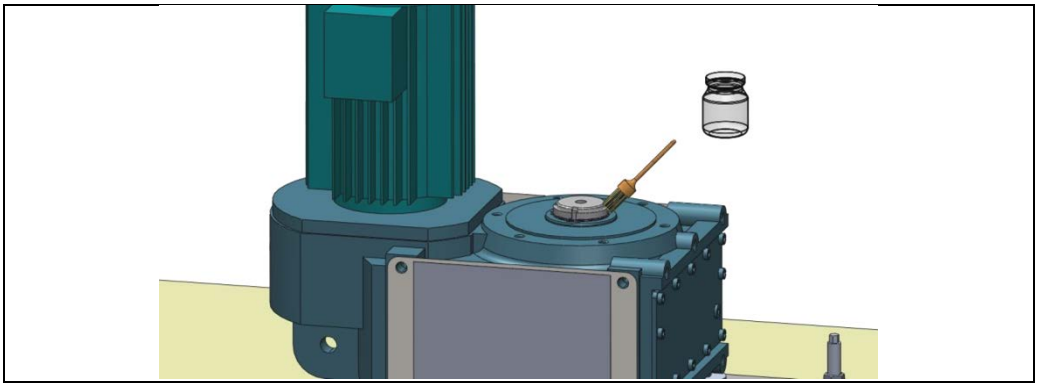
You need the following components to align the drive unit and the gear plate:

- Machine level
- Open-end wrench
- Torque wrench

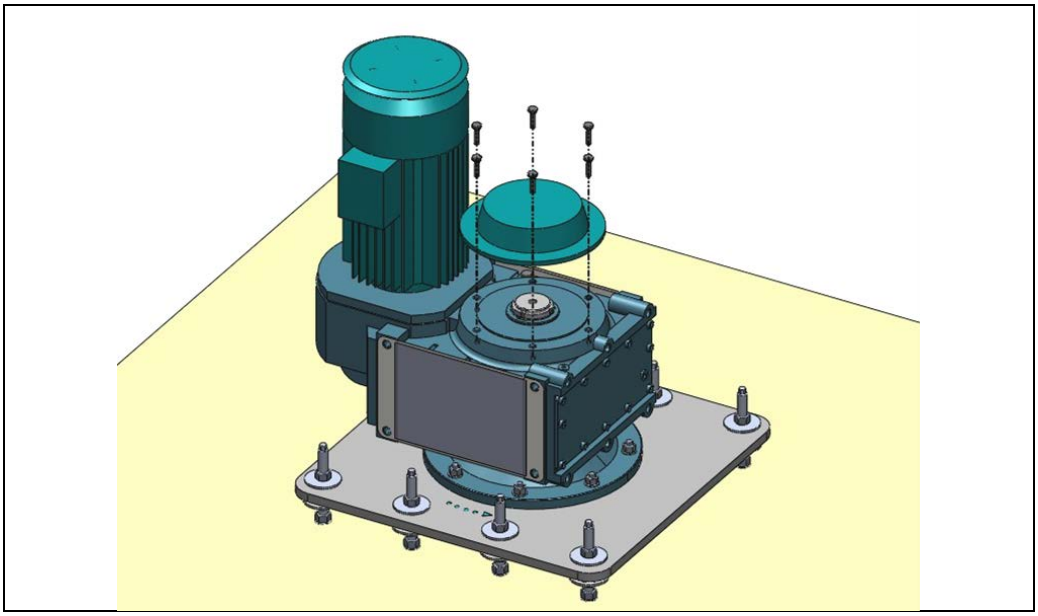


1. Please use a precision spirit level which you place on the smooth upper side of the hollow shaft. The bottom nuts facilitate exact alignment. Using the screws on the gear plate you set the drive such that the vial of the level is exactly in the middle.
2. Following the exact alignment in one direction you turn the level by 90° and align the other direction as described above. Following the alignment in transverse direction, check the alignment in longitudinal direction again and realign if necessary.
3. After the assembly has been exactly aligned you should retighten the upper nuts.

The tightening torque is 200 to 250 Nm.



4. Now, please grease the upper end of the shaft and the shaft nut with a sufficient amount of commercial grease. The grease can also be introduced into the hollow shaft cover cap to prevent any corrosion in the hollow space.



5. Reinstall the hollow shaft cover cap and secure it by means of the supplied hexagon screws.

3.7.10 Installing the bottom guide

Figure 3.26 is an explosion view of the bottom guide.

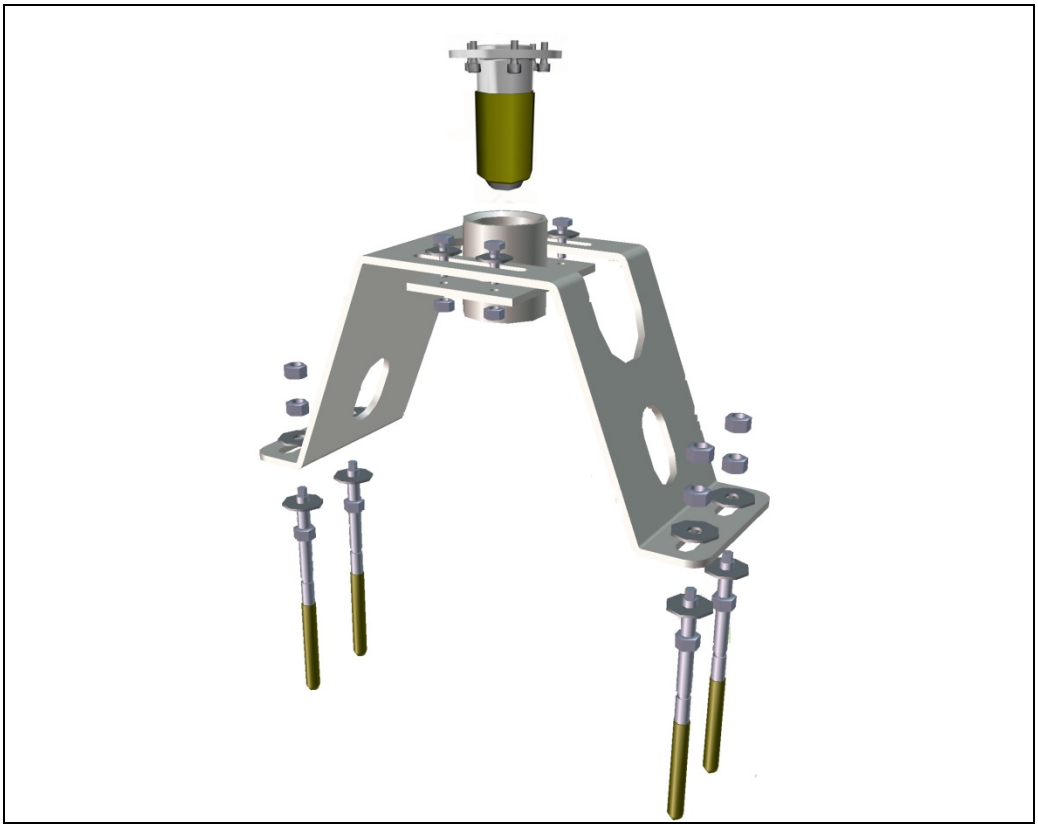
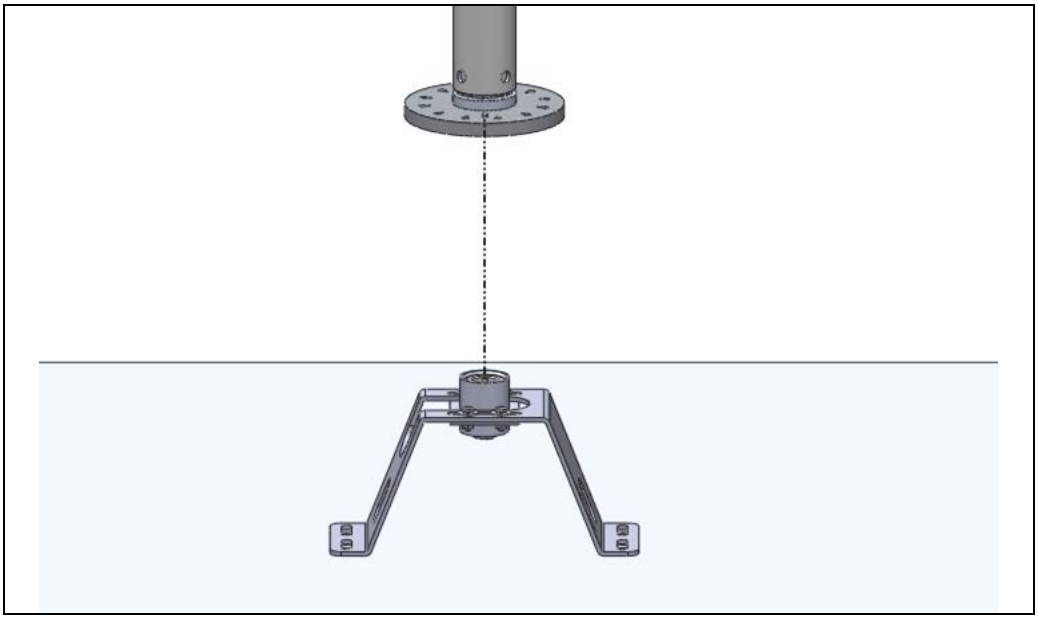


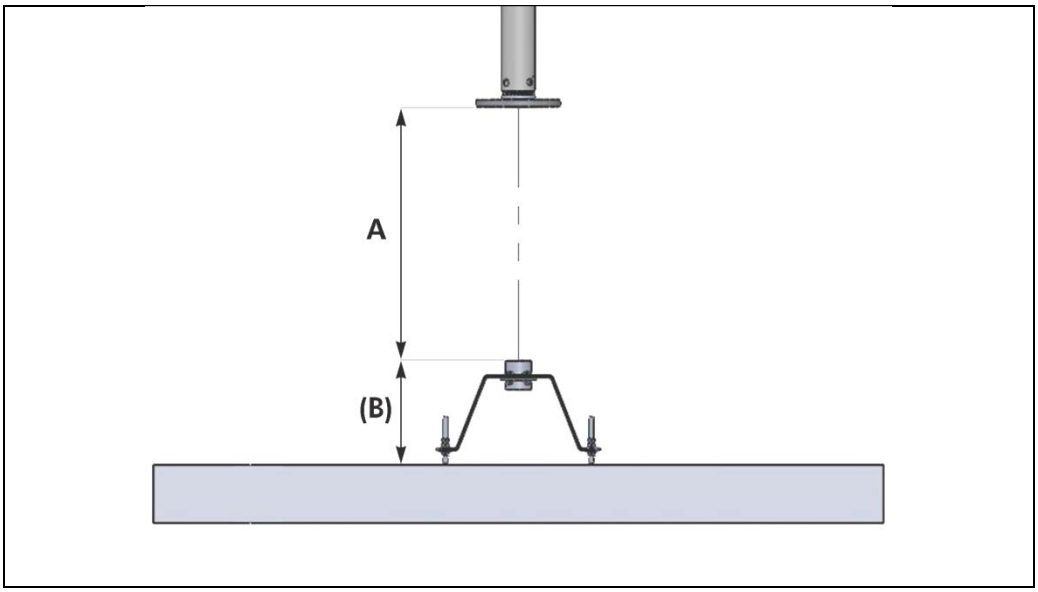
Figure 3.26:
Bottom guide

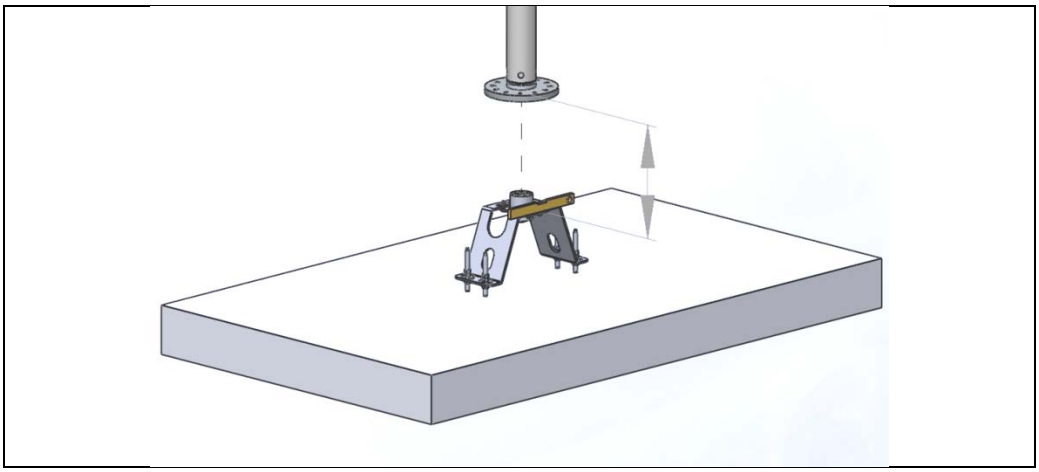
1. First mount the guide bushing in central position to the bottom side of the foot. Tighten the screws just finger tight.
2. Drop the plumb from the middle of the mixer shaft flange center. To this end, a special adaptor (included in the delivery) may be screwed into the front side of the flange to centrically mount a plumb line to the bottom flange side.



▼

3. Use a plumb to align the preassembled bottom guide in central position directly beneath the shaft. The 4 anchor holes may be drilled by means of a masonry drill using the foot as the template (cf. instructions for anchor systems in the annex).
4. After the holes have been cleaned and any drilling dust and other dirt have been removed, insert a mortar cartridge into each hole. The anchor rods are screwed in according to the instructions and may be loaded after the time indicated there.
5. Fasten the bottom guide with nuts and washers. First set the nominal value B for the floor clearance as indicated in the installation drawing.





6. Then set the exact distance A between the shaft flange and the foot of the bottom guide according to the installation drawing and horizontally align the bottom guide with a spirit level in both directions. Finally screw on and tighten the hexagon nuts with the washers using the screw locking paste.

The tightening torque is 200 to 250 Nm

The guide bushing needs to be removed again for mounting the mixer body.

3.7.11 Installing the ring sparger

You need the following components for installing the ring sparger:

- Fixing set for the ring sparger

The following tools and aids are required for installing the floor anchors:

- Drill (we recommend the use of core removing hole drills)
- Blowout device and brush for cleaning the boreholes
- Hammer (for driving in the anchors)
- Wrench and ring wrench for tightening the nuts
- Torque wrench
- Screw locking paste
- Water connection for cooling and lubricating the drill bits (only if the core removing hole drills are used)

The ring sparger is positioned with the help of the bottom guide. The center of the bottom guide must exactly match the center of the circle formed by the ring sparger.

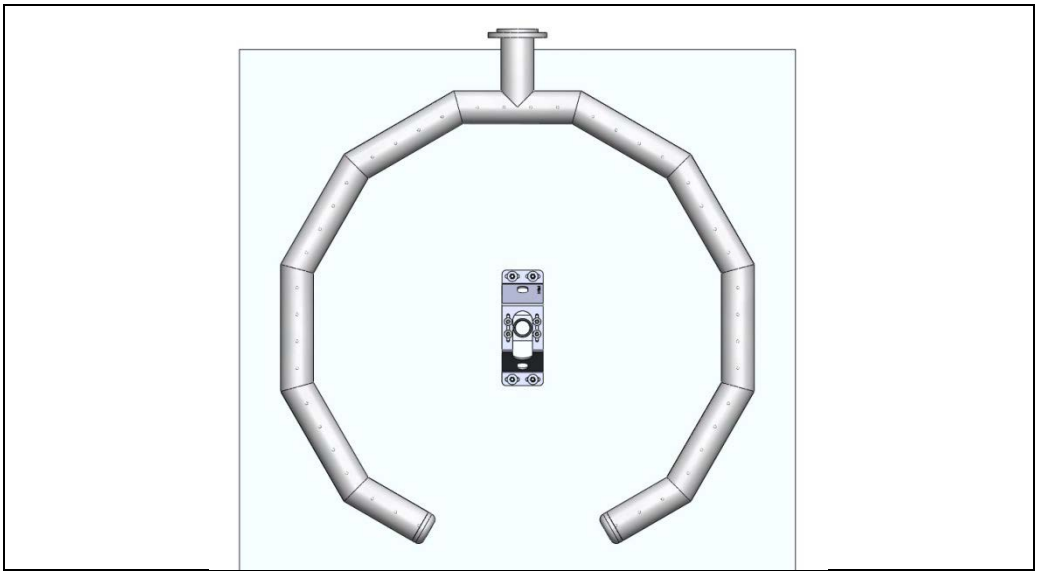


Figure 3.27: Centering of the ring sparger

1. To align the ring sparger firstly mount the supplied plates and pipe clips to the ring sparger; for screw connections use hexagon screws, washers and hexagon nuts. These pipe clips are fastened to the ring sparger.

CAUTION **Be careful when handling the retaining plates and clips. They have sharp edges and corners. Wear your personal protective clothing (hand protection).**

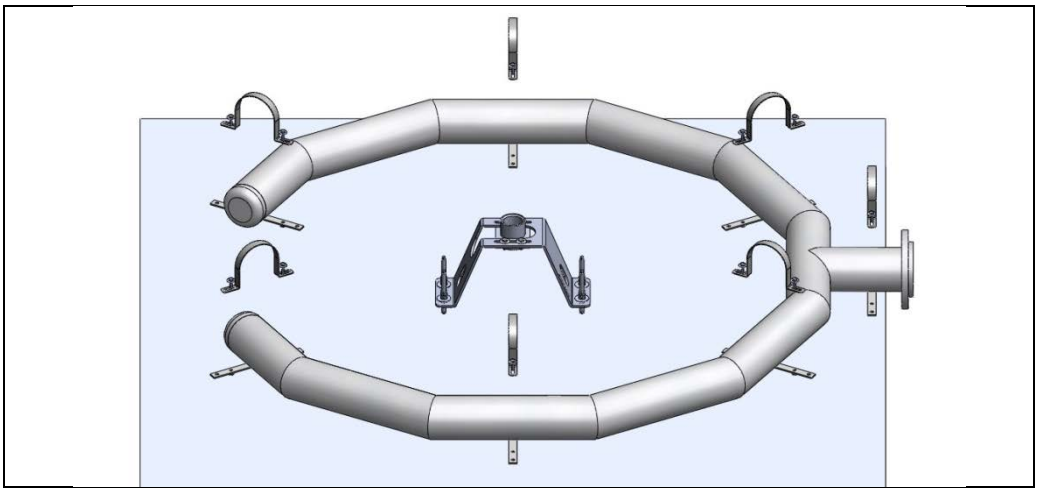


Figure 3.28: Fastening of the ring sparger

NOTE
Care must be exercised to ensure that the air outlet holes of the ring sparger face downwards, i.e. to the floor, and are not covered by a retaining plate.

2. Subsequently place the ring sparger onto the floor and bring it into its exact position. Pre-drill the holes in the concrete through the holes in the plates using a masonry drill and complete the drilling operations after having removed the ring sparger; for the borehole diameter and depth please refer to the operating instructions for composite anchors. After the boreholes have been blown out, a mortar cartridge is inserted into each borehole. Screw in the anchor rods as described in the operating instructions mentioned above (cf. annex). They may be loaded after the time indicated there.

NOTE
To ensure uniform aeration during operation, the ring sparger needs to be exactly aligned by using a spirit level. If more than one ring sparger is connected to an air pipe or blower station, it is mandatory to align all ring spargers on the same level. It is not sufficient to solely adjust the bottom distance.

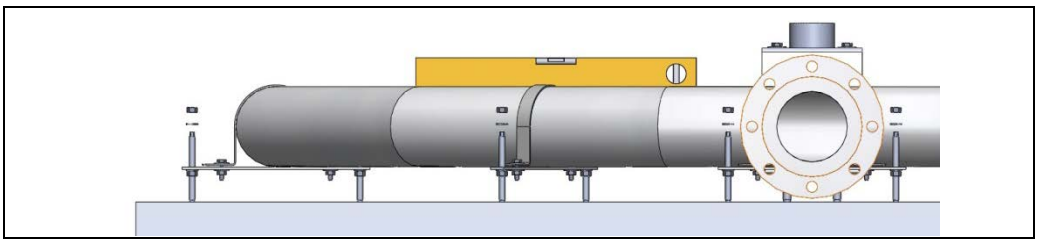


Figure 3.29: Aligning the ring sparger

After you have aligned the ring sparger, screw on the hexagon nuts with washers and tighten them by using the screw locking paste.

The tightening torque is 90 to 100 Nm

3.7.12 Mounting the mixer body to the lower shaft end

You need the following components to mount the mixer body to the shaft:

- Drive motor with shaft assembled at the installation site
- Hyperboloid mixer body with bearing shaft
- Fastening set bearing journal/bearing shaft
- Shaft / mixer body connecting set

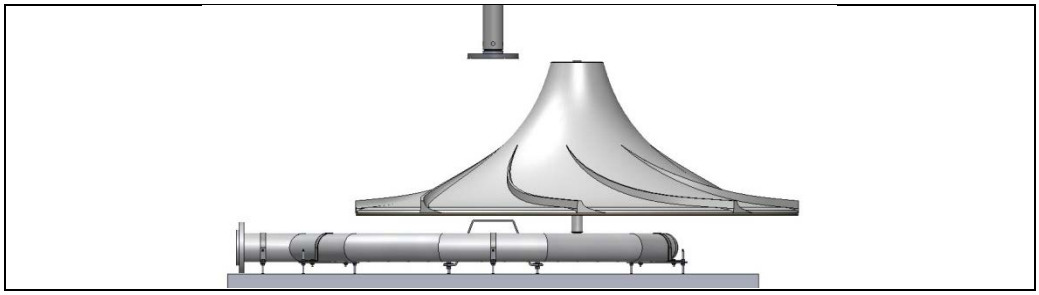
You need the following tools and accessories to mount the mixer body to the shaft:

- Squared lumbers and wedges to position the mixer body beneath the flange
- A small scaffolding if required
- Open-end or ring wrench
- Torque wrench
- Screwdriver
- Hammer

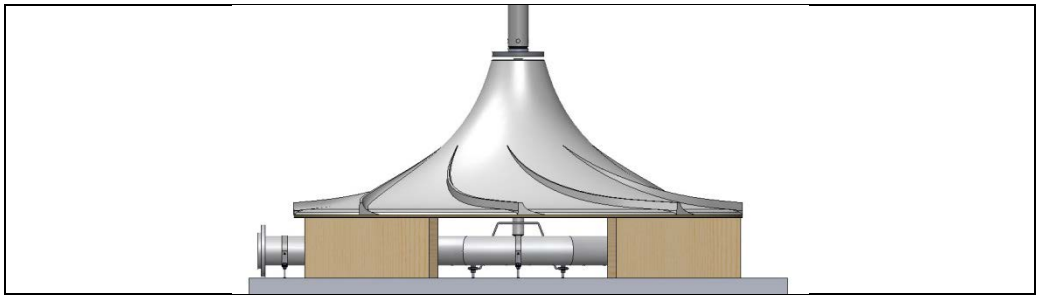
WARNING

Please use suitable hoisting / slinging equipment and exercise care with regard to the center of gravity of the load (do not lift heavy parts by muscle power - pay attention to the maximum lifting capacity!)

The installation is carried out in the following steps:



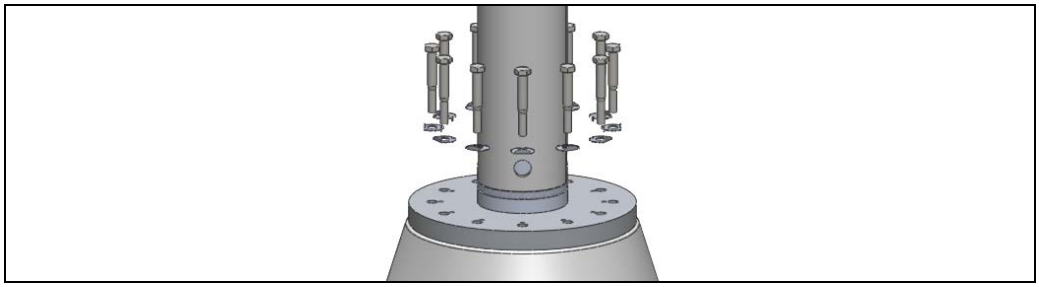
1. First remove the guide bushing of the bottom guide.
2. Attach the bearing journal to the bearing shaft of the mixer by means of the supplied screws.
3. Lift the mixer body from one side through the recess in the ring sparger beneath the shaft flange, and insert the bearing journal into the hole of the bottom guide foot.



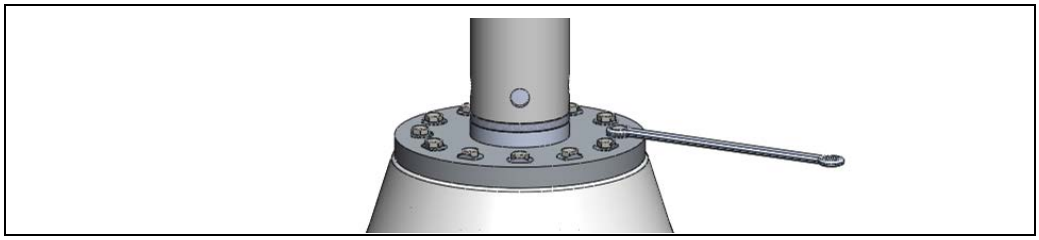
Please note that the mixer body must not directly rest on the bottom guide but needs to be supported by squared lumbers or similar means such that the mixer head is arranged directly beneath the shaft flange.

CAUTION **Do not step on the mixer body to reach the flange; for safety reasons scaffolding is required.**

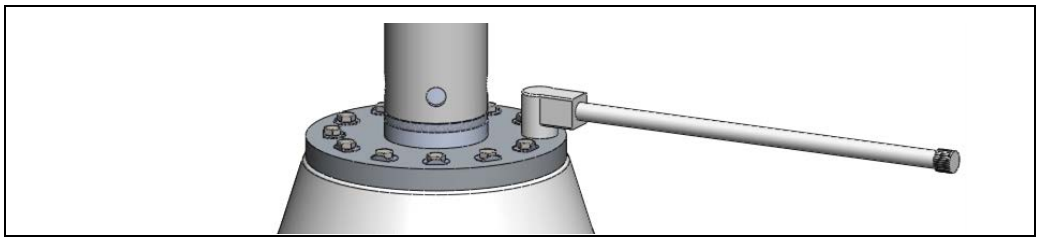
4. If you are not able to reach the shaft flange without stepping on the mixer body, position the small scaffolding so that you can reach the flange easily without stepping on the mixer body.



5. Place the Safety Lock®[7] retaining plates and screw the Safety Lock® screws through the flange into the threaded sleeves in the head of the mixer body.



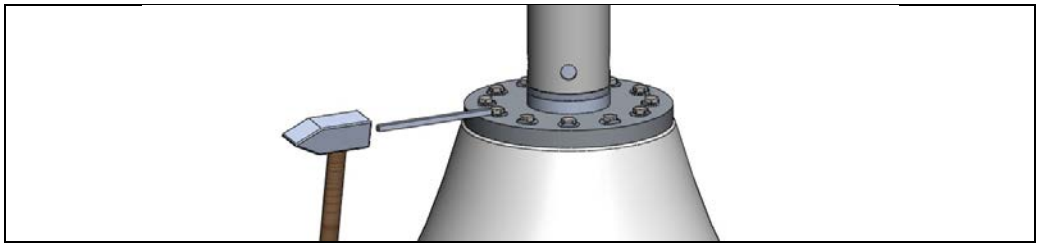
6. Use a ratchet wrench with socket to evenly tighten all screws (crosswise) and draw the mixer body to the flange until the head of the mixer body bears firmly against the flange.



7. Finally use a torque wrench to firmly tighten the screws. Care must be exercised to evenly tighten the screws (crosswise).

The tightening torque is 90 to 100 Nm

[7] Safety Lock® is a registered trademark of **INVENT** Umwelt- und Verfahrenstechnik AG.



8. After all screws have been firmly tightened, bend the retaining plates upwards by means of a screwdriver.

3.7.13 Aligning the guide bushing

After you have completed the installation of the mixer, reinstall the guide bushing.

CAUTION

Working in the area of the shear fins on the bottom side of the mixer body involves the risk of cuts. Therefore, the shear fins need to be installed in the last step after the guide bushing has been installed and aligned.

The guide bushing is positioned around the bearing shaft of the mixer body with an even circumferential clearance between the bearing journal and the guide bushing. The guide bushing can be positioned along the slots in the foot structure. When aligning, make sure that the guide bushing of the bottom guide is in vertical position. This can be easily checked by using a spirit level. The clearance inside the guide bushing can be checked with a hand mirror.

The sliding bush has to be flush with the bottom edge of the guide bushing.

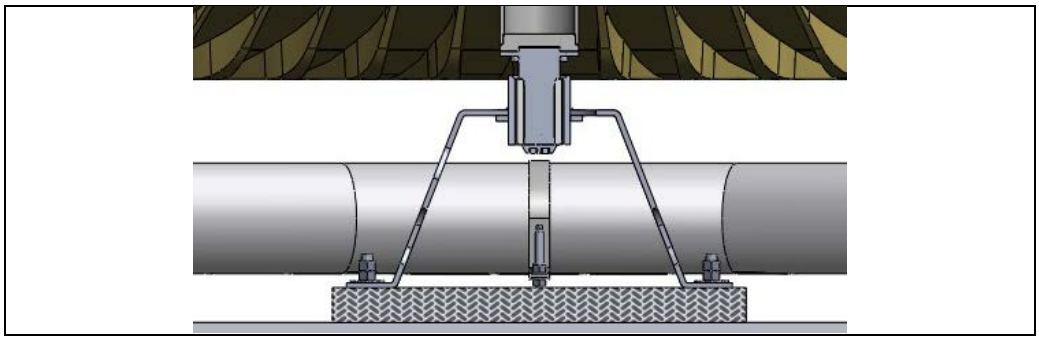


Figure 3.30:: Supporting the bottom guide

After the guide bushing has been positioned, the nuts with washers are tightened using a screw locking paste.

The tightening torque is 90 to 100 Nm

Now, the foot structure needs to be supported by placing concrete as shown in the installation drawing (cf. Figure 3.30).

3.7.14 Install the shear fins

Following the alignment of the bottom guide and filling the floor clearance with concrete, the last installation step is to screw on and secure the shear fins with washers.

The tightening torque is 15 to 20 Nm

3.8 Provide all connections

DANGER

Before you start any work make sure that the mixing system is disconnected from the mains and the power switch is secured with a padlock and a sign that work is being carried out to prevent any accidental release of the power supply.

NOTE
The electrical connection must only be carried out by sufficiently trained and skilled staff if the mixing and aeration system is at standstill.

NOTE
Wrong and/or missing connections may cause severe damage to the product and/or massive operating trouble.

For further instructions for the electrical connection of the motor and any additional and safety systems (motor protection, standstill heaters, etc.) please refer to the enclosed operating instructions of the drive manufacturer and the wiring diagram for the drive, which is attached to the motor.

NOTE
If the wiring diagram is missing, the motor must not be connected. Please contact our technical service to obtain the valid wiring diagram for your motor.

NOTE
Please refer for all electrical connections to the enclosed original instructions of the drive manufacturer.

NOTE
We recommend the additional provision of a star delta connection for a soft start of the motor for an output above 3.0 kW if the motor is not connected to a frequency converter or is not run with a soft start function. This ensures optimum protection of the motor and of all components of the system. For outputs of 5.5 kW and higher such provision is mandatory; otherwise, the guarantee is forfeited.

NOTE
Moreover, please note that compliance with all guidelines and instructions of INVENT and the drive suppliers is a prerequisite for proper operation and any claims on guarantee.

3.9 Checking the supply

Please check all connections for completeness and correct installation. In particular, check the correct direction of rotation and the correct connection of all protective systems.

NOTE

Wrong and/or missing connections may cause severe damage to the product and/or massive operating trouble.

3.10 How to dispose of / keep packaging material

Please dispose of all packaging material in an environmentally friendly manner and in compliance with the applicable national statutory regulations.

CAUTION

Be careful when handling the packaging material: Sharp edges/corners (nails, straps, splinters of wood) may cause cuts and stab wounds. Wear your personal protective equipment.

3.11 Disassembly

The **HYPERCLASSIC**® Mixer/Aerator is disassembled according to the installation instructions in reverse order.

3.11.1 General procedure

Before you start to disassemble a **HYPERCLASSIC**® Mixing and Aeration System first switch it off and disconnect it from the mains. Empty and clean the basins. Then the procedure is as follows:

1. Disassemble the guide bushing.
2. Remove the Mixer body from the lower shaft end.
3. Disassemble the bottom guide and the ring sparger.
4. Lift out the drive with shaft.
5. Trust out the drive shaft of the geared motor.
6. Remove the gear plate from the motor.
7. Clean the individual components and prepare them for storage.
8. Pack up and store.

4 Operation

4.1 Introduction

This chapter contains instructions for the handling of the **HYPERCLASSIC**® Mixer/Aerator when it is first put into service, the operating sequence of the Mixer/Aerator system, information about switching off and taking out of service, and storage of the product.

4.2 Observe safety precautions

To avoid accidents, observe the following rules:

- The Mixer/Aerator must only be put into operation when completely assembled and in serviceable condition.
- The Mixer/Aerator may only be operated when all safety and safety-related equipment is available and functioning.
- The Mixer/Aerator drive units may only be installed, commissioned, maintained and where necessary repaired by suitably qualified professionals.
- Always wear your personal safety equipment when working on the Mixer/Aerator.
- When personnel are in the vicinity of a stationary Mixer/Aerator in an emptied basin, secure the drive units against unintentional powering up (for example, by shutting off the key switch or removing the fuses from the power supply).
- During any test running of the Mixer/Aerator, personnel must not be in the basin, as severe injuries can be caused by the ribs on the Mixer/Aerator body.
- Collect all old oil and dispose of it appropriately. Remove any oil that leaks out immediately and in an environmentally sound manner, using an oil binding agent.

4.3 Check safety installations

- Check that any emergency off switch is in working order.
- Check that the motor circuit-breaker and the control unit for the PTC thermal motor-monitoring unit (if there is one) have been correctly installed.
- Make sure, that the fan wheel of the electric motor is equipped with a protective hood which is properly installed.

Insufficient safety equipment can lead to damage to the product and/or in the worst case to personal injury.

4.4 Observe the maintenance schedules

No maintenance is necessary before the Mixer/Aerator is commissioned.

For a description of maintenance operations, please refer to section Changing or draining the oil.

4.5 Follow regulations

NOTE
The relevant accident prevention regulations and other generally recognized safety and occupational health rules, as well as national safety regulations must be observed.

During assembly, commissioning and operation of the Mixer/Aerator, all current national standards for accident prevention, safety and occupational safety must for obvious reasons be observed. These include, for example, the current accident prevention regulations, Equipment Safety Law and many other guidelines.

Please enquire about any other national guidelines, regulations or laws that may apply.

4.6 Commissioning

No special training is required to operate the Mixer/Aerator. However, it is essential that each operator has read and understood the operating instructions.

All work on the Mixer/Aerator must be carried out only by authorized personnel. Only qualified and trained personnel should be used.

Before initial start-up, check that all assembly works on the Mixer/Aerator has been carried out carefully and correctly.

Danger of flying parts: Make sure, that after installation all assembly material and tools have been removed, especially from the Mixer/Aerator body.

In the case of unsafe access possibilities to the installation site, there is a risk of sliding, stumbling or falling. The access possibilities to the installation site as well as the installation site itself must be secured correctly. If necessary, secure yourself (e.g. belt or fall protection device)

Check that all screw connections are tight and secure.

Check the horizontal alignment of the drive unit using an industrial spirit level on the flat surfaces above the hollow shaft (remove the hollow shaft cover).

Check the correct alignment of the bottom guide unit and ring sparger.

NOTE
Before start-up, please remove the transport lock of the pressure ventilation valve of the gear box.

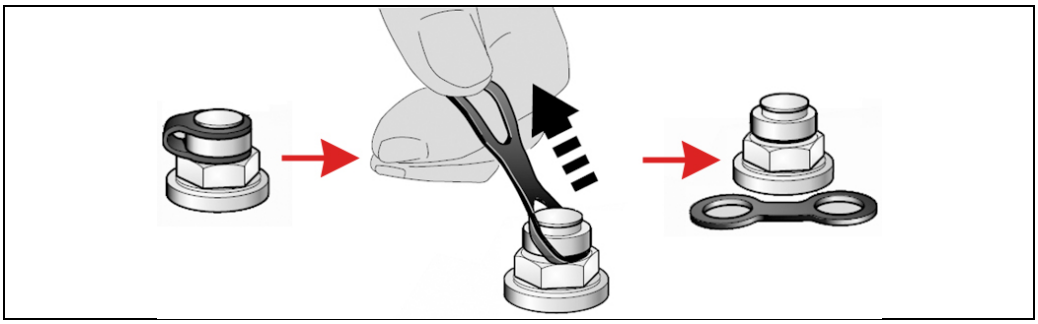


Figure 4.1
Remove the transport lock oft the ventilation valve

NOTE
Before commissioning, check the oil level and correct it if necessary. If the drive unit was delivered without oil, fill it with oil before commissioning.

Check the motor's electrical connections. Pay particular attention to the correct connection according to the wiring diagram (check the motor's direction of rotation on the basis of the phase-sequence). This work has to be done by qualified personnel.

NOTE
Please carry out the start-up procedure according to the manual of the drive manufacturer.

4.7 Carry out operational check

WARNING **No personnel must be in the basin during the test run.**

WARNING

Check protection against contact:

Make sure, that the fan wheel of the electric motor is equipped with a protective hood which is properly installed.

4.7.1 Dry test run

If all checks have been carried out without discovering any faults, or if any faults that were discovered have been corrected, you can connect the power for a test run in the empty basin.

Make sure that no personnel are in the basin and close to the Mixer/Aerator. One member of staff should stay close to the emergency Off switch, and switch off the power immediately in the case of danger.

Switch on the Mixer/Aerator by connecting the power.

The Mixer/Aerator should then rotate in the prescribed direction and with the specified nominal speed of rotation.

CAUTION

During test run hot oil may spill from the ventilation valve due to entrapped air in the gear box. Please wear your personal safety equipment. Any oil that does leak out should be removed immediately and in an environmentally sound manner, using an oil-binding agent.

NOTE
The test run of the Mixer/Aerator without water must be supervised, and last only as long as it takes to establish the direction and speed of rotation (max. 120 seconds).

NOTE
In rare cases, the Mixer/Aerator may begin to oscillate during the dry run as a result of resonance, and built up during continued operation. If this happens, the Mixer/Aerator must be switched off immediately.

Switch the Mixer/Aerator off immediately after the direction of rotation has been established. If the direction of rotation is in accordance with the specification given in the installation drawing, the basin can be filled.

NOTE
Operation of the Mixer/Aerator is not allowed during the filling operation. The drive unit must be secured against unintentional switching on.

4.7.2 Test run with full basin

NOTE
Continuous operation of the Mixer/Aerator is only allowed with the design fill level.

During the test run with full basin, check the power consumption of the motor and record it in the commissioning report. If the nominal power is exceeded (see the part label), the Mixer/Aerator must be switched off to prevent possible damage to the motor.

DANGER **All work on power supply lines, such as measurements of electrical power consumption has to be carried out by qualified personnel.**

Take notice of the sound of the motor when it is running and listen for any irregularities.

Check the drive unit for oil-leaks from the housing and shaft seals

NOTE
Any oil that does leak out should be removed immediately and in an environmentally sound manner, using an oil-binding agent.

Check the drive unit during operation for raised operating temperature. The drive unit is suited to a temperature of 90°C during continuous operation and using mineral oil. If it is necessary to run at higher temperatures, synthetic oils should be used. Short-term temperatures of 100°C are permissible.

CAUTION **Overheating of the drive my cause burns. Please wear your personal safety equipment.**

4.8 Operating sequence

Operation of the Mixer/Aerator comprises the “ON” function (Mixer/Aerator operation) and the “OFF” function (machine stopped). In the case of intermittent operation, the sequence of operation is usually specified by the customer.

NOTE
If operation of the Mixer/Aerator is intermittent, the number of starts per hour should be limited to 5. If starting is more frequent than this, the Mixer/Aerator must be started with a soft start unit. A soft start is generally recommended, if the Mixer/Aerator is operated intermittently, in order to increase the lifetime of the drive.

4.9 Implementing the functions

The On and Off switching functions are usually integrated into the process control system for the whole installation. The customer should install an emergency Off switch between the motor's terminal box and switchgear case, so that the Mixer/Aerator can be taken out of service manually in the case of a fault.

4.10 Switching the Mixer/Aerator off

The Mixer/Aerator should only be switched off in accordance with the intended usage, or as part of a procedure planned by the customer and covered by the Mixer/Aerator design.

NOTE
Unforeseen standstill of the Mixer/Aerator can have a negative effect on the functioning of the process as a whole (for example, successful purification in a sewage treatment plant). In aeration tanks and sludge tanks, undesirable deposits can occur. If the Mixer/Aerator has been switched off for a lengthy period of time, deposits on the Mixer/Aerator body can cause damage to the Mixer/Aerator on restart.

NOTE
If it is necessary to switch the Mixer/Aerator off for a long period of time, please follow the instructions in 4.11.2

4.11 Decommissioning and dismantling the Mixer/Aerator

Decommissioning may be necessary for a number of different reasons:

1. The basin is being taken out of service for an inspection.
2. The Mixer/Aerator is not going to be run for a long time for processing reasons, for example in bivalent zones.
3. The basin as a whole is being taken out of service, for example when it is used seasonally.

In each case, consider carefully whether a long-term decommissioning is required, or just a temporary, short-term stoppage.

4.11.1 Short-term decommissioning and intermittent operation

If the Mixer/Aerator is switched off for a short time (a few minutes or hours) when the basin is full – for example for inspection or when operating intermittently – no special measures need be taken.

4.11.2 Long-term decommissioning

During a long-term decommissioning, you must ensure that the Mixer/Aerator body and shaft cannot freeze up.

If the Mixer/Aerator is taken out of service for a long period of time, long-term protection of the drive unit is recommended. The gear unit must – whatever the design – be completely filled with oil. For further information, see 3.3, storing the Mixer/Aerator.

During long-term decommissioning the basin should be emptied, especially if there is a risk of frost. If the basin cannot be emptied, the Mixer/Aerator should be dismantled and stored in accordance with the instructions in 3.3, storing the Mixer/Aerator

4.11.3 Dismantling the Mixer/Aerator

Dismantling the Mixer/Aerator is the reverse of the installation process. For further information, see chapter 3.11, Disassembly.

4.12 Interrupting the power supply

The best way to break the power supply is to use an on-site switch-box. If this is not available, the power must be switched off at the main distribution box.

4.13 Remove electrical connection

Work on the power supply and the drive unit's terminal box must only be carried out by qualified professionals.

5.1 Introduction

The **INVENT HYPERCLASSIC**® Mixer/Aerator is designed and built in such a way that reliable operation and a long lifetime of service can be achieved with a minimum of investment in maintenance. Nevertheless, machines and the plant as a whole must be inspected and maintained on a regular basis. The recommended maintenance intervals ands operations are described in the following sections. If the Mixer/Aerator is being used with particularly corrosive or abrasive fluids, the maintenance intervals should be reduced accordingly, in discussion with **INVENT**. In such situations, please consult our Customer Service.

Please note the following points:

WARNING

Machines that are circulating hazardous fluids or that are installed in a contaminated environment must be decontaminated before the work begins.

NOTE
All inspection and maintenance work must be carried out carefully and by trained personnel. It is essential to take into account the safety information in chapter 2.

NOTE
Maintenance personnel must have read and understood the operating instructions and maintenance notes before starting the work.

NOTE
The electrical drive units may only be maintained and where necessary repaired by qualified professionals.

NOTE
Materials that are being replaced, such as lubricating oils, must be collected in suitable containers and disposed of in accordance with the current legal stipulations.

NOTE
Only lubricants recommended by the manufacturers may be used.

NOTE
Only original parts from the manufacturers may be used.

5.2 Maintenance intervals

After 6 weeks or 1,000 hours of operation:

- Clean the drive unit and mounting plate.
- Check the alignment of the drive unit with an industrial spirit level and correct if necessary.
- Check all bolt connections above the waterline and tighten if necessary

NOTE
Please make sure that any tightening of bolt connections does not change the alignment of the drive unit.

- Check the oil-level.
- Examine the gear unit for leaks.
- Examine the ventilation valve for contamination, and clean if necessary.
- Check the terminal box for leak-tightness.
- Check current/power consumption.
- Check the working of safety and monitoring equipment.

Annually or after 8,000 hours of operation

- Clean the drive unit and mounting plate.
- Check the condition of rubber buffers. If there is apparent wear, rubber buffers have to be replaced.
- Check the alignment of the drive unit with an industrial spirit level and correct if necessary.
- Renew the grease packing under the hollow shaft cover.
- Check all bolt connections above the waterline and tighten if necessary.

NOTE
Please make sure that any tightening of bolt connections does not change the alignment of the drive unit.

- Examine the drive unit for unusual noises.
- Examine the gear unit for leaks.
- Change the oil. (If you are using a 2-year oil-change interval, check the oil-level after 1 year.)
- Clean the ventilation valve.
- Check the terminal box for leak-tightness.

- Check the insulation resistance against earthing.
- Check the insulation resistance phase to phase.
- Check current/power consumption.
- Carry out a visual check of the coating and repair if necessary.
- Check the working of safety and monitoring equipment.

Every 24 Months:

- Carry out a check of the alignment of the bottom guide unit.
- Check the bearing journal for wear. If abrasion is apparent, replace the sliding bush by a new one and realign the bottom guide unit.

In addition, every 3–5 years:

- Carry out a visual check of the coating on the mixer body, and repair if necessary. The required consumables can be ordered from **INVENT**.

5.3 Cleaning the Mixer/Aerator

The parts of the Mixer/Aerator under the waterline do not require cleaning. If the basin is emptied, the Mixer/Aerator body and shaft can be rinsed off with a jet of water. If a high-pressure spray is used, a low-pressure spray setting should be chosen, and the Mixer/Aerator should not be sprayed from a short distance.

The following cleaning instructions apply to the Mixer/Aerator drive unit:

Build-ups of dirt and dust can hinder the dissipation of heat. You should therefore keep the drive unit free of dirt and dust etc., and clean it regularly with a damp cloth.

NOTE
The drive unit must not be cleaned with high-pressure cleaning equipment. Sharp-edged tools are not permissible.

Clean the breather valve according to the rate of build-up of dirt, but at least every 6 months – **the Mixer/Aerator must be switched off**:

1. Unscrew the ventilation valve.
2. Wash the breather valve with cleaning solvent.
3. Clean off the breather valve with compressed air.
4. Seal the gear unit with the breather valve.

Blowing out the ventilation valve with compressed air can evaporate aerosols. Please wear your personal safety equipment – additionally face mask.

5.4 Maintaining the drive unit

NOTE
Please refer to the original inspection- and maintenance manual of the drive manufacturer.

5.4.1 Information on maintenance and repair work

5.4.1.1 Changing or draining the oil

NOTE
Do not mix different types of oil or oil types of different manufacturers!

The type of oil, oil viscosity and required the amount of oil, which was used for the initial filling, can be seen from the specification plate or can be requested from our service.

Oil types:

- Mineral oil (CLP oil, DIN 51517/3)
- Synthetic oil of specified grade (CLP PG)

Details of oil type, viscosity and the required quantity can be found on the rating plate.

Procedure

If you are topping up the oil-level, you must use the type of oil that was previously used. If you are using a new type, you must change the oil completely.

When draining the oil, clean the housing thoroughly of oil sludge, debris and oil remnants by flushing with new oil.

NOTE
Viscous oils should be pre-heated. Old oil should be drained with the gear unit warm, immediately after the drive has been taken out of service.

Switch off the drive unit and secure it against unintentional restarting. Put a suitable receptacle under the oil drain plug on the gear housing and unscrew the ventilation valve on the top of the housing. Unscrew the oil drain plug and drain the oil into the container.

CAUTION **The hot oil that drains out could cause scalding. Please wear safety gloves.**

Screw the oil drain plug back into the housing and check the condition of the sealing ring. If it is worn, replace it with a new sealing ring.

Remove the top ventilation plug/filter or screw plug and fill the gear unit with fresh oil, using an inlet filter (max. 60μm mesh).

NOTE
The quantity of oil to be used depends on the mounting orientation of the drive. Please consult the manufacturer's instructions.

For further information about oil types, viscosities and required quantities please see the rating plate. Afterwards, please check the oil-level and remove any spilt oil immediately in an environmentally sound manner, with an oil-binding agent. Finally, screw the breather valve back on.

5.4.1.2 Relubrication of the anti-friction bearings in the drive units

For special drives relubrication is required. Please refer to the original manual of the manufacturer for more information.

5.4.1.3 Check all fixing bolts for tightness

Switch off the drive unit and secure it against unintentional restarting. Check all fixing bolts for tightness, using a torque wrench.

5.4.1.4 Inspecting the drive unit

The drive unit should have a scheduled annual inspection, using the criteria in section 5.5. In addition, the drive unit should be inspected in accordance with the criteria in section, check safety installations.

NOTE
Any damage to the coating must be professionally repaired.

5.4.2 Lubricants

The determining factor in the choice of oil is always the oil viscosity (ISO VG class) shown on the gear unit's rating plate. The viscosity class shown applies to the contractually agreed conditions of operation. For any other operating conditions, please contact **INVENT**. The lubricants suitable for use in the gear drive are recommended by the drive manufacturer. For this information please refer to the enclosed operating instructions of the drive manufacturer.

The recommended lubricants have not been approved under USDA (United States Department of Agriculture) H1 and H2, and therefore cannot be used – or can only be used to a limited extent – in the food or pharmaceuticals industries. The lubricants are not biodegradable, or only partially so. In general, they correspond to Water Hazard class 2 or 1. If lubricants in accordance with these classifications are required, please contact **INVENT** service. If gear units have by agreement been filled on manufacture with special lubricants for the applications described above, this will be shown on the rating plate: for example, CLP-H1 VG220 or CLP E VG220. Note: in order to avoid any misunderstanding, we would point out that this recommendation does not constitute any approval in the sense of a guarantee for the quality of the lubricants obtained from your supplier. Each lubricant manufacturer must provide their own guarantees for the quality of their product. If you do not follow the recommendations of the drive manufacturer, you assume the responsibility for the technical suitability of the lubricant. Besides that, the guarantee expires. If oil is used that is not recommended by the drive manufacturer, the corrosive effect of the oil on the inner coating must also be investigated. An investigation of this type can be commissioned from **INVENT** (cost on application).

5.5 Rectifying faults

Fault	Possible causes	Solution
Motor protection trips	Too high a load on the drive unit	Inform Customer Service. Reset load to the nominal value.
PTC (if present) trips	Too high a load on the drive unit	Inform Customer Service. Reset load to the nominal value.
Current consumption too high	Too high a load on the drive unit	Inform Customer Service. Reset load to the nominal value.
Bearing temperature higher than normal	Oil-level too low	Check oil-level.
	Oil outdated	Establish when oil was last changed. Check oil quality. Change oil if necessary.
	Bearing defective	Inform Customer Service. Check bearing and change if necessary.
Running temperature higher than normal	Oil-level too high	Check oil-level.
	Oil is too old	Establish when oil was last changed. Check oil quality. Change oil if necessary.
	Oil is very dirty	Change the oil.
	Fan cover or drive unit is dirty	Clean the drive unit.
Change in operating noise	Damaged gearing	Inform Customer Service. Check toothed components and if necessary replace damaged parts.

Fault	Possible causes	Solution
	Bearing detective	Inform Customer Service and replace bearing.
	Too high a load on power input or output	Reset load to the nominal value.
Loud noises in region of the gear mounting	Mounting has worked loose	Tighten the nuts and bolts with the prescribed torque. Change any damaged bolts or nuts.
Significant leakage of lubricant	Incorrect oil-level for mounting orientation of the drive	Confirm model from rating plate. Check oil-level and correct if necessary.
	Unsatisfactory seal of housing cover or joints	Inform Customer Service. Renew seal.
	Shaft sealing ring detective	Inform Customer Service. Change shaft sealing ring.
Drive unit does not start or difficult to start	Wrong lubricant viscosity	Fill with correct lubricant.
	Oil-level too high	Check oil-level and correct if necessary.
	Too high a load on the drive unit	Reset load to the nominal value.
Increased play on power input and output	Positive-locking connection knocked out by overload	Inform Customer Service.

5.6 Further recommended Inspections

In order to ensure energy-efficient operation of the **HYPERCLASSIC** ®- Mixer/Aerator, we recommend to also checking the aeration system components "air production" and air piping at regular intervals.

5.6.1 General inspections

1. Check the leak-tightness of all flanges and connections from the edge of the basin (noise check, optical and manual checks).
2. Check the trouble free operation of the blowers and intake filters. Contaminated filters lead to increased operating pressures and higher energy costs. Please comply with the instructions of the blower manufacturers.
3. Check the air flow to each single Mixer/Aerator. The loading with air must be limited to the maximum value given on the part label of the **HYPERCLASSIC** ®- Mixer/Aerator. Otherwise the system is exposed to increased vibration and wear. At the same time the oxygen transfer rate will drop when the mixer is overloaded with air.

5.6.2 General performance monitoring

In addition to the regular maintenance as described above it is recommended to check the following parameters of the system which can be indicators for extraordinary maintenance required:

5.6.2.1 Blower station

- Energy consumption
- Pressure indicator of the air intake filter
- Regular blower maintenance
- Backpressure

5.6.2.2 Aeration Basin

- Water Quality
- Dissolved oxygen concentration in the aerated basin

5.6.2.3 Aeration system

- Bubble pattern
- Backpressure
- Air flow rates
- Quantity and quality of condensed water

5.6.3 Fault finding / fault removal

Some of the most frequent faults and their causes as well as procedures for removal are listed below

NOTE
Please note that faults may have a wide variety of causes, which may not necessarily be directly related to the functionality of the aerators, such as the load situation of the overall plant and the quality of the waste water, the condition of the air supply (blowers), control valves, oxygen probes etc.

Fault	Possible causes	Removal
Blower pressure increases or is excessive	Control fittings defective or shutoff valves are not fully open	Check the opening position and functionality of all fittings and valves.
	Intake filter of the blower is blocked	Check the pressure loss on the air filter. Replace the air filter.
Air consumption increases while the plant load remains the same	Oxygen probes are defective or out of calibration	Check and calibrate the oxygen probes.
	Intensification of the sludge respiration	Check the sludge load and the sludge age. If necessary reduce sludge load and sludge age.
Uneven air distribution in the basin (between Mixer/Aerators)	The shut-off fittings upstream of the aerators have been opened to different degrees	Adapt the degree of shutoff valve opening until an even air distribution is achieved.
	Ring sparger are not aligned on same level Sparger outlets are covers by retaining plates	Check the installation of the ring spargers and correct if necessary

5.7 Informing Customer Service

If you need to contact Customer Service for assistance, we would ask you to have the following information to hand:

- Project number and year (Mixer/Aerator nameplate)
- Serial number of the drive unit
- Rating plate information
- Type and extent of the fault
- Suspected cause
- If possible, please make pictures of the damage or fault available

NOTE
Faults that arise during the warranty period and require repairs to the Mixer/Aerator may only be dealt with by INVENT Customer Service. We recommend that you take out a maintenance contract.

5.8 Disposing of the product

INVENT HYPERCLASSIC® Mixer/Aerators are constructed with an environmentally sound approach, and can therefore be disposed of in an environmentally friendly manner. The following sections give recommendations for any disposal of the Mixer/Aerator components that may be required.

5.8.1 Drive unit

The drive unit consists of the electric motor, gear unit and mounting plate. The drive unit housing is made of grey cast iron, the motor's coil out of copper, and the mounting plate out of normal commercial steel. These components can thus be disposed of as scrap metal and recycled. Simply make sure that the gear oil is properly disposed of by an authorized collection point, either before or during disposal. If the drive unit is still intact, it is recommended to give or sell it to a used plant dealer.

5.8.2 Mixer body

The mixer body is constructed of high-grade glass-fiber reinforced plastic. For disposal, it is recommended that the metallic parts laminated into them should be removed, and the GRP parts sawed up into manageable pieces.

⚠ WARNING **When sawing, grinding or drilling GRP, personal safety equipment must be worn. Eye protection, respiratory protection and gloves are essential.**

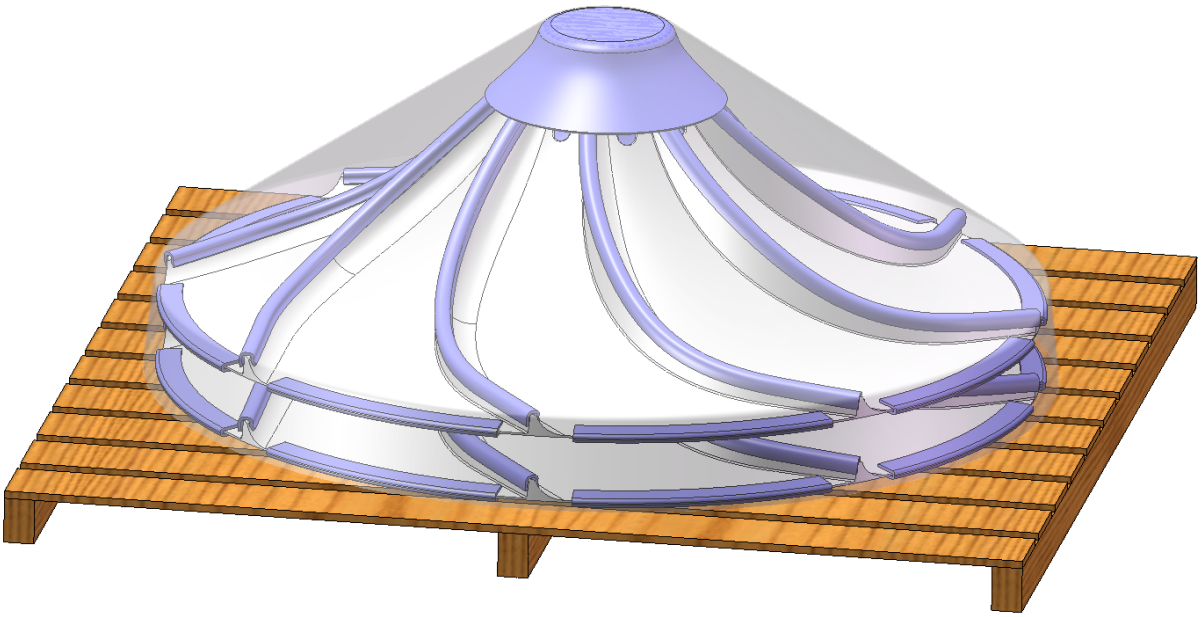
The remaining pieces can be disposed of at an authorized collection point.

3. Storage Requirements

INVENT HYPERCLASSIC®-Mixing and Aeration System

Vertical Shaft Hyperbolic Mixer/Aerators

Storage Requirements



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1. Delivery of the mixer/aerator components

INVENT HYPERCLASSIC®-Mixing and Aeration System are normally delivered to the installation site as individually packaged components. The following packages will usually be supplied:

1.1. Drive unit.

- Drive units will be delivered packed on pallets. They will be packed either individually or in pairs

Figure 1: Delivery of the drives

1.2. Shaft.

- Shafts will be packed in crates either individually or in group.

Figure 2: Delivery of the shaft

1.3. Hyperboloid Mixer Body

- Mixer bodies will be delivered on wooden pallets. The pallet will contain either a single mixer body or a stack of two.
- Wooden blocks are used to prevent them moving and they are secured to the pallet using straps. Foam protection is used on the edges, transport ribs and the flange connection point to protect the mixer body from knocks and bumps during transportation and handling.
- The ring spargers are packed in the same package as the mixer bodies

Figure 3: Delivery of the mixer body

1.4. Box of small parts

- In addition, the delivery includes a box of small components used for the installation of the mixer, plus any necessary accessories and special tools. This will either be included in one of the packages described above, or on an additional pallet depending on the size of the project.

2. Short term storage requirements for the mixer components.

It is imperative that the mixer/aerator components are stored correctly after delivery. Failure to follow the below listed storage instructions may void the warranty.

It is best to store the mixer body, shaft and small parts in the original, undamaged packaging, and in a dry enclosed area. The materials should be protected from effects of the weather, such as rain, snow and direct sunlight. When choosing a place of storage, make sure that it is protected from building-site traffic and other outside influences.

Special preventive protection will be required, if the storage period is longer than 4 months. Please see section 3 on long term storage for more details.

2.1. Short term storage instructions for the drive units

- The place of storage must be free from vibration and excessive amounts of dust or other contaminants (A metal container is not suitable unless it is climate controlled as it will not protect the drives from temperature fluctuations and will actually increase the temperature fluctuations in summer conditions).

Caution

Do not stack drive units!
Ensure a stable temperature environment is maintained!

- The gear units are provided with internal protection for short term storage. The hollow shaft and the flange surfaces are provided with a protective coating that is sufficient for the above mentioned storage conditions.

- In the case of prolonged storage (> 4 months), please see section 3 for long term storage details.

- The gear units will be delivered with running oil. This oil protects the gears and bearing for short term storage.

Caution

Do not damage the coating! Mechanical (scratches), chemical (acids, alkaline solutions) or thermal (sparks, welding beam, heat) damage leads to corrosion and to the failure of the external protection.

2.2. Short term storage instructions for mixer/aerator shafts

The shafts should be stored under clean and dry conditions and must be protected from the weather. The following points should be taken into account during storage:

- The upper shaft end must be greased and protected from damage by a plastic net or similar (supplied by **INVENT** as part of original delivery). Further more, the shaft end has to be protected with wrapped foil to protect it from humidity (supplied by **INVENT** as part of original delivery).
- The surface of the shaft must be protected from scratches by being wrapped in heavy duty plastic (supplied by **INVENT** as part of original delivery).
- The lower flange should likewise be wrapped to prevent damage.
- If components are not stored in the original packaging, they must be stored on a smooth, flat surface that is free from stones or other debris and must be protected as listed above. Use squared timbers as supports. The distance between supports must not exceed 5ft (1.5m).
- Shafts may be stacked.
- If mixer shafts are stacked during storage, they must be stacked alternately and the support span must not exceed 5ft or 1.5m. In addition, the stack must be laterally secured (see Figure 4).

Figure 4: Storing shafts in stacks

2.3. Short term storage instructions for mixer bodies

- Mixer bodies can be stored in the open air. Store the mixer body in shrink-wrapping on a wooden pallet.

Information

For safety and protection during long periods of storage, we recommend contacting **INVENT** Customer Service.

3. Long term storage conditions

The folowing storage conditions should be folowed if the storage time is over 4 months. These storage conditions should be implemented as soon as possible. Preferably at the time of receipt of the goods.

3.1. Long term storage conditions for drive units

- The drive units should be removed from their original packing and stored in the intended mounting position on a pallet (see figure 6).
- The drive units should be stored in a dry area that is not subject to fluctuations in temperature. The storage area must be climate controlled to ensure that temperature is maintained at all times.
- The place of storage must be free from vibration and excessive amounts of dust or other contaminants.
- If the intended storage time is over 9 months, the oil should be topped off and an oil additive added to the oil.

Figure 6: Storing position for drive

3.2. Long term idle conditions for installed drive unit

Long term storage conditions should also be applied to drives that are installed, but not in operation.

- The oil in the gearbox should be topped off (an additive added if the idle time will be over 9 months). The drive should be wrapped in plastic to keep dust away from the units and heating blankets should be installed to keep the internal temperature of the drives constant until such a time as the units are ready to be put into operation.

3.3. Long term storage conditions for shafts and mixer bodies.

Long term storage conditions for the mixer bodies and shafts are the same as for normal storage. The only additions are: -

- The mixer bodies and shafts need to be covered in order to exclude UV light.
- They should also be stored under cover to avoid snow build up on top of the mixers.

4. Technical Data

Technical Data of the HYPERCLASSIC®- Mixer/Aerator 2500-26-12.5hp
IET-60437 Taunton WWTP

diameter:	2500 mm EVO6	
transport ribs	8 transport ribs	
construction:	parallel shaft helical geared motor with hollow shaft mounted on center bonded mounts; drive shaft bottom bearing	
material:	gear base	St 37-2, primed and varnished
	drive shaft	high grade steel, ASTM 316
	hyperboloid mixer body	high quality FRP
	transport ribs	8 transport ribs integrated
weight:	hyperboloid mixer body	276 lbs
	drive shaft	173 lbs
	parallel shaft helical geared motor	838 lbs
dimensions drive shaft:		
	length	155 "

Motor:

Brand	SEW	
Motortype	DRN132L4/TF/C	
Rated Power	12.3	hp
Voltage	230/460	V
Frequency	60	Hz
Rated current	33.00/16.50	A
Rated rpm	1775	min^{-1}
Protection type	IP66	
ISO-Class	IE3	
Motor Protection	PTC	
Anti Condensation Heater	115V/45W Strip Heater	

Drive Unit

Brand	SEW	
Gear type	FAF107	
Rated rpm	26	min^{-1}
Gear Ratio	67.62	
Oil Sort	CLP 220 Miner. Oil	
Form	M4	

Process Data of the HYPERCLASSIC®- Mixer

Rotational direction:	3x	clockwise
	3x	counter clockwise
Rotation speed:	26	min^{-1}

HYPERCLASSIC® Mixer/Aerator design

December 17. 2021

Offer number	QT-1311030-HCMA-Rev00
Project	Taunton. MA Re-Aeration Zones
Sales contact	Patrick O'Donnell

Waste water properties			
Origin		municipal	
MLSS concentration		5,000	ppm
SVI		80	ml/g
Temperature		68	°F
Basin geometry			
Basin type		rectangular	
Width		36.8	ft
Length		36.8	ft
Water depth		10.0	ft
Freeboard		4.0	ft
Basin area		1,356	sqft
Basin volume		0.101	Mgal
Number of basins		6	-
Aeration system			
Number of mixers per basin		1	-
Total number of mixers		6	-
Required SOTR per basin		29.3	lbO2/h
Air flow per HCMA		148	scfm
Air flow per basin		148	scfm
Total air flow (68 °F, 14.7 PSI)		890	scfm
Aeration depth		10.0	ft
SOTE (oxygen utilisation)		19.0	%
Pressure loss @ battery limits		4.6	PSI
Atmospheric pressure		14.7	PSI
SOTR design			
Standard temperature		68	°F
Alpha value		0.85	-
Beta value		0.98	-
Altitude a.s.l.		0	ft
Dissolved oxygen (DO)		3.0	mg/l
AORh (AOR/tAer)		17.0	lbO2/h
aSOTR		24.9	lbO2/h
AORh/SOTR		0.58	-
Mixer			
	Mixing mode	**Aeration mode**	
Output speed	18.0	26.2	rpm
Power input	3.3	9.3	hp
Power consumption	3.8	10.7	hp
Power density	0.24	0.68	hp/1000 cuft
Power reserve	75	25	%
Type		HCMA/2500-26-12.5hp	
Selected diameter		98.4	in
Rated power		12.5	hp
Grid frequency		60	Hz
Rated voltage		460	V
Rated current		15.4	A
Start-up current		126.3	A
Static axial force		1,479	lbf
Dynamic axial force		1,315	lbf
Rated torque		29,700	lb.in
Start-up torque		103,950	lb.in
Total mixer weight		1,477	lb

Information

Please note that the following data may be incomplete.
When ordering spare parts please indicate the complete serial number.

Catalog designation

FAF107 DRN132L4/TF/C
Parallel-shaft helical gearmotors F..DRN.. (IE3)

Click these icons for further information in Online Support

Reference data

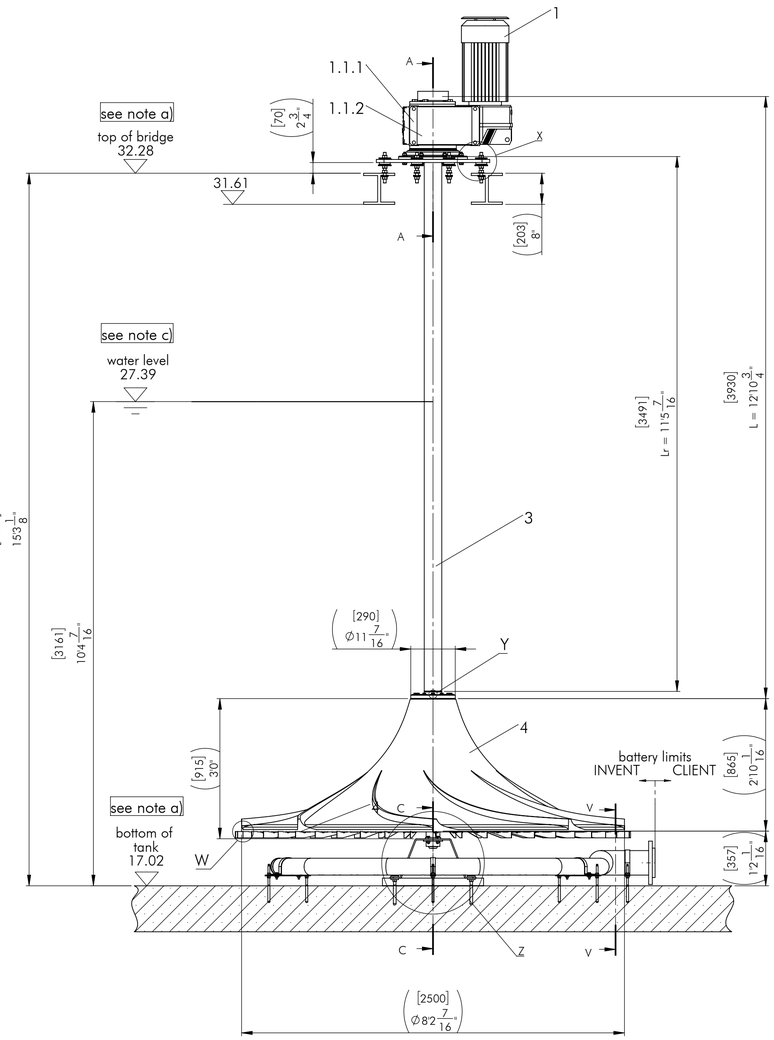
Transaction	: 82380958
Item	: 100
Serial number	: 87.8238095801.0001-0006X23.10

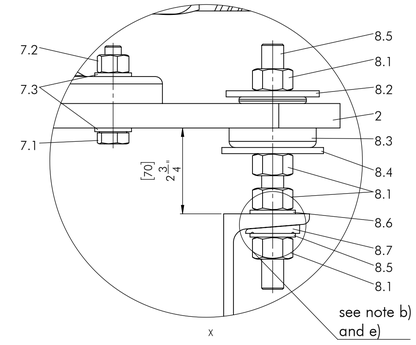
Product data

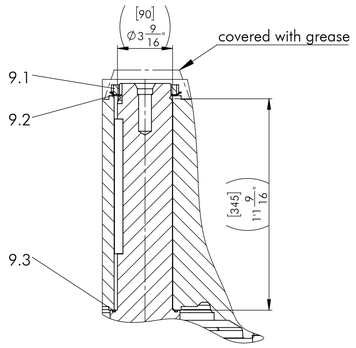
Speed [r/min]	: 1775 / 26
Total ratio [i]	: 67,62
Ma max [Nm]	: 7.680
Output torque [Nm]	: 3350
Service factor SEW-FB	: 2,30
Mounting position	: M4
Drive with special feature	: Yes
ISO code	: CLP 220
Lubricant type	: Miner.Oil
Lubricant volume [l]	: 36,50
Motor power [kW]	: 9.2
Motor power [HP]	: 12.3
Motor frequency [Hz]	: 60
Cyclic duration factor S1-S10	: S1
Motor voltage [V] / conn. type	: 230/460 double star/star
Rated current [A]	: 33,00 / 16,50
cos phi	: 0,76
Thermal cl.[°C]/Enclosure[IP]	: 155(F) / 66
Service factor motor	: 1.15
International efficiency class	: IE3
Efficiency (100% Pn) [%]	: 91,7
Design specification	: USA (UR) /Canada (CSA)
K.V.A.code	: K
Design	: NEMA A
Ambient temperature min. [°C]	: -20
Ambient temperature max. [°C]	: 40
CT speed range	: 300-1800RPM
Nameplate	: English / Imperial units
COO	: US
Weight	: 367.00 kg

5. Drawings

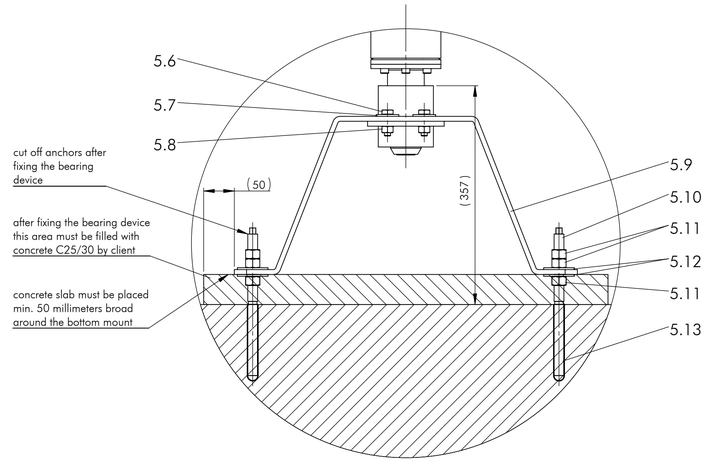
Notes:
a) Level/dimensions to be verified and confirmed by Contractor. Wrong levels/dimension would result in an incorrect shaft length, which might have consequenses on the mixing performance.
b) Contractor needs to confirm the type of structure on which the baseplate will be mounted. Design and dimensions of structure is client´s responsibility
c) Level to be verified and confirmed by Engineer/Contractor. Too high water level might cause a gear drive failure
d) Mixer must not operate below indicated level in order to avoid severe damage to entire unit.
e) If the support structure requires the installation of any wedge washers to align the mounting hardware, Contractor to provide the appropriate wedge washers.
f) Contractor needs to confirm the type of structure on which the bottom support will be mounted (if applicable).



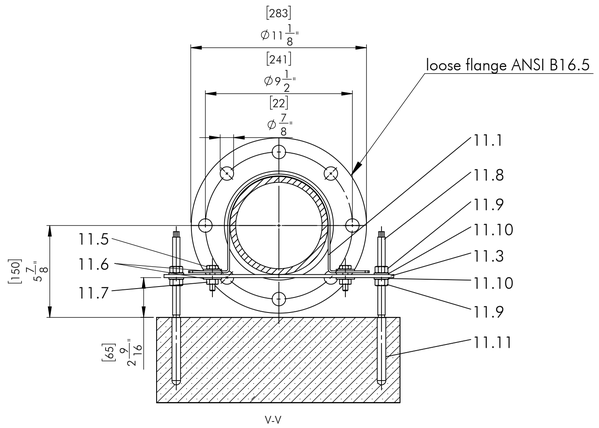


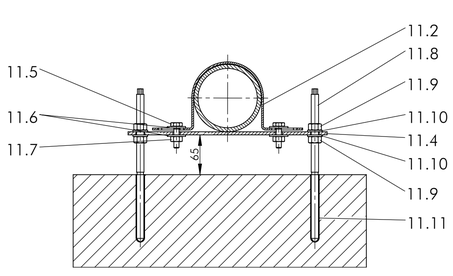


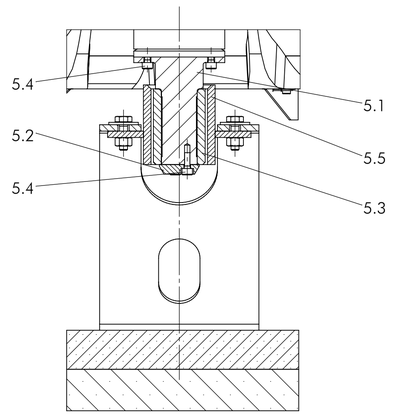
Section through the hollow shaft



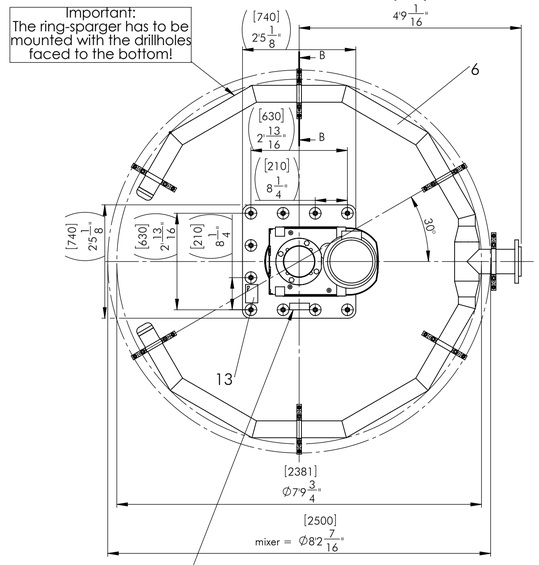
Z
Shown without mixer body/ring-sparger

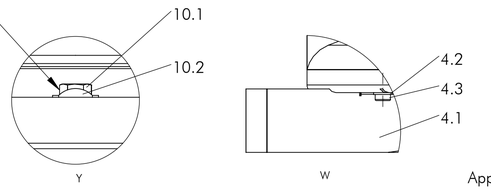






C-C



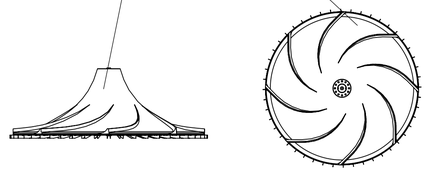


Details and sections are not drawn to scale

Important:
all bolt connections of the entire plant have to be secured with a medium-strenght bolt securing paste (e.g. loctite)

For counter clockwise (ccw) mixer

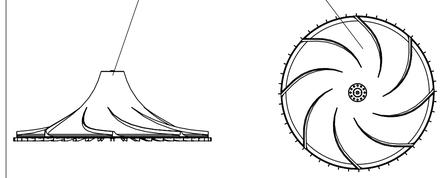
use mixerbody 2500 04 00 (Complete 2500 left)



apply the rotation indicator "left" on the mounting base

For clockwise (cw) mixer

use mixerbody 2500 03 00 (Complete 2500 right)



apply the rotation indicator "right" on the mounting base

ITEM NO.	QTY.	DESCRIPTION	STANDARD	MATERIAL	ARTNR
1	1	Gear Drive	FAF107-DRN132L4	-	-
1.1	1	Labeling Drive Unit	HCM A F.AF148 FAF107 - SEW	A570	14950
1.1.1	2	Plate For Sticker (Drive)	F.AF149 FAF107 454x254	A 570 GR.36	10532
1.1.2	2	Drive Label Sticker	HCM F.AF149 FAF107 358x246	-	14948
2	1	Mounting Base	2540 00 14	Fe 360 B	10093
3	1	Shaft	2611 05 00	316 Ti	11436
4	1	Mixer Body HCMA Complete	According to rotational direction		-
4.1	48	Shear Fin	2565 00 30	316L / 316 Ti	11014
4.2	96	Washer	DIN 125-A-6,4-A4	316	11019
4.3	96	Hexagon Head Screw	DIN 933-M6x10	316	20731
5	1	Bottom Guide HCMA	UNGESPÜLT - 1.4571	316L / 316Ti	11321
5.1	1	Bearing Journal	2810 02 07	316L / 316Ti	11816
5.2	1	Retaining Disc	2571 00 01	316L / 316Ti	11305
5.3	1	Sliding Bushing	2563 00 54	#425-07	21421
5.4	9	Socket Head Cap Screw	DIN 912-M8x20-A4-TufLok	316	15076
5.5	1	Guide Bush	3553 01 00	316L / 316Ti	11309
5.6	4	Hexagon Head Screw	DIN 933-M12x40 TufLok	316	15515
5.7	2	Washer for guide bush	2563 00 41	316	20474
5.8	4	Hexagon Nut	DIN 934-M12-A4	316	10666
5.9	1	Bottom Mount for Guide Bush	2563 00 17	316L / 316Ti	13878
5.10	4	Anchor Rod	M16x250-A4	316	10281
5.11	12	Hexagon Nut	DIN 934-M16-A4	316	10063
5.12	8	Washer	2563 00 43	316	20476
5.13	4	Resin Capsule	M16		10638
6	1	ring sparger	2550 00 42	PE100	14069
7	1	Fixing Set Drive	F.AF129 - F.AF128 - FAF097		10671
7.1	8	Hexagon Head Screw	DIN 933-M16x70-A4-TufLok	316	15519
7.2	8	Hexagon Nut	DIN 934-M16-A4	316	10063
7.3	16	Washer	DIN 125-A-17-A4	316	10067
8	1	Fixing Set Mounting Base	2540 00 14 - Stahl		11010
8.1	48	Hexagon Nut	DIN 934-M20-A4	316	10062
8.2	12	Washer Rubber Buffer	2571 00 04	316	10617
8.3	12	Rubber Buffer	CBA 28-1050	A4/EPDM	10553
8.4	12	Washer Rubber Buffer	2571 00 02	316	10618
8.5	12	Threaded Rod	DIN 975 M20x200	316	10626
8.6	24	Washer	DIN 125-A-21	316	10535
8.7	12	Taper Washer	DIN 434-22	gal.	10636
9	1	Fixing Set Shaft	HW90x350		10977
9.1	1	Groove Nut	DIN 981-KM 17-M85x2	Steel	10961
9.2	1	Retaining Washer	MB 17/Ø85	Steel	10969
9.3	1	O-Ring Seal	98,02x3,53	NBR 70 Shore	10953
10	1	Fixing Set Mixer Body	HCMA-VA GEN6-2500		11034
10.1	13	Hexagon Head Screw Tuflok	DIN 931-M12x80-A4-TufLok	316	14019
10.2	12	Washer	DIN 9021-13-A4	A4	10068
11	1	Fixing Set Ring Sparger	ø2500 ø160-ø110		11297
11.1	1	Pipe Clamp Ring Sparger	3557 00 03	316L / 316Ti	11047
11.2	6	Pipe Clamp Ring Sparger	3557 00 01	316L / 316Ti	11045
11.3	1	Plate for Pipe Clamp	2564 01 02	316L / 316Ti	11079
11.4	6	Plate for Pipe Clamp	2564 01 01	316L / 316Ti	11078
11.5	14	Hexagon Head Screw	DIN 933-M10x35-A4-TufLok	316	15514
11.6	28	Washer	DIN 9021-10,5-A4	316	10263
11.7	14	Hexagon Nut	DIN 934-M10-A4	316	10134
11.8	14	Anchor Rod	M12x250-A4	316	10276
11.9	28	Hexagon Nut	DIN 934-M12-A4	316	10666
11.10	28	Washer	DIN 125-A-13-A4	316	10667
11.11	14	Resin Capsule	M12		11236
12	1	Rotation indicator	According to rotational direction		-
13	1	Name plate mixer	-	Aluminium	18397

corners per DIN ISO 13715 -0,3 -0,5 +0,5 +0,3
geometric tolerances DIN ISO 1101
general tolerances per DIN ISO 2768-1 m
surface texture per ISO 1302 in micrometers

scale 1:20
material:
Taunton, MA
64150TAUNINVE08

	date	name	sign.
drawn	06.10.22	BHa	
contr.			
acce.			

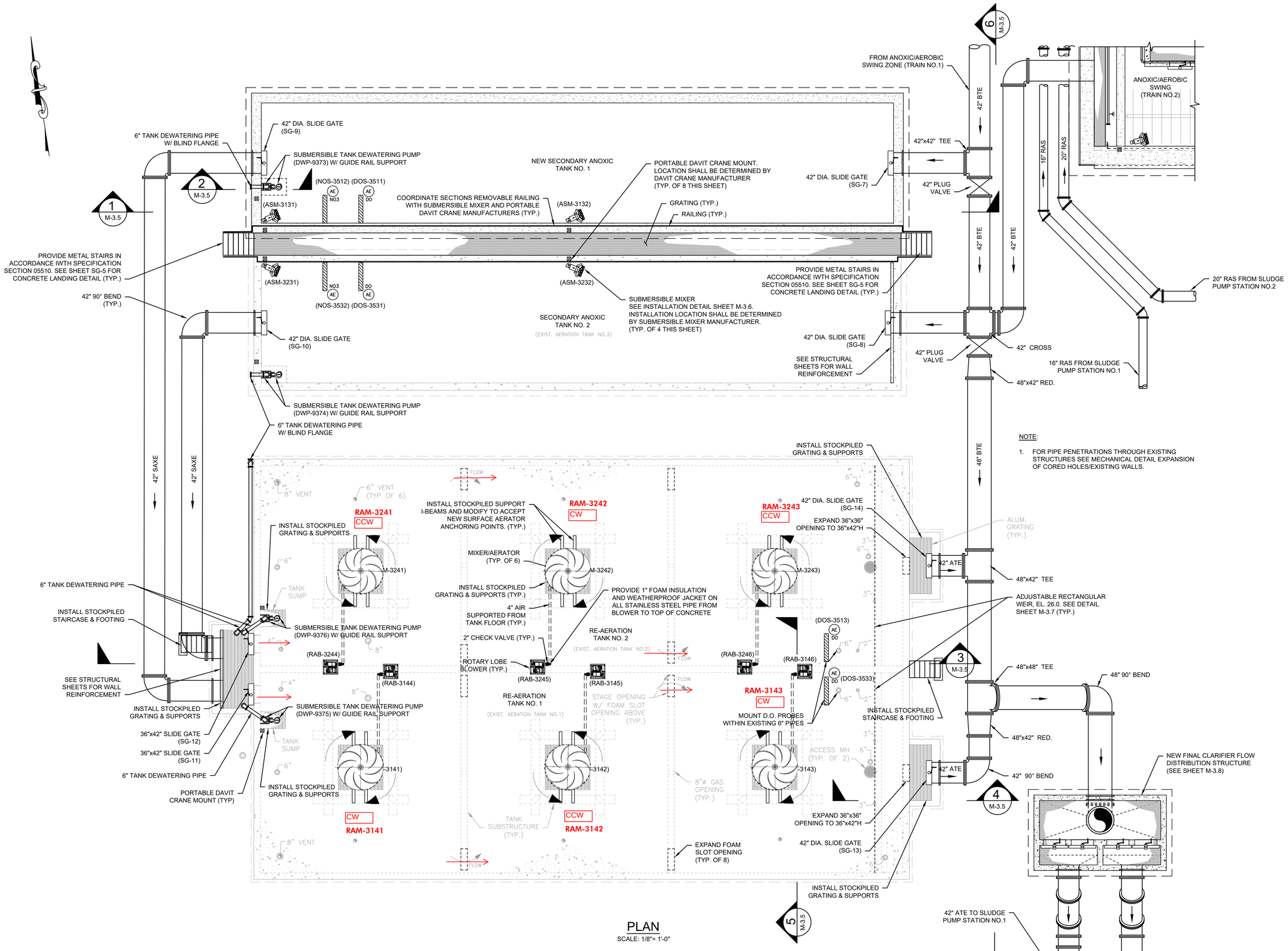
HYPERCLASSIC MIXER/AERATOR-2500-26-12,5hp
cw rot. RAM-3141, RAM-3143, RAM-3242
ccw rot. RAM-3142, RAM-3241, RAM-3243

INVENT
Umwelt- und Verfahrenstechnik AG

64150-Z002 | A1 | 1/1

nr.	revision	date	name

12.10.2022



PLAN

SCALE: 1/8"= 1'-0"

NOTE:

1. FOR PIPE PENETRATIONS THROUGH EXISTING STRUCTURES SEE MECHANICAL DETAIL EXPANSION OF CORED HOLES/EXISTING WALLS.

PREPARED BY

BETA
www.BETA-Inc.com

REGISTERED PROFESSIONAL

COMMONWEALTH OF MASSACHUSETTS
JOSEPH FEDERICO, JR.
No. 30853
REGISTERED PROFESSIONAL ENGINEER

SUBCONSULTANT

PROJECT

Taunton Wastewater Treatment Facility Improvements Phase 2

Taunton, MA

TITLE

Secondary Anoxic & Re-Aeration Tanks No.1 & 2 Plans

NO.	REVISIONS	DATE

DRAWN BY:	BM
DESIGNED BY:	BM
CHECKED BY:	SR
ISSUE DATE:	3/31/2022
BETA JOB NO.:	6050

SCALE

AS SHOWN

SHEET NO.

M-3.4

6. Gear Unit Operating Instructions

SEW EURODRIVE

Assembly and Operating Instructions

Gear Unit Model Series R.., F.., K.., S.., SPIROPLAN® W..

Edition 05/2021

26865351/EN

Table of contents

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1 General information

1.1 About this documentation

The documentation at hand is the original.

This documentation is an integral part of the product. The documentation is intended for all employees who perform work on the product.

Make sure this documentation is accessible and legible. Ensure that persons responsible for the systems and their operation as well as persons who work on the product independently have read through the documentation carefully and understood it. If you are unclear about any of the information in this documentation or if you require further information, contact SEW-EURODRIVE.

1.2 Structure of the safety notes

1.2.1 Meaning of signal words

The following table shows the grading and meaning of the signal words for safety notes.

Signal word	Meaning	Consequences if disregarded
⚠ **DANGER**	Imminent hazard	Severe or fatal injuries
⚠ **WARNING**	Possible dangerous situation	Severe or fatal injuries
⚠ **CAUTION**	Possible dangerous situation	Minor injuries
NOTICE	Possible damage to property	Damage to the product or its environment
INFORMATION	Useful information or tip: Simplifies handling of the product.	

1.2.2 Structure of section-related safety notes

Section-related safety notes do not apply to a specific action but to several actions pertaining to one subject. The hazard symbols used either indicate a general hazard or a specific hazard.

This is the formal structure of a safety note for a specific section:

SIGNAL WORD

Type and source of hazard.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the hazard.

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Meaning of the hazard symbols

The hazard symbols in the safety notes have the following meaning:

Hazard symbol	Meaning
	General hazard
	Warning of hot surfaces
	Warning of risk of crushing
	Warning of automatic restart

1.2.3 Structure of embedded safety notes

Embedded safety notes are directly integrated into the instructions just before the description of the dangerous action.

This is the formal structure of an embedded safety note:

⚠ **SIGNAL WORD!** Type and source of hazard. Possible consequence(s) if disregarded. Measure(s) to prevent the hazard.

1.3 Rights to claim under limited warranty

Read the information in this documentation. This is essential for fault-free operation and fulfillment of any rights to claim under limited warranty. Read the documentation before you start working with the product.

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1.4 Product names and trademarks

The brands and product names in this documentation are trademarks or registered trademarks of their respective titleholders.

1.5 Copyright notice

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2 Safety notes

2.1 Preliminary information

The following general safety notes serve the purpose of preventing injury to persons and damage to property. They primarily apply to the use of products described in this documentation. If you use additional components, also observe the relevant warning and safety notes.

2.2 Duties of the user

As the user, you must ensure that the basic safety notes are observed and complied with. Make sure that persons responsible for the machinery and its operation as well as persons who work on the device independently have read through the documentation carefully and understood it.

As the user, you must ensure that all of the work listed in the following may be carried out only by qualified specialists:

- Setup and installation
- Installation and connection
- Startup
- Maintenance and repairs
- Shutdown
- Disassembly

Ensure that the persons who work on the product pay attention to the following regulations, conditions, documentation, and information:

- National and regional safety and accident prevention regulations
- Warning and safety signs on the product
- All other relevant project planning documents, installation and startup instructions, and wiring diagrams
- Do not assemble, install or operate damaged products
- All system-specific specifications and conditions

Ensure that systems in which the product is installed are equipped with additional monitoring and protection devices. Observe the applicable safety regulations and legislation governing technical work equipment and accident prevention regulations.

2.3 Target group

Specialist for mechanical work

Any mechanical work may be performed only by adequately qualified specialists. Specialists in the context of this documentation are persons who are familiar with the design, mechanical installation, troubleshooting, and maintenance of the product who possess the following qualifications:

- Qualifications in the field of mechanics in accordance with the national regulations
- Familiarity with this documentation

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Specialist for electrotechnical work

Any electrotechnical work may be performed only by electrically skilled persons with a suitable education. Electrically skilled persons in the context of this documentation are persons who are familiar with electrical installation, startup, troubleshooting, and maintenance of the product who possess the following qualifications:

- Qualifications in the field of electrical engineering in accordance with the national regulations
- Familiarity with this documentation

Additional qualifications

In addition to that, these persons must be familiar with the valid safety regulations and laws, as well as with the requirements of the standards, directives, and laws specified in this documentation.

The persons must have the express authorization of the company to operate, program, parameterize, label, and ground devices, systems, and circuits in accordance with the standards of safety technology.

Instructed persons

All work in the areas of transportation, storage, operation and waste disposal must be carried out by persons who are trained appropriately. The purpose of the training is to give persons the ability to perform the required tasks and work steps in a safe and correct manner.

2.4 Designated use

The product is intended for use in industrial and commercial systems.

In case of installation in electrical systems or machines, startup of the product is prohibited until it is determined that the machine meets the requirements stipulated in the local laws and directives. For Europe, Machinery Directive 2006/42/EC as well as the EMC Directive 2014/30/EU apply.

Use in potentially explosive atmospheres is prohibited, unless specifically designated otherwise.

2.5 Transportation/storage

Inspect the shipment for damage as soon as you receive the delivery. Inform the shipping company immediately about any damage. If the product is damaged, it must not be assembled, installed or started up.

Observe the storage information concerning climatic conditions in accordance with chapter "Extended storage" (→ 🗎 187).

The permissible storage temperature is -30 °C to +50 °C.

If the product is not immediately installed, it must be stored in a dry and dust-free location. The product can be stored for up to 9 months without requiring any special measures before startup. Do not store the product outdoors.

The installed lifting eyebolts are in accordance with DIN 580. Observe the loads and regulations specified there. The tension force vector of the slings must not exceed a 45° angle in accordance with DIN 580.

The lifting eyes are designed to carry only the weight of the product. Do not mount any additional loads. If the product has several lifting eyes or lifting eyebolts, then you should use all lifting eyes and lifting eyebolts for attaching transport ropes. Tighten the screwed-in lifting eyes.

The gear units K..167 and K..187 have no lifting eyes and are supplied without lifting eyebolts. Use alternative, suitable slings.

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Use suitable, sufficiently rated handling equipment, that can be used for further transport.

2.6 Installation/assembly

Ensure that the product is installed and cooled according to the regulations in the documentation.

Protect the product from strong mechanical strain. The product and its mounting parts must never protrude into the path of persons or vehicles. Ensure that components are not deformed, particularly during transportation and handling. Electrical components must not be mechanically damaged or destroyed.

The following applications are prohibited unless the device is explicitly designed for such use:

- Operation in applications with impermissibly high mechanical vibration and shock loads in excess of the regulations stipulated in EN 61800-5-1
- Use in environments with harmful oils, acids, gases, vapors, dust, radiation, etc.

Before using a stainless steel shrink disk or stainless steel output shaft, check if the ambient conditions are compatible with the stainless steel material. For information on the material, refer to the order confirmation.

Observe the danger due to static overdetermination. Gear units with foot (e.g. KA19/29B, KA127/157B or FA127/157B) must not be fastened via the torque arm and the foot plate at the same time. Gearmotors must also not be fastened to the foot plate of the gear unit (e.g. KA19/29B, KA127/157B or FA127/157B, R gear unit with foot-mounted motor) and the foot plate of the motor at the same time.

2.7 Startup/operation

Check the oil level before startup as described in chapter "Inspection/maintenance" (→ 🗎 123).

Check that the direction of rotation is correct in the **decoupled** state. Listen out for unusual grinding noises as the shaft rotates.

Secure the keys for the test run without output elements.

Do not deactivate monitoring and protection devices even for a test run.

Switch off the gearmotor if in doubt whenever changes occur in relation to normal operation (e.g. increased temperatures, unusual noises, vibrations). Determine the cause. It may be necessary to contact SEW-EURODRIVE.

2.8 Cleaning

When using a stainless steel shrink disk or stainless steel output shaft, check if the cleaning agents and chemicals are compatible with the stainless steel material. For information on the material, refer to the order confirmation.

2.9 Inspection/maintenance

Observe the information in chapter "Inspection/maintenance" (→ 🗎 123).

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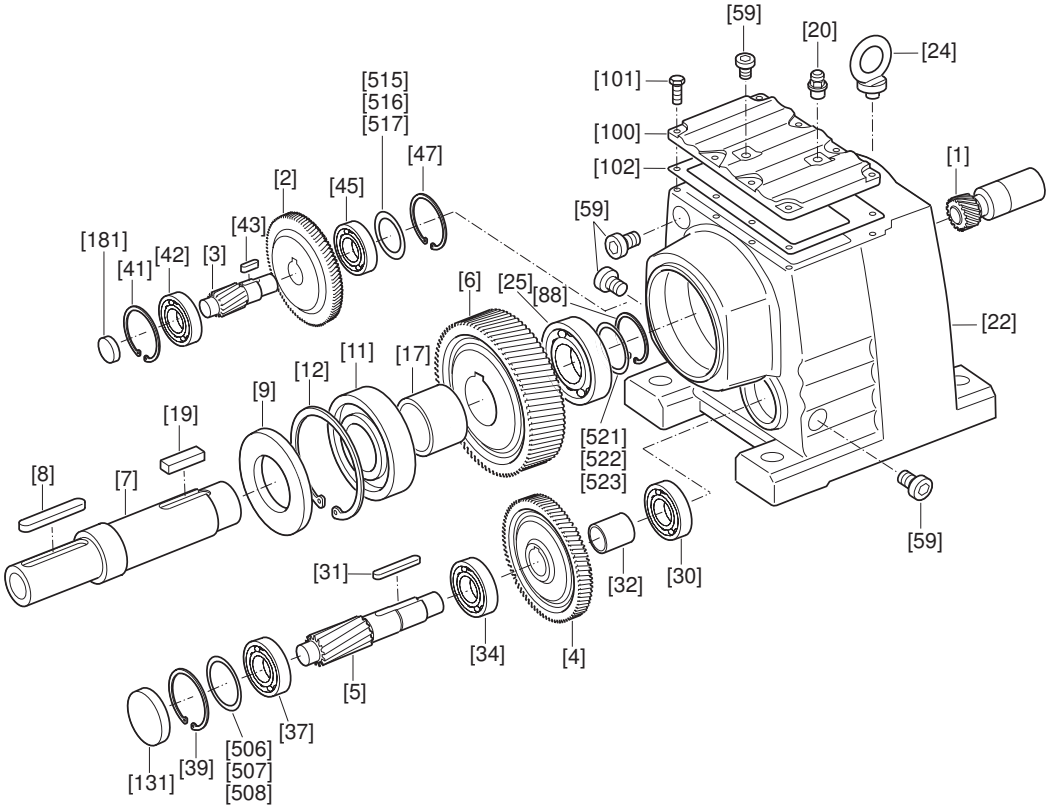
3 Gear unit structure

INFORMATION

The following figures are block diagrams. Their purpose is only to make it easier to assign components to the spare parts lists. Discrepancies may occur depending on the gear unit size and version.

3.1 Basic structure of helical gear units R..07 – R..167



18014398528676235

[1] Pinion
[2] Gear
[3] Pinion shaft
[4] Gear
[5] Pinion shaft
[6] Gear
[7] Output shaft
[8] Key
[9] Oil seal
[11] Rolling bearing
[12] Retaining ring
[17] Spacer tube
[19] Key
[20] Breather valve
[22] Gear unit housing
[24] Eyebolt
[25] Rolling bearing
[30] Rolling bearing
[31] Key
[32] Spacer tube
[34] Rolling bearing
[37] Rolling bearing
[39] Retaining ring
[41] Retaining ring
[42] Rolling bearing
[43] Key
[45] Rolling bearing
[47] Retaining ring
[59] Screw plug
[88] Retaining ring
[100] Inspection cover
[101] Hex head screw
[102] Gasket
[131] Closing cap
[181] Closing cap
[506] Shim
[507] Shim
[508] Shim
[515] Shim
[516] Shim
[517] Shim
[521] Shim
[522] Shim
[523] Shim

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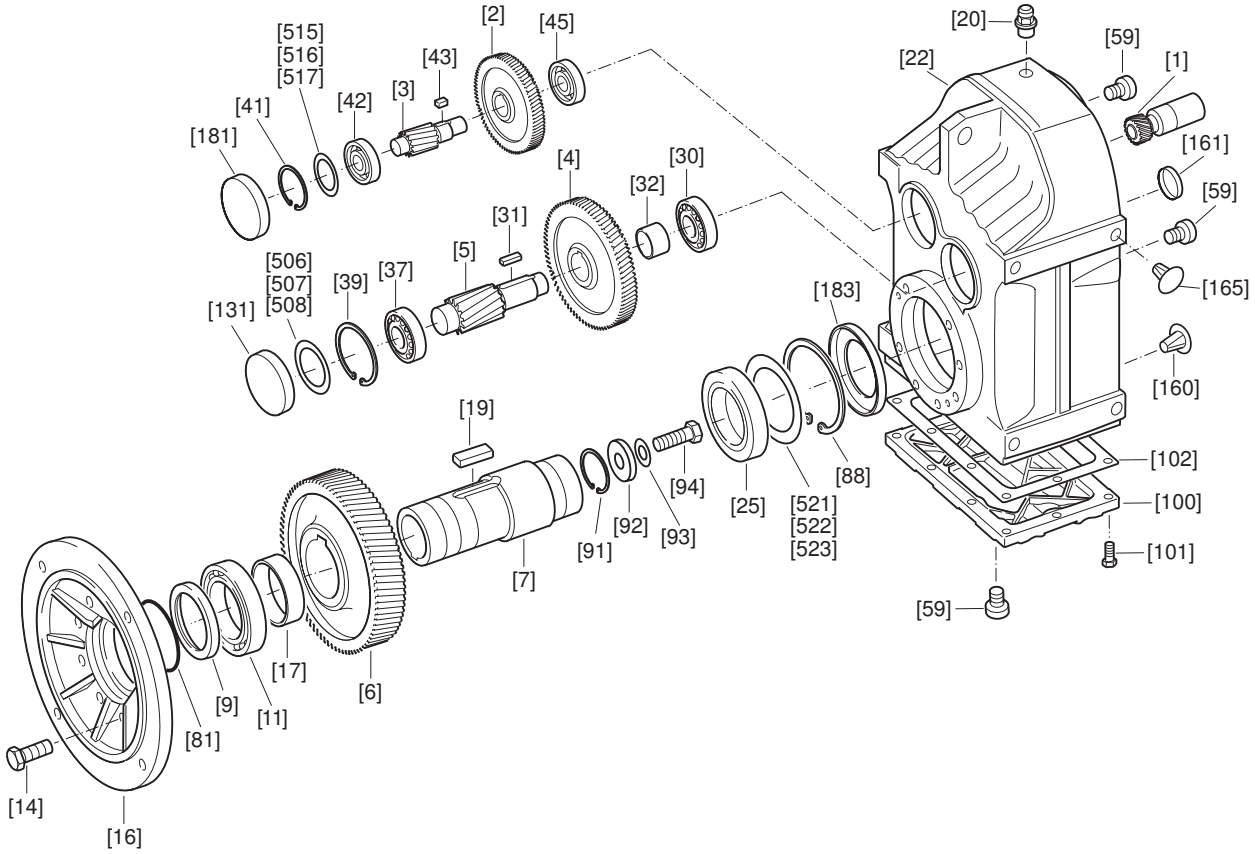
3.2 Basic structure of parallel-shaft helical gear units F..27 – F..157



9007199274039051

[1] Pinion
[2] Gear
[3] Pinion shaft
[4] Gear
[5] Pinion shaft
[6] Gear
[7] Hollow shaft
[9] Oil seal
[11] Rolling bearing
[14] Hex head screw
[16] Output flange
[17] Spacer tube
[19] Key
[20] Breather valve
[22] Gear unit housing
[25] Rolling bearing
[30] Rolling bearing
[31] Key
[32] Spacer tube
[37] Rolling bearing
[39] Retaining ring
[41] Retaining ring
[42] Rolling bearing
[43] Key
[45] Rolling bearing
[59] Screw plug
[81] Shield ring
[88] Retaining ring
[91] Retaining ring
[92] Washer
[93] Lock washer
[94] Hex head screw
[100] Inspection cover
[101] Hex head screw
[102] Gasket
[131] Closing cap
[160] Closing plug
[161] Closing cap
[165] Closing plug
[181] Closing cap
[183] Oil seal
[506] Shim
[507] Shim
[508] Shim
[515] Shim
[516] Shim
[517] Shim
[521] Shim
[522] Shim
[523] Shim

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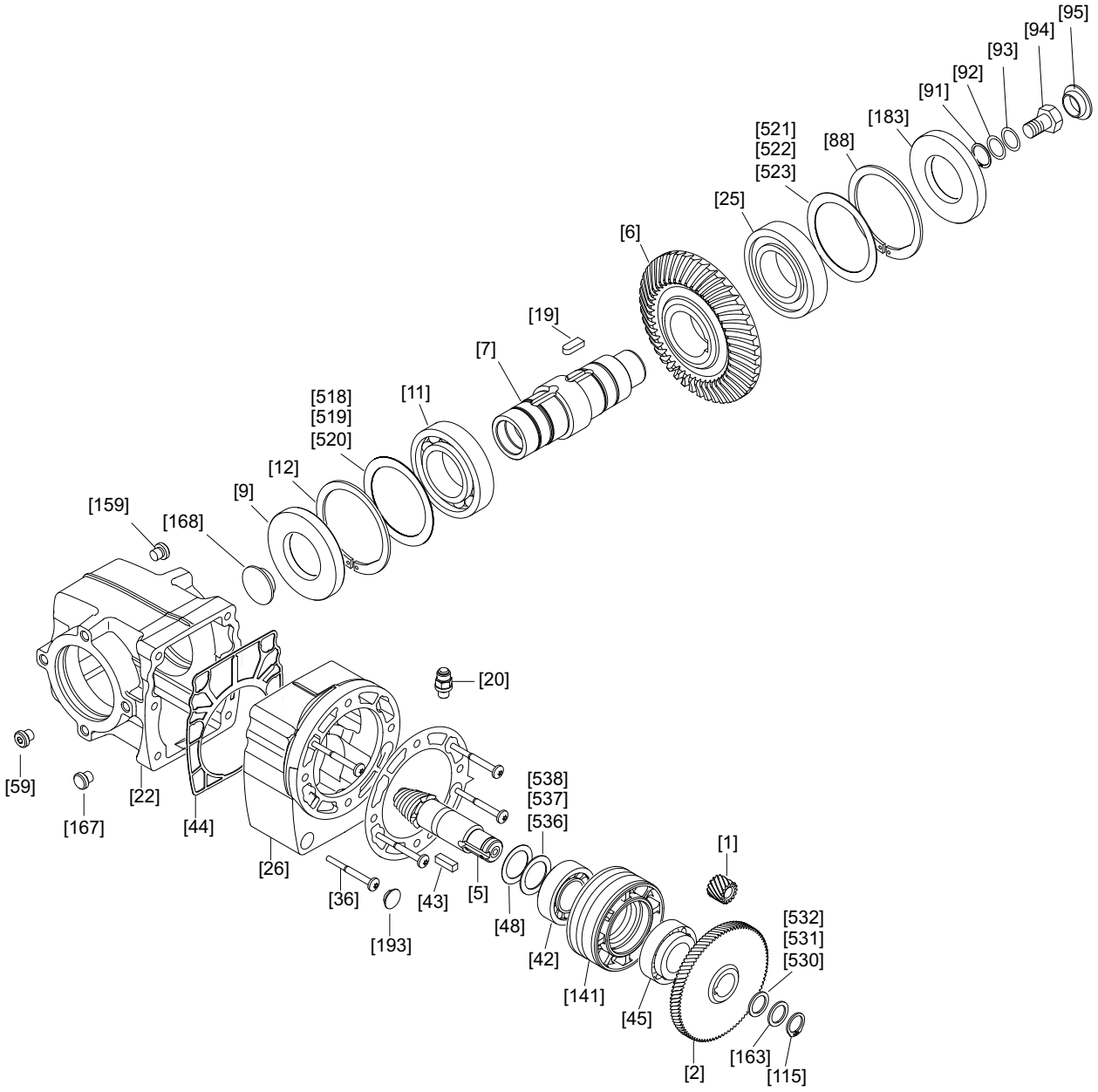
3.3 Basic structure of helical-bevel gear units K..19/K..29



9007206676351499

[1] Pinion
[2] Gear
[5] Pinion shaft
[6] Gear
[7] Hollow shaft
[9] Oil seal
[11] Rolling bearing
[12] Retaining ring
[19] Key
[20] Breather valve
[22] Gear unit housing
[25] Deep groove ball bearing
[26] Housing of 1st stage
[36] Stud
[42] Tapered roller bearing
[43] Key
[44] Seal
[45] Tapered roller bearing
[50] Bevel gear set
[59] Screw plug
[88] Retaining ring
[91] Retaining ring
[92] Washer
[93] Lock washer
[94] Hex head screw
[95] Protection cap
[115] Retaining ring
[141] Bushing
[159] Closing plug
[163] Supporting ring
[167] Closing plug
[168] Protection cap
[183] Oil seal
[193] Closing plug
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[519] Shim
[520] Shim
[521] Shim
[522] Shim
[523] Shim
[530] Shim
[531] Shim
[532] Shim
[536] Shim
[537] Shim
[538] Shim

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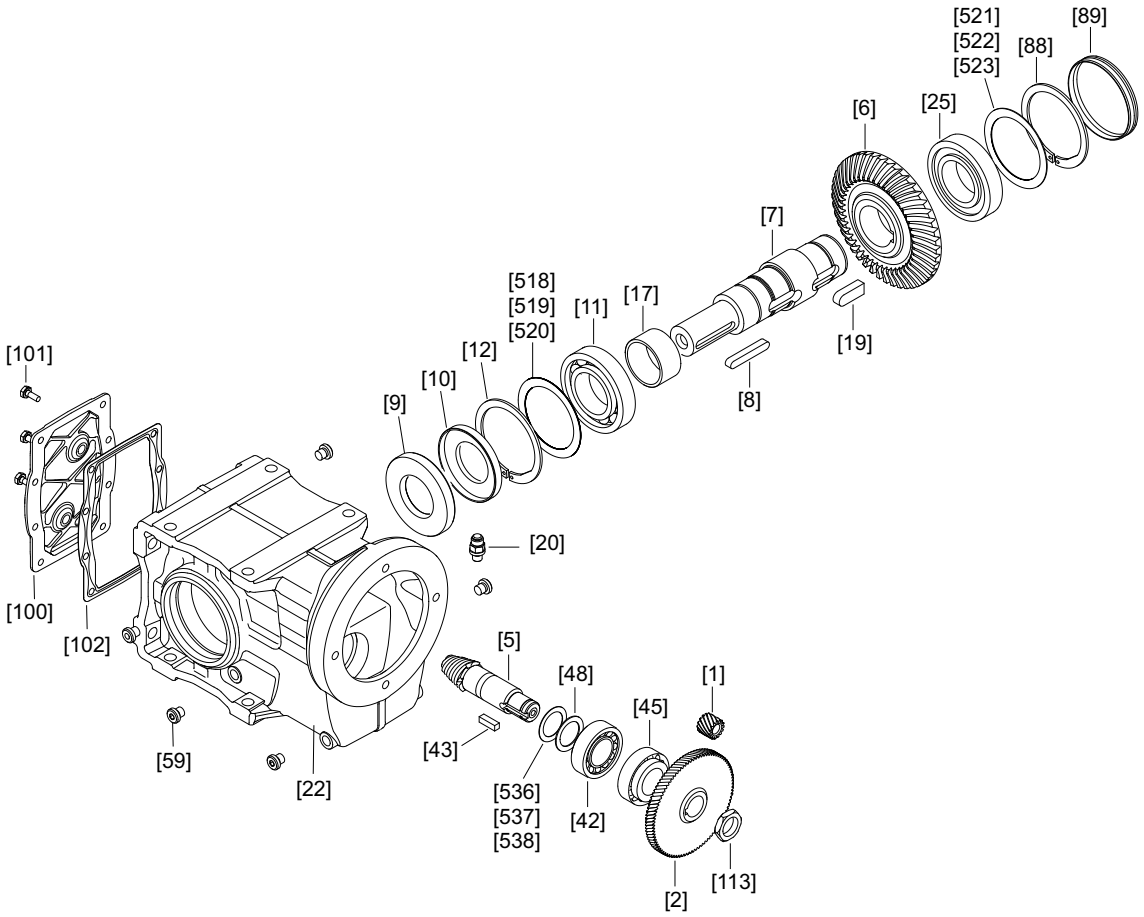
3.4 Basic structure of helical-bevel gear units K..39/K..49



14457456395

[1]	Pinion	[12]	Retaining ring	[48]	Supporting ring	[518]	Shim
[2]	Gear	[17]	Spacer tube	[50]	Bevel gear set	[519]	Shim
[5]	Pinion shaft	[19]	Key	[59]	Screw plug	[520]	Shim
[6]	Gear	[20]	Breather valve	[88]	Retaining ring	[521]	Shim
[7]	Hollow shaft	[22]	Gear unit housing	[89]	Closing cap	[522]	Shim
[8]	Key	[25]	Deep groove ball bearing	[100]	Inspection cover	[523]	Shim
[9]	Oil seal	[42]	Tapered roller bearing	[101]	Hex head screw	[536]	Shim
[10]	Oil seal	[43]	Key	[102]	Gasket	[537]	Shim
[11]	Deep groove ball bearing	[45]	Tapered roller bearing	[113]	Slotted nut	[538]	Shim

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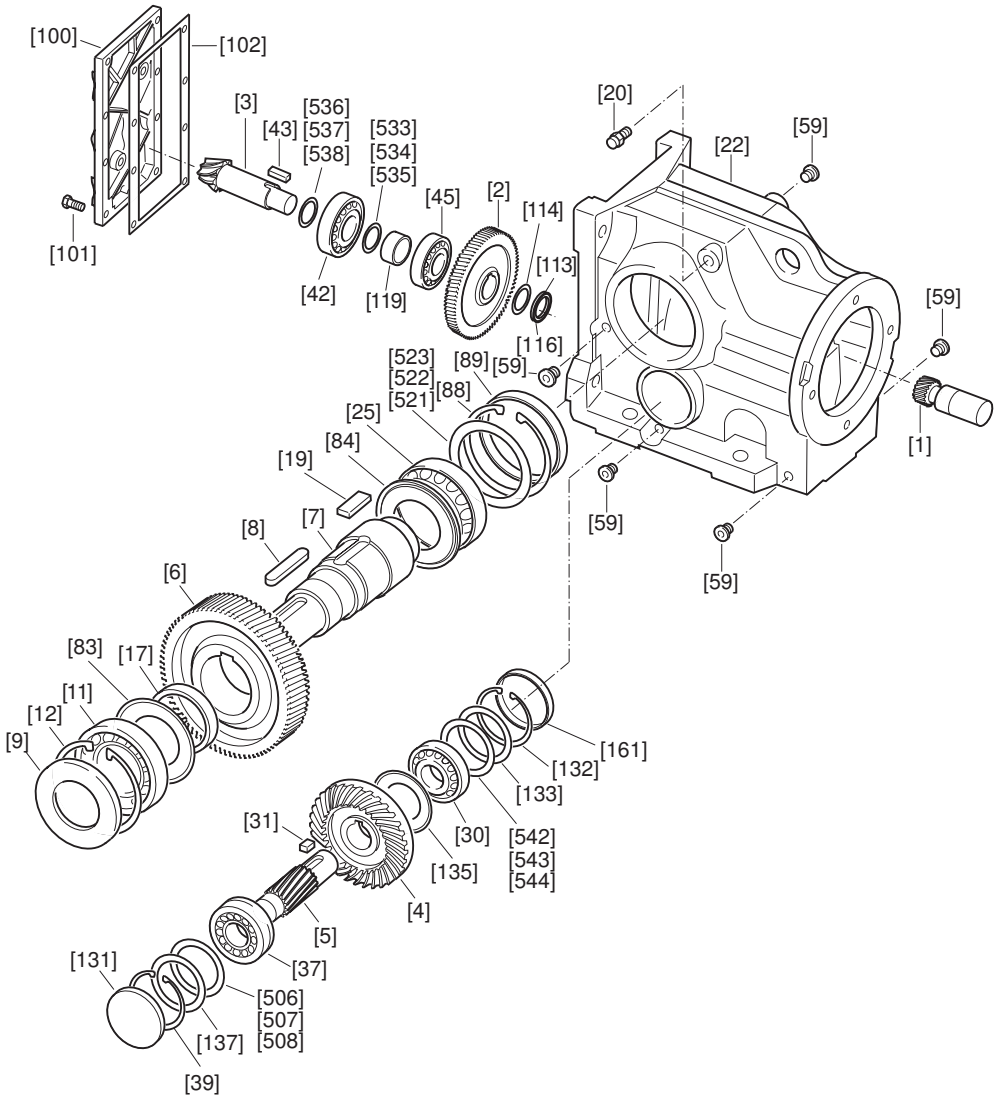
3.5 Basic structure of helical-bevel gear units K..37 – K..187



9007199274042123

[1] Pinion
[2] Gear
[3] Pinion shaft
[4] Gear
[5] Pinion shaft
[6] Gear
[7] Output shaft
[8] Key
[9] Oil seal
[11] Rolling bearing
[12] Retaining ring
[17] Spacer tube
[19] Key
[20] Breather valve
[22] Gear unit housing
[25] Rolling bearing
[30] Rolling bearing
[31] Key
[37] Rolling bearing
[39] Retaining ring
[42] Rolling bearing
[43] Key
[45] Rolling bearing
[59] Screw plug
[83] Shield ring
[84] Shield ring
[88] Retaining ring
[89] Closing cap
[100] Inspection cover
[101] Hex head screw
[102] Gasket
[113] Slotted nut
[114] Multi-tang washer
[116] Thread lock
[119] Spacer tube
[131] Closing cap
[132] Retaining ring
[133] Supporting ring
[135] Shield ring
[137] Supporting ring
[161] Closing cap
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[534] Shim
[535] Shim
[536] Shim
[537] Shim
[538] Shim
[542] Shim
[543] Shim
[544] Shim

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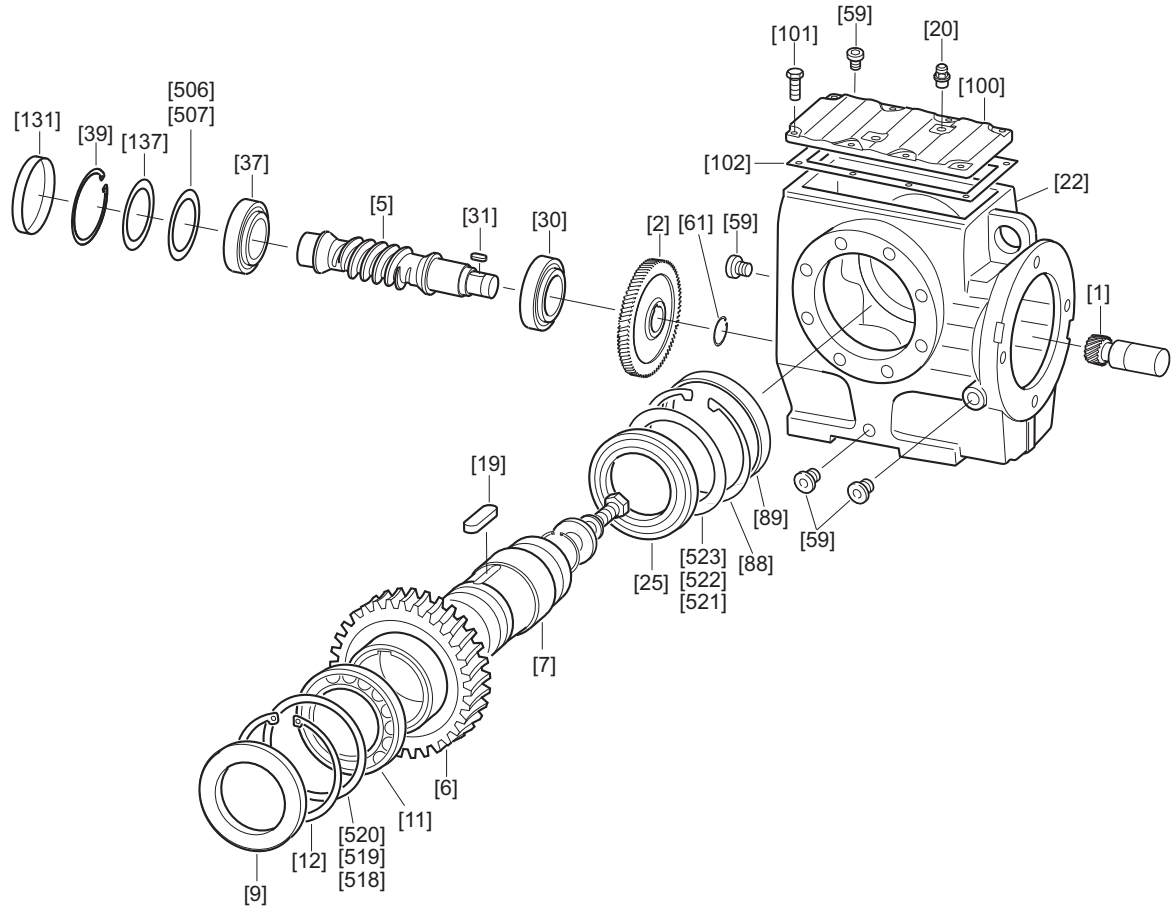
3.6 Basic structure of helical-worm gear units S..37 – S..97, S..37p – S..97p



18014398528786187

[1]	Pinion	[20]	Breather valve	[88]	Retaining ring	[518]	Shim
[2]	Gear	[22]	Gear unit housing	[89]	Closing cap	[519]	Shim
[5]	Worm	[25]	Rolling bearings	[100]	Gear unit cover	[520]	Shim
[6]	Worm gear	[30]	Rolling bearings	[101]	Hex head screw	[521]	Shim
[7]	Output shaft	[31]	Key	[102]	Gasket	[522]	Shim
[9]	Oil seal	[37]	Rolling bearings	[131]	Closing cap	[523]	Shim
[11]	Rolling bearings	[39]	Retaining ring	[137]	Supporting ring		
[12]	Retaining ring	[59]	Screw plug	[506]	Shim		
[19]	Key	[61]	Retaining ring	[507]	Shim		

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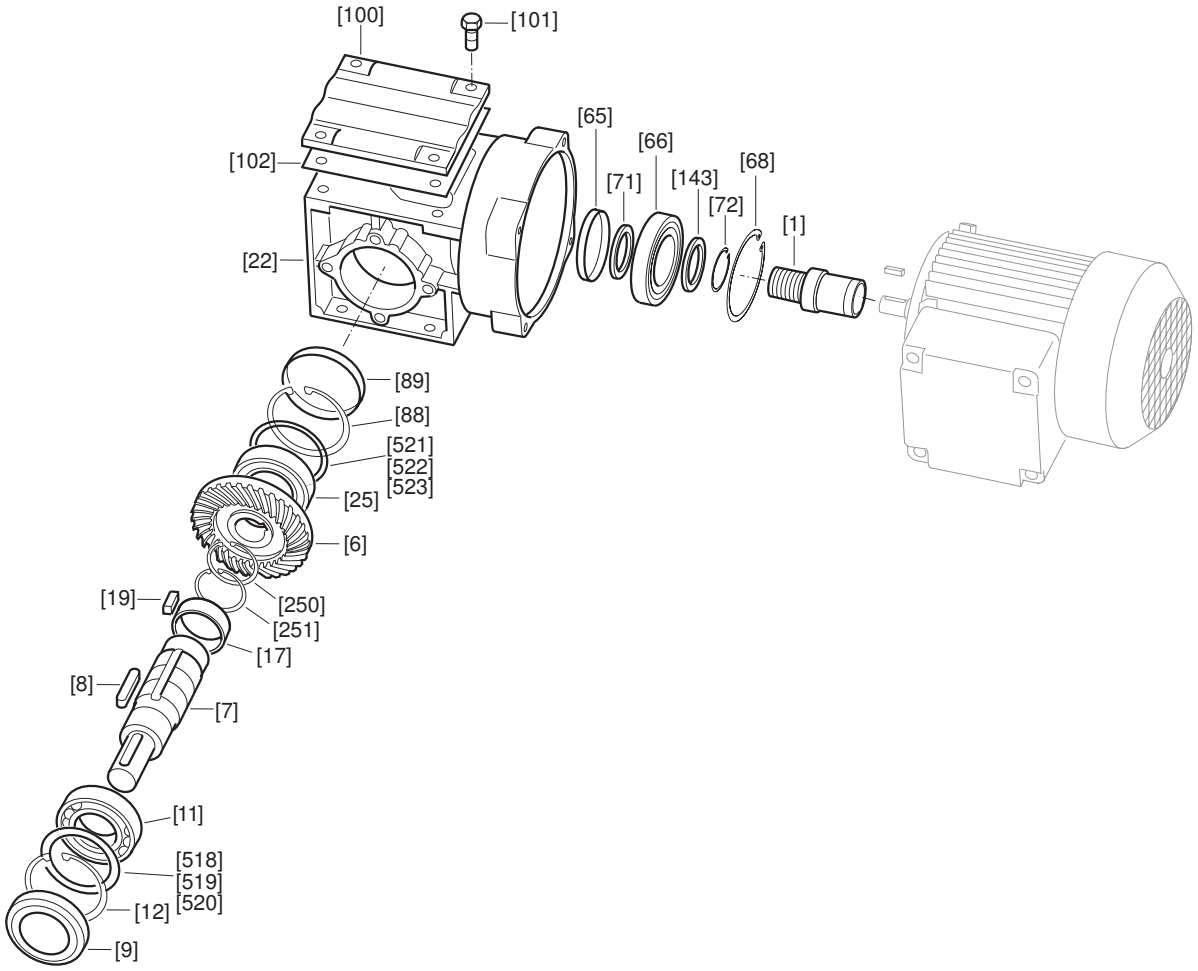
3.7 Basic structure of SPIROPLAN® gear units W..10 – W..30



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[1] Pinion
[6] Gear
[7] Output shaft
[8] Key
[9] Oil seal
[11] Rolling bearing
[12] Retaining ring
[17] Spacer tube
[19] Key
[22] Gear unit housing
[25] Rolling bearing
[65] Oil seal
[66] Rolling bearing
[68] Retaining ring
[71] Supporting ring
[72] Retaining ring
[88] Retaining ring
[89] Closing cap
[100] Inspection cover
[101] Hex head screw
[102] Gasket
[143] Supporting ring
[250] Retaining ring
[251] Retaining ring
[518] Shim
[519] Shim
[520] Shim
[521] Shim
[522] Shim
[523] Shim

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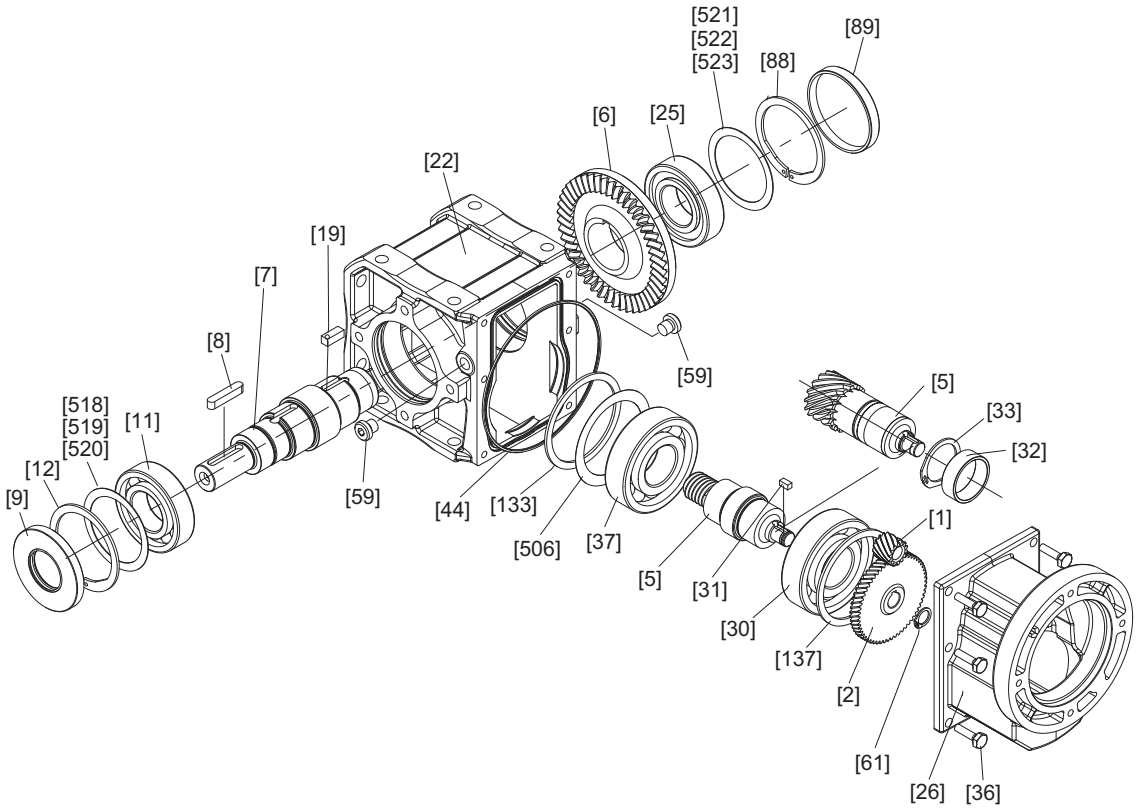
3.8 Basic structure of SPIROPLAN® gear units W..37 – W..47



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[1]	Pinion	[22]	Gear unit housing	[59]	Screw plug	[521]	Shim
[2]	Gear	[25]	Deep groove ball bearing	[61]	Retaining ring	[522]	Shim
[5]	Pinion shaft	[26]	Housing stage 1	[88]	Retaining ring	[523]	Shim
[6]	Gear	[30]	Deep groove ball bearing	[89]	Closing cap		
[7]	Output shaft	[31]	Key	[133]	Shim		
[8]	Key	[32]	Spacer tube	[137]	Shim		
[9]	Oil seal	[33]	Retaining ring	[506]	Shim		
[11]	Deep groove ball bearing	[36]	Hex head screw	[518]	Shim		
[12]	Retaining ring	[37]	Deep groove ball bearing	[519]	Shim		
[19]	Key	[44]	O-ring	[520]	Shim		

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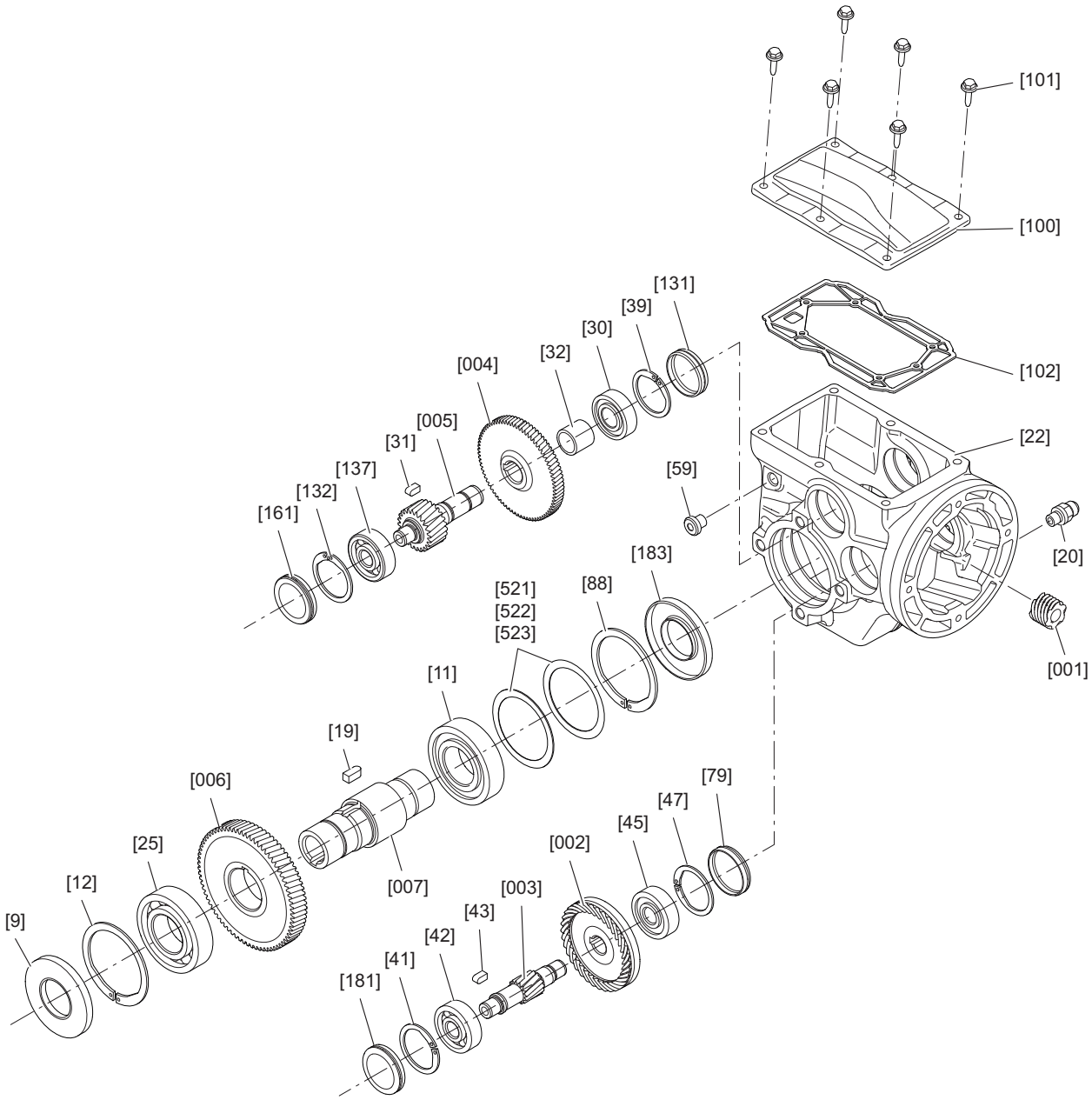
3.9 Basic structure of SPIROPLAN® gear units W..29/W..39



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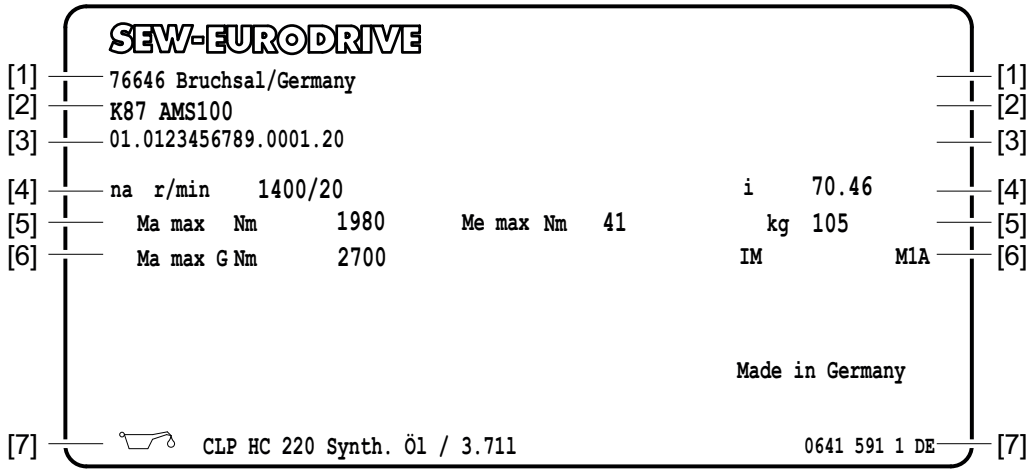
[1]	Pinion	[22]	Gear unit housing	[79]	Closing cap	[522]	Shim
[2]	Gear	[25]	Deep groove ball bearing	[88]	Retaining ring	[523]	Shim
[3]	Pinion shaft	[30]	Deep groove ball bearing	[100]	Gear unit cover		
[4]	Gear	[31]	Key	[101]	Hex head screw		
[5]	Pinion shaft	[32]	Spacer tube	[102]	Gasket		
[6]	Gear	[39]	Retaining ring	[131]	Closing cap		
[7]	Input shaft	[41]	Retaining ring	[132]	Retaining ring		
[9]	Oil seal	[42]	Deep groove ball bearing	[137]	Deep groove ball bearing		
[11]	Deep groove ball bearing	[43]	Key	[161]	Closing cap		
[12]	Retaining ring	[45]	Deep groove ball bearing	[181]	Closing cap		
[19]	Key	[47]	Retaining ring	[183]	Oil seal		
[20]	Breather valve	[59]	Screw plug	[521]	Shim		

3.10 Nameplate/type designation

3.10.1 Gear unit nameplates

The following figures show examples of nameplates for a helical-bevel gear unit with input adapter:

Nameplate 1



- [1] • Manufacturer, address
- [2] • Type designation
- [3] • Serial number
- [4] • Input speed / output speed
  • Gear ratio
- [5] • Maximum permitted output torque of the gear unit / adapter combination
  • Maximum permitted input torque
  • Weight
- [6] • Maximum permitted output torque of the open gear unit without additional component
  • Mounting position
- [7] • Oil type and oil fill volume

Explanation of the production number:

01.	0123456789.	0001.	20
Sales Organization	Order number	Item number	Year of manufacture

Nameplate 2

	Product label with QR code. The QR code can be scanned. You will be redirected to the digital services of SEW-EURODRIVE. There, you have access to product-specific data, documents and further services.

3.10.2 Type designation of the gear unit

A helical-bevel gear unit with AQA adapter, for example, has the following type designation:

Example: K37/R AQSA 80 /1		
Gear unit type	**K**	Helical-bevel gear units
Gear unit size	**37**	19 – 49; 37 – 187
Option	**/R**	E.g. option /R: reduced rotational clearance
Adapter	**AQSA**	E.g. adapter for mounting servomotors: AQSA: Adapter with keyway AQSH: Adapter with clamping ring hub
Adapter size	**80**	
Variants	**/1**	

3.10.3 DRN.. gearmotor nameplates

The following figures show examples of the nameplates of a DRN.. gearmotor.

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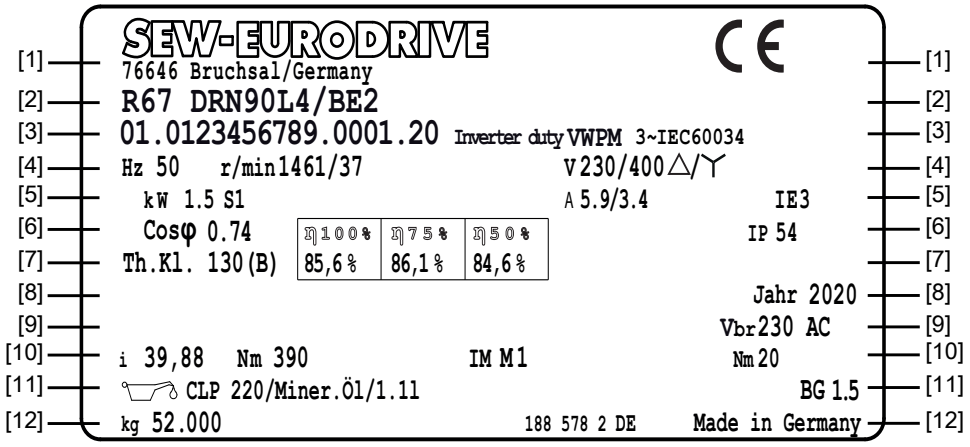
Nameplate 1



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Line	Information
[1]	• Manufacturer, address, CE mark
[2]	• Type designation
[3]	• Serial number • Suitability for inverter operation • Number of phases and underlying rating and performance standard
[4]	• Rated frequency • Rated speed of the motor / speed of the gear unit output shaft • Nominal voltage
[5]	• Rated power and operating mode • Rated current • Energy efficiency class according to IEC/EN 60034-30-1
[6]	• Power factor • Efficiency after capacity utilization of 100%, 75%, and 50% • Degree of protection according to IEC 60034-5
[7]	• Thermal class
[8]	• Year of manufacture
[9]	• Brake voltage
[10]	• Gear unit ratio • Output torque • Mounting position • Nominal braking torque
[11]	• Oil type and oil fill volume • Brake control
[12]	• Gearmotor weight • Nameplate number • Country of manufacture

Nameplate 2

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	Product label with QR code. The QR code can be scanned. You will be redirected to the digital services of SEW-EURODRIVE. There, you have access to product-specific data, documents and further services.

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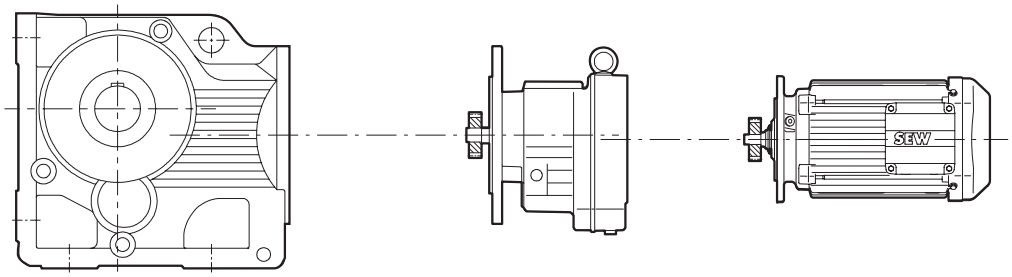
3.10.4 Type designation of a DRN.. gearmotor

The type designation of the gearmotor starts from the component on the output end.

For instance, a multi-stage helical-bevel gearmotor with temperature sensor in the motor winding has the following type designation:

Example: K107R77 DRN100LS4 /TF		
Gear unit type	K	1st gear unit
Size	107	
Gear unit type	R	2nd gear unit
Size	77	
Motor series	DR	Motor
Product line	N	
Size	100LS	
Number of poles	4	
Motor option temperature sensor	/TF	Option

Example: DRN.. gearmotor



K107 R77 DRN100LS4/TF

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3.11 Designs and options – R, F, K, S, W gear units

Below is an overview of type designations for R, F, K, S, and W gear units and their options.

3.11.1 Helical gear units

Designation	Description
RX..	Single-stage foot-mounted design, output shaft with key
RXF..	Single-stage B5 flange-mounted design, output shaft with key
R..	Foot-mounted design, output shaft with key
R..F	Foot- and B5 flange-mounted design, output shaft with key
RF..	B5 flange-mounted design, output shaft with key
RZ..	B14 flange-mounted design, output shaft with key
RM..	B5 flange-mounted design with extended bearing hub, output shaft with key

3.11.2 Parallel-shaft helical gear units

Designation	Description
F..	Foot-mounted design, output shaft with key
FA..B	Foot-mounted design, hollow shaft with keyway
FH..B	Foot-mounted design, hollow shaft with shrink disk
FV..B	Foot-mounted design, splined hollow shaft to DIN 5480
FF..	B5 flange-mounted design, output shaft with key
FAF..	B5 flange-mounted design, hollow shaft with keyway
FHF..	B5 flange-mounted design, hollow shaft with shrink disk
FVF..	B5 flange-mounted design, splined hollow shaft to DIN 5480
FA..	Hollow shaft with keyway
FH..	Hollow shaft with shrink disk
FT..	Hollow shaft with TorqLOC® hollow shaft mounting system
FV..	Splined hollow shaft to DIN 5480
FZ..	B14 flange-mounted design, output shaft with key
FAZ..	B14 flange-mounted design, hollow shaft with keyway
FHZ..	B14 flange-mounted design, hollow shaft with shrink disk
FVZ..	B14 flange-mounted design, splined hollow shaft to DIN 5480
FM..	B5 flange-mounted design with extended bearing hub, output shaft with key
FAM..	B5 flange-mounted design with extended bearing hub, hollow shaft with keyway

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3.11.3 Helical-bevel gear units

Designation	
K..	Foot-mounted design, output shaft with key
KA..B	Foot-mounted design, hollow shaft with keyway
KAF..B	B5 flange-mounted design, foot-mounted design, hollow shaft with keyway
KF..B	B5 flange-mounted design, foot-mounted design, output shaft with key
KH..B	Foot-mounted design, hollow shaft with shrink disk
KHF..B	B5 flange-mounted design, foot-mounted design, hollow shaft with shrink disk
KV..B	Foot-mounted design, splined hollow shaft to DIN 5480
KF..	B5 flange-mounted design, output shaft with key
KAF..	B5 flange-mounted design, hollow shaft with keyway
KHF..	B5 flange-mounted design, hollow shaft with shrink disk
KVF..	B5 flange-mounted design, splined hollow shaft to DIN 5480
KA..	Hollow shaft with keyway
KH..	Hollow shaft with shrink disk
KT..	Hollow shaft with TorqLOC® hollow shaft mounting system
KV..	Splined hollow shaft to DIN 5480
KZ..	B14 flange-mounted design, output shaft with key
KAZ..	B14 flange-mounted design, hollow shaft with keyway
KHZ..	B14 flange-mounted design, hollow shaft with shrink disk
KVZ..	B14 flange-mounted design, splined hollow shaft to DIN 5480
KM..	B5 flange-mounted design with extended bearing hub, output shaft with key
KAM..	B5 flange-mounted design with extended bearing hub, hollow shaft with keyway

3.11.4 Helical-worm gear units

Designation	Description
S..	Foot-mounted design, output shaft with key
SF..	B5 flange-mounted design, output shaft with key
SAF..	B5 flange-mounted design and hollow shaft with keyway
SHF..	B5 flange-mounted design and hollow shaft with shrink disk
SA..	Hollow shaft with keyway
SH..	Hollow shaft with shrink disk
ST..	Hollow shaft with TorqLOC® hollow shaft mounting system
SAZ..	B14 flange-mounted design and hollow shaft with keyway

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Designation	Description
SHZ..	B14 flange-mounted design and hollow shaft with shrink disk

3.11.5 SPIROPLAN® gear units

Designation	Description
W..	Foot-mounted design, output shaft with key
WF..	B5 flange-mounted design, output shaft with key
WAF..	B5 flange-mounted design and hollow shaft with keyway
WA..	Hollow shaft with keyway
WHF..	B5 flange-mounted design and hollow shaft with shrink disk
WH..	Hollow shaft with shrink disk
WT..	Hollow shaft with TorqLOC® hollow shaft mounting system

3.11.6 Options

R, F and K gear units:

Designation	Description
/R	Reduced backlash

K, S and W gear units:

Designation	Description
/T	With torque arm

F gear units:

Designation	Description
/G	With rubber buffer

3.11.7 Condition monitoring

Designation	Description
/DUO	Diagnostic Unit Oil = Oil aging sensor
/DUV40A	Diagnostic Unit Vibration = Vibration sensor

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4 Mechanical installation

4.1 Installation requirements

NOTICE

Damage to the gear unit/gearmotor due to improper installation can occur.

Damage to property can occur.

- Observe the following information.

Make sure that the following requirements are met before you start installing the unit:

- The drive has not been damaged during transportation or storage.
- The entries on the nameplate of the gearmotor match the voltage supply system.
- In the case of abrasive ambient conditions, the output-end oil seals must be protected against wear.
- Output shafts and flange surfaces must be completely free from anti-corrosion agent and any kind of pollution. Use a commercially available solvent to clean the flange surfaces. Note that solvent damages the oil seal ring. Do not let the solvent come into contact with the sealing lips of the oil seal!
- **For standard drives:**
  - Check if the gear unit/gearmotor is designed for the ambient temperature. For the application limits, refer to the technical documentation, the nameplate, or the lubricant table (see chapter "Lubrication table (017512104)" (→ 🗎 190)).
  - Make sure the environment contains no hazardous substances (oils, acids, gases, vapors, dusts, etc.) or radiation.
- **For special designs:**
  - Check if the gear unit/gearmotor is designed for the ambient temperature. You can find the application limits on the nameplate.
- **With helical-worm gear units / SPIROPLAN® W..0 gear units:**
  - Note that no large external mass moments of inertia which could exert a retrodriving load on the gear unit must be present.
  - Note the self-locking at η' (retrodriving) < 0.5.

    Calculation of η':η' = 2 - 1/η
- **Servomotor mounting:**
  - The drive may only be mounted if it is ensured that after the mounting the drive will be sufficiently ventilated. Ventilation prevents heat build-up.

4.1.1 Required tools/resources

The following tools and resources are required for the mechanical installation:

- Wrench
- Torque wrench for:
  - Gear unit mounting
  - Shrink disks
  - AQSH or EWH motor adapter
  - Input shaft assembly with centering shoulder

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- Mounting device
- Compensation elements (shims and spacing rings)
- Fasteners for input and output elements
- Lubricant (e.g. NOCO® fluid)
- Thread locking compound for input shaft assembly with centering shoulder (e.g. Loctite 243®)

INFORMATION

Standard parts are not included in the delivery.

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4.1.2 Installation tolerances

Shaft end	Flanges
Diameter tolerance according to DIN 748 • ISO k6 for solid shafts with Ø ≤ 50 mm • ISO m6 for solid shafts with Ø > 50 mm • ISO H7 for hollow shafts • Centering bore according to DIN 332, shape DR	Centering shoulder tolerance to DIN EN 50347 • ISO j6 with N ≤ 250 mm • ISO h6 with N > 250 mm

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4.2 Direction of rotation

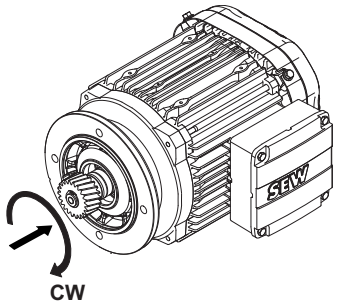
4.2.1 Definitions

Standard direction of rotation for motor shaft

In accordance with the standard DIN EN 60034-8 defined as standard:

Clockwise direction of rotation (CW) as viewed on the pinion shaft end of the motor.

Prerequisite: Connection U1-V1-W1



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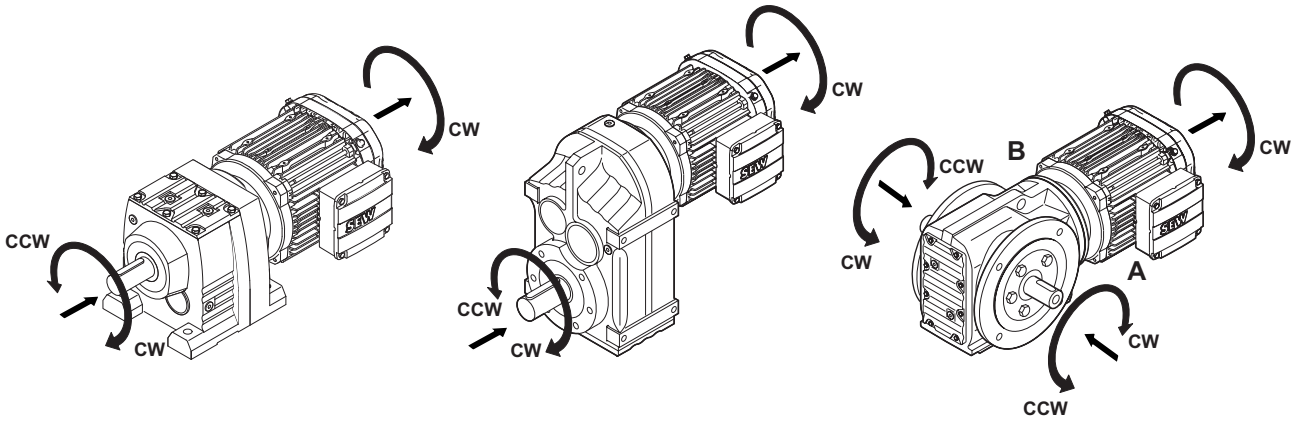
Standard direction of rotation for output shaft

Standard direction of rotation as viewed on the output shaft of the gear unit:

- CW (clockwise)
  Clockwise direction of rotation
- CCW (counterclockwise)
  Counterclockwise direction of rotation



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4.2.2 Direction of rotation of the gear unit

INFORMATION

With helical-bevel gear units K.., helical-worm gear units S.. and SPIROPLAN®-W gear units, shaft position A, B or AB is possible.

The direction of rotation is specified in accordance with the shaft position as viewed on the output end A or B, or A and B.

Series	Size	Gear unit stages	Shaft position	Standard direction of rotation as viewed on the output shaft[1)]
RX	57 – 107	1		CCW
R	07 – 167	2		CW
		3		CCW
F	27 – 157	2		CW
		3		CCW

1) CW = clockwise; CCW = counterclockwise.

Series	Size	Gear unit stages	Shaft position	Standard direction of rotation as viewed on the output shaft[1)]	
				View of output end A	View of output end B
K	19 – 49	2	A	CW	
			AB	CW	CCW
			B		CCW
K	37 – 187	3	A	CCW	
			AB	CCW	CW
			B		CCW
S	37 – 97	2	A	CW	
			AB	CW	CCW
			B		CCW
W	10 – 30	1	A	CCW	
			AB	CCW	CW
			B		CW
W	29 – 39	2	A	CW	
			AB	CW	CCW
			B		CCW
		3	A	CCW	
			AB	CCW	CW
			B		CW

1) CW = clockwise; CCW = counterclockwise.

4.3 Installing the gear unit

⚠ CAUTION

Risk of injury due to improper installation/disassembly.

Severe personal injury and damage to property can occur.

- Work on the gear unit only when the machine is in an idle state.
- Secure the drive unit against unintentional power-up.
- Prevent heavy component parts (e.g. shrink disks) against falling during installation/disassembly.

⚠ CAUTION

Risk of injury due to protruding gear unit parts.

Severe injuries can occur.

- Keep a sufficient safety distance from the gear unit/gearmotor.

⚠ CAUTION

Danger due to static overdetermination if gear units with foot (e.g. KA19/29B, KA127/157B or FA127/157B) are mounted both via the torque arm and via the foot plate.

Risk of injuries and damage to property

- Especially with the KA.9B/T variant, it is not permitted to use the foot plates and the torque arm at the same time.
- Attach the KA.9B/T design only via the torque arm.
- Attach the K.9 or KA.9B design only via the foot plate.
- If you want to use foot plates and torque arms for mounting, contact SEW-EURODRIVE.

⚠ CAUTION

Danger due to static overdetermination in the case of gearmotors when the gear unit is attached to the foot plate (e.g. KA19/29B, KA127/157B or FA127/157B, R gear unit with foot-mounted motor) and the motor is attached to the foot plate as well.

Risk of injuries and damage to property

- Attach only the gear unit or only the motor to the foot plate.

NOTICE

Damage to gear unit/gearmotor due to cold air currents can occur. Condensed water in the gear unit can cause damage.

Damage to property can occur.

- Protect the gear unit from direct cold air currents.

INFORMATION

When installing the gear unit, make sure that the oil level and oil drain plugs as well as the breather valves are easily accessible!

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Mounting position

It is only permitted to install the gear unit or gearmotor in the specified mounting position. Observe the information on the nameplate. SPIROPLAN® gear units of sizes W10 – W30 are mounting position-independent.

Oil level

Check the mounting position-dependent oil level, refer to chapter "Inspection/maintenance of the gear unit" (→ 🗎 130). The gear units are filled with the required oil quantity at the factory. There may be slight deviations at the oil level plug as a result of the mounting position, which are permitted within the manufacturing tolerances.

Adjust the lubricant fill quantities and the position of the breather valve accordingly in the event of a change of mounting position. Observe chapter "Lubricant fill quantities" (→ 🗎 204) and chapter "Mounting positions" (→ 🗎 146).

Contact SEW-EURODRIVE in case of the following mounting position changes:

- Mounting position change to M4: Depending on the operating mode of the drive, an oil expansion tank can be necessary (see chapter "Oil expansion tank" (→ 🗎 108)).
- Changing the mounting position of K gear units to M5 or M6 or within these mounting positions
- Changing the mounting position of size S47 – S97 S gear units to mounting positions M2 and M3
- Changing the mounting positions of R gear units to mounting position M2.

Submounting

The support structure must have the following characteristics:

- Level
- Vibration damping
- Torsionally rigid

The following table shows the maximally permitted flatness defect for foot and flange-mounting (guide values based on DIN ISO 1101):

Gear unit size	Flatness defect
≤ 67	Max. 0.4 mm
77 – 107	Max. 0.5 mm
127 to 147	Max. 0.7 mm
157 – 187	Max. 0.8 mm

Do not twist housing legs and mounting flanges against each other. Observe the permitted overhung and axial loads! Observe the chapter "Project Planning" in the gear unit/gearmotor catalog for calculating the permitted overhung and axial loads.

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Strength class of the screws

Always mount gearmotors using screws of strength class 8.8. The gearmotors in flange-mounted design and in foot/flange-mounted design listed in the following table are an exception. Always use screws of strength class 10.9 for these gearmotors. Use suitable washers.

Gear unit	Flange Ø mm	Strength class of the screws
RF37/R37F SF37p	120	10.9
RF47/R47F	140	
RF57/R57F	160	
SF67p	200	
FF/FAF77 KF/KAF77 SF77p	250	
FM/FAM67, FM/FAM77 KM/KAM67, KM/KAM77	300	
FM/FAM87 KM/KAM87 SF87p	350	
FM/FAM97 KM/KAM97	400	
RF147 FM/FAM107 KM/KAM107	450	
RF167 FM/FAM127 KM/KAM127	550	
FM/FAM157 KM/KAM157	660	
RZ37 – RZ87	60ZR – 130ZR	

Corrosion protection for screw connections

Use plastic inserts (2 – 3 mm thick) if there is a risk of electrochemical corrosion between the gear unit and the driven machine. The material used must have an electrical leakage resistance < 10^9 Ω. Electrochemical corrosion can occur between various metals, for example, cast iron and stainless steel. Also install the screws with plastic washers! Additionally ground the housing. Use grounding screws on the motor.

4.3.1 Notes concerning tightening torques

The tightening torques specified in the following chapters are based on the following friction coefficients:

Friction coefficient $\mu_{G,K}$ for thread and head contact surface	Strength class of screw
0.14	8.8 / 70[1)], 80[1)]

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Friction coefficient $\mu_{G,K}$ for thread and head contact surface	Strength class of screw
0.09	10.9, 12.9

1) Stainless steel screws.

If screws with a different friction coefficient are used, the tightening torques must be adapted accordingly.

Only use one of the following tools to tighten the screws:

- Torque wrench
- Torque-controlled torque wrench
- Impulse driver, switched off and controlled mechanically
- Torque wrench with light and sound signal
- Motorized torque wrench with dynamic torque measuring
- Torque-controlled, gradual hydraulic tools

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4.3.2 Tightening torques for retaining screws

Screw on the gearmotors with the following tightening torques, and observe the details in chapter "Notes concerning tightening torques" (→ 🗎 36):

Screw/nut	Tightening torque ±15% Strength class 8.8 Nm
M6	12
M8	28
M10	56
M12	96
M16	235
M20	460
M24	795
M30	1590
M36	2760
M42	4410
M48	6650
M56	10 600

Screw on the specified gearmotors with flange-mounted design with the following tightening torques, and observe the details in chapter "Notes concerning tightening torques" (→ 🗎 36):

Flange Ø mm	Gear unit	Screw/nut	Tightening torque ±15% Strength class 10.9 Nm
120	RF37 SF37p	M6	12
140	RF37/RF47	M8	29
160	RF57	M8	29
200	SF67p	M10	57
250	SF77p	M12	98
300	FM/FAM67, FM/FAM77 KM/KAM67, KM/KAM77	M12	98
350	FM/FAM87 KM/KAM87 SF87p	M16	235
400	FM/FAM97 KM/KAM97	M16	235

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Flange Ø mm	Gear unit	Screw/nut	Tightening torque ±15% Strength class 10.9 Nm
450	FM/FAM107 KM/KAM107	M16	235
450	RF147	M20	465
550	FM/FAM127 KM/KAM127	M16	235
550	RF167	M20	465
660	FM/FAM157 KM/KAM157	M20	465
60ZR	RZ37	M8	29
70ZR	RZ47	M8	29
80ZR	RZ57	M10	57
95ZR	RZ67	M10	57
110ZR	RZ77	M10	57
130ZR	RZ87	M12	98
250	FF77/KF77/ FAF77/ KAF77	M12	98

4.3.3 Tightening torques for oil level plugs, oil drain plugs, screw plugs, breather valves and oil sight glasses

Observe the tightening torques in the following table when screwing in:

Thread	Tightening torque Nm
M10 × 1	12
M12 × 1.5	15
M22 × 1.5	60
M33 × 2	100
M42 × 2	150

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4.3.4 Installing the gear unit

INFORMATION

If you use the gear unit in flange-mounted design or foot/flange-mounted design in connection with VARIBLOC® variable-speed gear units, use screws of 10.9 quality and suitable washers for flange mounting on the customer side.

To improve the friction contact between flange and mounting surface, SEW-EURODRIVE recommends anaerobic gaskets or an anaerobic glue.

INFORMATION

With the gear units KAZ/KZ/FAZ/FZ 107 – 157, remove the 4 transport protection screws from the B14 flange. The 2 recessed screws **must** remain in the B14 flange.

Foot-mounted gear unit

The following table shows the thread sizes of the foot-mounted gear units depending on the gear unit type and size:

Screw	Gear unit type					
	R/R..F	RX	F/FH..B/ FA..B	K/KH..B/KV..B/ KA..B	S	W
M6	07	–	–	19	–	10/20
M8	17/27/37	–	27/37	29	37	30/37/47
M10	–	57	47	37/39/47/49	47/57	–
M12	47/57/67	67	57/67	57/67	67	–
M16	77/87	77/87	77/87	77	77	–
M20	97	97/107	97	87	87	–
M24	107	–	107	97	97	–
M30	127/137	–	127	107/167	–	–
M36	147/167	–	157	127/157/187	–	–

Gear unit with B14 flange-mounted design and/or hollow shaft

The following table shows the thread sizes of the gear units with B14 flange and/or hollow shaft depending on the gear unit type and size:

Screw	Gear unit type				
	RZ	FZ/FAZ/FHZ/ FVZ	KZ/KAZ/KHZ/ KVZ	SA/SAZ/SHZ	WA
M6	07/17/27	–	–	37	10/20/30[1)]
M8	37/47	27/37/47	37/47	47/57	29/37/39
M10	57/67	–	–	–	47
M12	77/87	57/67/77	57/67/77	67/77	–
M16	–	87/97	87/97	87/97	–
M20	–	107/127	107/127	–	–

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Screw	Gear unit type				
	RZ	FZ/FAZ/FHZ/ FVZ	KZ/KAZ/KHZ/ KVZ	SA/SAZ/SHZ	WA
M24	–	157	157	–	–

1) For the W30 design mounted directly on a CMP.. motor or mounted via an EWH.. adapter, the thread size is M8.

Gear unit with B5 flange-mounted design

The following table shows the thread sizes of the gear units with B5 flange depending on the gear unit type, size and flange diameter:

Flange Ø mm	Screw	Gear unit type						
		RF/R..F/RM	RXF	FF/FAF/ FHF/ FVF	FM/FAM KM/ KAM	KF/KAF/ KHF/ KVF	SF/SAF/ SHF	WF/WAF/ WHF
80	M6	–	–	–	–	–	–	10
110	M8	–	–	–	–	–	–	20
120	M6	07/17/27	–	–	–	–	37	10/20/30/37
120	M8	–	–	–	–	19	–	29
140	M8	07/17/27/37/47	57	–	–	–	–	–
160	M8	07/17/27/37/47	57/67	27/37	–	19/37	37/47	30/37/47/29
160	M10	–	–	–	–	29/39	–	39
200	M10	37/47/57/67	57/67/77	47	–	29/47	57/67	39
200	M12	–	–	–	–	49	–	–
250	M12	57/67/77/87	67/77/87	57/67	–	57/67	77	–
300	M12	67/77/87	87/97	77	67/77	77	–	–
350	M16	77/87/97/107	97/107	87	87	87	87	–
400	M16	–	–	–	97	–	–	–
450	M16	97/107/127/137/ 147	107	97/107	107	97/107	97	–
550	M16	107/127/137/ 147/167	–	127	127	127	–	–
660	M20	147/167	–	157	157	157	–	–

4.3.5 Installation in damp locations or outdoors

NOTICE

Paint can block the breather valve and damage the sealing lips of the oil seals.

Damage to property can occur.

- Thoroughly cover the breather valve and sealing lip of the oil seals with strips prior to painting/re-painting.
- Remove the adhesive strips after painting.

Drives are supplied in corrosion-resistant designs with a suitable surface protection coating for use in damp areas or outdoors.

- Repair any damage to the paint work (e.g. on the breather valve or the lifting eyes).
- When motors are being mounted onto AMA.., AQA.. adapters and to AR.., AT.. start-up couplings and slip clutches, seal the flange areas with a suitable sealant (e.g. Loctite® 574).
- During outdoor setup, the drives must not be exposed to direct sunlight. Install appropriate protection devices, e.g. a cover or a canopy. The protection device must not cause heat build-up.
- The system operator must ensure that no foreign objects (e.g. falling objects or coverings) affect the operation of the gear unit.

4.3.6 Gear unit venting

NOTICE

Dirt and dust in the environment impair the function of the breather valve.

Potential damage to property can occur.

- Check the breather valve function regularly and replace it if necessary.
- In the event of high dirt and dust load, use a breather filter instead of a breather valve.

Gear units with installed breather valve

Depending on gear unit size and mounting position, the gear units are delivered with the activated breather valve installed according to the mounting position. If the breather valve has not been activated, yet, remove the transport protection as described in chapter "Activating the breather valve" (→ 🗎 43). This activates the breather valve.

Gear units with separately included breather valve

The following gear units are delivered with a screw plug on the provided breather hole:

- For gear units in the pivoted mounting position (stationary), see chapter "Gear unit in pivoted mounting position (stationary)" (→ 🗎 148).
- For gear units in mounting position MX, see chapter "Mounting position MX" (→ 🗎 149).
- For gear units in the variable mounting position, see chapter "Variable mounting position" (→ 🗎 149).
- Gear head units vented on the input side.

Replace the screw plug with the provided breather valve before startup. The tightening torque can be found in chapter "Tightening torques for oil level plugs, oil drain plugs, screw plugs, breather valves and oil sight glasses" (→ 🗎 39).

Gear units that do not require venting

The following table lists gear units that do not require venting.

Gear unit	Mounting position
R..07	M1/M2/M3/M5/M6

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Gear unit	Mounting position
R..17/R..27/F..27	M1/M3/M5/M6
W..10/W..20/W..30	M1 – M6
W..37/W..47	M1/M2/M3/M5/M6
K..19/K..29	M1/M2/M3/M5/M6
W..29/W..39	M1/M2/M3/M5/M6

Gear units that can be operated without venting after verification by SEW-EURODRIVE

Certain gear units require individual verification. Contact SEW-EURODRIVE in case of the following gear units:

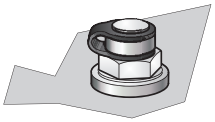
- Gear units in closed design.
- For gear units in the pivoted mounting position (dynamic), see chapter "Gear unit in pivoted mounting position (dynamic)" (→ 🗎 148).

Gear units with gear unit venting on fixed piping

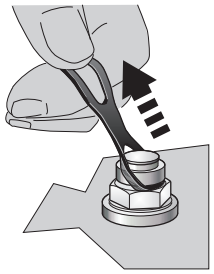
Gear units with gear unit venting on fixed piping, with expansion tanks and ventilation filters are delivered without a breather valve. Observe the installation notes provided with the respective venting system.

Activating the breather valve

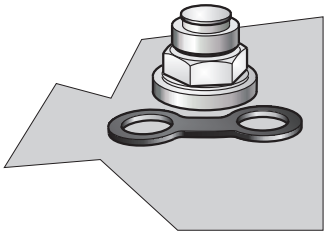
1. Before startup, check whether the transport protection on the breather valve has been removed and the valve is therefore activated. The following figure shows a breather valve with transport protection:



2. Remove the transport protection.



⇨ The following figure shows an activated breather valve:



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4.3.7 Painting the gear unit

NOTICE

Paint can block the breather valve and damage the sealing lips of the oil seals.

Damage to property.

- Thoroughly cover the breather valve and sealing lip of the oil seals with strips prior to painting/re-painting.
- Remove the strips after painting.

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4.4 Gear unit with solid shaft

4.4.1 Assembling input and output elements

NOTICE

Damage to bearing, housing or shafts due to incorrect mounting

Possible damage to property.

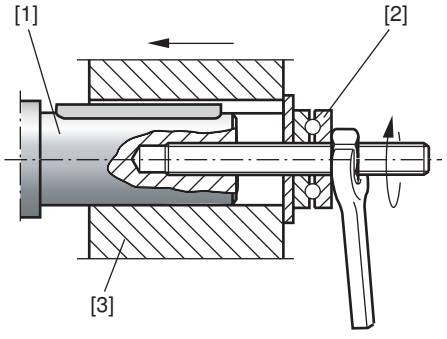
- Only use a mounting device for installing input and output elements (see chapter "Using the mounting device" (→ 🗎 45)). Use the threaded centering bore at the shaft end.
- Never force belt pulleys, couplings, pinions, etc. onto the shaft end by hitting them with a hammer.
- During the installation of belt pulleys, make sure the belt is tensioned correctly in accordance with the manufacturer's instructions.
- Make sure the transmission elements are balanced after fitting and do not give rise to any impermissible radial or axial forces. For the approved values, refer to the catalog "Gearmotors" or "Explosion-Proof Drives".

INFORMATION

Mounting is easier if you first apply lubricant to the output element or heat it up briefly to 80 – 100 °C.

Using a mounting device

The following figure shows a mounting device for installing couplings or hubs on gear unit or motor shaft ends. Should you be able to tighten the screw without any problems, you may not need the thrust bearing on the mounting device.



211368587

[1] Gear shaft end
[2] Thrust bearing
[3] Coupling hub

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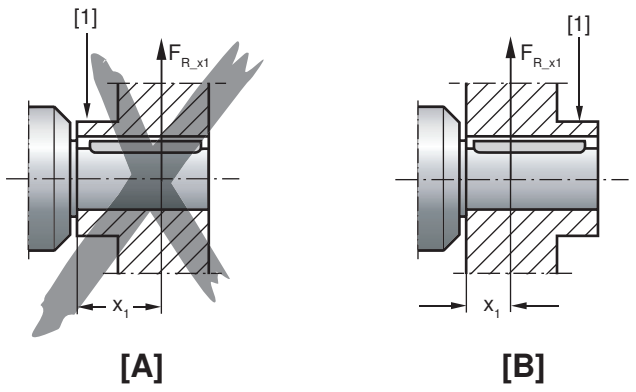
Avoiding high radial loads

To avoid high radial loads, mount gears and sprockets according to figure **B**.



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[1] Hub
[A] Incorrect assembly
F_{R_X1} Radial load at position x_1
[B] Correct assembly

4.4.2 Mounting of couplings

⚠ CAUTION

Risk of injury due to moving drive components and output elements, such as belt pulleys or couplings, during operation.

Risk of jamming and crushing.

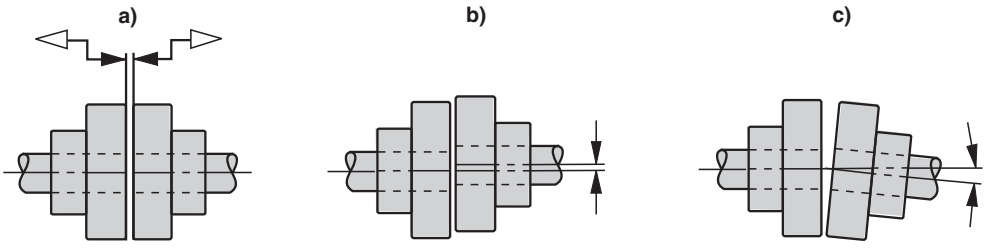
- Equip the input and output elements with a touch guard.

Adjust the following misalignments according to the coupling manufacturer's specifications when mounting couplings:

a) Maximum and minimum clearance

b) Axial misalignment

c) Angular offset



211395595

4.5 Torque arms for shaft-mounted gear units

4.5.1 Mounting the bushing

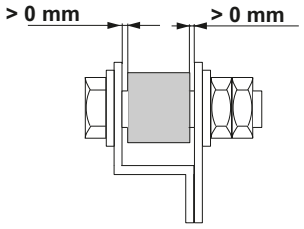
NOTICE

Damage to gear unit due to improper installation of the torque arm.

Damage to the gear unit.

- Do not deform the torque arm during installation.

The following illustration shows a bushing attached at both sides without tightening:



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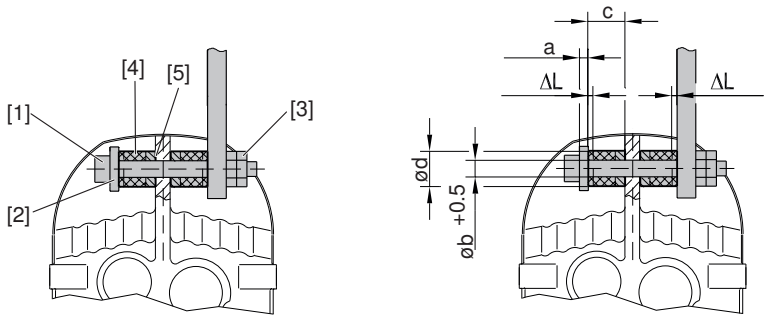
4.5.2 Mounting torque arms for parallel-shaft helical gear units

The following figure shows the torque support for parallel-shaft helical gear units in a loose condition.



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[1] Screw
[2] Washer
[3] Nuts
[4] Rubber buffer
[5] Metal side of the rubber buffer
a Washer width
b Rubber buffer inner diameter
c Rubber buffer length in loose state
d Rubber buffer diameter
ΔL Preload per rubber buffer in tightened state

Proceed as follows:

1. Make sure that the metal sides of the rubber buffers lay against the gear unit.
2. Use screws [1] and washers [2] according to the following table.
3. Secure the screw connection with a nut [3].
4. Tighten the screw [1] until the preload "Δ L" of the rubber buffers is reached in accordance with the following table:

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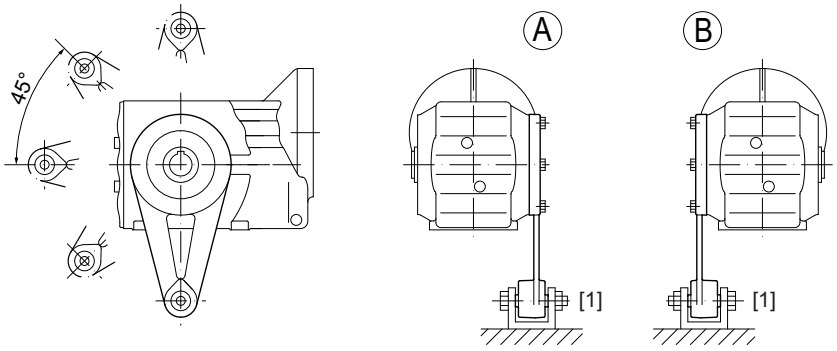
Gear unit	Washer	Rubber buffer			
	a	d	b	c	Δ L
	mm	mm	mm	mm	mm
F..27 /G	5	40	12.5	20	1
F..37 /G	5	40	12.5	20	1
F..47 /G	5	40	12.5	20	1.5
F..57 /G	5	40	12.5	20	1.5
F..67 /G	5	40	12.5	20	1.5
F..77 /G	10	60	21.0	30	1.5
F..87 /G	10	60	21.0	30	1.5
F..97 /G	12	80	25.0	40	2
F..107 /G	12	80	25.0	40	2
F..127 /G	15	100	32.0	60	3
F..157 /G	15	120	32.0	60	3

4.5.3 Mounting torque arms for helical-bevel gear unit K..19 – K..49

The following figure shows the torque support for the helical-bevel gear units K..19 – K..49:



[1] Bushing
A Connection side
B Connection side

Observe the following points during assembly:

- Fasten the bushing [1] on both sides without mechanical stress, as described in chapter "Mounting the bushing" (→ 🗎 47).
- When tightening the screws, please observe chapter "Notes concerning tightening torques" (→ 🗎 36).
- Refer to the following table for the screw sizes and tightening torques:

Gear unit	Screws	Tightening torque in Nm ±15 %		
		Strength class		
		8.8	70	80
K..19 /T	4 × M8 × 20	28	–	28
K..29 /T	4 × M8 × 20	28	–	28

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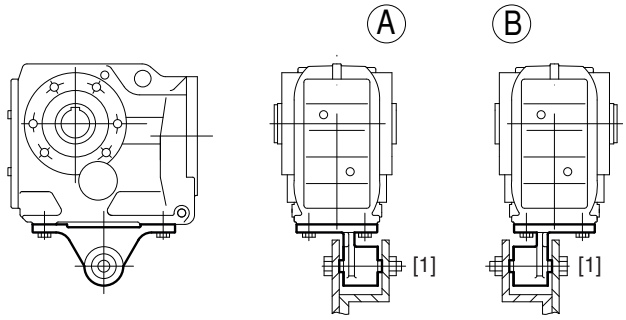
Gear unit	Screws	Tightening torque in Nm ±15 % Strength class		
		8.8	70	80
K..39 /T	4 × M10 × 30	56	36	–
K..49 /T	4 × M12 × 35	96	62	–

4.5.4 Mounting torque arms for helical-bevel gear unit K..37 – K..157

The following figure shows the torque support for the helical-bevel gear units K..37 – K..157.



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[1] Bushing
A Connection side
B Connection side

Observe the following points during assembly:

- Fasten the bushing [1] on both sides without mechanical stress, as described in chapter "Mounting the bushing" (→ 🗎 47).
- When tightening the screws, please observe chapter "Notes concerning tightening torques" (→ 🗎 36).
- Refer to the following table for the screw sizes and tightening torques:

Gear unit	Screws	Tightening torque in Nm ±15 % Strength class		
		8.8	70	80
K..37 /T	4 × M10 × 25	56	36	–
K..47 /T	4 × M10 × 30	56	36	–
K..57 /T	4 × M12 × 35	96	62	–
K..67 /T	4 × M12 × 35	96	62	–
K..77 /T	4 × M16 × 40	235	151	–
K..87 /T	4 × M16 × 40	235	151	–
K..97 /T	4 × M20 × 50	460	295	–
K..107 /T	4 × M24 × 60	795	510	–
K..127 /T	4 × M36 × 130	2760	1770	–
K..157 /T	4 × M36 × 130	2760	1770	–

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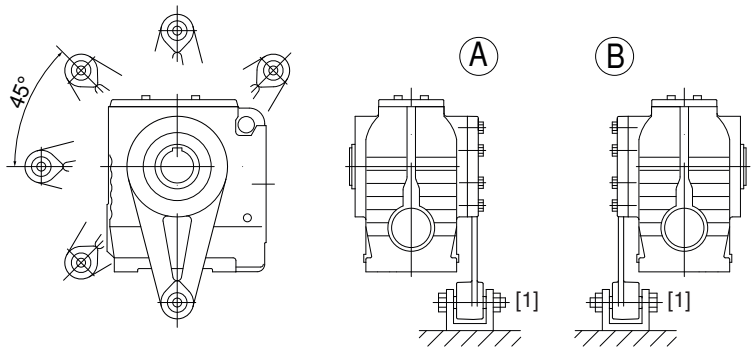
4.5.5 Mounting torque arms for helical-worm gear units

The following figure shows the torque support for helical-worm gear units.



36028797230455691

[1] Bushing

Observe the following points during assembly:

- Fasten the bushing [1] on both sides without mechanical stress, as described in chapter "Mounting the bushing" (→ 🗎 47).
- When tightening the screws, please observe chapter "Notes concerning tightening torques" (→ 🗎 36).
- Refer to the following table for the screw sizes and tightening torques:

Gear unit	Screws	Tightening torque in Nm ±15 % Strength class		
		8.8	70	80
S..37 /T	4 × M6 × 16	12	–	12
S..47 /T	4 × M8 × 25	28	–	28
S..57 /T	6 × M8 × 25	28	–	28
S..67 /T	4 × M12 × 35	96	–	96
S..77 /T	4 × M12 × 35	96	–	96
S..87 /T	4 × M16 × 45	235	–	235
S..97 /T	4 × M16 × 50	235	–	235

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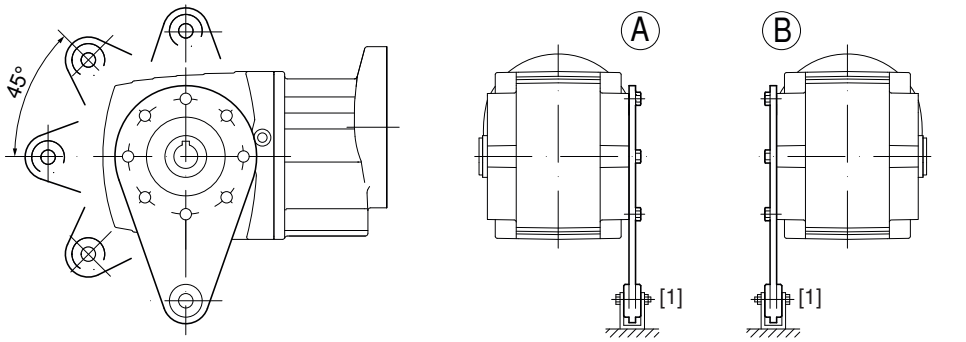
4.5.6 Mounting torque brackets for SPIROPLAN® W gear units

The following figure shows the torque support for SPIROPLAN® W gear units.



36028797230453515

[1] Bushing

- Fasten the bushing [1] on both sides without mechanical stress, as described in chapter "Mounting the bushing" (→ 🗎 47).
- When tightening the screws, please observe chapter "Notes concerning tightening torques" (→ 🗎 36).
- Refer to the following table for the screw sizes and tightening torques:

Gear unit	Screws	Tightening torque in Nm ±15 % Strength class		
		8.8	70	80
W..10 /T	4 × M6 × 16	12	–	12
W..20 /T	4 × M6 × 16	12	–	12
W..30 /T	4 × M6 × 16	12	–	12
W..29 /T	4 × M8 × 20	28	–	28
W..37 /T	4 × M8 × 20	28	–	28
W..39 /T	4 × M8 × 20	28	–	28
W..47 /T	4 × M10 × 20	56	–	56

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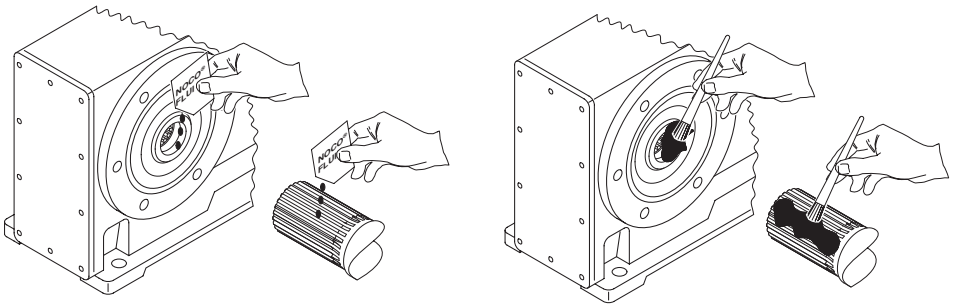
4.6 Mounting shaft-mounted gear units with splined hollow shaft

INFORMATION

Concerning the configuration of the customer shaft, please also refer to the design notes in the "Gearmotors" catalog.

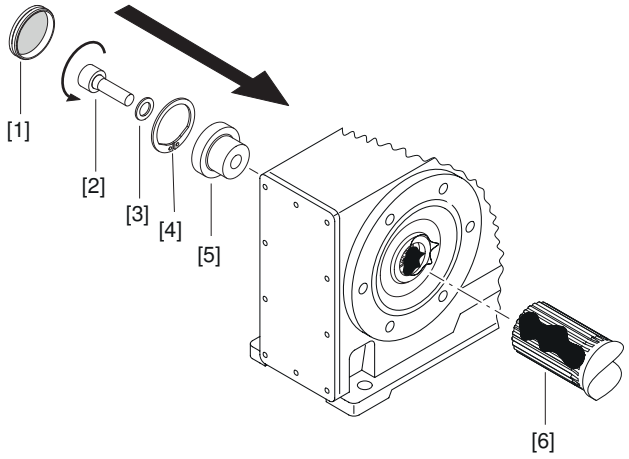
Proceed as follows:

1. Apply NOCO® fluid. Spread carefully.



20685469067

2. Install the shaft and secure it axially. For easier installation, use a mounting device.



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[1] Closing plug
[2] Cap screw
[3] Supporting ring
[4] Retaining ring
[5] Washer

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4.7 Shaft-mounted gear unit with keyway

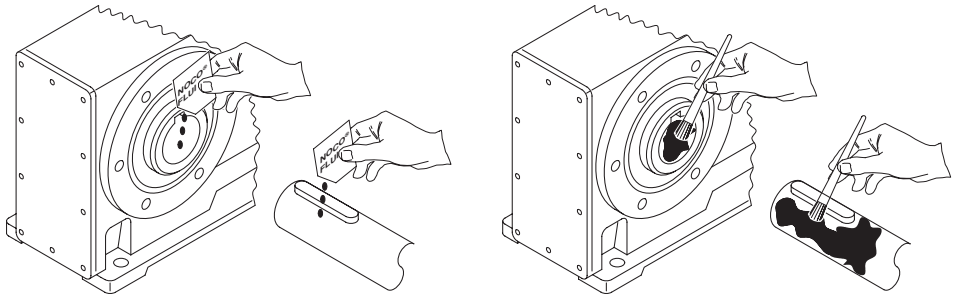
INFORMATION

Concerning the design of the customer shaft, please also refer to the design notes in the "Gearmotors" catalog.

4.7.1 Mounting shaft-mounted gear units with keyway

Proceed as follows:

1. Apply NOCO® fluid. Spread carefully.



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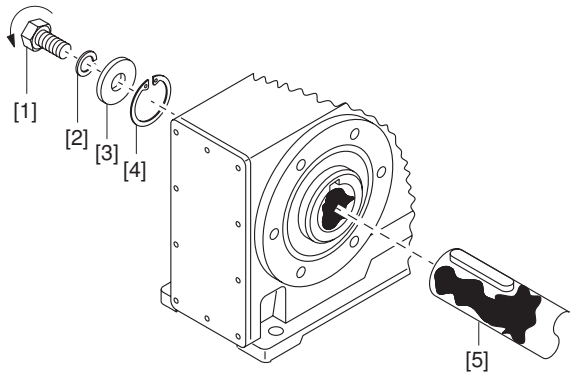
2. Install the shaft and secure it axially. For easier installation, use a mounting device. Proceed according to one of the **3 mounting types**, depending on the scope of delivery.

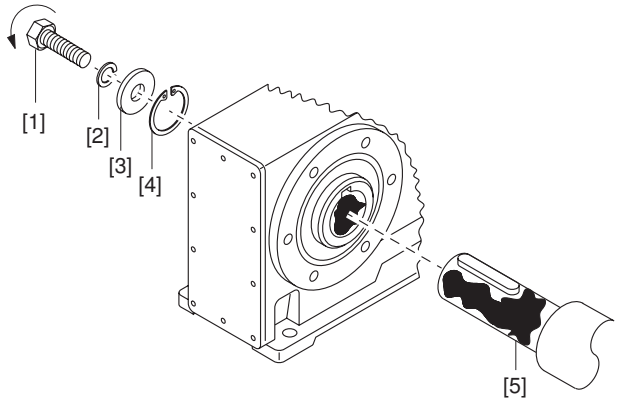
A) Fit customer shaft (standard scope of delivery, except with shaft position AB):



18014398721000331

[1] Short retaining screw (standard scope of delivery)
[2] Lock washer
[3] Washer
[4] Retaining ring
[5] Customer shaft

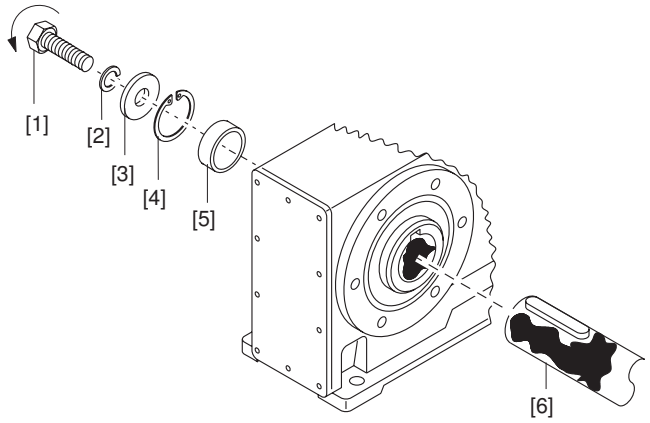
B) Mounting customer shaft with contact shoulder using the SEW-EURODRIVE assembly/disassembly kit:



18014398721002507

[1] Retaining screw
[2] Lock washer
[3] Washer
[4] Retaining ring
[5] Customer shaft with contact shoulder

C) Mounting customer shaft without contact shoulder using the SEW-EURODRIVE assembly/disassembly kit:



18014398721004683

[1] Retaining screw
[2] Lock washer
[3] Washer
[4] Retaining ring
[5] Spacer tube
[6] Customer shaft without contact shoulder

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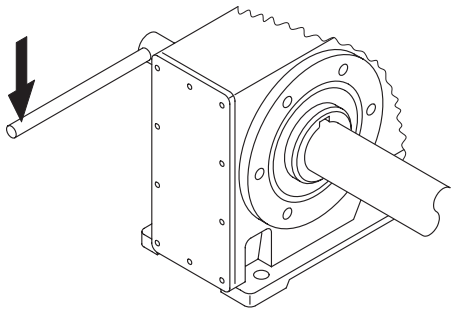
3. Tighten the retaining screw to the appropriate torque. Observe the tightening torques specified in the following table.



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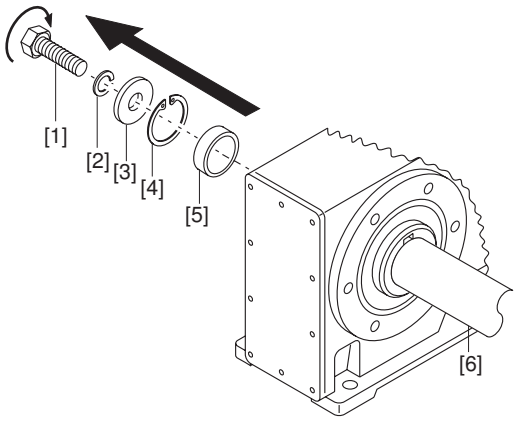
Screw	Tightening torque Nm
M5	5
M6	8
M10/12	20
M16	40
M20	80
M24	200

4.7.2 Removing the shaft-mounted gear unit

This description is only applicable if the gear unit was assembled using the SEW-EURODRIVE assembly/disassembly kit (see step 2 of Mounting the shaft-mounted gear unit).



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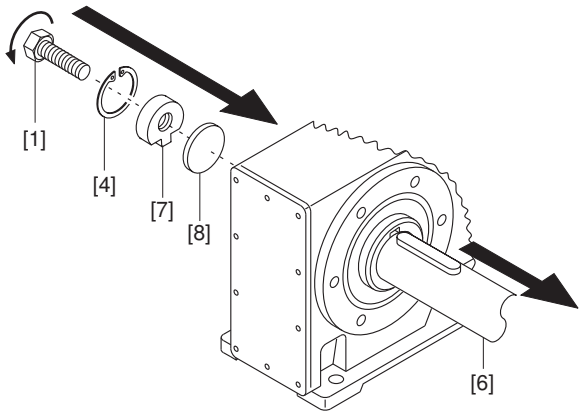
[1] Retaining screw
[2] Lock washer
[3] Washer
[4] Retaining ring
[5] Spacer tube
[6] Customer shaft

Proceed as follows:

1. Loosen the retaining screw [1].
2. Remove parts [2] to [4] and, if applicable, the spacer tube [5].

3. Insert the forcing washer [8] and the fixed nut [7] from the SEW-EURODRIVE assembly/disassembly kit between the customer shaft [6] and the retaining ring [4] (see SEW-EURODRIVE assembly/disassembly kit).
4. Re-install the retaining ring [4].
5. Re-install the retaining screw [1]. Press the gear unit off the shaft by tightening the screw.



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[1] Retaining screw
[4] Retaining ring
[6] Customer shaft
[7] Fixed nut
[8] Forcing washer

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4.7.3 Assembly/disassembly kit by SEW-EURODRIVE

Applies only if the installation/removal kit was previously used for installation.

1. Loosen the retaining screw [2].
2. Remove the retaining ring [3] and, if used, the spacer tube.
3. Insert the forcing washer [6] and the fixed nut [5] between the customer shaft [4] and retaining ring [3] as shown in the following figure.
4. Re-install the retaining ring [3].
5. Re-install the retaining screw [2]. Now you can force the gear unit off the shaft.

The following figure shows the SEW-EURODRIVE assembly/disassembly kit.

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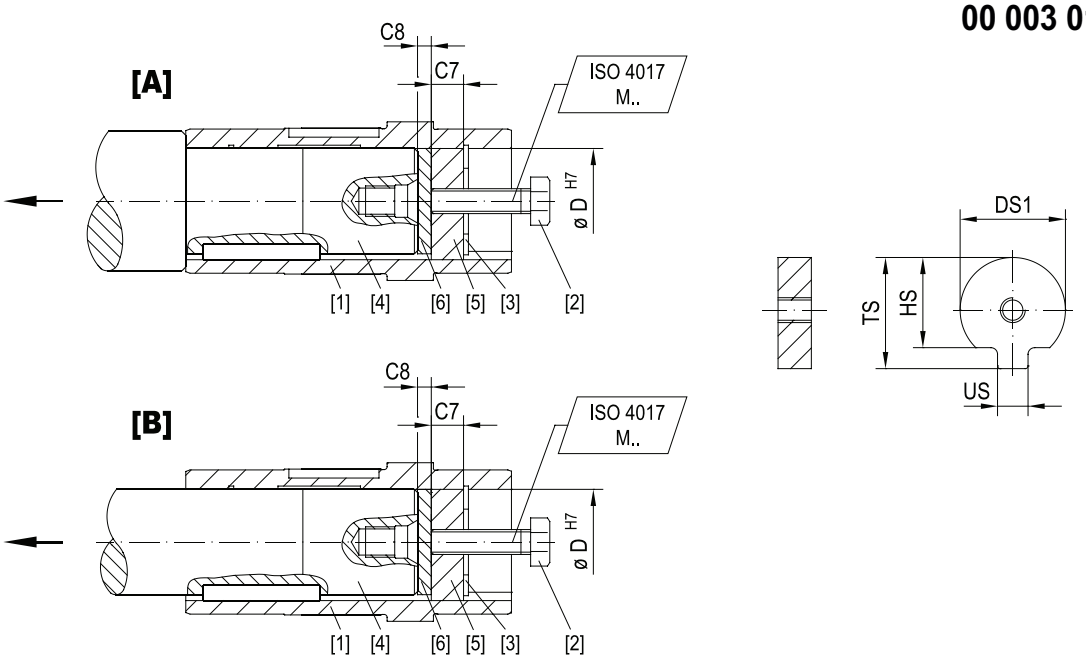

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C7 Width of fixed nut
C8 Width of forcing washer
D Hollow shaft diameter
DS1 Diameter of fixed nut
HS Height 1 of fixed nut
TS Height 2 of fixed nut
US Base width of fixed nut
[1] Hollow shaft
[2] Retaining screw
[3] Retaining ring
[4] Customer shaft
[5] Fixed nut for disassembly
[6] Forcing washer

Dimensions and part numbers of the assembly/disassembly kit:

Gear unit	D^{H7} mm	C8 mm	C7 mm	HS mm	US mm	TS mm	DS1 mm	ISO 4017 M..	Part number of the assembly/disassembly kit
WA..10	16	5	5	12	4.5	18	15.7	M5 × 50	06437125
WA..20	18	5	6	13.5	5.5	20.5	17.7	M6 × 25	0643682X

Gear unit	D^{H7} mm	C8 mm	C7 mm	HS mm	US mm	TS mm	DS1 mm	ISO 4017 M..	Part number of the assembly/disassembly kit
WA..20, WA..30, SA..37, KA..19, W..29	20	5	6	15.5	5.5	22.5	19.7	M6 × 25	06436838
FA..27, SA..47, KA..29, W..29, W..39	25	5	10	20	7.5	28	24.7	M10 × 35	06436846
FA..37, KA..29, KA..37, KA..39, SA..47, SA..57, W..29, W..39	30	5	10	25	7.5	33	29.7	M10 × 35	06436854
FA..47, KA..39, KA..47, KA..49, SA..57	35	5	12	29	9.5	38	34.7	M12 × 45	06436862
FA..57, KA..57, FA..67, KA..49, KA..67, SA..67	40	5	12	34	11.5	41.9	39.7	M16 × 50	06436870
SA..67	45	5	12	38.5	13.5	48.5	44.7	M16 × 50	06436889
FA..77, KA..77, SA..77	50	5	12	43.5	13.5	53.5	49.7	M16 × 50	06436897
FA..87, KA..87, SA..77, SA..87	60	5	16	56	17.5	64	59.7	M20 × 60	06436900
FA..97, KA..97, SA..87, SA..97	70	5	16	65.5	19.5	74.5	69.7	M20 × 60	06436919
FA..107, KA..107, SA..97	90	5	20	80	24.5	95	89.7	M24 × 70	06436927
FA..127, KA..127	100	5	20	89	27.5	106	99.7	M24 × 70	06436935
FA..157, KA..157	120	5	20	107	31	127	119.7	M24 × 70	06436943

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4.8 Shaft-mounted gear unit with shrink disk

4.8.1 Mounting shaft mounted gear units with shrink disk

NOTICE

Deformation of the hollow shaft due to tightening the locking screws without first installing the shaft.

Gear unit damage can occur.

- Never tighten the locking screws without the shaft installed.

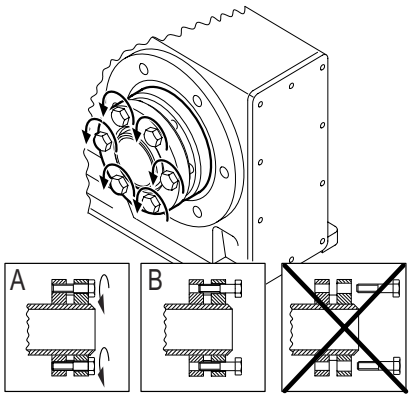
INFORMATION

The exact values for the tightening torques are shown on the shrink disk.

INFORMATION

Standard shrink disks and stainless steel shrink disks have the same tightening torques.

1. Slightly loosen the locking screws. Do not remove the locking screws completely.



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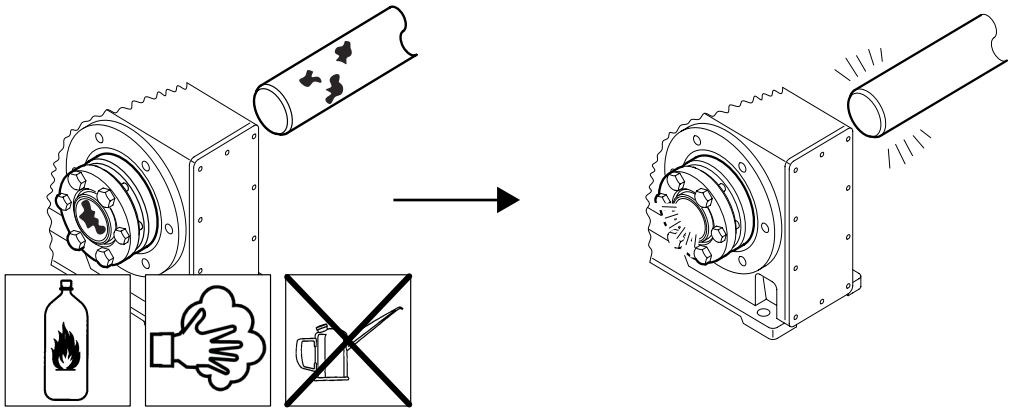
2. Carefully **degrease** the hollow shaft bore and the input shaft using a commercial solvent.



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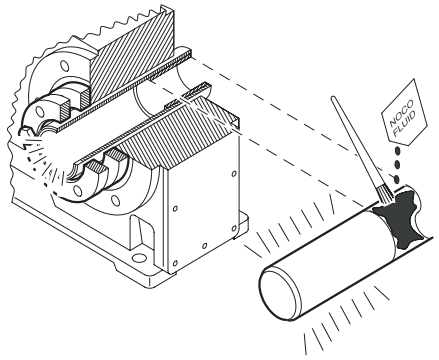
3. ⚠ **CAUTION!** Never apply NOCO® fluid directly onto the bushing, since the compound can get into the clamping area of the shrink disk when the machine shaft is fitted.
   Apply NOCO® fluid to the machine shaft in the vicinity of the bushing. It is essential to make sure that the clamping area of the shrink disk is free from grease!



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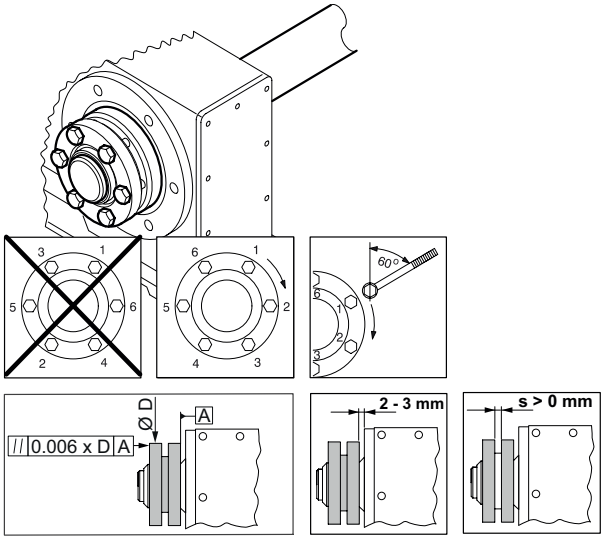
4. ⚠ **CAUTION!** Risk of injury due to falling shrink disk. Secure the shrink disk immediately after fitting the shaft.
   Install the shaft. Make sure that the outer rings of the shrink disc are installed plane-parallel to each other when doing this.
5. Install the input shaft. Proceed as follows to do so:
6. If you have a gear unit with a shaft shoulder, then fit the shrink disk to the shaft shoulder as far as it will go, whereby the minimum distance between the outer ring of the shrink disk facing the gear unit and the gear unit housing must be no less than 2 mm.
7. In the case of a gear unit without a shaft shoulder, mount the shrink disk at a distance of 2 – 3 mm from the gear unit housing.
8. Tighten the locking screws by working round several times from one screw to the next (not in diametrically opposite sequence). The tightening torques can be found in the following table. After installation, grease the outer surface of the hollow shaft in the vicinity of the shrink disk to prevent corrosion.



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9. After installation, make sure the remaining gap "s" between the outer rings of the shrink disk is > 0 mm.

10. To prevent corrosion, grease the outer surface of the hollow shaft around the shrink disk.
11. ⚠ **CAUTION!** Install the provided rotating safety cover or another, suitable protective cover at the shrink disk to prevent injuries. Never start up the drive if the protective covers are not installed.

Gear unit type				Locking screw ISO 4014/ISO 4017/ ISO 4762	Tightening torque ±4 % Nm
KH..	FH..	SH..	WH..		
19/29	27	37	37/29/39	M5	5
37/39/47/49/57/67/77	37/47/57/67/77	47/57/67/77	47	M6	12
87/97	87/97	87/97	–	M8	30
107	107	–	–	M10	59
127/157	127/157	–	–	M12	100
167	–	–	–	M16	250
187	–	–	–	M20	470

4.8.2 Removing shaft mounted gear units with shrink disk

INFORMATION

There is no need to dismantle clean, removed shrink disks before they are reinstalled.

1. ⚠ **CAUTION!** Risk of injury due to falling shrink disk. Secure the shrink disk before disassembly.
2. To prevent the outer rings from jamming, loosen the locking screws for a quarter turn, one after the other.
3. Steadily loosen the locking screws one after the other, but do not remove the locking screws completely.
4. If rust has formed on the shaft in front of the hub, remove the rust.
5. Remove the shaft or pull the hub off the shaft.
6. Remove the shrink disk from the hub.

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4.8.3 Cleaning and lubricating the shrink disk

If a removed shrink disk is clean, it does not have to be disassembled or re-greased before re-tightening.

The shrink disk only needs to be cleaned and greased if it is contaminated.

Use one of the following solid lubricants for the tapered surfaces:

Lubricant (Mo S_2)	Sold as
Molykote 321 (lube coat)	Spray
Molykote spray (powder spray)	Spray
Molykote G Rapid	Spray or compound
Aemasol MO 19P	Spray or compound
AemasolDIO-sétral 57 N (lube coat)	Spray

Grease the locking screws with a multipurpose grease such as Molykote BR 2 or similar.

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4.9 Shaft-mounted gear units with TorqLOC®

NOTICE

With a fixed flange or foot mounting, stress can build up in the drive train because of the possible tolerance adjustment of the TorqLOC® shaft.

Damage to property

- A flange or foot mounting is only allowed for TorqLOC® mounting if it is ensured that no static overdetermination can occur. Tolerance adjustment of the shaft must be possible.

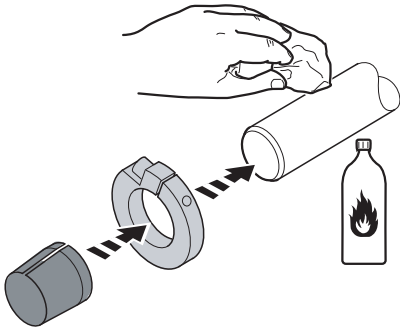
INFORMATION

In case of flange mounting, installing the clamping ring may not be possible depending on the size.

4.9.1 Mounting a customer shaft without contact shoulder

Proceed as follows:

1. Clean the customer shaft and the inside of the hollow shaft. Ensure that all traces of grease or oil are removed.
2. Install the stop ring and the bushing on the customer shaft.



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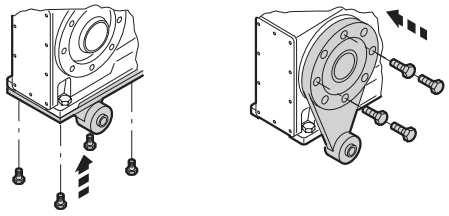
3. Attach the torque bracket to the drive unit. Observe the information in chapter "Torque arms for shaft-mounted gear units" (→ 🗎 47).



K..7 **S../W../K..9**

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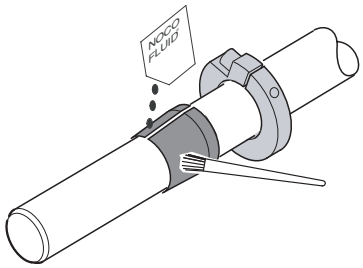
4. Apply NOCO® fluid to the bushing. Spread carefully.



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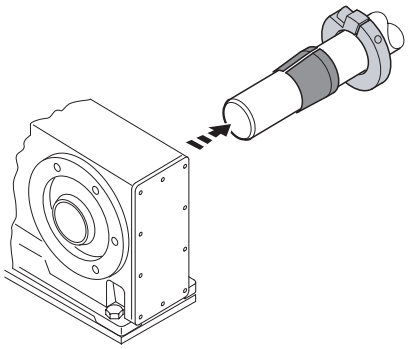
5. Push the gear unit onto the customer shaft.



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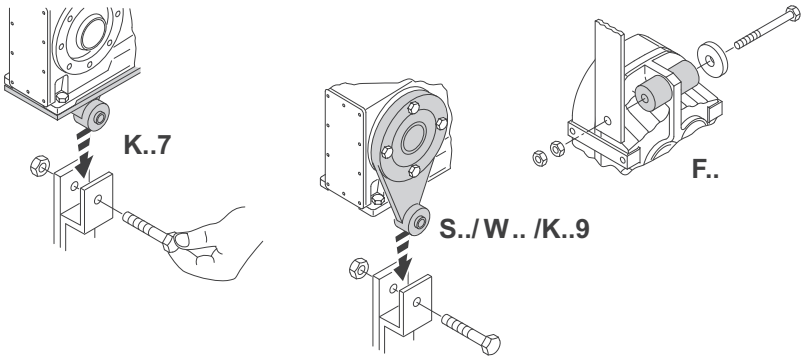
6. Preassemble the torque bracket. Do not firmly tighten the screws.



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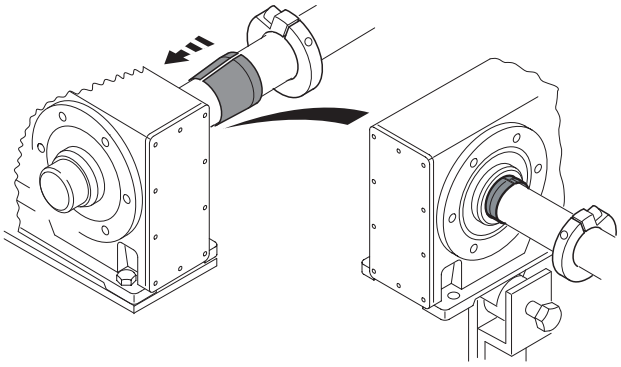
7. Push the bushing into the gear unit up to the stop.



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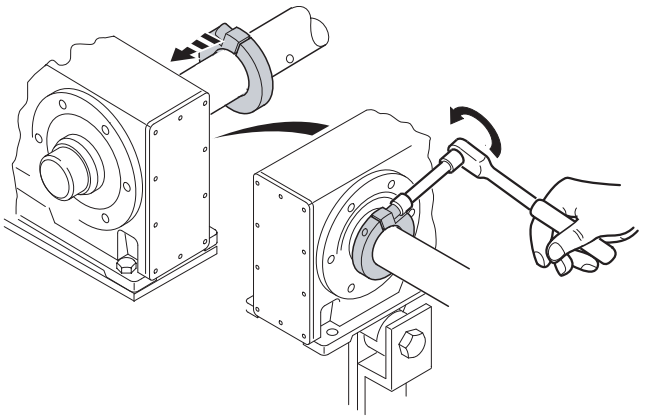
8. Secure the bushing with the stop ring. Attach the stop ring to the bushing with the respective tightening torque. Refer to the following table for the suitable tightening torque.



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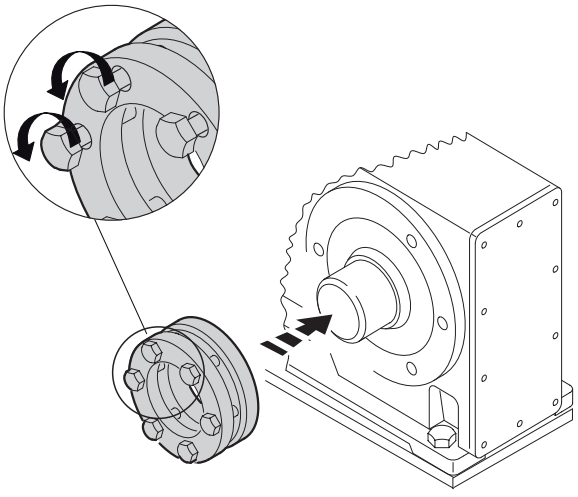
Gear unit type				Tightening torque Nm	
FT..	KT..	ST..	WT..	Standard	Stainless steel
–	19	37	37/29	10	10
37	29/37	47	47/39	10	10
47	39/47	57	–	10	10
57/67	49/57/67	67	–	25	25
77	77	77	–	25	25
87	87	87	–	25	25
97	97	97	–	25	25
107	107	–	–	38	38
127	127	–	–	65	65
157	157	–	–	150	150

9. Make sure that all screws are loosened and slide the shrink disk onto the hollow shaft.



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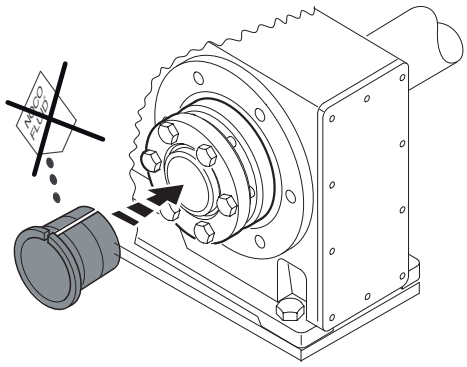
10. Slide the counter bushing onto the customer shaft and into the hollow shaft. Make sure that the gear unit is mounted flush with the customer shaft.



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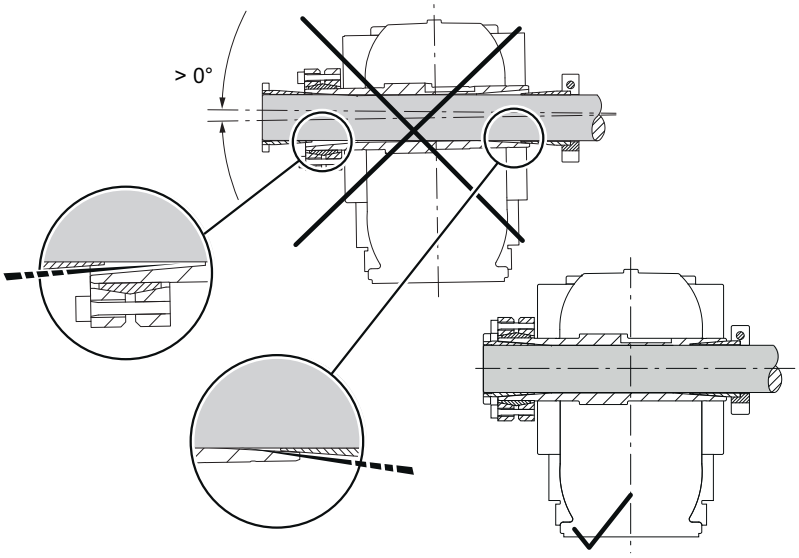

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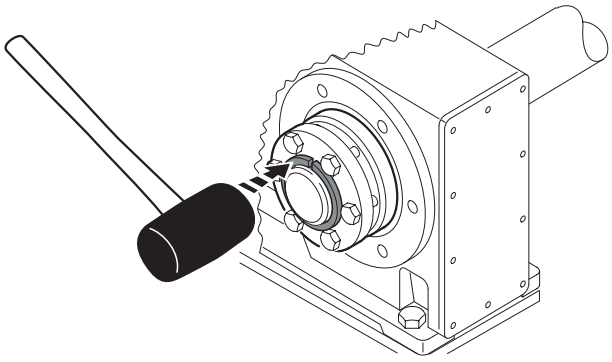
11. If you have a gear unit **with a shaft shoulder**, then fit the shrink disk to the shaft shoulder as far as it will go, whereby the minimum distance between the outer ring of the shrink disk facing the gear unit and the gear unit housing must be no less than 2 mm. In the case of a gear unit **without a shaft shoulder**, mount the shrink disk at a distance of 2 – 3 mm from the gear unit housing.
12. Tap lightly on the flange of the counter bushing to ensure that the bushing is fitted securely in the hollow shaft.



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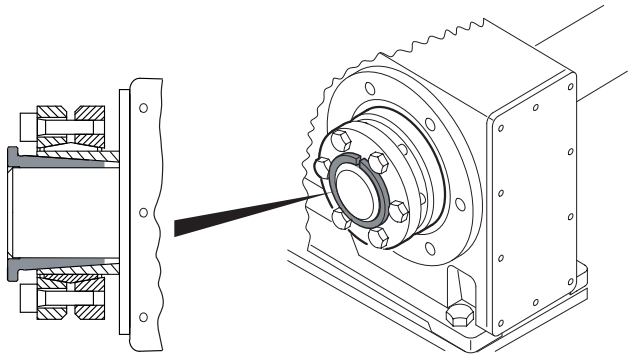
13. Make sure that the customer shaft is seated in the counter bushing.



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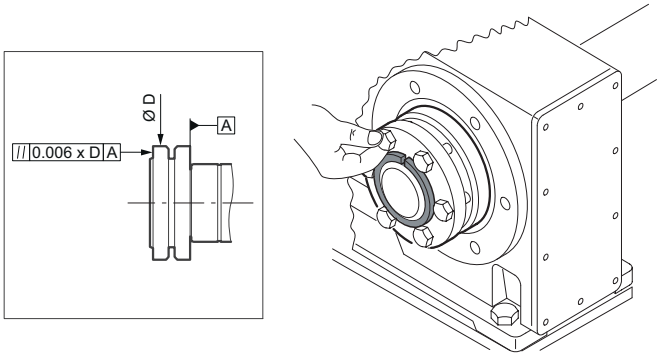
14. Manually tighten the screws of the shrink disk. Make sure that the outer rings of the shrink disk are plane-parallel.



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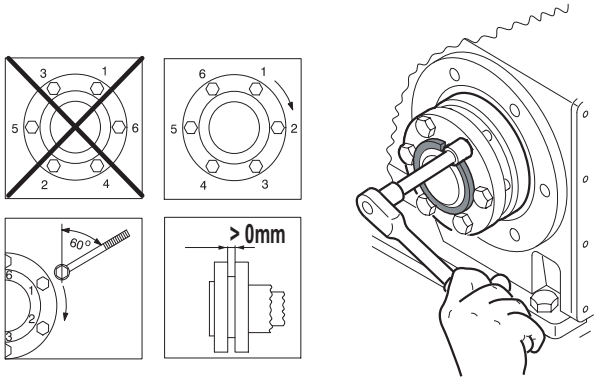
15. Tighten the locking screws with the specified tightening torque in accordance with the following table. Tighten the screws by working round several times from one bolt to the next (not in diametrically opposite sequence).



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INFORMATION

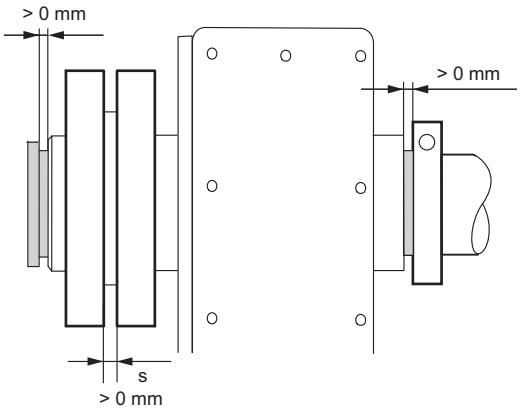
The exact values for the tightening torques are shown on the shrink disk.

INFORMATION

Standard shrink disks and stainless steel shrink disks have the same tightening torques.

Gear unit type				Locking screw	Tightening torque ±4 %
FT..	KT..	ST..	WT..	ISO 4762	Nm
–	19	37	37/29	M5	4
–	29		39	M5	5
37	37	47	47	M6	12
47/57/67	39/47/49/57/67	57/67	-	M6	12
77/87/97	77/87/97	77/87/97	–	M8	30
107	107	–	–	M10	59
127/157	127/157	–	–	M12	100

16. After installation, make sure the remaining gap "s" between the outer rings of the shrink disk is > 0 mm.
17. Make sure that the remaining gap between counter bushing and hollow shaft end, as well as between hollow shaft end and the stop ring is > 0 mm.



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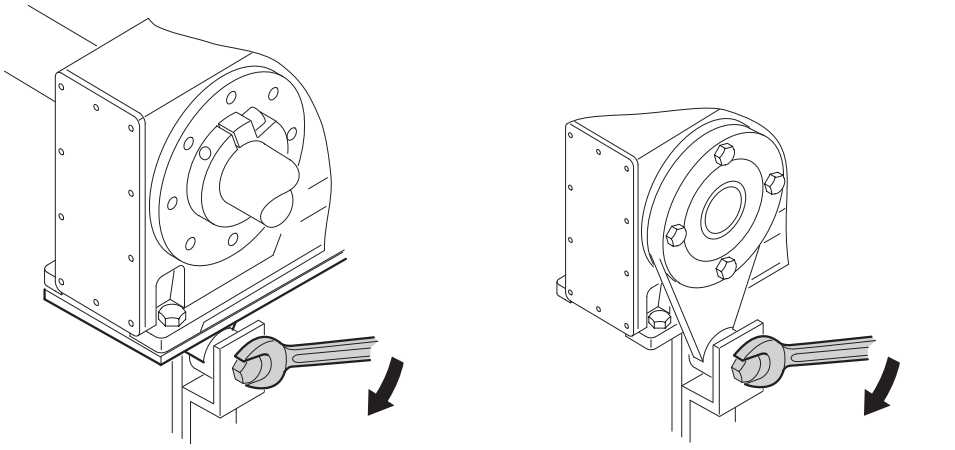
18. Tighten the torque bracket. Observe the information in chapter "Torque arms for shaft-mounted gear units" (→ 🗎 47).



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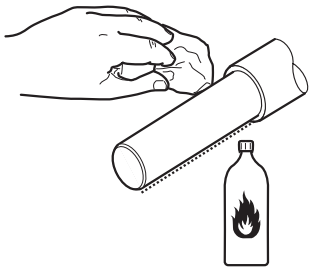
4.9.2 Mounting a customer shaft with contact shoulder

1. Clean the customer shaft and the inside of the hollow shaft. Ensure that all traces of grease or oil are removed.



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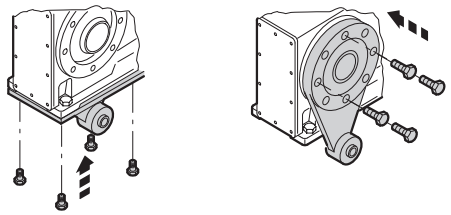
2. Attach the torque bracket to the drive unit. Observe the information in chapter "Torque arms for shaft-mounted gear units" (→ 🗎 47).



K..7 **S../W../K..9**

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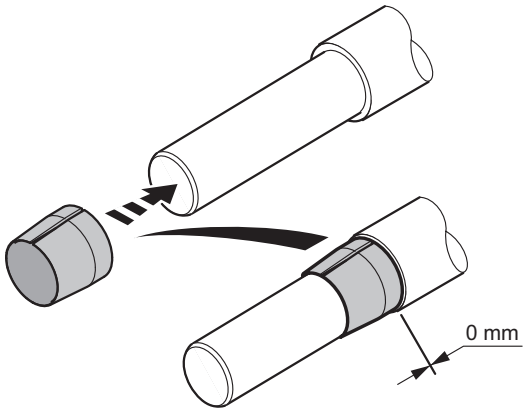
3. Slide the bushing onto the customer shaft.



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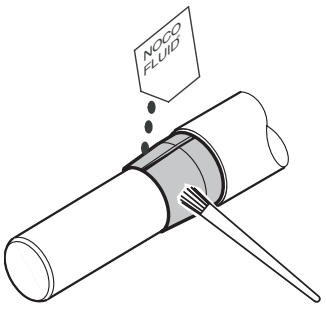
4. Apply NOCO® fluid to the bushing. Spread carefully.



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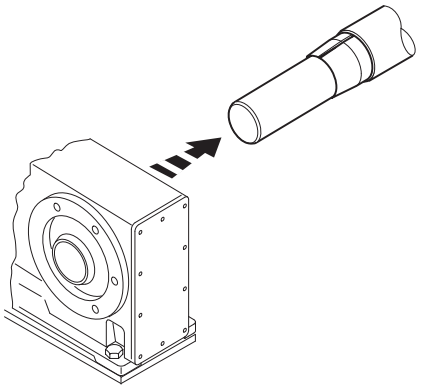
5. Push the gear unit onto the customer shaft.



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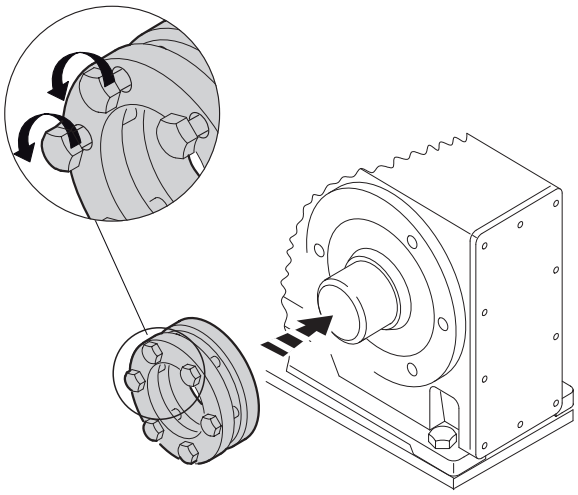
6. Ensure that all screws are loosened. Slide the shrink disk onto the hollow shaft.



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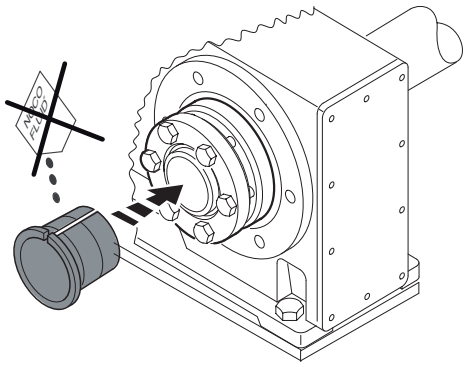
7. Slide the counter bushing onto the customer shaft and into the hollow shaft. Make sure that the gear unit is mounted flush with the customer shaft.



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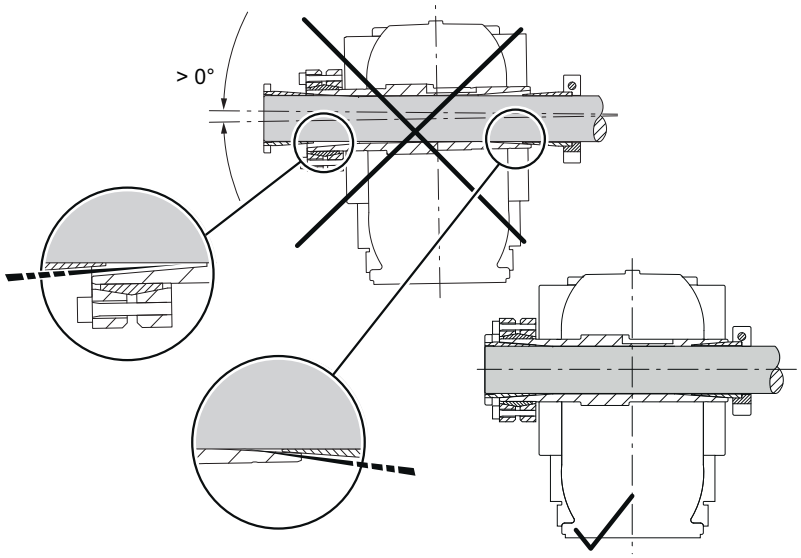

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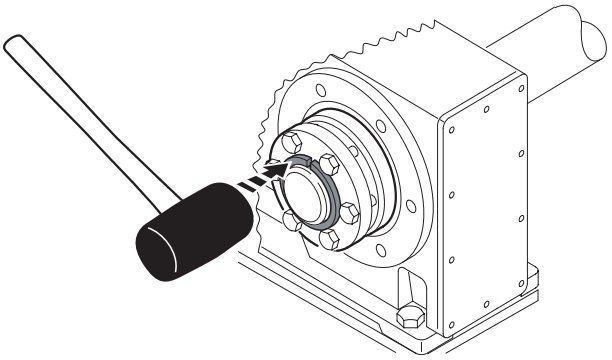
8. In the case of a gear unit **with a shaft shoulder**, fit the shrink disk to the shaft shoulder as far as it will go. If the case of a gear unit **without a shaft shoulder**, then fit the shrink disk at a distance of 2 – 3 mm from the gear unit housing, whereby the minimum distance between the outer ring of the shrink disk facing the gear unit and the gear unit housing must be no less than 2 mm.
9. Tap lightly on the flange of the counter bushing to ensure that the bushing is fitted securely in the hollow shaft.



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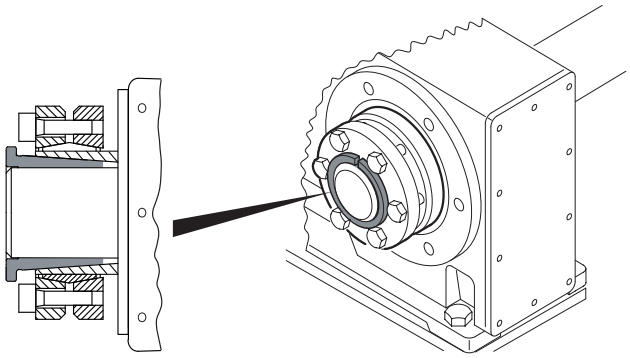
10. Make sure that the customer shaft is seated in the counter bushing.



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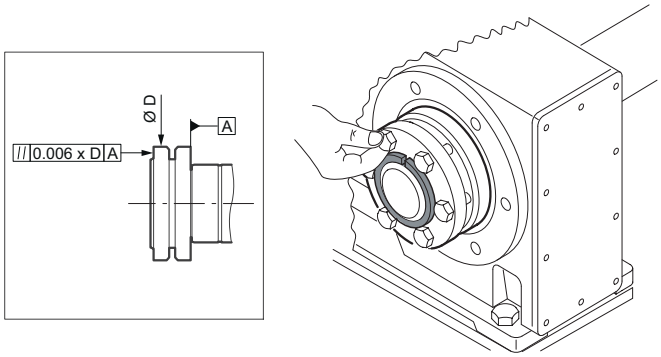
11. Manually tighten the screws of the shrink disk. Make sure that the outer rings of the shrink disk are plane-parallel.



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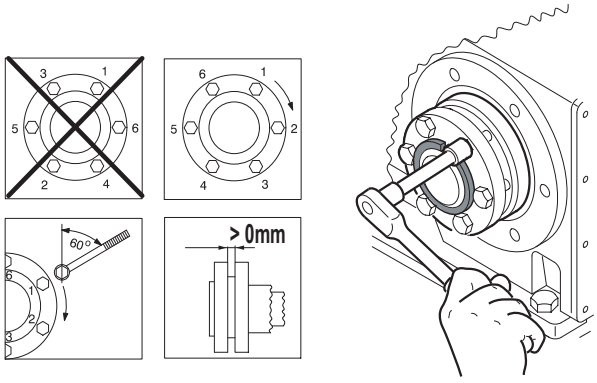
12. Tighten the locking screws with the specified tightening torque in accordance with the following table. Tighten the screws by working round several times from one bolt to the next (not in diametrically opposite sequence).



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INFORMATION

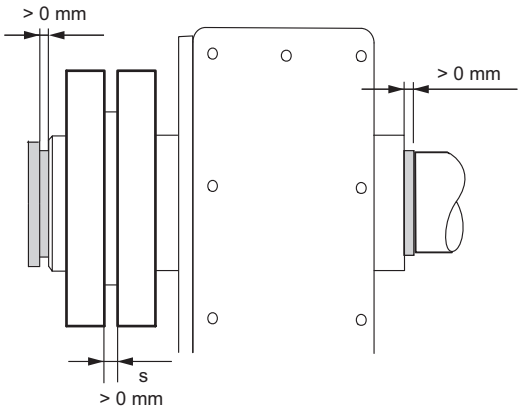
The exact values for the tightening torques are shown on the shrink disk.

INFORMATION

Standard shrink disks and stainless steel shrink disks have the same tightening torques.

Gear unit type				Locking screw	Tightening torque ±4 %
FT..	KT..	ST..	WT..	ISO 4762	Nm
–	19	37	37/29	M5	4
–	29		39	M5	5
37	37	47	47	M6	12
47/57/67	39/47/49/57/67	57/67	-	M6	12
77/87/97	77/87/97	77/87/97	–	M8	30
107	107	–	–	M10	59
127/157	127/157	–	–	M12	100

13. After installation, make sure the remaining gap "s" between the outer rings of the shrink disk is > 0 mm.
14. Make sure that the remaining gap between counter bushing and hollow shaft end, as well as between the hollow shaft end and customer shaft shoulder is > 0 mm.



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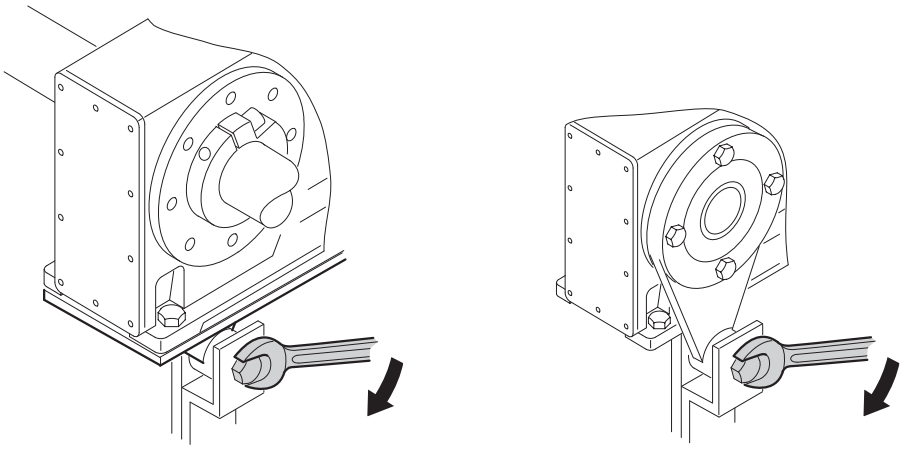
15. Mount the torque bracket and firmly tighten it. Observe the information in chapter "Torque arms for shaft-mounted gear units" (→ 🗎 47).



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4.9.3 Removing the shaft-mounted gear unit

⚠ CAUTION

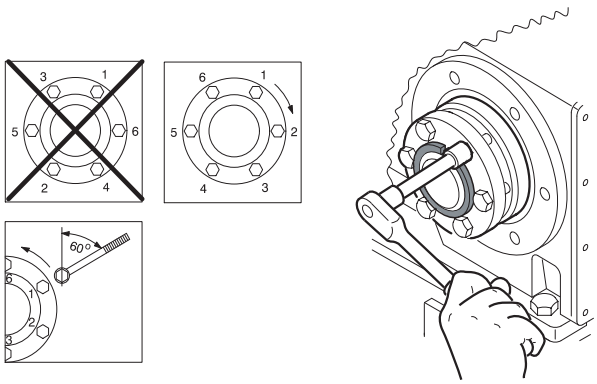
Risk of burns caused by hot surfaces

Severe injuries

- Let the units cool down before working on them.

Proceed as follows:

1. To prevent the outer rings from jamming, loosen the locking screws for a quarter turn, one after the other.



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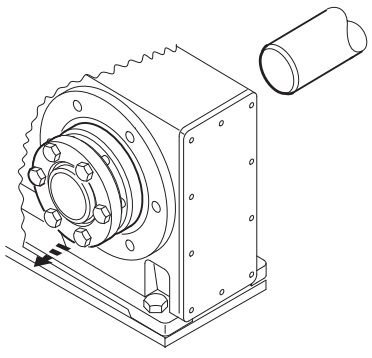
2. Unscrew the locking screws evenly one after the other. Do not remove the locking screws completely.
3. Remove the conical steel bushing. If required, use the outer rings as pullers. Proceed as follows to do so:

- Remove all the locking screws.
- Screw the respective number of screws in the tapped holes of the shrink disk.
- Support the inner ring against the gear unit housing.
- Pull off the conical steel bushing by tightening the screws.

4. Remove the gear unit from the shaft.



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5. Remove the shrink disk from the hub.

INFORMATION

There is no need to dismantle removed shrink disks before they are reinstalled.

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4.9.4 Cleaning and lubricating shaft-mounted gear units

- If the shrink disk is dirty, clean and lubricate the shrink disk.
- Lubricate the tapered surfaces with one of the following solid lubricants:

Lubricant (Mo S2)	Sold as
Molykote 321 (lube coat)	Spray
Molykote spray (powder spray)	Spray
Molykote G Rapid	Spray or paste
Aemasol MO 19P	Spray or paste
Aemasol DIO-sétral 57 N (lube coat)	Spray

- Grease the locking screws with a multipurpose grease such as Molykote BR 2.

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4.10 Mounting the cover

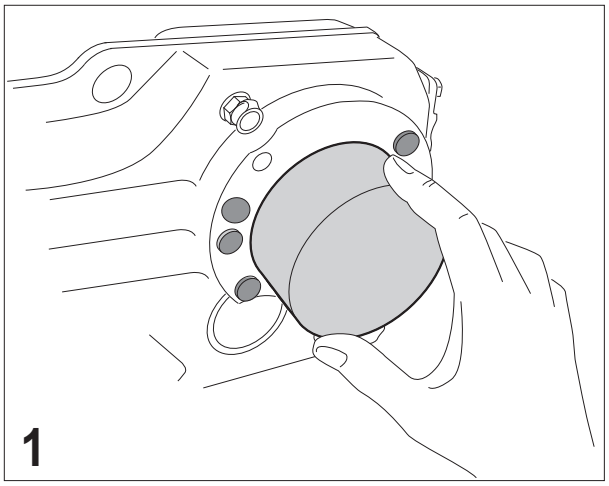
⚠ CAUTION

Injury due to assembly work during operation.

Injury

- Before you begin working on the unit, disconnect the motor from the power supply. Safeguard the drive against unintentional restart.

4.10.1 Installing the rotating safety cover



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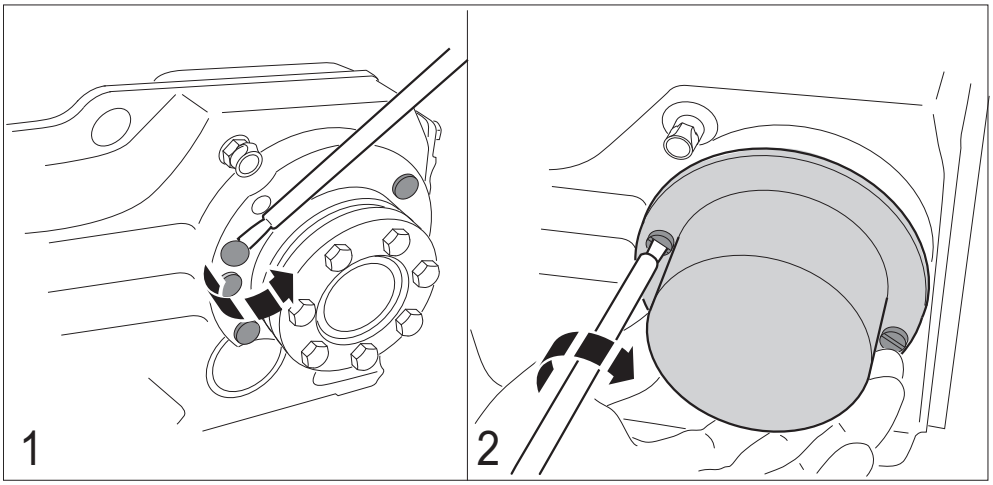
1. Slide the rotating safety cover onto the shrink disc until it snaps in.

4.10.2 Mounting the fixed cover

Proceed as follows:

1. Remove the plastic plug on the gear unit housing (see figure 1).



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2. Use the delivered screws to mount the cover to the gear unit housing (see figure 2).

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4.10.3 Operation without cover

In certain application cases, e.g. with a through-shaft, a cover cannot be installed. The cover is not necessary if the system or unit manufacturer provides corresponding components to guarantee for compliance with the required degree of protection. If this results in additional maintenance, the manufacturer has to describe this in the operating instructions for the system or component.

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4.11 AMS.. adapter

4.11.1 Figure and note concerning the installation of the AMS.. adapter

NOTICE

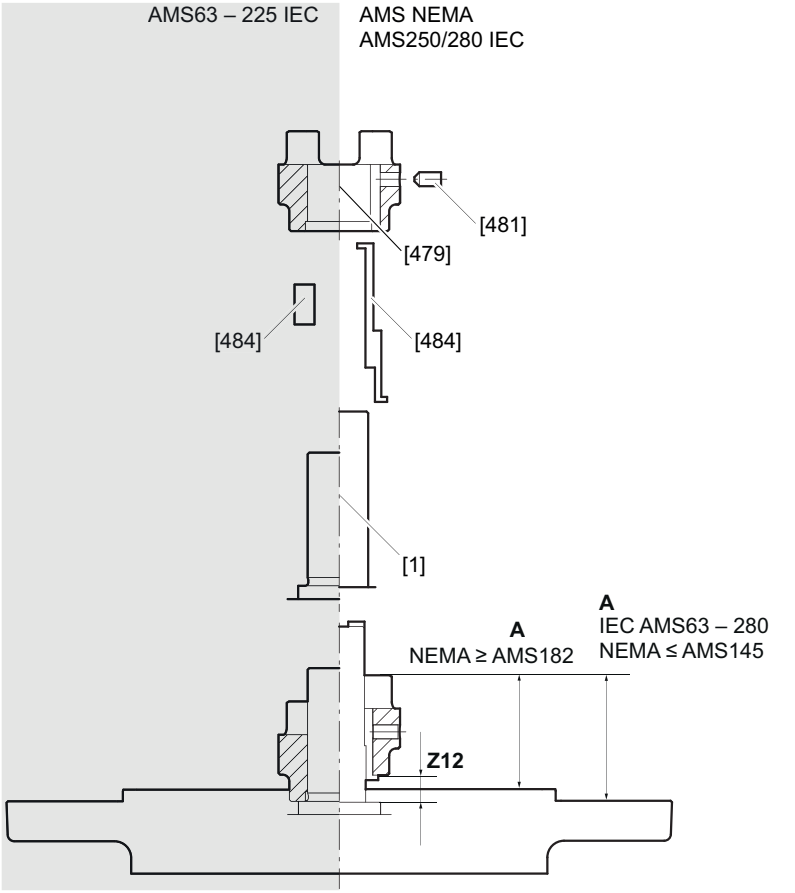
Damage to the adapter due to ingress of moisture or dirt (e.g. dust) when a motor/drive is attached to the adapter.

Damage to the adapter

- Seal the adapter with an anaerobic fluid seal.
- When the motor/drive to be attached has openings or bores that provide access to the inside of the adapter, seal these against dust or liquid.

INFORMATION

To avoid contact corrosion, SEW-EURODRIVE recommends applying NOCO® fluid to the motor shaft before mounting the coupling half.



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[1] Motor shaft
[479] Coupling half
[481] Set screw
[484] Key
A Distance A
Z12 Distance between shaft shoulder and coupling

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4.11.2 Fitting the motor to IEC adapter AMS63 – 225

1. Clean the motor shaft [1] and the flange surfaces of the motor and the adapter.
2. Remove the key from the motor shaft. Replace this key with the supplied key [484]. **Notice!** The key must not protrude beyond the base of the coupling claw in the installed condition!
3. Heat the coupling half [479] to approx. 80 °C – 100 °C. Slide the coupling half onto the shoulder of the motor shaft as far as it will go.
4. Check the position of the coupling half. The values for distance "A" are listed in the following table.
5. Secure the key and the coupling half to the motor shaft using the set screw [481]. Refer to the following table for the required tightening torque "T_A".
6. Seal the contact surfaces between the adapter and motor using a suitable sealing compound.
7. Fit the motor to the adapter in such a way that the coupling claws of the adapter shaft engage in the plastic coupling ring. Please adhere to the tightening torques specified in chapter "Tightening torques for motor to adapter" (→ 🗎 85).

IEC adapter AM63 – 225: Distance A and tightening torque T_A

	63/71	80	90	100/112	132	160/180	200/225
A /mm	27.3	30	39	48.5	56.5	80.5	78
T_A /Nm	1.5	2	2	4.8	10	17	17
Thread	M4	M5	M5	M6	M8	M10	M10

4.11.3 Fitting the motor to IEC adapter AMS250/280 and NEMA adapter AMS56 – 365 with the provided key

1. Clean the motor shaft [1] and the flange surfaces of the motor and the adapter.
2. Remove the key from the motor shaft. Replace this key with the provided key [484]. The position of the key is dependent upon the adapter: **AMS250-280**: The key must lie against the shoulder of the motor shaft. **NEMA**: The shoulder of the key must lie against the front of the motor shaft.
3. Heat the coupling half [479] to approx. 80 °C – 100 °C and slide the coupling half onto the motor shaft. Slide the coupling half onto the shoulder of the key as far as it will go.
4. Check the position of the coupling half. The values for distance "A" are listed in the following table.
5. Secure the key and the coupling half to the motor shaft using the set screw [481]. Refer to the following table for the required tightening torque "T_A".
6. Seal the contact surfaces between the adapter and motor using a suitable sealing compound.
7. Fit the motor to the adapter in such a way that the coupling claws of the adapter shaft engage in the plastic coupling ring. Please adhere to the tightening torques specified in chapter "Tightening torques for motor to adapter" (→ 🗎 85).

IEC adapter AMS250/280: Distance A and tightening torque T_A

	250/280
A /mm	139

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	250/280
T_A /Nm	17
Thread	M10

NEMA adapter AMS56 – 365: Distance A and tightening torque T_A

	56	143/145	182/184	213/215	254/256 284/286	324/326 364/365
A /mm	37.7	46.3	54.2	61.2	81.6	90.4
T_A /Nm	2	2	4.8	10	17	17
Thread	M5	M5	M6	M8	M10	M10

4.11.4 Fitting the motor to IEC adapter AMS250/280 and NEMA adapter AMS56 – 365 with standard key

1. Clean the motor shaft [1] and the flange surfaces of the motor and the adapter.
2. Remove the key from the motor shaft. Replace this with a standard key. The required standard key size can be found in the following table. **Notice!** The key must not protrude beyond the base of the coupling claw in the installed condition!
3. Heat the coupling half [479] to approx. 80 °C – 100 °C and slide the coupling half onto the motor shaft. Slide the coupling half onto the motor shaft up to distance Z12. The values for distance "Z12" are listed in the following table.
4. Check the position of the coupling half. The values for distance "A" are listed in the table in chapter "Fitting the motor to IEC adapter AMS250/280 and NEMA adapter AMS56 – 365 with the provided key" (→ 🗎 79).
5. Secure the key and the coupling half to the motor shaft using the set screw [481]. The required tightening torque "T_A" can be found in the table in chapter "Fitting the motor to IEC adapter AMS250/280 and NEMA adapter AMS56 – 365 with the provided key" (→ 🗎 79).
6. Seal the contact surfaces between the adapter and motor using a suitable sealing compound.
7. Fit the motor to the adapter in such a way that the coupling claws of the adapter shaft engage in the plastic coupling ring. Please adhere to the tightening torques specified in chapter "Tightening torques for motor to adapter" (→ 🗎 85).

Adapter	Z12 mm	Standard key[1)] inch	Standard key[2)] mm
AMS56	3.1	B3/16 × 3/16 × 7/16	–
AMS143/145	10.6	B3/16 × 3/16 × 9/16	–
AMS182/184	9	B1/4 × 1/4 × 1/2	–
AMS213/215	11.3	B5/16 × 5/16 × 13/16	–
AMS254/256	7.4	B3/8 × 3/8 × 1-1/4	–
AMS284/286	13.8	B1/2 × 1/2 × 1-1/4	–
AMS324/326	18.7	B1/2 × 1/2 × 1-1/2	–
AMS364/365	19	B5/8 × 5/8 × 1-1/4	–
AMS250	19	–	B18 × 11 × 70

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Adapter	Z12 mm	Standard key[1] inch	Standard key[2] mm
AMS280	19	–	B20 × 12 × 70

1) The key size relates to material type 1045 or type 1018 in accordance with ASTM A 29/A29M.
2) The key size relates to material C45+C in accordance with DIN EN 10277-2.

4.11.5 Permitted loads

NOTICE

Overloading of the gear unit can occur due to excessive weight or excessive power rating of an attached motor.

Gear unit damage can occur.

- Note that the load data specified in the following table must not be exceeded.
- Ensure that the approved power rating (torque and speed) on the adapter is observed in accordance with the nameplate.

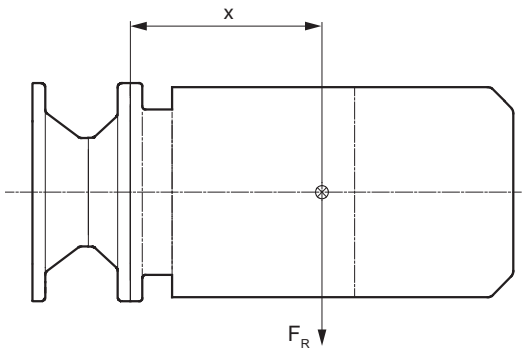
NOTICE

Danger due to static overdetermination when motors are additionally attached via a foot plate.

Damage to property

- A motor attached at the foot relieves the interface on the adapter, but you have to make sure that the attached foot-mounted motor is attached to the customer's construction stress-free.

The following figure shows the load caused by the mass of the motor:



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⊗ Motor center of gravity
x Distance between adapter flange and motor center of gravity
F_R Overhung load

Permitted loads for gear unit model series R..7, F..7, K..7, K..9, S..7, S..7p and W..9:

IEC adapter	x[1]	Gear unit input end flange diameter	Standard	/DH option	/RS option
	mm	mm	F_R[1] in N	F_R[1] in N	F_R[1] in N
AMS63/71	77	105	260	220	-
		≥ 120	530	455	-
AMS80	113	105	300	265	-
		120	420	370	350
		≥ 160	1000	880	820
AMS90	113	120	420	375	350
		≥ 160	1000	895	840
AMS100/112	144	≥ 160	2000	1685	1685
AMS132	186	160	1600	1375	1370
		≥ 200	4700	4060	4055
AMS160/180	251	≥ 250	4600	4200	4600
AMS200/225	297	≥ 300	5600	5600	5600
AMS250/280	390	≥ 450	11200	11200	11200

NEMA adapter	x[1]	Gear unit input end flange diameter	Standard	/DH option	/RS option
	mm	mm	F_R[1] in N	F_R[1] in N	F_R[1] in N
AMS56	77	105	215	185	-
		≥ 120	445	385	-
AMS143/145	113	120	410	370	345
		≥ 160	965	865	820
AMS182/184	144	≥ 160	1960	1660	1660
AMS213/215	186	160	1585	1360	1360
AMS213/215		≥ 200	4640	4010	4010
AMS254 – 286	251	≥ 250	4525	4135	4525
AMS324 – 365	297	≥ 300	5600	5600	5600

1) Maximum load values for connection screws of strength class 8.8. If the center of gravity distance x increases, the maximum permitted weight F_R of the attached motor must be reduced linearly. If the center of gravity distance x decreases, the maximum permitted weight F_R must not be increased.

Permitted loads for gear unit model series SPIROPLAN® W37 – W47

IEC adapter	x[1]	Standard	/DH option	/RS option
	mm	F_R[1] in N	F_R[1] in N	F_R[1] in N
AMS63/71	115	140	125	-
AMS80/90	151	270	245	230

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NEMA adapter	x[1]	Standard	/DH option	/RS option
	mm	F_R[1] in N	F_R[1] in N	F_R[1] in N
AMS56	115	120	105	-
AMS143/145	151	265	240	230

1) Maximum load values for connection screws of strength class 8.8. If the center of gravity distance x increases, the maximum permitted weight F_R of the attached motor must be reduced linearly. If the center of gravity distance x decreases, the maximum permitted weight F_R must not be increased.

Permissible power ratings and mass moments of inertia

The following table shows the permitted power ratings and mass moments of inertia:

Adapter		P_m[1]	$J_{Adapter}$
IEC	NEMA	kW	kg × m²
AMS63	–	0.25	0.44×10^{-4}
AMS71	–	0.37	0.44×10^{-4}
AMS80	AMS56	0.75	1.3×10^{-4}
AMS90	AMS143/145	1.5	2.5×10^{-4}
AMS100	AMS182	3	7.8×10^{-4}
AMS112	AMS184	4	7.8×10^{-4}
AMS132S/M	AMS213/215	7.5	22×10^{-4}
AMS132ML	–	9.2	22×10^{-4}
AMS160	AMS254/256	15	72×10^{-4}
AMS180	AMS284/286	22	72×10^{-4}
AMS200	AMS324/326	30	201×10^{-4}
AMS225	AMS364/365	45	204×10^{-4}
AMS250	–	55	442×10^{-4}
AMS280	–	90	547×10^{-4}

1) Maximum rated power of the attached standard electric motor at 1400 1/min.

The specified mass moments of inertia apply for the standard adapter and the adapter with reinforced bearings. The mass moments of inertia of the adapters with backstop AMS../RS and drain hole AMS../DH can be found in the tables in chapters "Adapter with backstop AMS../RS" (→ 🗎 83) and "Adapter with drain hole AMS../DH" (→ 🗎 84).

4.11.6 Adapter with backstop AMS../RS

Check the direction of rotation of the drive prior to mounting or startup. If the direction of rotation is wrong, please consult SEW-EURODRIVE.

The backstop is maintenance-free in operation. Backstops have a minimum lift-off speed depending on the size (see following table).

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NOTICE

If the speed is below the minimum lift-off speed of the drive, the backstop is subject to wear and heats up.

Possible damage to property can occur.

- In nominal operation the lift-off speed of the drive must not drop below the specified minimum.
- During startup or braking, the lift-off speed of the drive may drop below the minimum levels.

Adapter		max. Locking torque backstop	Minimum lift-off speed	$J_{Adapter}$
IEC	NEMA	Nm	min^{-1}	$kg \times m^2$
AMS80/RS	–	130	720	4.5×10^{-4}
AMS90/RS	AMS143/145/RS			
AMS100/RS	AMS182/RS	190	625	15×10^{-4}
AMS112/RS	AMS184/RS			
AMS132/RS	AMS213/215/RS	500	550	44×10^{-4}
AMS160/RS	AMS254/256/RS	900	515	108×10^{-4}
AMS180/RS	AMS284/286/RS			
AMS200/RS	AMS324/326/RS	1900	490	257×10^{-4}
AMS225/RS	AMS364/365/RS			
AMS250/RS	–			496×10^{-4}
AMS280/RS	–			601×10^{-4}

4.11.7 Adapter with drain hole AMS../DH

The following table shows the maximum permissible rotational speeds and mass moments of inertia for the adapters with the drain hole option (condensation drain hole):

Adapter		Max. permitted speed	$J_{Adapter}$
IEC	NEMA	min^{-1}	$kg \times m^2$
AMS63/71/DH	–	3600	0.6×10^{-4}
AMS80/DH	AMS56/DH	3600	1.8×10^{-4}
AMS90/DH	AMS143/145/DH	3600	3.1×10^{-4}
AMS100/DH	AMS182/DH	3600	11×10^{-4}
AMS112/DH	AMS184/DH	3600	11×10^{-4}
AMS132/DH	AMS213/215/DH	3200	31×10^{-4}
AMS160/DH	AMS254/256/DH	2600	87×10^{-4}
AMS180/DH	AMS284/286/DH	2600	86×10^{-4}
AMS200/DH	AMS324/326/DH	1900	201×10^{-4}
AMS225/DH	AMS364/365/DH	1900	204×10^{-4}

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Adapter		Max. permitted speed	$J_{Adapter}$
IEC	NEMA	min^{-1}	$kg \times m^2$
AMS250/DH	–	1900	442×10^{-4}
AMS280/DH	–	1900	547×10^{-4}

4.11.8 Mounting of third-party motors(s) to AR../AL.. adapters

If a third-party motor is mounted, the customer must ensure that the permitted weight and the power at the adapter are adhered to according to the operating instructions. For information on the permitted loads, refer to chapter "Permitted loads" (→ 🗎 81).

Adapter	x[1)] mm	F_R[1)] N
AR/AL71	77	375
AR/AL80/90	113	320
AR/AL100/112	144	1560
AR/AL132[2)]	186	1230
AR/AL132	186	3630
AR/AL160/180	251	3540

1) Maximum load values for connection screws of strength class 8.8. If the center of gravity distance x increases, the maximum permitted weight F_R of the attached motor must be reduced linearly. If the center of gravity distance x decreases, the maximum permitted weight F_R must not be increased.

2) Gear unit input end flange diameter: 160 mm.

4.11.9 Tightening torques for motor to adapter

Screw the motors to the adapters with the following tightening torques: When doing this, observe the tightening torques in chapter "Notes concerning tightening torques" (→ 🗎 36).

Screw size	Strength class	Tightening torque ±15 % Nm
M5	8.8	7
M6		12
M8		28
M10		56
M12		96
M16		235

4.11.10 AMS.. adapter with attached foot-mounted motor

A foot-mounted motor reduces the loads at the adapter interface. The foot-mounted motor at the adapter must be installed without tensions at the customer construction.

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4.12 AQS.. adapter

4.12.1 Figure and note concerning the installation of the AQS.. adapter

NOTICE

Damage to the adapter due to ingress of moisture or dirt (e.g. dust) when a motor/drive is attached to the adapter.

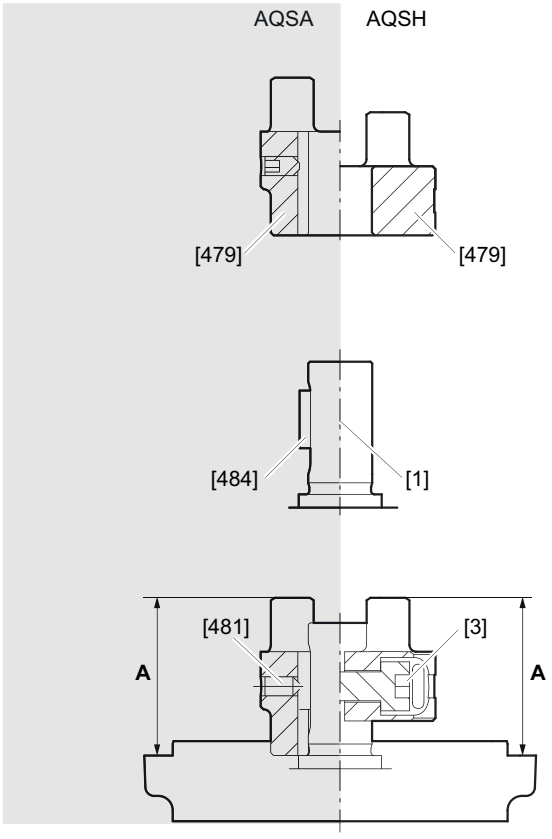
Damage to the adapter

- Seal the adapter with an anaerobic fluid seal.
- When the motor/drive to be attached has openings or bores that provide access to the inside of the adapter, seal these against dust or liquid.

INFORMATION

With AQSA..: To avoid contact corrosion, SEW-EURODRIVE recommends applying NOCO® fluid to the motor shaft before mounting the coupling half.

With AQSH..: The use of NOCO® fluid is not permitted.



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[1] Motor shaft
[3] Clamping screw
[479] Coupling half
[481] Set screw
[484] Key
A Distance A

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4.12.2 Mounting of motor to adapter AQSH.. with coupling half pre-mounted in adapter

1. Clean the motor shaft [1] and the flange surfaces of the motor and the adapter.
2. Ensure that the clamping screw [3] of the coupling is accessible through the lateral hole in the housing. **Information!** The coupling half [479] is spread apart in the delivery state.
3. Seal the contact surfaces between the adapter and motor using a suitable sealing compound.
4. Fit the motor to the adapter. Please adhere to the tightening torques specified in chapter "Tightening torques for motor to adapter" (→ 🗎 85).
5. Tighten the clamping screw of the coupling half. The values for tightening torque "T_A" are listed in the table in chapter "Distances and tightening torques" (→ 🗎 88).
6. Close the lateral holes using the closing plugs.

4.12.3 Mounting of motor to adapter AQSH.. with coupling half pre-mounted to motor shaft

1. Clean the motor shaft [1] and the flange surfaces of the motor and the adapter.
2. Unscrew the clamping screw [3] of the coupling until the screw head is lying against the lateral pin. Then continue turning for half a revolution so that the coupling half [479] is spread apart.
3. Slide the coupling half onto the motor shaft up to distance "A". The values for distance "A" are listed in the table in chapter "Distances and tightening torques" (→ 🗎 88).
4. Check the position of the coupling half. The values for distance "A" are listed in the table in chapter "Distances and tightening torques" (→ 🗎 88).
5. Secure the coupling half to the motor shaft. Tighten the clamping screw of the coupling half. The values for tightening torque "T_A" are listed in the table in chapter "Distances and tightening torques" (→ 🗎 88).
6. Seal the contact surfaces between the adapter and motor using a suitable sealing compound.
7. Mount the motor onto the adapter, making sure that the claws of the two coupling halves engage in each other. Please adhere to the tightening torques specified in chapter "Tightening torques for motor to adapter" (→ 🗎 85). **Information!** The amount of mounting force can be reduced by lightly greasing or oiling the coupling ring or the coupling half. To do this, only use mineral oil-based oil or grease without additives.
8. Close the lateral holes using the closing plugs.

⇨ The force that must be applied when joining the two coupling halves is dissipated after final assembly, so there is no risk of any axial load being applied to adjacent bearings.

4.12.4 Mounting of motor to adapter AQSA..

1. Clean the motor shaft [1] and the flange surfaces of the motor and the adapter.
2. Remove the key [484] of the motor shaft. Replace this key with the provided key. **NOTICE!** With AQSA80 – AQSA190, the key must not protrude beyond the base of the coupling claw in the installed condition.
3. Heat the coupling half [479] to approx. 80 °C – 100 °C.

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4. Slide the coupling half onto the motor shaft up to distance "A". The values for distance "A" are listed in the table in chapter "Distances and tightening torques" (→ 🗎 88). With the usual motor shaft dimensions, the coupling half lies flush against the motor shaft.
5. Check the position of the coupling half. The values for distance "A" are listed in the table in chapter "Distances and tightening torques" (→ 🗎 88).
6. Secure the coupling half and the key to the motor shaft using the set screw [481]. The values for tightening torque "T_A" are listed in the table in chapter "Distances and tightening torques" (→ 🗎 88).
7. Seal the contact surfaces between the adapter and motor using a suitable sealing compound.
8. Mount the motor onto the adapter, making sure that the claws of the two coupling halves engage in each other. Please adhere to the tightening torques specified in chapter "Tightening torques for motor to adapter" (→ 🗎 85). **Information!** The amount of mounting force can be reduced by lightly greasing or oiling the coupling ring or the coupling half. To do this, only use mineral oil-based oil or grease without additives.
9. Close the lateral holes using the closing plugs.

⇨ The force that must be applied when joining the two coupling halves is dissipated after final assembly, so there is no risk of any axial load being applied to adjacent bearings.

4.12.5 Distances and tightening torques

Adapter	Ø of coupling bore	Distance A	Screws		Tightening torque T_A Nm	
	mm	mm	AQSA..	AQSH..	AQSA..	AQSH..
AQSA/AQSH50	8	23.3	–	M4	–	4.1
	9		M3		0.6	
AQSA/AQSH80	11	27.3	M4	M5	1	8.1
	14					
AQSA/AQSH100	14	30	M5	M6	2	14
	16					
	19					
AQSA/AQSH115	19	39	M5	M6	2	14
	22		–		–	14
	24		M5		2	14
AQSA/AQSH140	24	48.5	M6	M8	4.8	34
	28					
	32					
AQSA/AQSH160/190	28	56.5	M8	M10	10	67
	32			M10		
	35		–	M10	–	
	38		M8	M10	10	

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4.12.6 Permitted loads

NOTICE

Overloading of the gear unit can occur due to excessive weight or excessive power rating of an attached motor.

Gear unit damage can occur.

- Note that the load data specified in the following table must not be exceeded.
- Ensure that the approved power rating (torque and speed) on the adapter is observed in accordance with the nameplate.

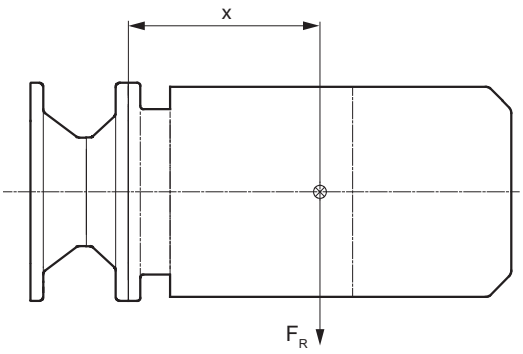
NOTICE

Danger due to static overdetermination when motors are additionally attached via a foot plate.

Damage to property can occur.

- A motor attached at the foot relieves the interface on the adapter, but you have to make sure that the attached foot-mounted motor is attached to the customer's construction stress-free.

The following figure shows the load caused by the mass of the motor:



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⊗ Motor center of gravity
x Distance between adapter flange and motor center of gravity
F_R Overhung load

Permitted loads for gear unit model series R..7, F..7, K..7, K..9, S..7, S..7p and W..9:

Adapter	x[1)] mm	Gear unit input end flange diameter mm	F_R[1)] N
AQS50	45	≥ 105	200
AQS80	77	105	200
		≥ 120	370
AQS100	113	105	200
		≥ 120	350
AQS115	113	≥ 120	300

Adapter	x[1)] mm	Gear unit input end flange diameter mm	F_R[1)] N
AQS140	144	120	300
		≥ 160	1550
AQS160	144	≥ 160	1450
AQS190	186	160	1250
		≥ 200	3750

Permitted loads for gear unit model series SPIROPLAN® W37/W47:

Adapter	x[1)] mm	F_R[1)] N
AQS50/80	115	140
AQS100/115	151	265
AQS140	151	265

1) Maximum load values for connection screws of strength class 8.8. If the center of gravity distance x increases, the maximum permitted weight F_R of the attached motor must be reduced linearly. If the center of gravity distance x decreases, the maximum permitted weight F_R must not be increased.

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4.13 EWH adapters

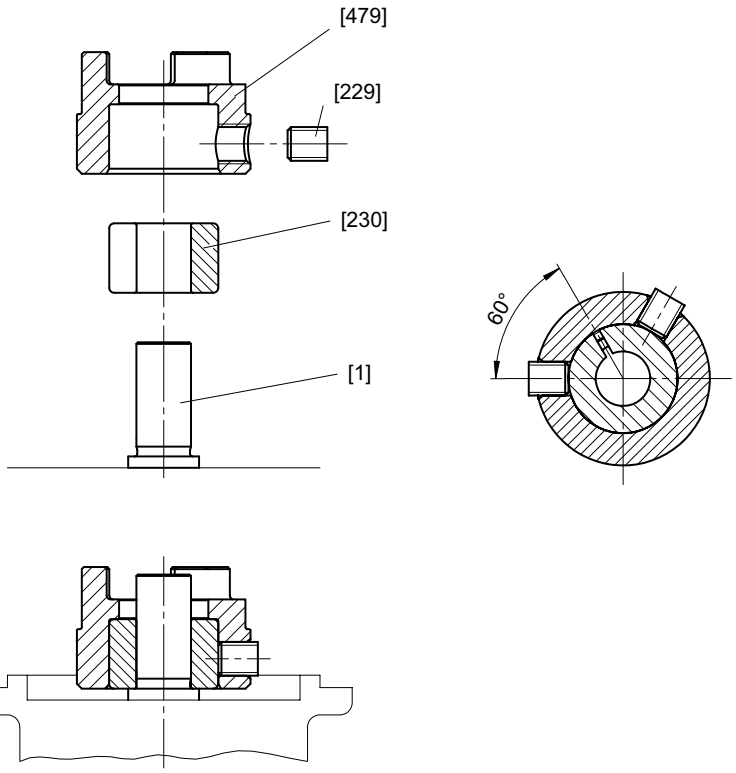
4.13.1 Adapter EWH01 – 03

NOTICE

Damage to the adapter due to ingress of moisture or dirt (e.g. dust) when a motor/drive is attached to the adapter.

Damage to the adapter

- Seal the adapter with an anaerobic fluid seal.
- When the motor/drive to be attached has openings or bores that provide access to the inside of the adapter, seal these against dust or liquid.



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[1]	Motor shaft	[230]	Motor shaft sleeve
[229]	Clamping screws	[479]	Coupling half

1. Clean and de-grease the hollow shaft hole of the coupling half [479], the motor shaft sleeve [230], and the motor shaft [1].
2. Insert the motor shaft sleeve [230] into the coupling half [479] so that the slot of the motor shaft sleeve [230] is at a 60° angle to the two clamping screws [229].
3. Push the coupling half [479] until it reaches the shoulder of the motor shaft.
4. Tighten the clamping screws [229] one after the other with a suitable torque wrench, initially to 25% of the tightening torque prescribed in the following table.
5. Tighten the two clamping screws [229] to the full prescribed tightening torque.

Adapter	Motor shaft diameter mm	Number of clamping screws	Clamping screw tightening torque Nm	Wrench size mm
EWH01	9	2	6	3
EWH01	11	2	10	4
EWH02	11, 14, 16	2	10	4
EWH03	11, 14, 16	2	10	4

4.13.2 Permitted loads

NOTICE

Overloading of the gear unit due to excessive weight or excessive power rating of an attached motor.

Gear unit failure

- Note that the load data specified in the following table must not to be exceeded.
- Make sure that the approved power rating (torque and speed) on the adapter is observed according to the nameplate.

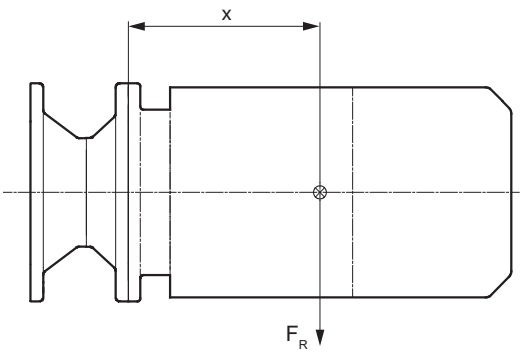
NOTICE

Danger due to static overdetermination when motors are additionally attached via a foot plate.

Damage to property

- A motor attached at the foot relieves the interface on the adapter, but you have to make sure that the attached foot-mounted motor is attached to the customer's construction stress-free.

The following figure shows the load caused by the mass of the motor:



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⊗ Motor center of gravity
x Distance between adapter flange and motor center of gravity
F_R Overhung load

Adapter	x[1)] mm	F_R[1)] N
EWH01	113	40

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Adapter	x[1)] mm	F_R[1)] N
EWH02	120	56
EWH03	120	56

1) Maximum load values for connection screws of strength class 8.8. If the center of gravity distance x increases, the maximum permitted weight F_R of the attached motor must be reduced linearly. If the center of gravity distance x decreases, the maximum permitted weight F_R must not be increased.

4.13.3 Tightening torques for motor to adapter

Screw the motors to the adapters with the following tightening torques: When doing this, observe the tightening torques in chapter "Notes concerning tightening torques" (→ 🗎 36).

Screw size	Strength class	Tightening torque ±15 % Nm
M5	8.8	7
M6		12
M8		28
M10		56
M12		96
M16		235

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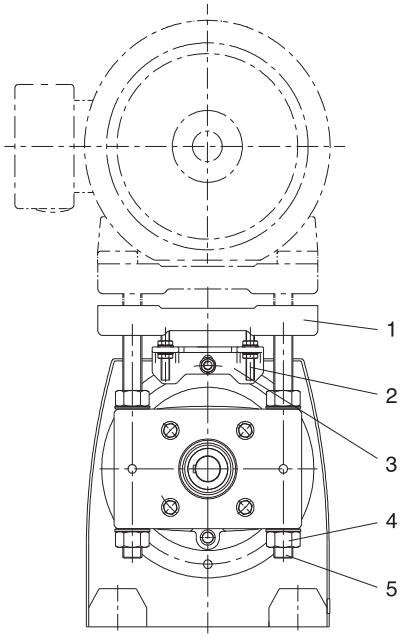
4.14 AD Input shaft assembly

Observe chapter "Mounting the drive components and output elements" (→ 🗎 45) when installing drive components.

4.14.1 Mounting the cover with motor platform AD../P



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[1] Motor platform
[2] Stud bolt (only AD6/P / AD7/P)
[3] Support (only AD6/P / AD7/P)
[4] Nut
[5] Threaded column

To mount the motor and to adjust the motor platform proceed as follows:

1. Set the motor platform [1] to the required mounting position by evenly tightening the adjusting nuts [4].
2. If necessary, remove the lifting eyebolt/lifting eye of the helical gear unit to reach the lowest adjustment position. Touch up any damage to the paint work.
3. Align the motor on the motor platform [1] so that the shaft ends are in line. Attach the motor.
4. Mount the drive components onto the input side shaft end and the motor shaft.
5. Align the drive components, shaft end and motor shaft. If necessary, correct the motor position again.
6. Put on the traction elements (V-belt, chain, etc.) and apply a preload by evenly adjusting the motor platform [1]. Do not stress the motor platform and the columns against each other when doing this.
7. To fasten the threaded columns [5], tighten the nuts [4] that are not used for adjustment.

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4.14.2 Special aspects of AD6/P and AD7/P

Proceed as follows:

1. Unscrew the nuts on the threaded bolts [2] before adjustment to allow the threaded bolts [2] to move axially in the support [3] without restriction.
2. Only tighten the nuts when the final adjustment position is reached.

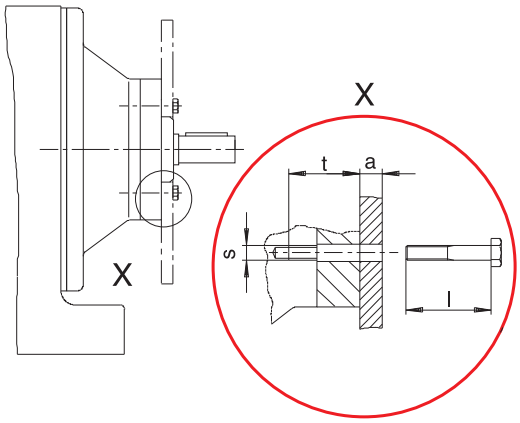
INFORMATION

Do not adjust the motor platform [1] via the support [3].

4.14.3 AD../ZR input shaft assembly with centering shoulder

Mounting applications on the input shaft assembly with centering shoulder

1. Prepare screws of a suitable length for attaching the application. The following figure shows the screw length l = t + a. **Round off the result to the next smaller standard length**.



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a Strength of the additional element
t Screw-in depth (see table)
s Retaining thread (see table)

2. Remove the retaining screw from the centering shoulder
3. Clean the contact surface and the centering shoulder.
4. Clean the threads of the new screws and apply a thread locking compound (e.g. Loctite® 243) to the first few threads.
5. Place the application on the centering shoulder. Tighten the retaining screws with the specified tightening torque "T_A" (see following table).

Cover	Screw-in depth t m	Retaining thread	Tightening torque T_A for connection screws in strength class 8.8 Nm
AD2/ZR	25.5	M8	27
AD3/ZR	31.5	M10	54
AD4/ZR	36	M12	93
AD5/ZR	44	M12	93
AD6/ZR	48.5	M16	230

Cover	Screw-in depth t m	Retaining thread	Tightening torque T_A for connection screws in strength class 8.8 Nm
AD7/ZR	49	M20	464
AD8/ZR	42	M12	93

Permitted loads

NOTICE

Overloading of the gear unit can occur due to excessive weight or excessive power rating of an attached motor.

Gear unit damage can occur.

- Note that the load data specified in the following table must not be exceeded.
- Make sure that the approved power rating (torque and speed) on the adapter is observed according to the nameplate.

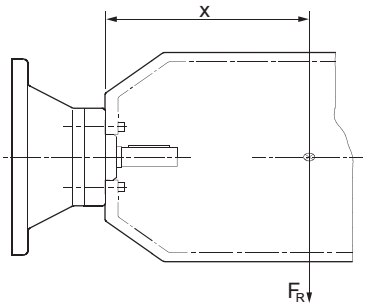
NOTICE

Danger due to static overdetermination when motors are additionally attached via a foot plate.

Damage to property

- A motor attached at the foot relieves the interface on the adapter, but you have to make sure that the attached foot-mounted motor is attached to the customer's construction stress-free.

The following figure shows the load caused by the mass of the motor:



⊗ Motor center of gravity
x Distance between adapter flange and motor center of gravity
F_R Overhung load

Cover	x[1)] mm	F_R[1)] N
AD2/ZR	193	330
AD3/ZR	274	1400
AD4/ZR[2)]	361	1120
AD4/ZR		3300

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Cover	x[1)] mm	F_R[1)] N
AD5/ZR	487	3200
AD6/ZR	567	3900
AD7/ZR	663	10000
AD8/ZR	516	4300

1) Maximum load values for connection screws of strength class 8.8. If the center of gravity distance x increases, the maximum permitted weight F_R of the attached motor must be reduced linearly. If the center of gravity distance x decreases, the maximum permitted weight F_R must not be increased.

2) Diameter of the adapter output flange: 160 mm

4.14.4 Cover with backstop AD../RS

NOTICE

If the speed is below the minimum lift-off speed of the drive, the backstop is subject to wear and heats up.

Possible damage to property can occur.

- In nominal operation the lift-off speed of the drive must not drop below the specified minimum.
- During startup or braking, the lift-off speed of the drive may drop below the minimum levels.

Check the direction of rotation of the drive prior to mounting or startup. If the direction of rotation is wrong, please consult SEW-EURODRIVE.

The backstop is maintenance-free in operation. Backstops have a minimum lift-off speed depending on the size (see following table).

Cover	Maximum locking torque of the backstop Nm	Minimum lift-off speed min^{-1}
AD2/RS	65	820
AD3/RS	425	620
AD4/RS	850	530
AD5/RS	1450	480
AD6/RS	1950	450
AD7/RS	1950	450
AD8/RS	1950	450

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4.15 Direct mounting of a motor on a gear unit

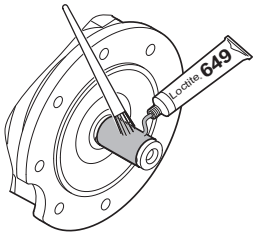
INFORMATION

Secure all pinions on the motor or input shaft with Loctite® 649, even if a retaining ring is additionally present.

If the pinion is already fastened to the shaft, start cleaning the sealing surface (step 6).

Joining the pinion to the motor or input shaft

1. Clean and degrease the shaft and the bore of the pinion.
2. Apply Loctite® 649 to the shaft behind the groove over the entire area of the circumference.



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3. Warm the pinion up to **at least** 100 °C to a **maximum of** 130 °C.
4. Push the pinion onto the shaft.
5. Secure the pinion on the shaft with the retaining ring.

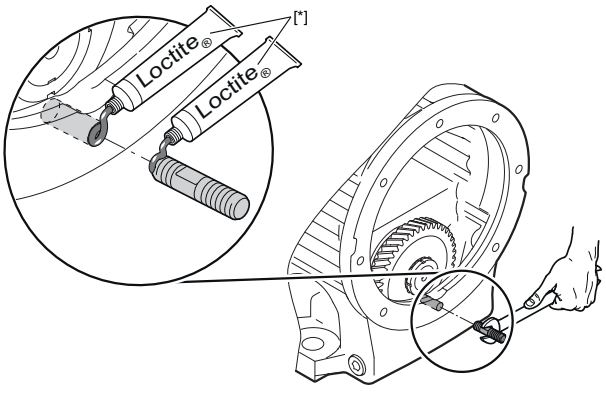
Cleaning the sealing surfaces

6. Remove oils, grease, irregularities of the surface, rust, and old Loctite® residue from the flange surfaces.

Sealing threads that lead into the housing interior

To prevent oil from escaping after installation, flange threads that lead into the housing interior must be sealed!

7. Clean and degrease the thread through bores that lead into the housing interior and their studs.
8. Apply Loctite® 574 or Loctite® 5188 (selection according to the table at the end of the chapter) in a continuous ring on the upper threads of the flange thread and the stud.



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[*] Loctite® according to the table at the end of the chapter

Screwing in the studs

9. Screw the studs into the thread up to the shoulder.

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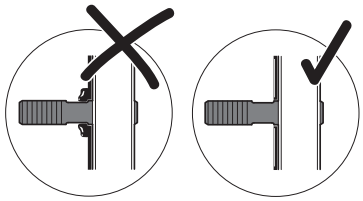
10. Remove any excess Loctite® (see following diagram) from the sealing surface 60 minutes after screwing in at the latest.



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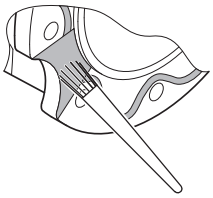
Sealing the flange surface

INFORMATION

Always apply the sealant over a large area in narrow places and on the gear units R97, R107, R127, F97 or F107.



11. Only distribute Loctite® 574 or Loctite® 5188 (selection according to the table at the end of the chapter) to one of the sealing surfaces. Apply the sealant in beads or over a large area without gaps. Use a suitable application tool that does not contaminate the sealing surface, for example, a non-shedding brush or a short-hair lamb's wool roller.

Joining flange surfaces

12. Join the flange surfaces together. Next, **immediately** tighten the nuts with the specified torque (see the table below). If you tighten the nuts too late, the sealing film can tear.
13. The sealant must harden for 30 minutes and must not come into contact with the gear oil during this time.

4.15.1 Tightening torques

When tightening, observe the tightening torques in chapter "Notes concerning tightening torques" (→ 🗎 36).

Screw/nut	Tightening torque ±15 % Nm
M6	12
M8	28
M10	56
M12	96
M16	235

4.15.2 Selecting and using Loctite®

Sealant	Use	Suitability	Batch size	Part number
Loctite® 649	Locking agent for pinions	All gear units	50 ml	09120998
Loctite® 574	Surface sealant	All gear units except for R97 – R127, F97, F107	7 ml	09102558
Loctite® 5188		R97 – R127, F97, F107	50 ml	03207013

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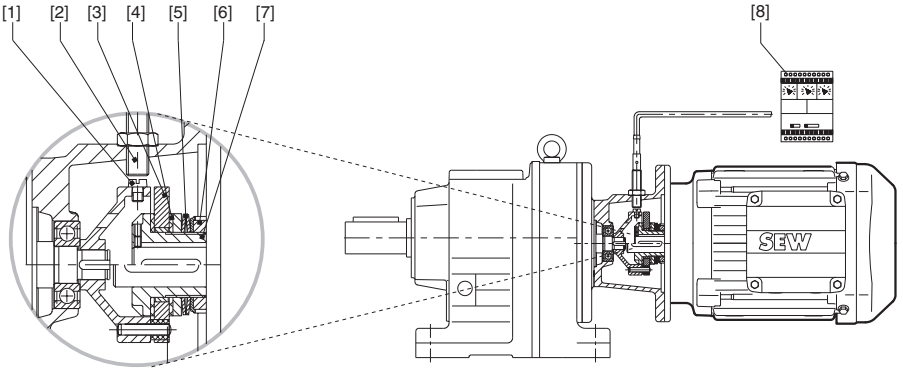
4.16 Accessory equipment

4.16.1 AR.. and AT.. centrifugal and friction couplings

AR.. friction coupling

Drives with a slip clutch consist of a standard toothed gear drive and motor/variable speed gearmotor with an adapter installed between them. This adapter accommodates the slip clutch. In gearmotors with a compound gear unit, the slip clutch may be located between the first and second gear units. On delivery, the slip torque is set individually according to the particular drive design.

The following figure shows a drive with slip clutch and W: speed monitor



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[1] Trip cam
[2] Incremental encoder
[3] Driving disk
[4] Friction lining
[5] Cup spring
[6] Slotted nut
[7] Friction hub
[8] Speed monitor

W speed monitor:

The speed monitor is used with constant-speed gearmotors and is connected to the incremental encoder in the adapter.

WS slip monitor:

The slip monitor is used with the following components:

- Speed-controlled motors with speed sensor
- VARIBLOC® variable-speed gear unit

INFORMATION

For further information about the AR.. coupling, refer to the "Start-up coupling and slip clutch AR.. and AT.." operating instructions.

AT.. hydraulic centrifugal coupling

Hydraulic start-up couplings are fluid couplings based on the Föttinger principle. They consist of 2 hinged hemispheres with blades separated by a tight gap.

The applied torque is transmitted by the inertial force of the streaming fluid. This fluid circulates within a closed circuit, between the pump wheel (primary side) [12] on the driving shaft (motor shaft) and the turbine wheel (secondary side) [9] on the driven shaft (gear unit input shaft).

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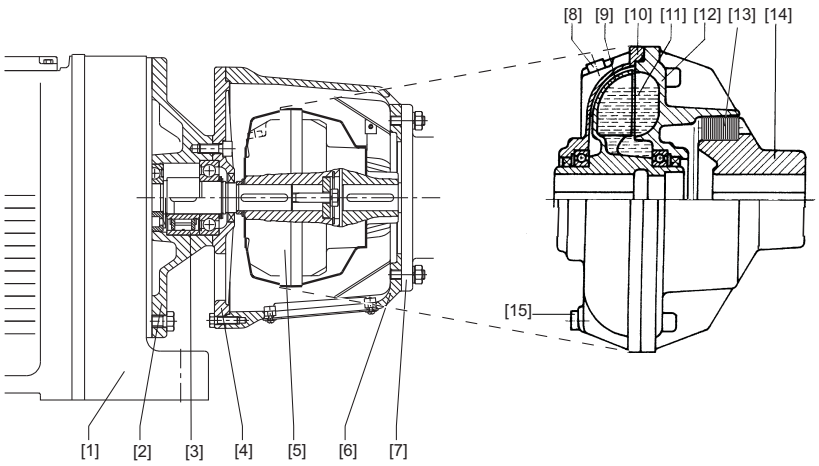
The following figure shows the structure of a drive with hydraulic start-up coupling:



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[1]	Gear unit	[6]	Extended housing complete	[11]	Operating fluid (hydraulic oil)
[2]	Basic flange complete	[7]	Motor	[12]	Pump wheel
[3]	Backstop (optional)	[8]	Filling plugs	[13]	Elastic components
[4]	Intermediate flange	[9]	Turbine wheel	[14]	Flexible connection coupling

INFORMATION

For detailed information about the AT.. coupling, refer to the "Start-up coupling and slip clutch AR.. and AT.." operating instructions.

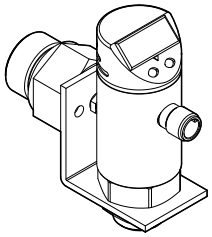
4.16.2 Diagnostic units /DUV and /DUO

/DUO diagnostic unit

DUO10A comprises a diagnostic unit and a temperature sensor. The temperature sensor (PT100 or PT1000 resistance sensor) is positioned in the gear unit oil to record the oil's temperature. The diagnostic units uses the oil temperature values to calculate the remaining service life of the oil.

The diagnostic unit continuously records the gear unit temperature and calculates the remaining service life for the selected oil type immediately. For this purpose, the diagnostic unit must be supplied with a 24 V voltage supply. Times when the diagnostic unit is switched off are not included in the forecast.

The following figure shows the DUO10A diagnostic unit:



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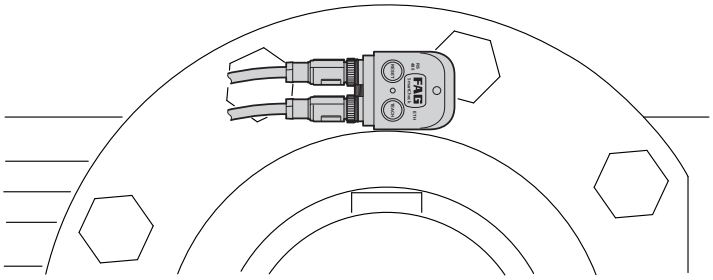
INFORMATION

For further information on the evaluation unit, refer to the manual "DUV30A Diagnostic Unit".

DUV40A (Diagnostic Unit Vibration)

The DUV40A vibration monitoring system is used for early detection of damage to gear units and gearmotors (e.g. bearing damage or imbalance). Permanent frequency-selective monitoring of the gearmotor is used for this purpose. Apart from the vibration analysis, additional measured values of up to 3 signal encoders can be detected, recorded and analyzed. The additional signals can be used as reference values for signal analysis e.g. to trigger time or event-based measuring tasks. After the analysis and depending on user-defined alarm limits, the system can switch outputs and display the state using LEDs.

DUV40A is configured using the SmartWeb software. If you use several Vibration SmartCheck systems, you can control them centrally from one PC using the SmartUtility Light software.



INFORMATION

For more information about DUV40A, refer to the "Diagnostic Unit Vibration" manual, part No.: 29190258/DE.

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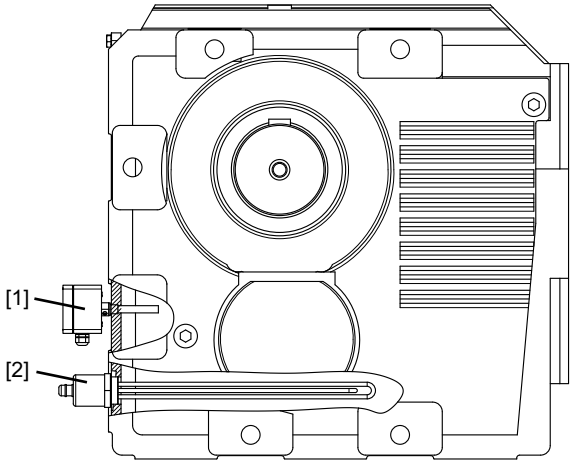
4.16.3 Gear unit heater for gear unit series R..7, F..7, and K..7

An oil heating can be required in order to allow for a smooth startup in the event of a cold start at low ambient temperatures. An oil heating is available with an external or an integrated thermostat depending on the gear unit design.

The heater is screwed into the gear unit housing and is controlled via a thermostat. The limit temperature of the thermostat below which the oil must be heated, is set depending on the respective lubricant.

The following figure shows a gear unit with heater and external thermostat:



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[1] Thermostat [2] Heater

INFORMATION

For further information regarding gear unit heaters, refer to the addendum "Gear unit heaters for gear unit series R..7, F..7 and K..7" to the operating instructions "Gear unit series R..7, F..7, K..7, K..9, S..7, SPIROPLAN® W".

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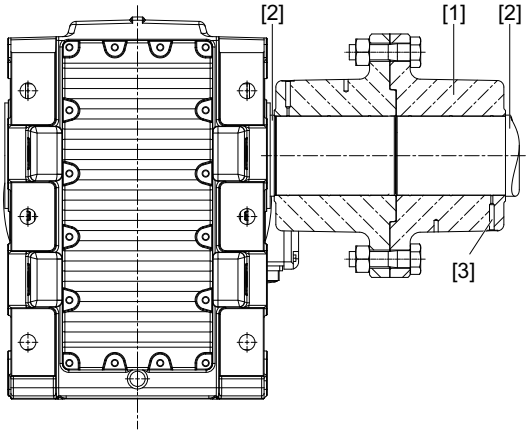
4.16.4 Flange coupling

Flange couplings [1] are rigid couplings for connecting 2 shafts [2].

Flange couplings are suitable for operation in both directions of rotation, but cannot compensate any shaft misalignments.

Torque between shaft and coupling is transmitted via a cylindrical interference fit. The two coupling halves are mounted together at the flanges. The couplings are equipped with several disassembly bores [3] for removing the interference fit hydraulically.



27021601961007627

[1] Rigid flange coupling
[2] Customer and gear shaft
[3] Disassembly bores

INFORMATION

For detailed information about the flange coupling, refer to the "Gear Unit Model Series R..7, F..7, K..7, S..7, and SPIROPLAN® W flange coupling" addendum to the operating instructions.

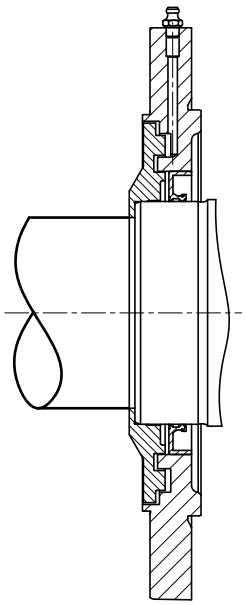
4.16.5 Regreasing the labyrinth seal

Labyrinth seals are used to protect the oil seal in case of very high dust load or other abrasive substances.

Output shaft

The following figure shows an example of a regreasable radial labyrinth seal (taconite).

- Single oil seal with radial labyrinth seal
- Used in **very dusty** environments with abrasive particles



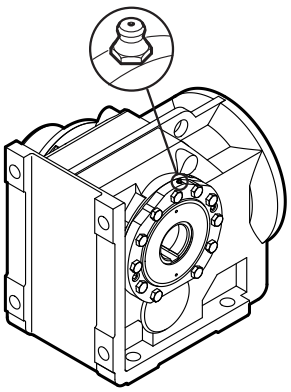
9007204406135947

INFORMATION

The gear shaft must rotate during relubrication.

Position of greasing points

Regreasable sealing systems are usually equipped with taper greasing nipples according to DIN 71412 A. Regreasing must be carried out at regular intervals. The greasing points are located near the output shaft, see following figure:



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Refilling grease

Regreasable sealing systems can be refilled with lubricating grease. Use moderate pressure to force grease into each lubrication point until new grease leaks out of the sealing gap.

Used grease, including contaminants and sand, is in this way pressed out of the sealing gap.

INFORMATION

Immediately remove the old grease that leaked out.

Inspection and maintenance intervals

Observe the following inspection and maintenance intervals for the regreasing of labyrinth seals:

Time interval	What to do?
Every 3000 operating hours, at least every 6 months	Fill regreasable sealing systems with grease.

Technical data

Sealing and rolling bearing grease

The table shows the lubricants recommended by SEW-EURODRIVE:

Area of operation	Ambient temperature	Manufacturer	Type
Standard	-40 °C to +80 °C	SEW-EURODRIVE	SEW Grease HL 2 E1[1)]
		Fuchs	Renolit CX-TOM 15[1)]
		Klüber	Petamo GHY 133 N
[2)]	-40 °C to +40 °C	SEW-EURODRIVE	SEW Grease HL 2 H1 E1
		Bremer & Leguil	Cassida Grease GTS 2
[3)]	-20 °C to +40 °C	Fuchs	Plantogel 2S

1) Bearing grease based on semi-synthetic base oil.
2) Lubricant for the food processing industry.
3) Easily biodegradable lubricant for environmentally sensitive areas.

INFORMATION

The following grease quantities are required:

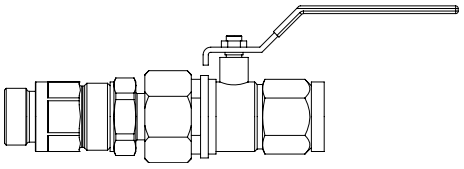
- **For fast-running bearings (gear unit input side):** Fill the cavities between the rolling elements one-third full with grease.
- **For slow-running bearings (gear unit output side):** Fill the cavities between the rolling elements two-thirds full with grease.

INFORMATION

If a customer wants to use a grease that is not listed in the above table, the customer has to make sure that it is suitable for the intended application.

4.16.6 Oil drain valve

The gear unit is equipped with an oil drain plug as standard. An oil drain valve that enables attaching a drain pipe for changing the gear unit oil can optionally be installed.



4984750475

4.16.7 Oil expansion tank

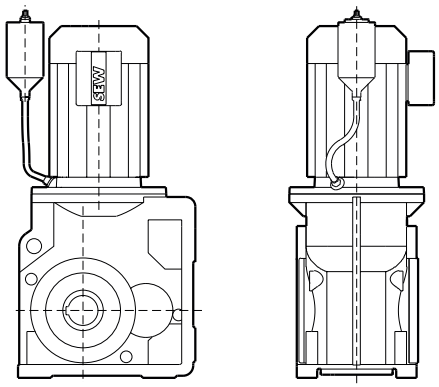
The oil fill level for gear units in mounting position M4 has technical reasons. In case of unfavorable circumstances, oil may leak from the breather valve of these gear units. Use an oil expansion tank to reliably prevent oil from leaking. The oil expansion tank provides additional space for the lubricant to expand.

In case of gear units and gearmotors of size 107 and larger, an oil expansion tank is always required for operation in mounting position M4.

SEW-EURODRIVE recommends using an oil expansion tank for gear units and gearmotors in mounting position M4, in the following cases:

- For input speeds > 2000 min^{-1}
- For sizes 77 – 97 and input speeds > 1800 min^{-1}

The following figure shows the oil expansion tank of a gearmotor.



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The oil expansion tank is delivered as an assembly kit for mounting onto the gearmotor. In case of limited space or of gear units without motor, the oil expansion tank can also be mounted to nearby machine parts.

INFORMATION

Transverse acceleration is not permitted for gear units with expansion tank with fixed piping for third party motors and servomotors.

For further information, contact your SEW-EURODRIVE sales representative.

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4.16.8 Oil-air cooler for splash lubrication /OAC

If the thermal rating of the naturally cooled gear unit is not sufficient, an oil-air cooling system can be used.

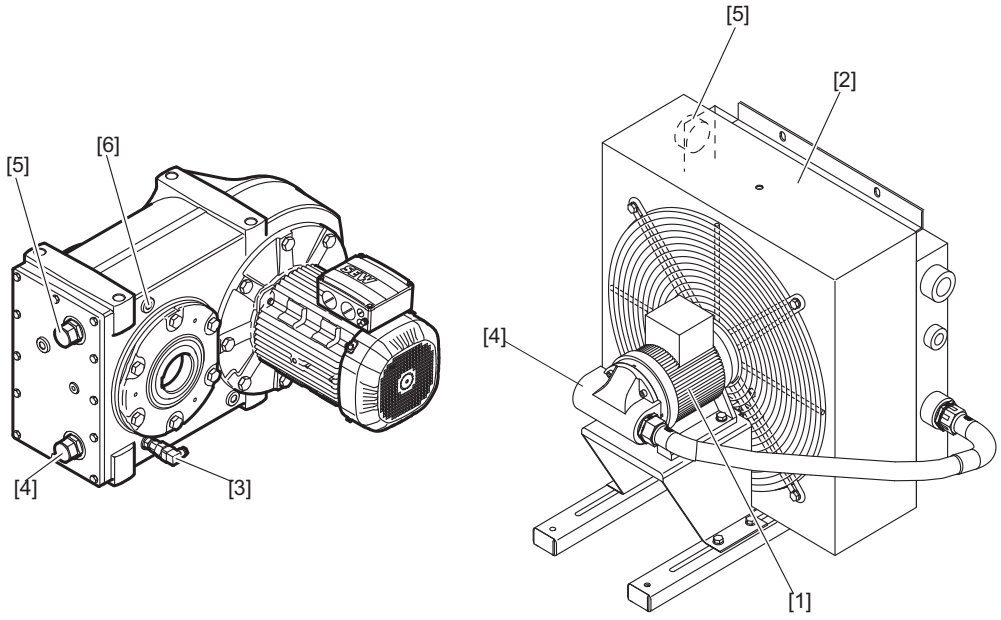
The cooling system is delivered without electrical wiring and piping as a complete unit on a base frame for separate installation.

The standard scope of delivery of the cooling system includes:

- Pump with directly mounted asynchronous motor
- Oil-air heat exchanger
- Temperature switch with 2 switching points

SEW-EURODRIVE uses oil-air cooling systems for standard gear units in sizes OAC 005 and OAC 010.

The following figure shows an example of a standard parallel-shaft helical gear unit next to an oil-air cooler.



9007208235792395

[1]	Motor for pump and fan	[4]	Suction pipe connections
[2]	Oil-air heat exchanger	[5]	Pressure pipe connections
[3]	Temperature switch with 2 switching points	[6]	Option: Oil expansion tank connection

INFORMATION

For more information on the cooling system, refer to the addendum to the operating instructions "Gear unit series R..7, F..7, K..7, K..9, S..7 and SPIROPLAN® W: Oil-air cooler for splash lubrication /OAC".

4.16.9 Agitator design

Relubrication of the agitator design

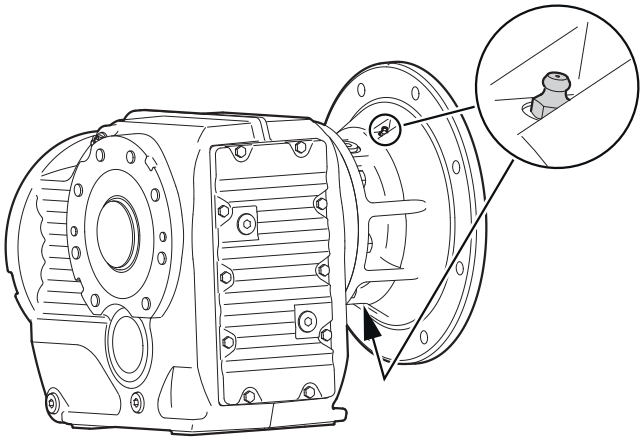
A relubrication of the output shaft bearing is offered as an option for the agitator drives FM.., FAM.., KM.. and KAM...

Position of greasing points

INFORMATION

The gear shaft must turn during the relubrication procedure.

Regreasable sealing systems are usually equipped with taper greasing nipples according to DIN 71412 A. The following figure shows the position of the greasing points:



23563258507

Maintenance interval and grease quantities

Regrease the agitator after 10 000 operating hours. The number of regreasing procedures is limited to 5×. Observe the information on the required grease quantities in the following table:

Size	Grease quantity for regreasing g
67	5
77	11
87	11
97	16
107	35
127	34
157	46

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The table shows the lubricants recommended by SEW-EURODRIVE:

Area of operation	Ambient temperature	Manufacturer	Type
Standard	-40 °C to +80 °C	SEW-EURODRIVE	SEW Grease HL 2 E1[1)]
		Fuchs	Renolit CX-TOM 15[1)]
		Klüber	Petamo GHY 133 N
[2)]	-40 °C to +40 °C	SEW-EURODRIVE	SEW Grease HL 2 H1 E1
		Bremer & Leguil	Cassida Grease GTS 2
[3)]	-20 °C to +40 °C	Fuchs	Plantogel 2S

1) Bearing grease based on semi-synthetic base oil.
2) Lubricant for the food processing industry.
3) Easily biodegradable lubricant for environmentally sensitive areas.

INFORMATION

If a customer wants to use a grease that is not listed in the above table, the customer has to make sure that it is suitable for the intended application.

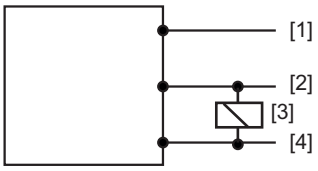
Leak sensor (Drywell design) with the agitator design

A Drywell design with level sensor is optionally available for agitator drives FM.., FAM.., KM.. and KAM...

One of the two following sensors is used, depending on the gear unit size:

Level sensor for sizes 67 – 97

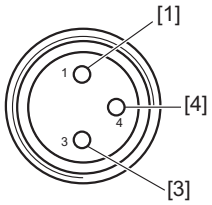
Electrical connection



23527583115

[1] DC 12 V – 32 V
[2] Output
[3] Load
[4] 0 V

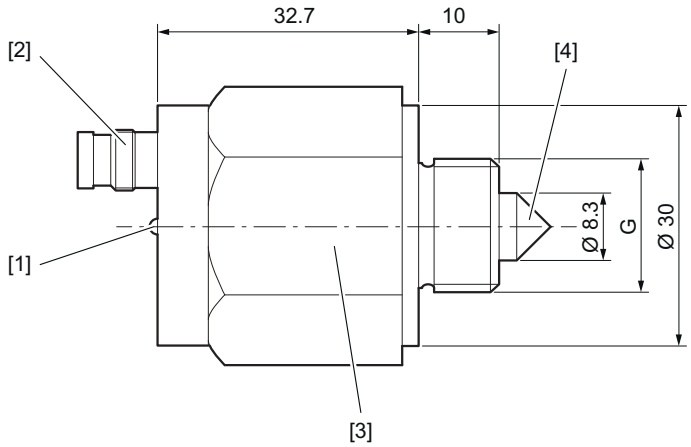
Pin assignment



23527590411

[1] DC 12 V – 32 V
[4] Output
[3] Load

Dimensions



23563256075

[1] LED function indicator
[2] M8×1 circular connector; 3-pin (alternatively cable connection)
[3] Wrench size: 30
[4] Glass prism

Technical Data

Measuring accuracy	± 0.5 mm
Minimum distance of the glass tip to an opposite surface	≥ 10 mm
Mounting position	Any
Optical display of the switching status	1 LED
Process connection	Male thread G 3/8", G 1/2" or M12 × 1

For more information, please contact SEW-EURODRIVE.

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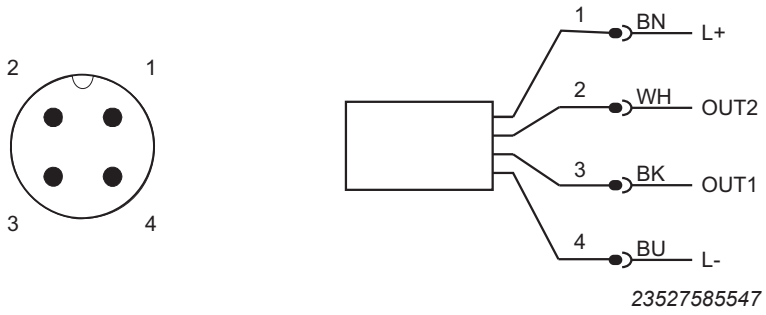
Level sensor for sizes 107 – 157

Electrical connection

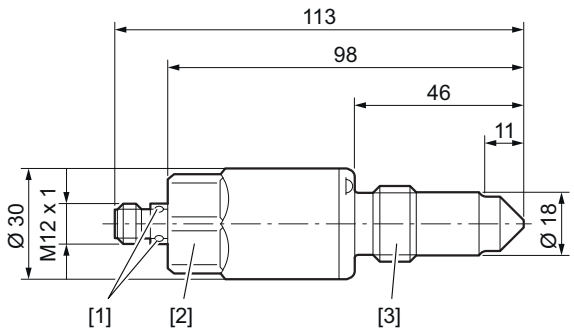
M12 plug-in connector:



23527585547

OUT1: Switching output/IO link/teach
OUT2: Switching output

Dimensions



23563253643

[1] LED
[2] Tightening torque 20 – 25 Nm
[3] G 1/2

Tightening torque 20 – 25 Nm

Technical Data

- Plug-in connection
- Process connection G 1/2 A
- Gold-plated contacts
- 2 switching outputs

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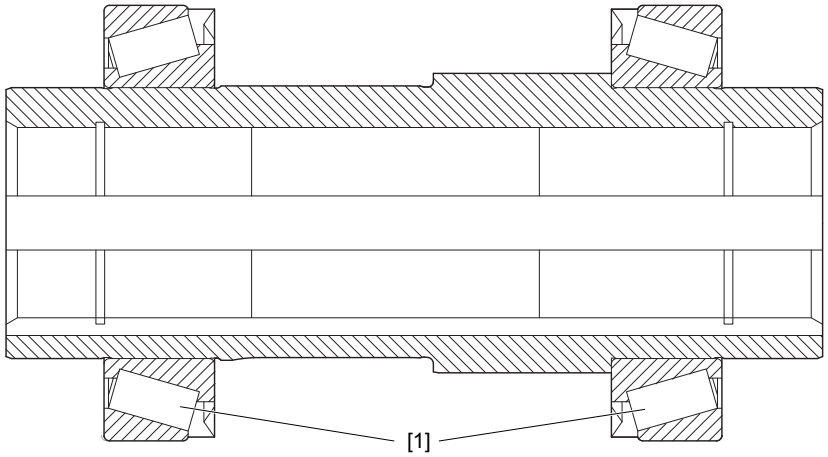
4.16.10 Reinforced hollow shaft bearing

With the reinforced hollow shaft bearing, the standard deep groove ball bearings are replaced with tapered roller bearings. This measure enables considerably higher overhung and axial loads and at the same time an increased service life of the bearings. Contact SEW-EURODRIVE for additional information.



34258018699

[1] Tapered roller bearing

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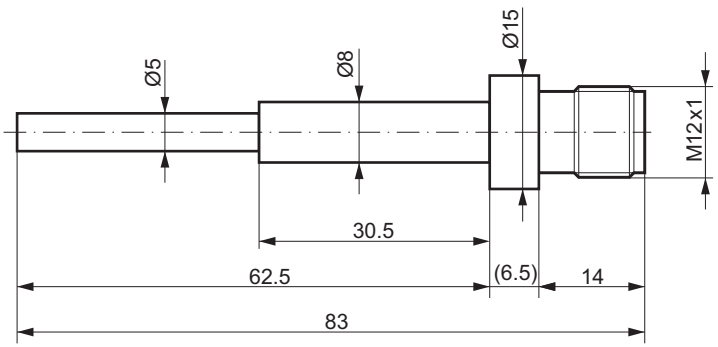
4.16.11 PT1000 temperature sensor

PT1000 dimension drawing

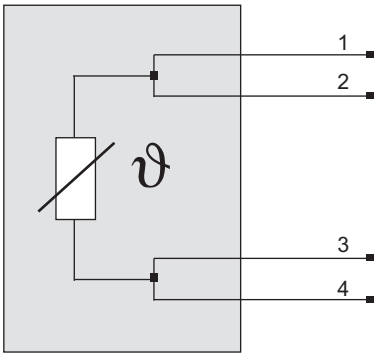


9007214369752075

PT1000 technical data

Technical Data	Value
Rod length	62.5 mm
Measuring range	-40 – 130 °C
Permitted oil temperature	-40 – 130 °C
Accuracy	± (PT1000 + 0.2 K)
Measuring element	1 × PT1000 to DIN EN 60751, class B, 4-wire connection
Dynamic response T05/T09 (s)	3/8 to DIN EN 60751
Ambient temperature	-25 – 80 °C
Degree of protection, protection class	IP67, III
Housing materials	V4A (1.4404)
Materials in contact with the medium	V4A (1.4404)
Port	M12 plug-in connection; gold-plated contacts

PT1000 connection diagram



15115128971

5 Startup

⚠ CAUTION

Damage to the gear unit can occur due to improper startup.

Possible damage to property can occur.

- Observe the following information.

- Check that the oil level is correct before startup, see chapter "Inspection/maintenance of the gear unit" (→ 🗎 130).
- The oil level plugs and oil drain plugs, as well as the breather plugs and breather valves, must be freely accessible.
- Observe the maximum and rms values of project planning during startup of gear units with servomotor. The buyer is obliged to make the data available to the end user.
- The most important technical data is provided on the nameplate. Additional data relevant for operation is available in drawings and the order confirmation.
- After gear unit setup, ensure that all retaining screws are tight.
- Make sure that the alignment has not changed after tightening the mounting elements.
- Prior to startup, ensure that rotating shafts and couplings are equipped with suitable protection covers.
- If the gear unit has an oil sight glass to monitor the oil level, the oil sight glass must be protected against damage.
- It is essential that there is no open fire or risk of sparks when working on the gear unit.
- Protect the gear unit from falling objects.
- Remove any available transport protection prior to startup.
- Strictly observe the safety notes in the individual chapters.

5.1 Inverter-operated gearmotors

For gear units with servomotor, the maximum and r.m.s. values of project planning must be observed during startup. The buyer is obliged to make the data available to the user.

5.2 Checking the oil level

Before startup, make sure that the oil level corresponds to the mounting position. Observe chapter "Checking the oil level and changing the oil" (→ 🗎 130).

If the gear unit is equipped with an oil sight glass, you can also determine the oil level at the oil sight glass.

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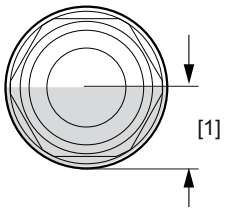
NOTICE

Damage to the gear unit can occur due to oil leaking from the damaged oil sight glass.

Possible damage to the unit can occur.

- Attach a protective device to prevent the oil sight glass from being damaged by mechanical impacts.

1. Check the oil level at the oil sight glass according to the following figure:



4158756363

[1] The oil level must be within this range.

2. Proceed as follows if the oil level is too low:
   - Open the respective oil fill plug; see chapter "Inspection/maintenance of the gear unit" (→ 🗎 130).
   - Fill in new oil of the same type up to the mark via the oil fill plug.
   - Screw in the oil fill plug.

5.3 Pseudo-leakage at shaft seals

Due to their operating principle, seals between moving surfaces at shaft passages cannot be completely tight, as a lubricant film must form during operation. The lubricant film between shaft and sealing lip keeps the built-up of heat and wear on the sealing system to a minimum and ensures the intended service life. The optimum sealing properties are only achieved after the run-in phase.

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5.4 Helical-worm gear units and SPIROPLAN® W gear units

5.4.1 Run-in period

SPIROPLAN® W..0-, SPIROPLAN® W..7 and helical-worm gear units require a run-in period of at least 48 hours before reaching their maximum efficiency. A separate run-in period applies for each direction of rotation if the gear unit is operated in both directions of rotation. The table shows the average power reduction during the run-in period.

Helical-worm gear units

	Worm	
	i range	**η reduction**
1-start	approx. 50 – 280	approx. 12 %
2-start	approx. 20 – 75	approx. 6 %
3-start	approx. 20 – 90	approx. 3 %
4-start	–	–
5-start	approx. 6 – 25	approx. 3 %
6-start	approx. 7 – 25	approx. 2 %

SPIROPLAN® gear units

Gear units in model series SPIROPLAN® W..9 are not subject to the run-in behavior, since the gear ratios in the SPIROPLAN® stage are smaller and therefore have a very small amount of sliding.

W10/W20/W30		W37/W47	
i range	**η reduction**	**i range**	**η reduction**
approx. 35 – 75	approx. 15 %		
approx. 20 – 35	approx. 10 %		
approx. 10 – 20	approx. 8 %	approx. 30 – 70	approx. 8 %
approx. 8	approx. 5 %	approx. 10 – 30	approx. 5 %
approx. 6	approx. 3 %	approx. 3 – 10	approx. 3 %

5.4.2 Helical-worm gear unit with projecting worm shaft

⚠ CAUTION

Risk of injury due to rotating parts

Injury

- Before you operate the helical-worm gear unit using the inserted handwheel or the hand crank, de-energize the drive.
- If the handwheel or the hand crank remains attached to the shaft during operation, take appropriate measures to prevent injuries.

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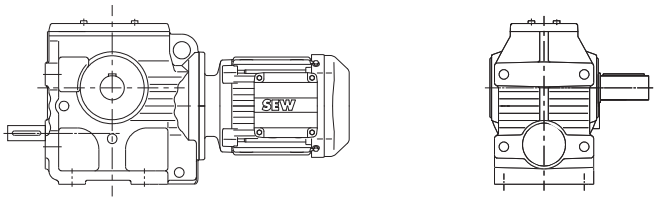
The following figure shows a helical-worm gearmotor with projecting worm shaft:



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5.5 Helical/parallel-shaft helical/helical-bevel gear units

If the gear units were installed according to chapter "Mechanical installation" (→ 🗎 29), no special startup notes must be observed for helical, parallel-shaft helical and helical-bevel gear units.

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5.6 Gear units with backstop

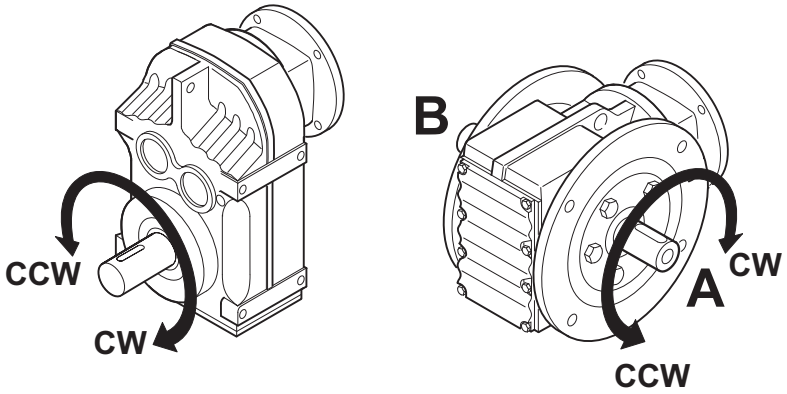
NOTICE

Operating the motor in the blocking direction could destroy the backstop.

Possible damage to property

- Do not start up the motor in the blocking direction. Before motor startup, make sure the current supply of the motor for the direction of rotation is connected accordingly.
- For control purposes, operation in blocking direction with half the output torque is permitted once.

The purpose of a backstop is to prevent unwanted directions of rotation. During operation, the backstop permits rotation only in the specified direction.



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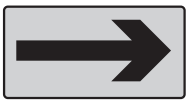
The permitted direction of rotation is indicated by a direction arrow on the housing:



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A replacement label is enclosed for the customer.

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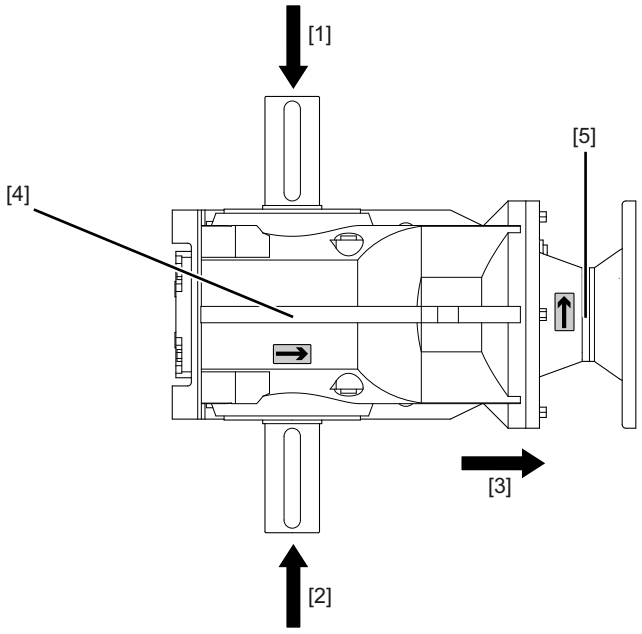
In right-angle gear units, you also have to indicate whether the direction of rotation is given looking onto the A or B-side.



16117549579

[1] Viewing direction, Direction of rotation Output B
[2] Viewing direction, Direction of rotation Output A and A+B
[3] Viewing direction, Direction of rotation Input end
[4] Gear unit
[5] Adapter/cover with RS option

5.7 Components made of elastomers with fluorocarbon rubber

⚠ CAUTION

Health risk due to dangerous gases, vapors, and residue created by heating fluorocarbon rubber to > 200 °C.

Damage to health.

- Make sure that components made of fluorocarbon rubber are not exposed to temperatures > 200 °C. Remove the components, if necessary.
- Avoid inhaling fluorocarbon rubber gases and vapors as well as skin and eye contact.
- Avoid contact with the cooled-down fluorocarbon rubber, as dangerous residue has formed while it was heated.

Under normal operating conditions and at temperatures up to 200 °C, fluorocarbon rubber is very stable and safe. However, when heated to more than 300 °C, e.g. by fire or the flame of a cutting torch, fluorocarbon rubber forms harmful gases and vapors as well as residue.

The following components of R..7, F..7, K..7, K..9, S..7, and SPIROPLAN® W gear units can contain elastomers made of fluorocarbon rubber:

- Oil seals

- Breather valve
- Screw plugs

The user is responsible for safe handling during the service life including eco-friendly disposal.

SEW-EURODRIVE is not responsible for damage caused by improper handling.

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6 Inspection/maintenance

⚠ WARNING

Risk of injury if the drive starts up unintentionally.

Severe or fatal injuries.

- Disconnect the drive from the power supply before you start working on the unit.
- Prevent the drive from starting up unintentionally for example, by locking the key switch or removing the fuses from the current supply, and attach a warning sign that prohibits switching on the drive.

⚠ WARNING

Risk of injury if preloaded shaft connections are loosened.

Severe or fatal injuries.

- Before releasing any shaft connections, make sure there is no active torsional torque present that could lead to tension within the system.

⚠ WARNING

Risk of burns due to hot gear unit and hot gear unit lubricant.

Severe injuries.

- Let the gear unit cool down before you start working on it.
- Carefully remove the oil level plug and the oil drain plug.

NOTICE

Loss of lubricant qualities due to filling of wrong lubricant.

Damage to the gear unit.

- Do not mix synthetic lubricants and mineral lubricants.
- Do not mix different synthetic lubricants.

NOTICE

Damage to oil seal caused by cleaning the gear unit with a high pressure device.

Gear unit damage.

- Do not clean the gear unit with a high-pressure cleaning device.

NOTICE

Damage to gear unit due to ingress of foreign objects during maintenance and inspection work.

Gear unit failure.

- Prevent foreign particles from entering into the gear unit during maintenance and inspection work.

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INFORMATION

Maintain the inspection and maintenance intervals. This is necessary to ensure operational safety.

INFORMATION

Perform a safety check and functional check following maintenance and repair work.

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6.1 Wearing parts

Gearing

If you observe the SEW-EURODRIVE design criteria and the inspection and maintenance intervals, then the gearing components of the gear units will be wear-free after the run-in period. The worm gearing is an exception for design reasons. Depending on the operating conditions, material on the tooth flanks of the worm gear is removed to different extents. The main influencing factors are:

- Rotational speed
- Load
- Operating temperature
- Lubricant (type, viscosity, additives, pollution)
- Switching frequency

For information on the worm gearing service life under certain operating conditions, contact SEW-EURODRIVE.

Rolling bearings

Rolling bearings in the gear unit, adapter, and input shaft assembly have a limited service life, even under ideal operating conditions. This nominal bearing service life is a solely statistical value. The actual service life of an individual bearing may deviate greatly from this value. The main influencing factors are:

- Rotational speed
- Equivalent bearing load
- Operating temperature
- Lubricant (type, viscosity, additives, pollution)
- Lubricant supply of the bearing
- Misalignment under operating load

Therefore the rolling bearings must be inspected regularly. Observe the corresponding inspection and maintenance intervals in the chapters "Inspection/maintenance intervals" (→ 🗎 127), "Lubricant change intervals" (→ 🗎 128), "Maintaining adapter AL../AMS../AQS../EWH.." (→ 🗎 128) and "AD input shaft assembly maintenance" (→ 🗎 129).

For information on the nominal bearing service life under certain operating conditions, contact SEW-EURODRIVE.

Lubricants

Lubricants are subject to aging. Their service life is limited depending on the load conditions.

The service life depends significantly on the oil operating temperature. The dependency of lubricant change intervals on the operating temperature is depicted in the figure in chapter "Lubricant change intervals" (→ 🗎 128).

Oil seals

Oil seals are contact seals that seal unit housings at emerging elements, such as shafts, from the environment. Oil seals are wear parts with a service life that is influenced by the following factors, among others:

- Shaft speed and circumferential speed at the sealing lip
- Ambient conditions (temperature, dust, humidity, pressure, chemicals, radiation)
- Lubricant (type, viscosity, additives, pollution)
- Surface quality of the sealing
- Lubricant supply of the sealing
- Oil seal material

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Due to the various influencing factors, it is not possible to predict the service life. Therefore the oil seals must be inspected regularly. Observe the corresponding inspection and maintenance intervals in the chapters "Inspection/maintenance intervals" (→ 🗎 127), "Lubricant change intervals" (→ 🗎 128), "Maintaining adapter AL../AMS../AQS../EWH.." (→ 🗎 128) and "AD input shaft assembly maintenance" (→ 🗎 129).

Coupling ring

The couplings installed in the AMS.., AL.., AQS... and EWH.. adapters are designed to be positive, puncture-proof and low-maintenance claw couplings with an impact and vibration-absorbing cam ring (AMS.., EWH..) or coupling ring (AQS..., AL..). The service life is determined by the following factors, among others:

- Ambient conditions (temperature, chemicals, radiation)
- Operational conditions (switching frequency, impact characteristics)

Adhere to the corresponding inspection and maintenance intervals in chapter "Maintaining adapter AL../AMS../AQS../EWH.." (→ 🗎 128).

Rubber buffer

The rubber buffer is required for shaft-mounted gear units of the F and W gear unit types for torque support. Rubber buffers are wear parts with a service life that is influenced by the following factors:

- Load
- Ambient conditions
  - Temperature
  - Humidity
  - Aggressive chemicals, e.g. ozone
- Switching frequency
- Impact characteristics

Flexible bushing

A so-called flexible bushing is required for the torque bracket of the S and K gear unit types. Flexible bushings are wear parts with a service life that is influenced by the following factors:

- Load
- Ambient conditions
  - Temperature
  - Humidity
  - Aggressive chemicals, e.g. ozone
- Switching frequency
- Impact characteristics

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6.2 Inspection/maintenance intervals

The following table lists the obligatory intervals and the corresponding measures:

Time interval	What to do?
• Every 3000 operating hours; at least every 6 months	• Check oil and oil level • Check running noise for possible bearing damage • Visual inspection of the seals for leakage • Check that all screw plugs, any oil sight glass, the breather valve, and the gear unit cover screws are tight. • For gear units with a torque bracket: Check and replace the rubber buffers, if necessary
With mineral oil: • Depending on the operating conditions (see illustration in chapter "Lubricant change intervals" (→ 🖹 128)), every 3 years at the latest • According to oil temperature	• Change the oil • Replace rolling bearing grease (recommendation) • Replace oil seal (do not install it in the same track again)
With synthetic oil: • Depending on the operating conditions (see illustration in chapter "Lubricant change intervals" (→ 🖹 128)), every 5 years at the latest • According to oil temperature	• Change the oil • Replace rolling bearing grease (recommendation) • Replace oil seal (do not install it in the same track again)
• Varying (depending on external factors)	• Touch up or renew the surface/ anti-corrosion coating • Check operation of breather valve (if present)
• From 5th year of operation	• Check the blocking effect of the backstop annually. Ensure that the maximum blocking torque is not exceeded.

Exceptions

The following gear units are lubricated for life. A scheduled oil change is not necessary:

- Helical gear units R07, R17, R27
- Parallel-shaft helical gear unit F27
- SPIROPLAN® gear units

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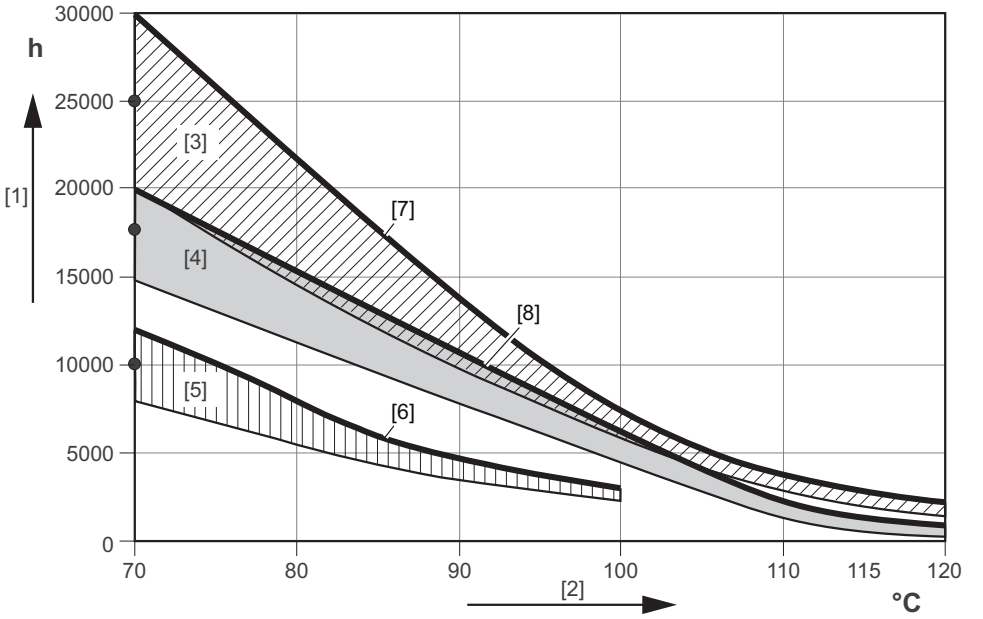
6.3 Lubricant change intervals

Use the following figure to determine the number of operating hours between 2 oil changes based on the sustained oil bath temperature at normal ambient conditions. In case of special designs under severe/aggressive ambient conditions, change the lubricant more frequently.



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[1] Operating hours
[2] Sustained oil bath temperature
[3] CLP PG/CLP PG NSF H1
[4] CLP HC/ CLP HC NSF H1
[5] CLP (CC)/E
[6] SEW GearOil Base
[7] SEW GearOil Poly (H1)
[8] SEW GearOil Synth (H1)
• Average value per oil type at 70 °C

6.4 Maintaining adapter AL../AMS../AQS../EWH..

The following table lists the obligatory intervals and the corresponding measures:

Time interval	What to do?
• Every 3000 operating hours; at least every 6 months	• Check the running noises to detect possible bearing damage. • Visually check the adapter for leakage. • With the drain hole design, check whether the condensation drain holes are clear.
• After 10 000 operating hours	• Check the rotational clearance. • Visually check the coupling ring (AMS.., EWH.., or AQS.., AL..).

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Time interval	What to do?
• After 10 000 operating hours with NBR/FKM oil seals • After 20 000 operating hours with Premium Sine Seal adapter oil seals:	• Change the oil seal. With standard NBR or FKM oil seals, the new oil seal must not be fitted on the previous track. This is allowed with Premium Sine Seal adapter oil seals.

6.5 AD input shaft assembly maintenance

The following table lists the obligatory intervals and the corresponding measures:

Time interval	What to do?
• Every 3000 operating hours; at least every 6 months	• Check the running noises to detect possible bearing damage. • Visually check the adapter for leakage.
• After 10 000 operating hours	• Change the oil seal. Do not mount it in the same track.

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6.6 Inspection/maintenance of the gear unit

6.6.1 Checking the oil level and changing the oil

The procedure when checking the oil level and changing the oil depends on gear unit type, size and mounting position. Determine the code letter (A, B, C, D or E) in the following table in regard of gear unit type and size. Use the code letter to find the reference for the procedure for the corresponding gear unit in the 2nd table.

Gear unit type	Size	Code letter for chapter "Checking the oil level and changing the oil"					
		M1	M2	M3	M4	M5	M6
R	R..07 – 27	B					
	R..37/R..67	A					
	R..47/R..57	A				B	A
	R..77 – 167	A					
	RX..57 – 107	A					
F	F..27	B					
	F..37 – 157	A					
K	K..19/K..29	C					
	K..39/K..49	A					
	K..37 – 187	A					
S	S..37	C					
	S..47 – 97	A					
W	W..10 – 30	B					
	W..29 – W..39	B					
	W..37 – 47	D			E	D	

Code letter	Chapter "Checking the oil level and changing the oil"	Reference
A:	• Helical gear units... • Parallel-shaft helical gear units... • K..39/K..49, K..37 – 187 helical-bevel gear units • Helical-worm gear units... S..47 – 97 **With oil level plug**	(→ 🗎 131)
B:	• Helical gear units... • Parallel-shaft helical gear units... • SPIROPLAN® gear units... **Without oil level plug, with cover plate**	(→ 🗎 134)
C:	• S..37 helical-worm gear unit • K..19/K..29 helical-bevel gear unit **Without oil level plug, without cover plate**	(→ 🗎 138)

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Code letter	Chapter "Checking the oil level and changing the oil"	Reference
D:	• SPIROPLAN® W..37/W..47 **In mounting positions M1, M2, M3, M5, M6 with oil level plug**	(→ 🗎 141)
E:	• SPIROPLAN® W..37/W..47... **In mounting position M4 without oil level plug and cover plate**	(→ 🗎 143)

Refer to chapter "Mounting positions" (→ 🗎 146) for notes on the mounting positions.

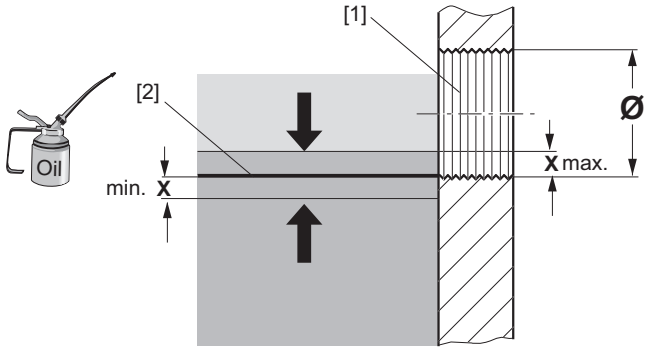
You cannot check the oil level of gear units in pivoted mounting position. The gear units are delivered with the correct oil level. Observe the specifications and fill quantities on the nameplate if you have to change the oil.

6.6.2 A: Helical, parallel-shaft helical, helical-bevel and helical-worm gear units with oil level plug

Checking the oil level at the oil level plug

Proceed as follows to check the oil level of the gear unit:

1. Observe the information at the beginning of chapter "Inspection/maintenance" (→ 🗎 123).
2. Determine the positions of the oil level plug and the breather valve using the mounting position sheets. See chapter "Mounting positions" (→ 🗎 146).
3. Place a container underneath the oil level plug.
4. Slowly unscrew the oil level plug. Small amounts of oil may leak out as the permitted maximum oil level is higher than the lower edge of the oil level bore.
5. Check the oil level according to the following figure and the corresponding table.



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[1] Oil level bore
[2] Oil level setpoint
X Min./max. oil level

Ø oil level bore	Approved fluctuation "x" of the oil level mm
M10 × 1	1.5
M12 × 1.5	2
M22 × 1.5	3
M33 × 2	4
M42 × 2	5

6. Proceed as follows if the oil level is too low:

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- Remove the breather valve from the breather bore.
- Fill in fresh oil of the same type (contact SEW-EURODRIVE if necessary) via the breather bore, up to the lower edge of the oil level bore.
- Screw in the breather valve again. When doing this, please observe the tightening torques in chapter "Tightening torques for oil level plugs, oil drain plugs, screw plugs, breather valves and oil sight glasses" (→ 🗎 39).

7. Screw in the oil level plug again. When doing this, please observe the tightening torques in chapter "Tightening torques for oil level plugs, oil drain plugs, screw plugs, breather valves and oil sight glasses" (→ 🗎 39).

Checking the oil via the oil drain plug

Proceed as follows to check the gear unit oil:

1. Observe the information at the beginning of chapter "Inspection/maintenance" (→ 🗎 123).
2. Determine the position of the oil drain plug using the mounting position sheets. See chapter "Mounting positions" (→ 🗎 146).
3. Remove a little oil from the oil drain plug.
4. Check the oil consistency:
   - Viscosity (have this carried out by a suitable laboratory if necessary)
   - If you can see that the oil is heavily contaminated, it is advisable to change the oil, even if this is outside the service intervals specified in "Inspection and maintenance intervals" (→ 🗎 127).
5. Check the oil level. See chapter “Checking the oil level via the oil level plug”.

Changing the oil via the oil drain plug and the breather valve

⚠ WARNING

Risk of burns due to hot gear unit and hot gear unit oil.

Severe injuries can occur.

- Let the gear unit cool down before you start working on it. Due to the better flowability, the gear unit oil should still be warm so that the gear unit can be drained best.

1. Observe the information at the beginning of chapter "Inspection/maintenance" (→ 🗎 123).
2. Determine the position of the oil drain plug, the oil level plug and the breather valve using the mounting position sheets. See chapter "Mounting positions" (→ 🗎 146).
3. Place a container underneath the oil drain plug.
4. Remove the oil level plug, the breather valve and the oil drain plug.
5. Drain all the oil.
6. Re-insert the oil drain plug. When doing this, please observe the tightening torques in chapter "Tightening torques for oil level plugs, oil drain plugs, screw plugs, breather valves and oil sight glasses" (→ 🗎 39).
7. Fill in fresh oil of the same type (contact SEW-EURODRIVE if necessary) via the breather bore. Do not mix different synthetic lubricants.

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- Observe the oil quantities according to the specifications on the nameplate or according to the mounting position. See chapter "Lubricant fill quantities" (→ 🗎 204).
- Check the oil level at the oil level plug.

8. Re-insert the oil level plug and the breather valve. When doing this, please observe the tightening torques in chapter "Tightening torques for oil level plugs, oil drain plugs, screw plugs, breather valves and oil sight glasses" (→ 🗎 39).

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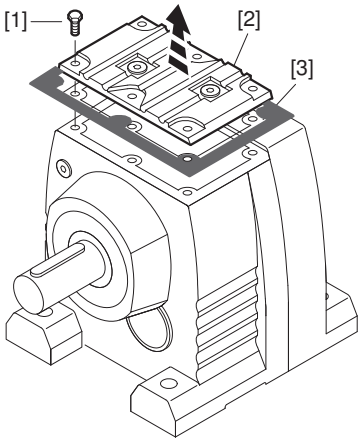
6.6.3 B: Helical, parallel shaft helical, SPIROPLAN® gear units without oil level plug with cover plate

Checking the oil level via the cover plate

For gear units without oil level bore, the oil level is checked via the cover plate opening. Proceed as follows:

1. Observe the information at the beginning of chapter "Inspection/maintenance" (→ 🗎 123).
2. To position the cover plate on the top, place the gear unit in the following mounting position:
   - R07 – R57 in mounting position M1
   - F27 in M3 mounting position
   - W10 – W30 and W..29 – W..39 in mounting position M1
3. Loosen the screws [1] of the cover plate [2] and remove the cover plate [2] and the corresponding gasket [3] (see following figure).



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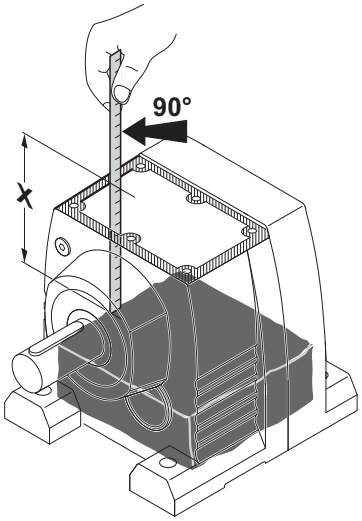
4. Determine the vertical distance "x" between oil level and sealing surface of the gear unit housing (see following figure).



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5. Compare the determined value "x" to the max. distance between oil level and sealing surface of the gear unit housing specified in the following table. Adjust the fill level if required.

Gear unit type		Maximum distance x between oil level and sealing surface of gear unit housing for mounting position					
		M1	M2	M3	M4	M5	M6
R07	2-stage	52 ± 1	27 ± 1	27 ± 1	27 ± 1	27 ± 1	27 ± 1
	3-stage	49 ± 1	21 ± 1	21 ± 1	21 ± 1	21 ± 1	21 ± 1
R17	2-stage	63 ± 1	18 ± 1	46 ± 1	18 ± 1	46 ± 1	46 ± 1
	3-stage	58 ± 1	11 ± 2	40 ± 2	11 ± 2	40 ± 2	40 ± 2
R27	2-stage	74 ± 1	22 ± 1	45 ± 1	22 ± 1	45 ± 1	45 ± 1
	3-stage	76 ± 1	19 ± 1	42 ± 1	19 ± 1	42 ± 1	42 ± 1
R47	2-stage	–	–	–	–	39 ± 1	–
	3-stage	–	–	–	–	32 ± 1	–
R57	2-stage	–	–	–	–	32 ± 1	–
	3-stage	–	–	–	–	28 ± 1	–
F27	2-stage	78 ± 1	31 ± 1	72 ± 1	56 ± 1	78 ± 1	78 ± 1
	3-stage	71 ± 1	24 ± 1	70 ± 1	45 ± 1	71 ± 1	71 ± 1
W..29		45 ± 1			5 ± 1	15 ± 1	
W..39		56 ± 1			4 ± 1	25 ± 1	
		Irrespective of mounting position					
W10		12 ± 1					
W20		19 ± 1					
W30		31 ± 1					

6. Close the gear unit after the oil level check:
   - Re-attach the seal of the cover plate. Make sure that the sealing surfaces are clean and dry.
   - Screw on the cover plate. Tighten the cover plate screw connections working from the inside to the outside. Tighten the cover plate screw connections in the sequence depicted in the following figure. Tighten the cover plate screw connections with the specified tightening torque according to the following table.

Repeat the tightening procedure until the screws are properly tightened. To avoid damaging the cover plate, use only impulse wrenches or torque wrenches. Do not use impact screwdrivers.

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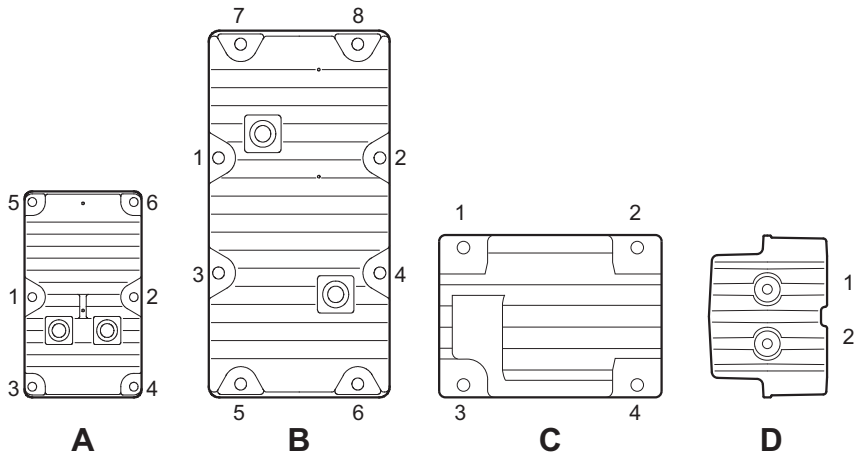

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Gear unit type	Image	Retaining thread	Tightening torque T_N Nm	Minimum tightening torque T_{min} Nm
R/RF07/17/27	D	M6	11	7
R/RF47/57	A			
F27	B	M5	6	4
W10	C	M5	6	4
W20	C	M6	11	7
W30	A			
W..29/W..39	A	M5	6	4

Checking the oil via cover plate

Proceed as follows to check the gear unit oil:

1. Observe the information at the beginning of chapter "Inspection/maintenance" (→ 🗎 123).
2. Open the cover plate of the gear unit according to chapter "Checking the oil level via the cover plate" (→ 🗎 134).
3. Take an oil sample via the cover plate opening.
4. Check the oil consistency.
   - Viscosity (have this carried out by a suitable laboratory if necessary)
   - If you can see that the oil is heavily contaminated, SEW-EURODRIVE recommends to change the oil, even if this is outside the service intervals specified in "Inspection and maintenance intervals" (→ 🗎 130).
5. Check the oil level. See chapter "Checking the oil level via the cover plate" (→ 🗎 134).
6. Screw on the cover plate. Observe the order and the tightening torques in accordance with chapter "Checking the oil level via the cover plate" (→ 🗎 134).

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Changing the oil via the cover plate

⚠ WARNING

Risk of burns due to hot gear unit and hot gear unit oil.

Severe injuries can occur.

- Let the gear unit cool down before you start working on it. Due to the better flowability, the gear unit oil should still be warm so that the gear unit can be drained best.

1. Observe the information at the beginning of chapter "Inspection/maintenance" (→ 🗎 123).
2. Open the cover plate of the gear unit according to chapter "Checking the oil level via the cover plate" (→ 🗎 134).
3. Completely drain the oil into a container via the cover plate opening.
4. Fill in fresh oil of the same type (contact SEW-EURODRIVE if necessary) via the cover plate. You must not mix different synthetic lubricants.
   - Fill in the oil quantity as specified on the nameplate or the order confirmation.
5. Check the oil level.
6. Screw on the cover plate. Observe the order and the tightening torques in accordance with chapter "Checking the oil level via the cover plate" (→ 🗎 134).

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6.6.4 C: Helical-worm gear units S..37 and helical-bevel gear units K..19/K..29 without oil level plug and cover plate

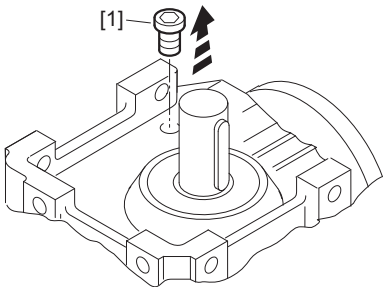
Checking the oil level via screw plug

The gear units S..37, K..19, and K..29 are not equipped with an oil level plug or a cover plate. This is why the oil level is checked via the control bore.

1. Observe the information at the beginning of chapter "Inspection/maintenance" (→ 🗎 123).
2. Place the gear unit in the mounting position stated in the following table. Thus the control bore always points upwards.

Gear unit	Mounting position
S..37	M5/M6
K..19/K..29	M6

3. Remove the screw plug [1] as shown in the following figure.



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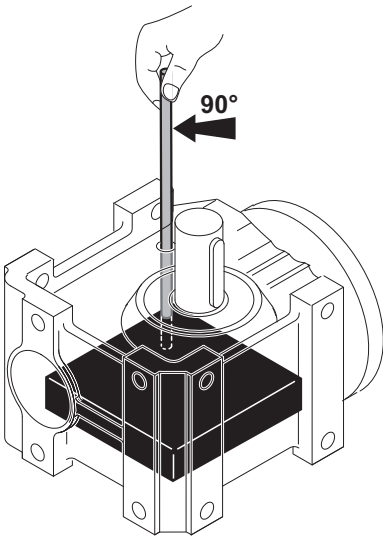
4. Insert the dipstick vertically via the control bore all the way to the bottom of the gear unit housing. Pull the dipstick vertically out of the control bore again, as shown in the following figure.



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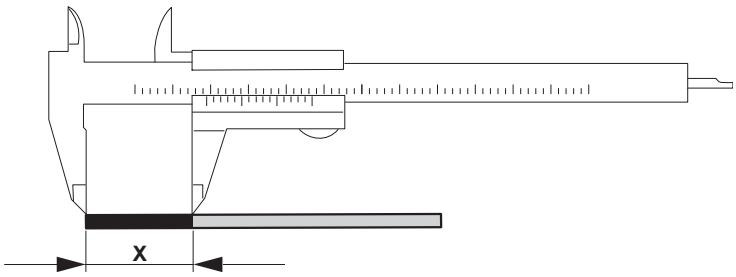
5. Determine the size of the section "x" of the dipstick covered with lubricant using a slide-gauge as depicted in the following figure.



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6. Compare the determined value "x" to the min. value depending on the mounting position specified in the following table. Correct the fill level if required.

Gear unit type	Oil level = wetted section "x" in mm of the dipstick Mounting position					
	M1	M2	M3	M4	M5	M6
K..19	33 ± 1	33 ± 1	33 ± 1	35 ± 1	33 ± 1	33 ± 1
K..29	50 ± 1	50 ± 1	50 ± 1	63 ± 1	50 ± 1	50 ± 1
S..37	10 ± 1	24 ± 1	34 ± 1	37 ± 1	24 ± 1	24 ± 1

7. Re-insert and tighten the screw plug. When doing this, please observe the tightening torques in chapter "Tightening torques for oil level plugs, oil drain plugs, screw plugs, breather valves and oil sight glasses" (→ 🗎 39).

Checking the oil via the screw plug

1. Observe the information at the beginning of chapter "Inspection/maintenance" (→ 🗎 123).
2. Open the screw plug of the gear unit according to chapter "Checking the oil level via screw plug" (→ 🗎 138).
3. Take an oil sample via the screw plug bore.
4. Check the oil consistency.
   - Viscosity (have this carried out by a suitable laboratory if necessary)
   - If you can see that the oil is heavily contaminated, SEW-EURODRIVE recommends to change the oil, even if this is outside the service intervals specified in "Inspection and maintenance intervals" (→ 🗎 127).
5. Check the oil level. See chapter "Checking the oil level via screw plug" (→ 🗎 138).
6. Screw the screw plug back into place. When doing this, please observe the tightening torques in chapter "Tightening torques for oil level plugs, oil drain plugs, screw plugs, breather valves and oil sight glasses" (→ 🗎 39).

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Changing the oil via the screw plug

⚠ WARNING

Risk of burns due to hot gear unit and hot gear unit oil.

Severe injuries can occur.

- Let the gear unit cool down before you start working on it. Due to the better flowability, the gear unit oil should still be warm so that the gear unit can be drained best.

1. Observe the information at the beginning of chapter "Inspection/maintenance" (→ 🗎 123).
2. Open the screw plug of the gear unit according to chapter "Checking the oil level via screw plug" (→ 🗎 138).
3. Completely drain the oil via the screw plug bore.
4. Fill in fresh oil of the same type (contact SEW-EURODRIVE if necessary) via the control bore. You must not mix different synthetic lubricants.
   - Observe the oil quantity specified on the nameplate or according to the mounting position. Observe chapter "Lubricant fill quantities" (→ 🗎 204).
5. Check the oil level.
6. Screw the screw plug back into place. When doing this, please observe the tightening torques in chapter "Tightening torques for oil level plugs, oil drain plugs, screw plugs, breather valves and oil sight glasses" (→ 🗎 39).

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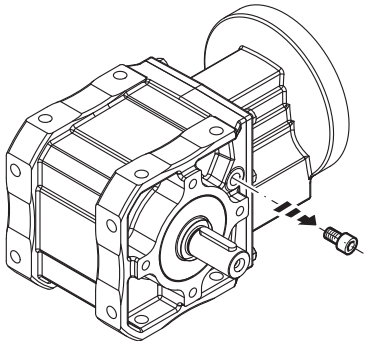
6.6.5 D: SPIROPLAN® W..37/W..47 in mounting position M1, M2, M3, M5, M6 with oil level plug

Checking the oil level at the oil level plug

Proceed as follows to check the oil level of the gear unit:

1. Observe the information at the beginning of chapter "Inspection/maintenance" (→ 🗎 123).
2. Set up the gear unit in M1 mounting position.
3. Slowly remove the oil level plug (see following figure). Small amounts of oil may leak out.



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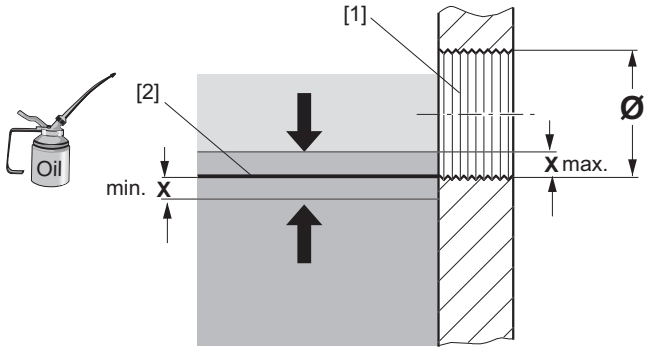
4. Check the oil level according to the following figure.



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[1] Oil level bore [2] Target oil level

Ø oil level bore	Fluctuation "x" for minimum and maximum fill level in mm
M10 × 1	1.5

5. If the oil level is too low, add fresh oil of the same type (consult SEW-EURODRIVE if necessary) via the oil level bore, up to the lower edge of the bore.
6. Screw in the oil level plug again. When doing this, please observe the tightening torques in chapter "Tightening torques for oil level plugs, oil drain plugs, screw plugs, breather valves and oil sight glasses" (→ 🗎 39).

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Checking the oil level at the oil level plug

Proceed as follows to check the oil of the gear unit:

1. Observe the information at the beginning of chapter "Inspection/maintenance" (→ 🗎 123).
2. Remove some oil at the oil level plug.
3. Check the oil consistency.
   - Viscosity (have this carried out by a suitable laboratory if necessary)
   - If you can see that the oil is heavily contaminated, SEW-EURODRIVE recommends to change the oil, even if this is outside the service intervals specified in "Inspection and maintenance intervals" (→ 🗎 127).
4. Check the oil level. See previous chapter.

Changing the oil at the oil level plug

⚠ WARNING

Risk of burns due to hot gear unit and hot gear unit oil.

Severe injuries can occur.

- Let the gear unit cool down before you start working on it. Due to the better flowability, the gear unit oil should still be warm so that the gear unit can be drained best.

1. Observe the information at the beginning of chapter "Inspection/maintenance" (→ 🗎 123).
2. Set up the gear unit in M5 or M6 mounting position. See chapter "Mounting positions" (→ 🗎 146).
3. Place a container underneath the oil level plug.
4. Remove the oil level plugs on the A- and B-side of the gear unit.
5. Drain all the oil.
6. Re-insert the lower oil level plug. When doing this, please observe the tightening torques in chapter "Tightening torques for oil level plugs, oil drain plugs, screw plugs, breather valves and oil sight glasses" (→ 🗎 39).
7. Fill in new oil of the same type (contact SEW-EURODRIVE if necessary) via the upper oil level plug. You must not mix different synthetic lubricants.
   - Observe the oil quantity specified on the nameplate or according to the mounting position. See chapter "Lubricant fill quantities" (→ 🗎 204).
   - Check the oil level in accordance with in chapter "Checking the oil level at the oil level plug" (→ 🗎 141).
8. Re-insert the upper oil level plug. When doing this, please observe the tightening torques in chapter "Tightening torques for oil level plugs, oil drain plugs, screw plugs, breather valves and oil sight glasses" (→ 🗎 39).

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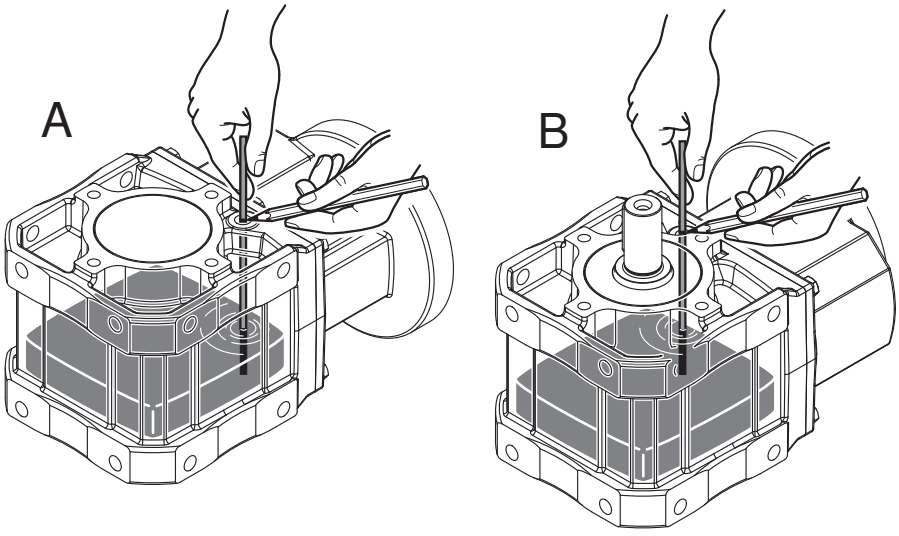
6.6.6 E: SPIROPLAN® W..37 / W..47 in mounting position M4 without oil level plug and cover plate

Checking the oil level via screw plug

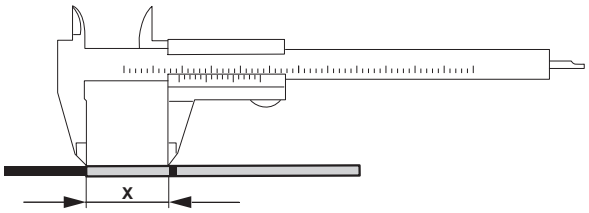
The W37 / W47 gear units are not equipped with an oil level plug or a cover plate. This is why the oil level is checked via the control bore.

1. Observe the information at the beginning of chapter "Inspection/maintenance" (→ 🗎 123).
2. Set up the gear unit in M5 or M6 mounting position. See chapter "Mounting positions" (→ 🗎 146).
3. Remove the screw plug.
4. Insert the dipstick vertically via the control bore all the way to the bottom of the gear unit housing. Mark the point on the dipstick where it exits the gear unit. Pull out the dipstick vertically (see following figure).



784447371

5. Determine the section "x" between the wetted part and the marking using a caliper (see following figure).



9007200039761803

6. Compare the determined value "x" to the min. value depending on the mounting position specified in the following table. Correct the fill level if required.

Gear unit type	Oil level = section "x" in mm of the dipstick Mounting position during check	
	M5 Lying on the A-side	M6 Lying on the B-side
W37 in M4 mounting position	37 ± 1	29 ± 1
W47 in M4 mounting position	41 ± 1	30 ± 1

7. Re-insert and tighten the screw plug. When doing this, please observe the tightening torques in chapter "Tightening torques for oil level plugs, oil drain plugs, screw plugs, breather valves and oil sight glasses" (→ 🗎 39).

Checking the oil via the screw plug

Proceed as follows to check the oil of the gear unit:

1. Observe the information at the beginning of chapter "Inspection/maintenance" (→ 🗎 123).
2. Remove a little oil at the oil screw plug.
3. Check the oil consistency:
   - Viscosity (have this carried out by a suitable laboratory if necessary)
   - If you can see that the oil is heavily contaminated, SEW-EURODRIVE recommends to change the oil, even if this is outside the service intervals specified in "Inspection and maintenance intervals" (→ 🗎 127).
4. Check the oil level. See previous chapter.

Changing the oil via the screw plug

⚠ WARNING

Risk of burns due to hot gear unit and hot gear unit oil.

Severe injuries can occur.

- Let the gear unit cool down before you start working on it. Due to the better flowability, the gear unit oil should still be warm so that the gear unit can be drained best.

1. Observe the information at the beginning of chapter "Inspection/maintenance" (→ 🗎 123).
2. Set up the gear unit in M5 or M6 mounting position. See chapter "Mounting positions" (→ 🗎 146).
3. Place a container underneath the screw plug.
4. Remove the screw plugs at the A and B-side of the gear unit.
5. Drain all the oil.
6. Re-insert the lower screw plug. When doing this, please observe the tightening torques in chapter "Tightening torques for oil level plugs, oil drain plugs, screw plugs, breather valves and oil sight glasses" (→ 🗎 39).
7. Add fresh oil of the same type (consult SEW-EURODRIVE if necessary) via the upper screw plug. You must not mix different synthetic lubricants.
   - Add the oil quantity specified on the nameplate or in accordance with the information in chapter "Lubricant fill quantities" (→ 🗎 204).
   - Check the oil level in accordance with in chapter "Checking the oil level via screw plug" (→ 🗎 143).
8. Re-insert the upper screw plug. When doing this, please observe the tightening torques in chapter "Tightening torques for oil level plugs, oil drain plugs, screw plugs, breather valves and oil sight glasses" (→ 🗎 39).

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6.6.7 Replacing the oil seal

NOTICE

Damage to oil seal when mounted below 0 °C.

Damage to oil seal.

- Store oil seals at ambient temperatures over 0 °C.
- If necessary, heat the oil seal before mounting it.

Proceed as follows:

1. Ensure that there is a sufficient grease reservoir between the dust lip and sealing lip, depending on the gear unit design.
2. If you use double oil seals, the space has to be filled with grease for one third.

6.6.8 Painting the gear unit

NOTICE

Paint can block the breather valve and damage the sealing lips of the oil seals.

Damage to property.

- Thoroughly cover the breather valve and sealing lip of the oil seals with strips prior to painting/re-painting.
- Remove the strips after painting.

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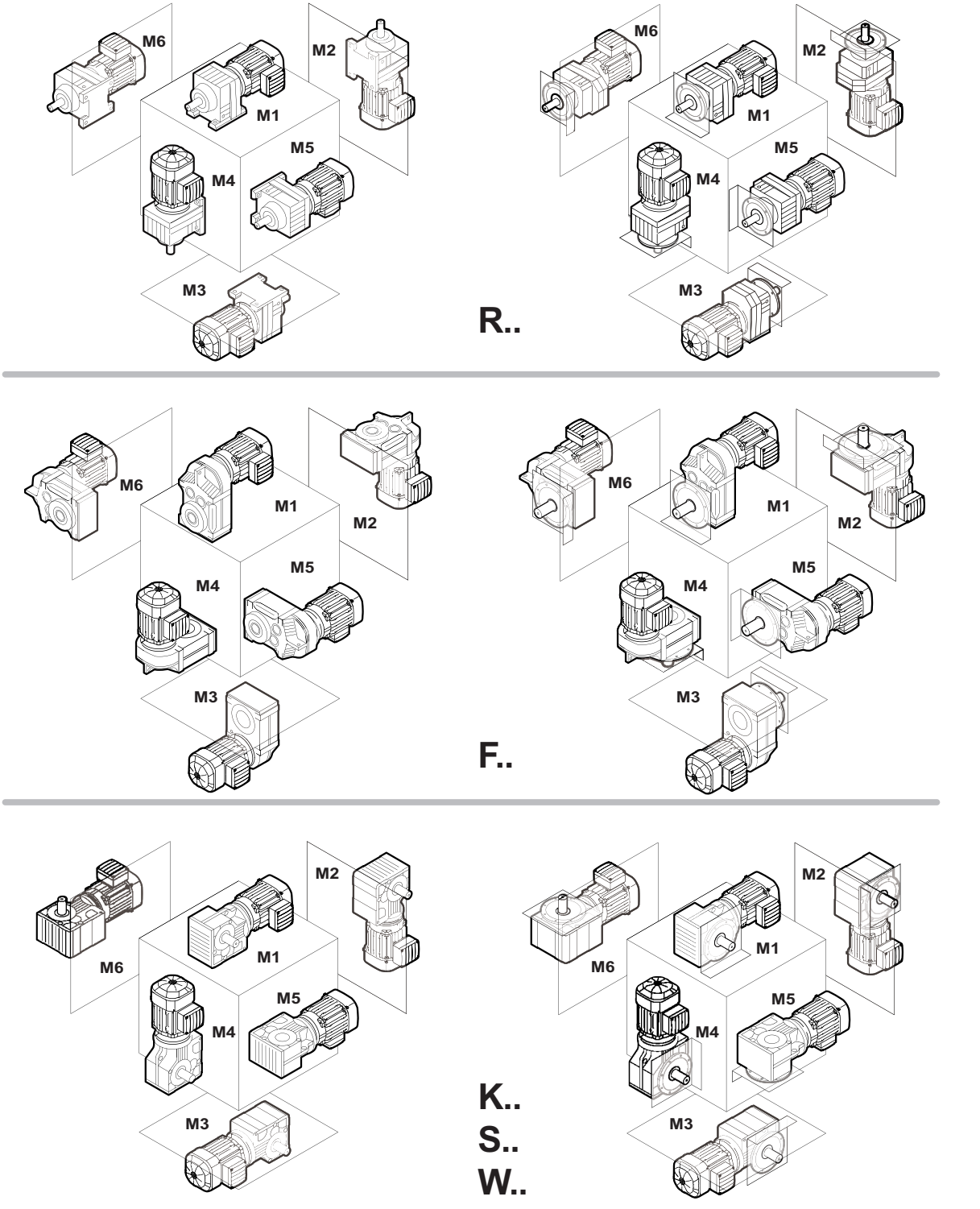
7 Mounting positions

7.1 Designation of the mounting positions

The following illustration shows the SEW-EURODRIVE mounting positions M1 – M6:



7.2 Churning losses and thermal rating

* (→ 🗎 X)

Churning losses may occur with the following conditions. They must be considered during thermal check:

- A mounting position where the first gear unit stage is fully immersed in the lubricant. The respective mounting positions of the gear units are marked with * in chapter "Mounting position sheets" (→ 🗎 150).
- A high mean input speed and consequently a high circumferential speed of the gear wheels of the input gear stage.

If one or both conditions are present, determine the requirements of the application and the corresponding operating conditions (see chapter "Data for calculating the thermal rating" (→ 🗎 147)) and contact SEW-EURODRIVE. SEW-EURODRIVE can calculate the thermal rating based on the actual operating conditions. The thermal rating of the gear unit can be increased by appropriate measures, such as by using a synthetic lubricant with higher thermal endurance properties.

INFORMATION

To reduce churning losses to a minimum, use gear units preferably in M1 mounting position.

7.2.1 Data for calculating the thermal rating

The following information is required for calculating the thermal rating:

Gear unit type and design:

- Gear unit ratio i
- Mean input speed n_{em} or mean output speed n_{am} each in min^{-1}
- Effective motor torque M_{eff} in Nm
- Input motor power P_{Mot} in kW
- Mounting position M1 – M6 or pivoting angle

Installation site:

- Ambient temperature T_{amb} in °C
- Installation altitude
- In small, closed rooms or in large rooms (halls) or outdoors

Installation situation:

- Space-critical or well ventilated
- Steel base or concrete base

7.3 Change of mounting position

Observe the following information when you operate the gearmotor in a mounting position other than the one indicated in the order:

- Adjust the lubricant fill quantity to the changed mounting position.
- Adjust the position of the breather valve.
- When changing the mounting position to M4: Contact SEW-EURODRIVE. Depending on the drive's operating mode, an oil expansion tank might be necessary (see chapter "Oil expansion tank" (→ 🗎 108)).

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- For helical-bevel gearmotors: Contact SEW-EURODRIVE if you want to change to mounting position M5 or M6.
- For helical-worm gearmotors: Contact SEW-EURODRIVE if you want to change to mounting position M2 or M3.
- For helical gearmotors: Contact SEW-EURODRIVE if you want to change to mounting position M2.
- If you change the mounting position to a mounting position that requires more oil, SEW-EURODRIVE recommends to perform a thermal check/project planning again.

7.4 Gear unit in pivoted mounting position (dynamic)

The dynamic pivoted mounting position is available on request for gear units of the types R..7, F..7, K..7, K..9, S..7 and SPIROPLAN® W..9.

In the pivoted mounting position, the gear units are delivered with the maximum required oil fill quantity and sealed with oil screw plugs. The gear unit can be pivoted during operation to the mounting positions required by the customer.

7.5 Gear unit in pivoted mounting position (stationary)

The stationary pivoted mounting position is available for all gear units of the type R..7, F..7, K..7, K..9, S..7 and SPIROPLAN® W..7.

In the stationary pivoted mounting position, the gear units are delivered with the oil fill quantity required for this pivoted mounting position and sealed with oil screw plugs. For gear units with stationary pivoted mounting position, replace the highest screw plug with the supplied breather valve before startup. When doing this, please observe the tightening torques in chapter "Tightening torques for oil level plugs, oil drain plugs, screw plugs, breather valves and oil sight glasses" (→ 🗎 39).

7.6 Universal mounting position M0

SPIROPLAN® gear units W10.. – W30.. are available in universal mounting position M0. Because of their compact size, they are fully enclosed and do not have a breather valve. You can use them in any M1 – M6 mounting position without having to adapt the gear unit.

All W10..to W30.. gear units of a certain size have the same oil fill quantity.

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7.7 Mounting position MX

Mounting position MX is available for all gear units of sizes R..7, F..7, K..7, K..9, S..7 and SPIROPLAN® W..7 and W..9.

Before startup, make adjustments dependent on the mounting position for gear units in mounting position MX.

In the mounting position MX, the gear units are delivered with the maximum required oil fill quantity and sealed with oil screw plugs. A breather valve is included with each drive. The oil fill volume must be adapted according to the mounting position of the gear unit (see chapter "Lubricant fill quantities" (→ 🗎 204)). Customers will also have to mount the enclosed breather valve at the proper location depending on the mounting position, see chapter "Mounting position sheets" (→ 🗎 150). When screwing in the breather valve, observe the corresponding tightening torque in chapter "Tightening torques for oil level plugs, oil drain plugs, screw plugs, breather valves and oil sight glasses" (→ 🗎 39).

Check for the correct oil level before startup, as described in chapter "Checking the oil level and changing the oil" (→ 🗎 130).

7.7.1 Compound gear units in MX mounting position

In MX mounting position, both gear units (primary and subsequent gear unit) are in the same mounting position.

7.8 Variable mounting position

The variable mounting position is available by request for gear units types R..7, F..7, K..7, K..9, S..7 and SPIROPLAN® W..7/W..9.

Before startup, make adjustments dependent on the mounting position for gear units in the variable mounting position.

In the variable mounting position, the gear units are delivered with the maximum required oil fill quantity of the mentioned mounting positions and sealed with oil screw plugs. A breather valve is included with each drive. The enclosed breather valve must be mounted in the proper location depending on the mounting position, see chapter "Mounting position sheets" (→ 🗎 150). When screwing in the breather valve, observe the corresponding tightening torque in chapter "Tightening torques for oil level plugs, oil drain plugs, screw plugs, breather valves and oil sight glasses" (→ 🗎 39).

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7.9 Mounting position sheets

7.9.1 Key to the mounting position sheets

INFORMATION

The positions of the breather valve, oil level plug, and oil drain plug specified in the mounting position sheets are binding and comply with the assembly specifications.

The motors are only depicted symbolically on the mounting position sheets.

INFORMATION

For gear units with solid shaft: The displayed shaft is always on the A-side.

For shaft-mounted gear units: The shaft with dashed lines represents the customer shaft. The output end (= output shaft position) is always shown on the A-side.

INFORMATION

SPIROPLAN® gearmotors do not depend on the mounting position. An exception are W..37, W..47, W..29 and W..39 gearmotors in M4 mounting position. However, mounting positions M1 to M6 are also shown for SPIROPLAN® gearmotors to assist you in working with this documentation.

INFORMATION

SPIROPLAN® gearmotors W..10 to W..30 cannot be equipped with breather valves, oil level plugs or oil drain plugs.

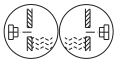
SPIROPLAN® gearmotors W..37, W..47, W..29 and W..39 are equipped with breather valves in mounting position M4 and with oil drain plugs in mounting position M2.

INFORMATION

Some gear units can be supplied in mounting position M0. In this case, the gear unit is delivered in a universal mounting position and can be adjusted to various mounting positions by the customer. It may be necessary to contact SEW-EURODRIVE.

Symbols used

The following table shows the symbols used in the mounting position sheets.

Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug

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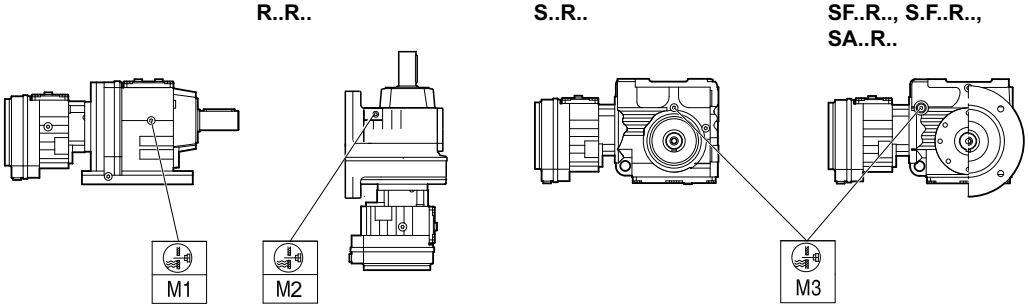
7.9.2 Position of the oil level plug of compound gear units

To ensure sufficient lubrication of the first gear unit (larger gear unit) in case of compound gear units, the following gear units have a higher oil level in the specified mounting positions:

- Helical gear unit type R..R in mounting position M1 and M2
- Helical-worm gear unit type S..R in mounting position M3

The oil level plugs are located at the following positions, deviating from the specifications on the mounting position sheets:

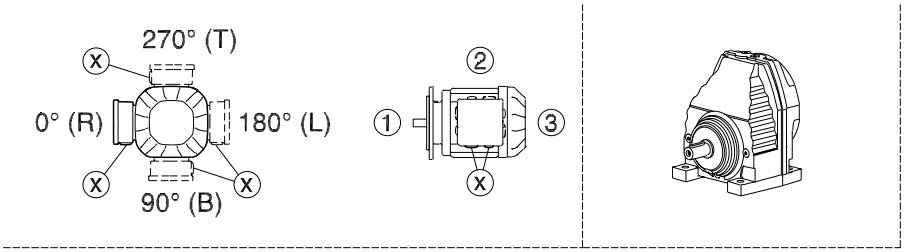


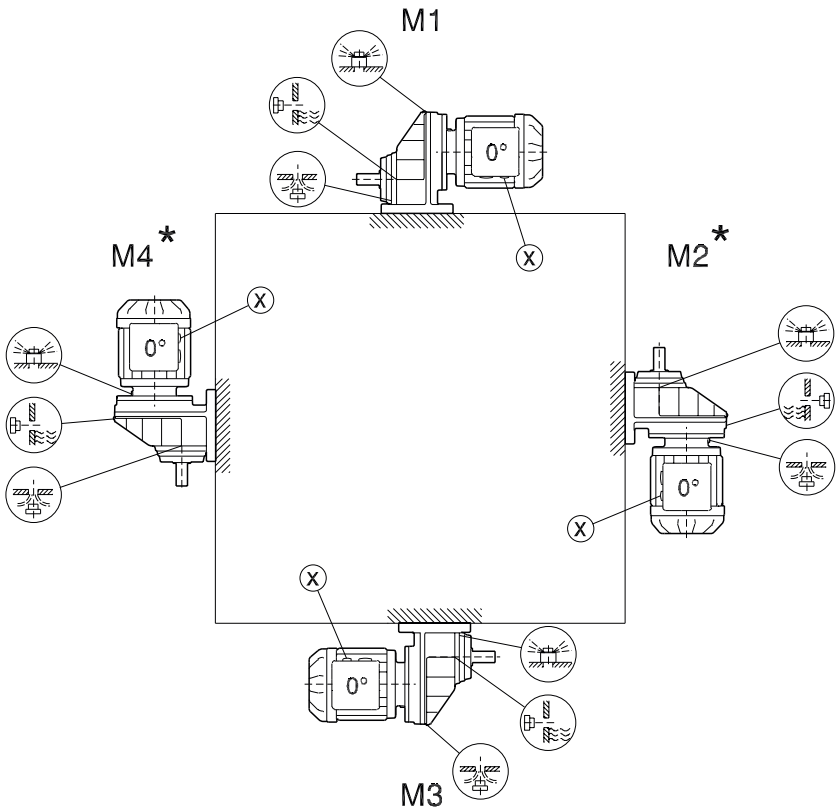
15987248395

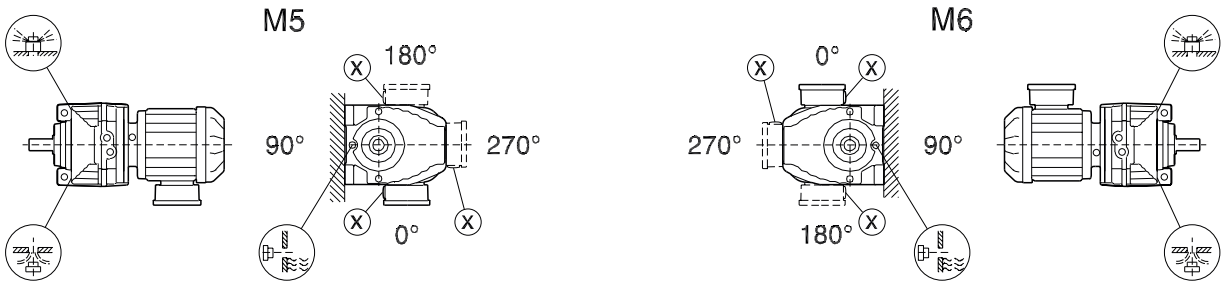
Icon	Meaning
	Oil level plug

7.9.3 Mounting positions of helical gearmotors

RX57-RX107







* (→ 🗎 147)

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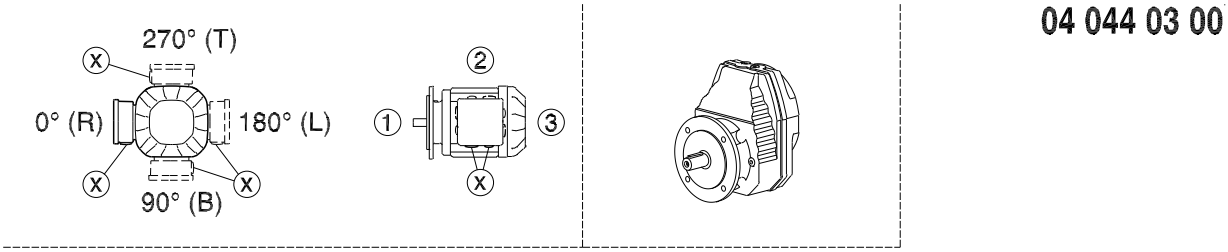
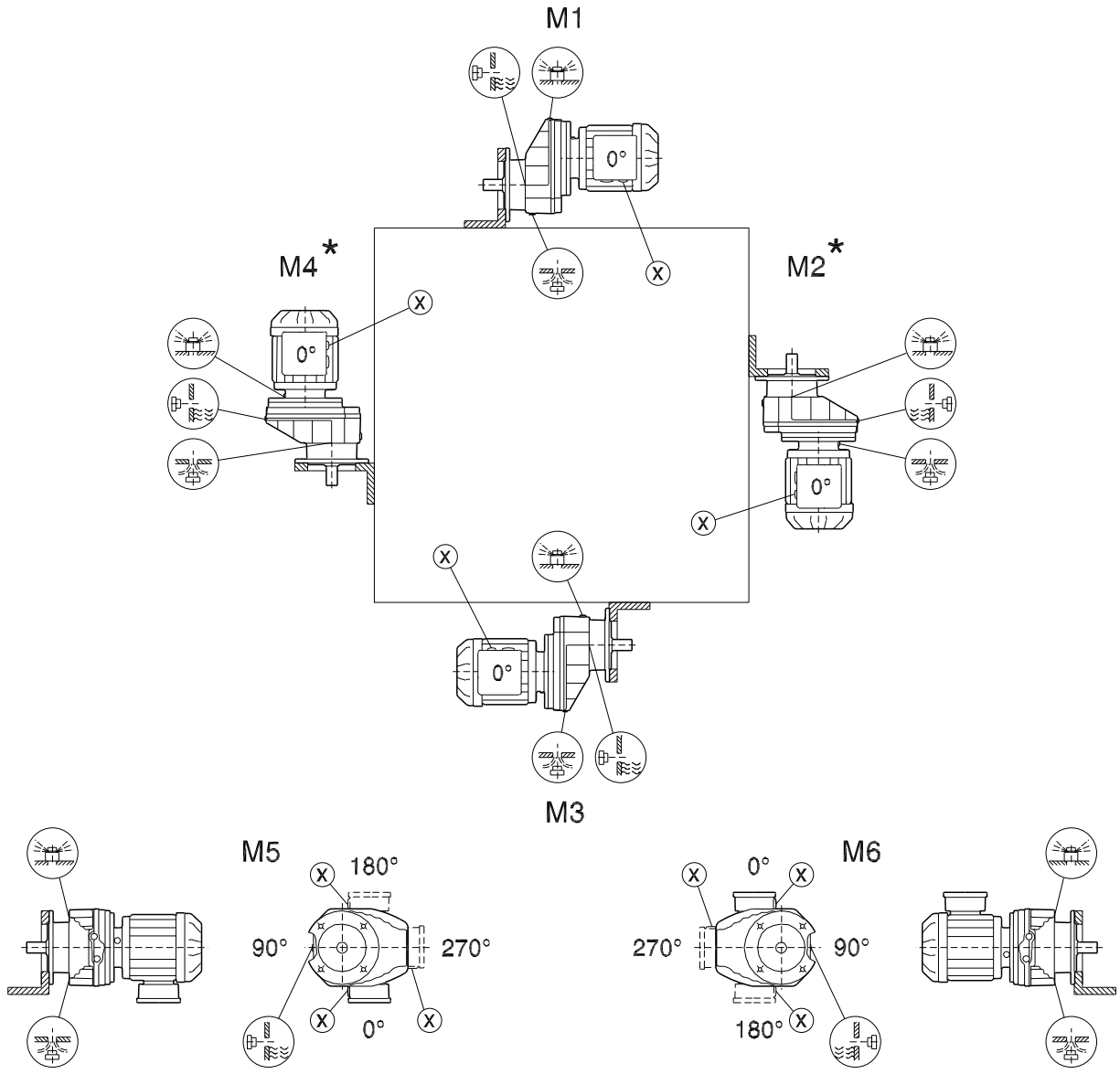
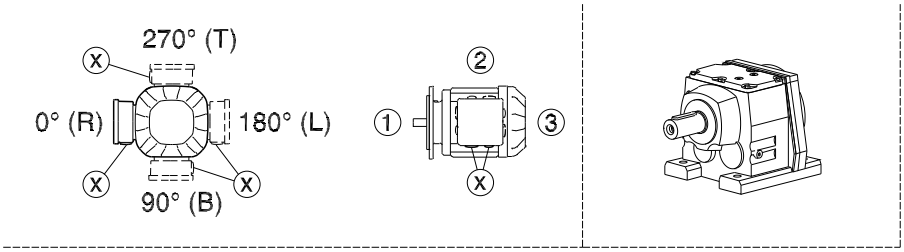
RXF57-RXF107



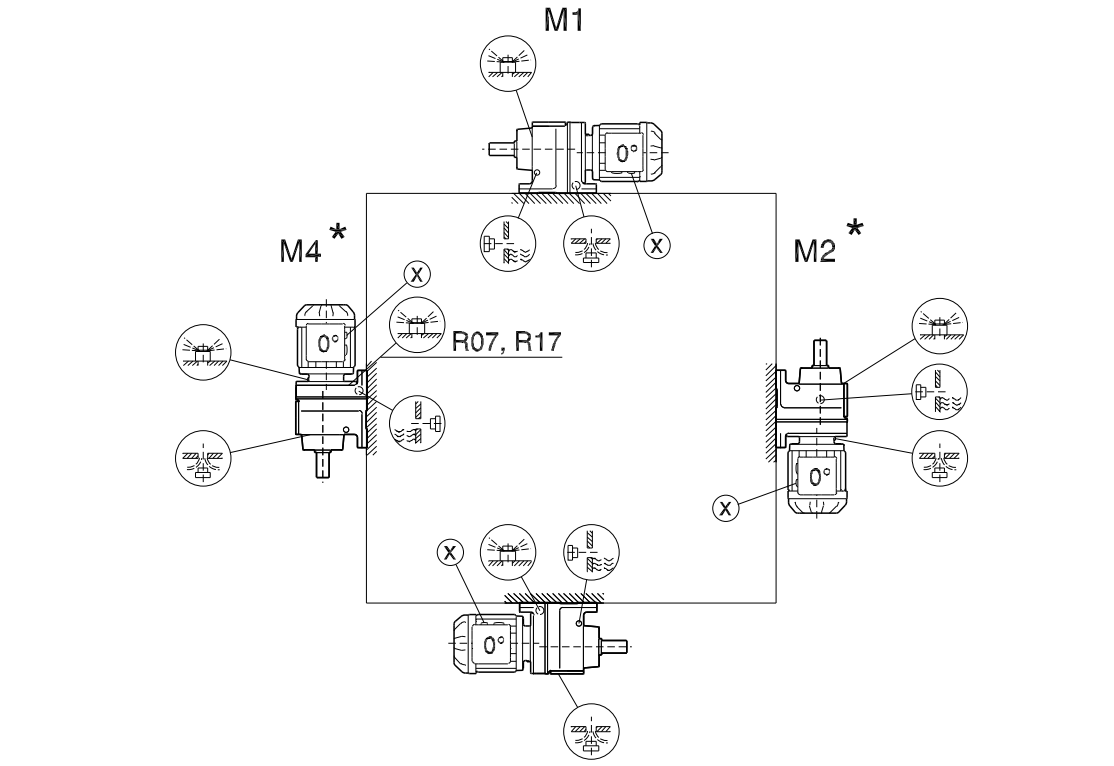


* (→ 🗎 147)

R07-R167



04 040 04 00



R07	⊗	M1, M2, M3, M5, M6
R17, R27	⊗	M1, M3, M5, M6
R07, R17, R27	⊗ ⊗	
R47, R57	⊗	M5

* (→ 🗎 147)

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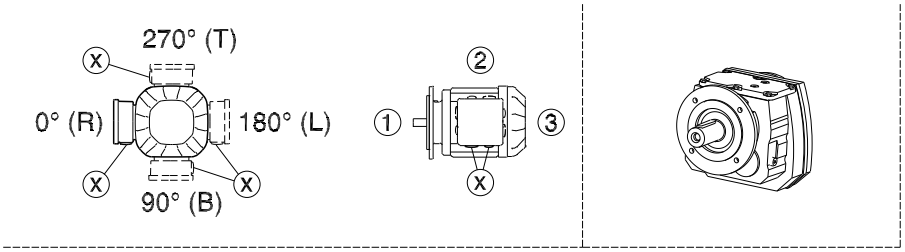
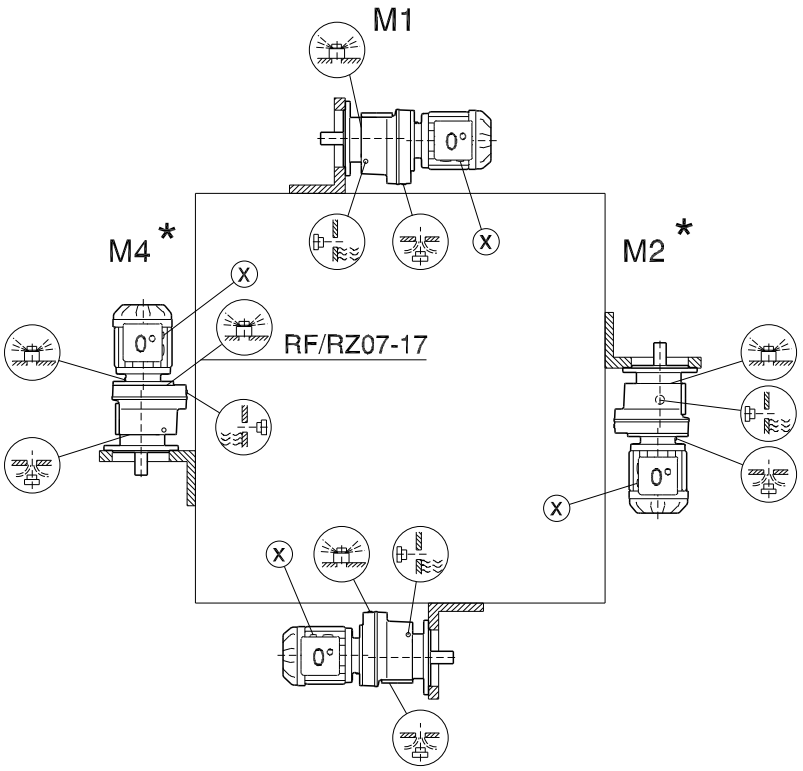
RF07-RF167, RZ07-RZ87, RM57-RM167

04 041 04 00

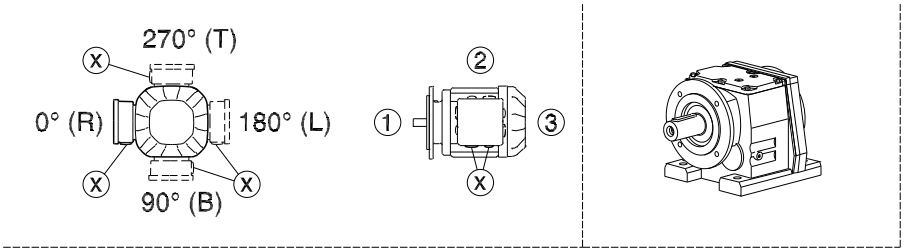




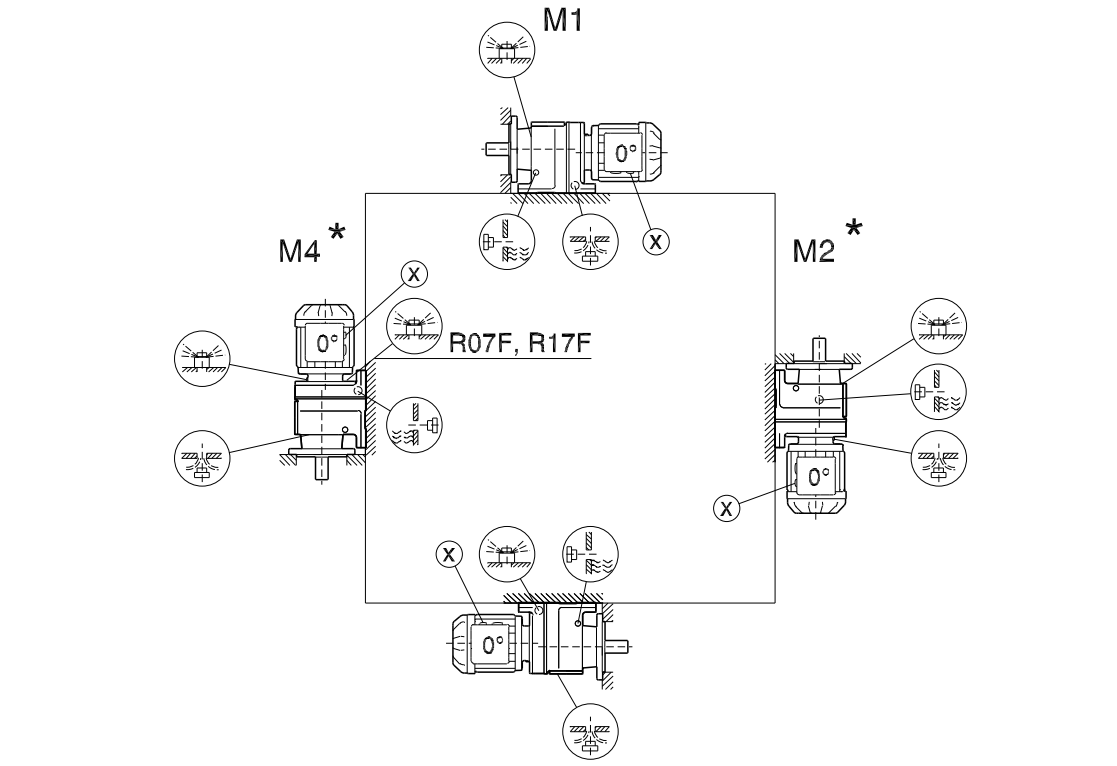
RF/RZ07	⊗	M1, M2, M3, M5, M6
RF/RZ17, 27	⊗	M1, M3, M5, M6
RF/RZ07, 17, 27	⊗ ⊗	
RF/RZ47, 57	⊗	M5

* (→ 🗎 147)

R07F-R87F



04 042 04 00



R07F	M1, M2, M3, M5, M6
R17F, R27F	M1, M3, M5, M6
R07F, R17F, R27F	
R47F, R57F	M5

* (→ 🗎 147)

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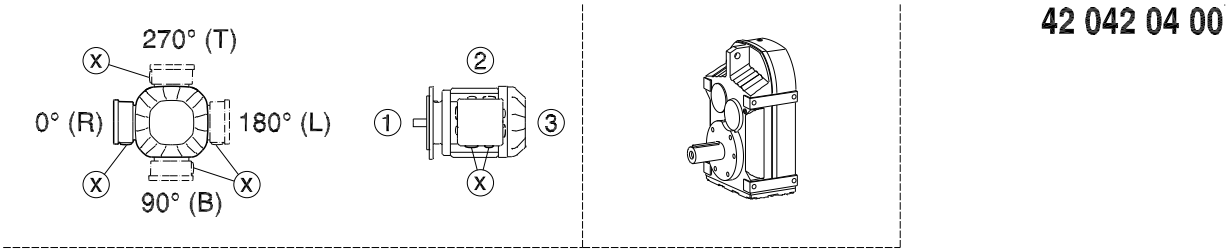
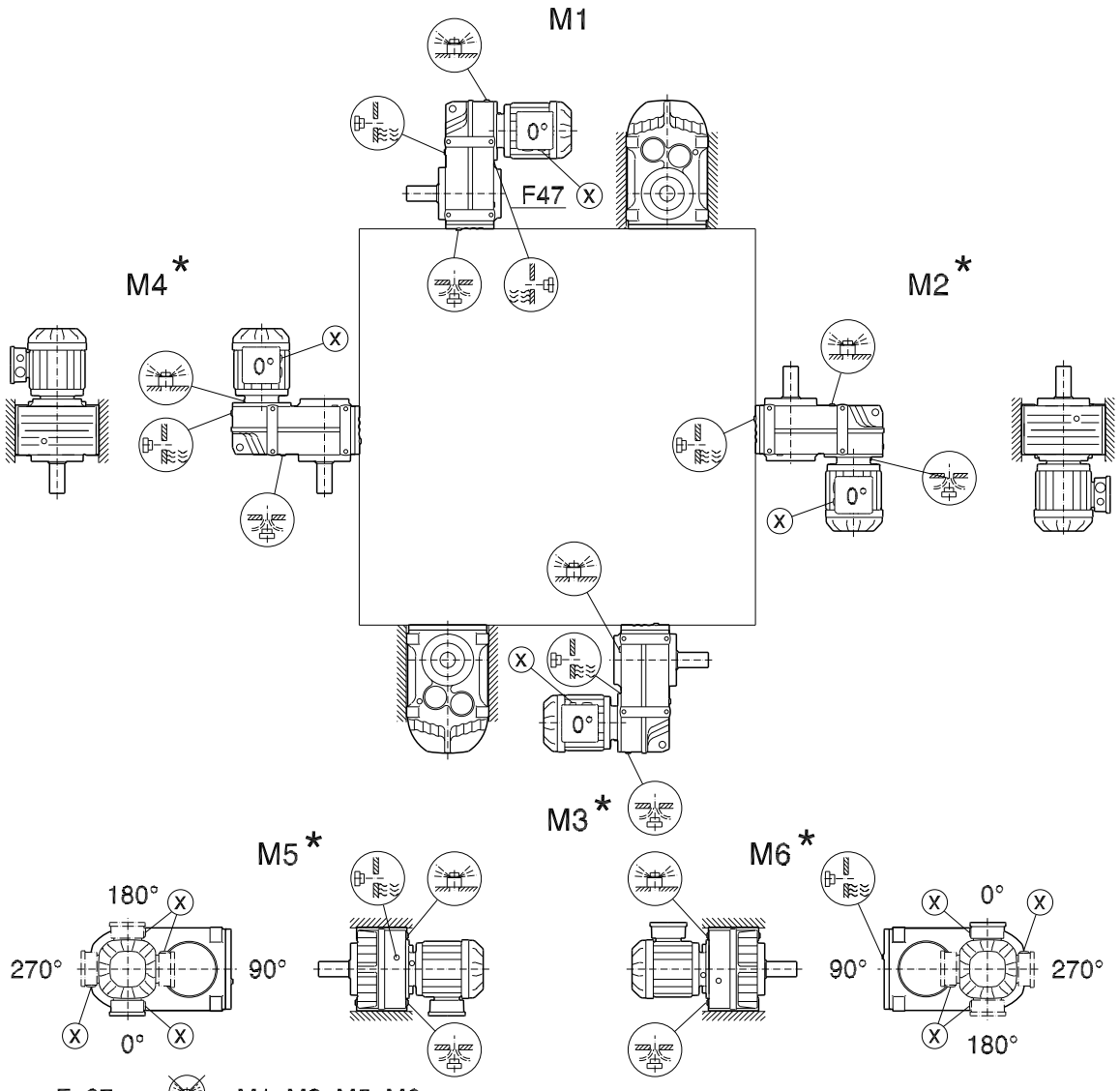
7.9.4 Mounting positions of parallel-shaft helical gearmotors

F/FA..B/FH27B-157B, FV27B-107B





F..27		M1, M3, M5, M6
F..27		M1 - M6
F..27		M1, M3, M5, M6

* (→ 🗎 147)

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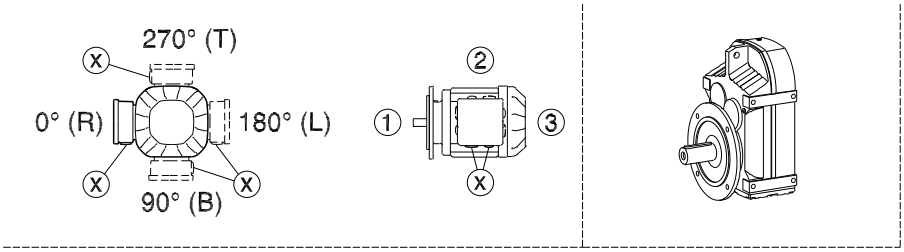
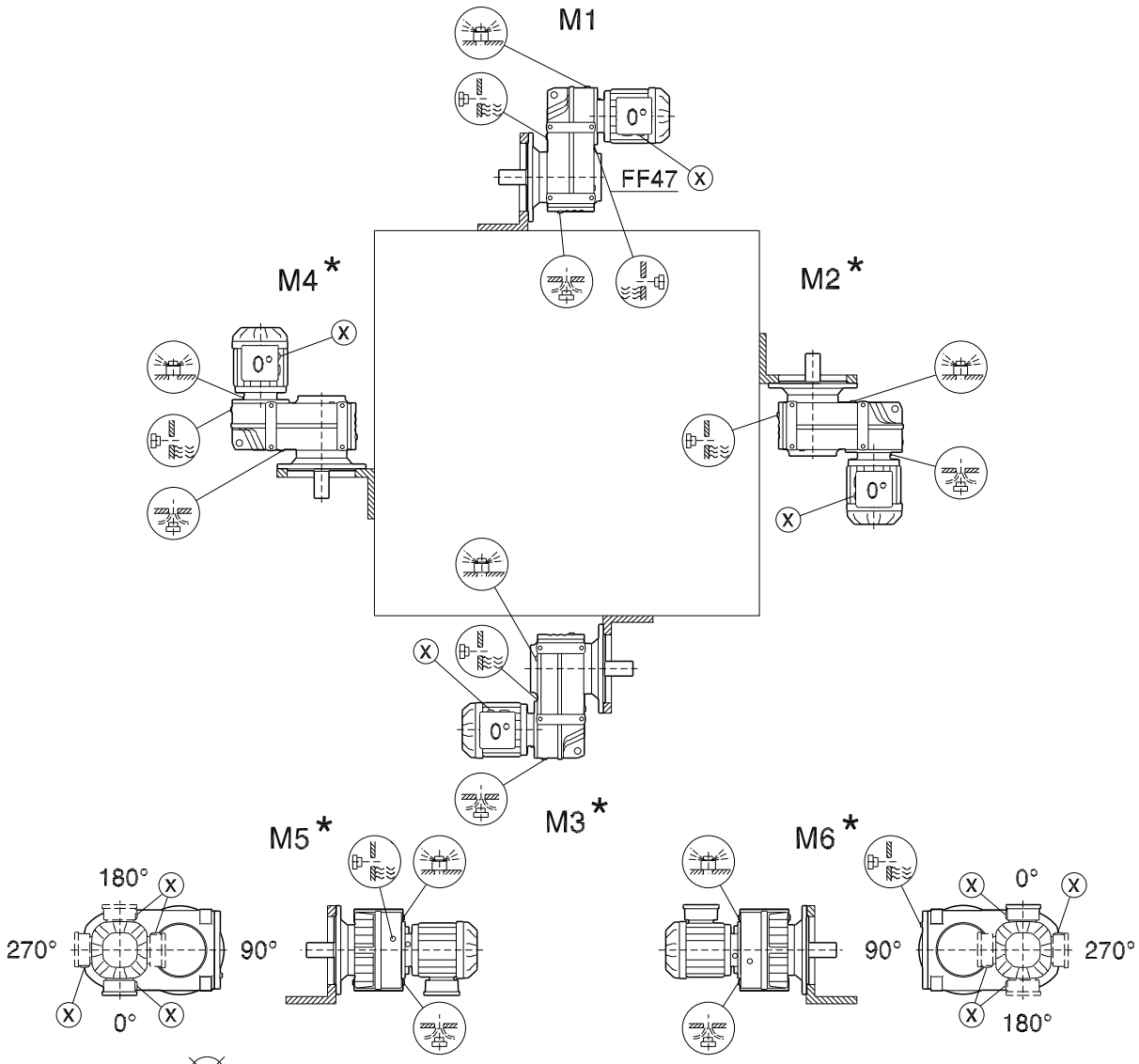
FF/FAF/FHF/FZ/FAZ/FHZ27-157, FVF/FVZ27-107, FM/FAM67-157

42 043 04 00





F..27		M1, M3, M5, M6
F..27		M1 - M6
F..27		M1, M3, M5, M6

* (→ 🗎 147)

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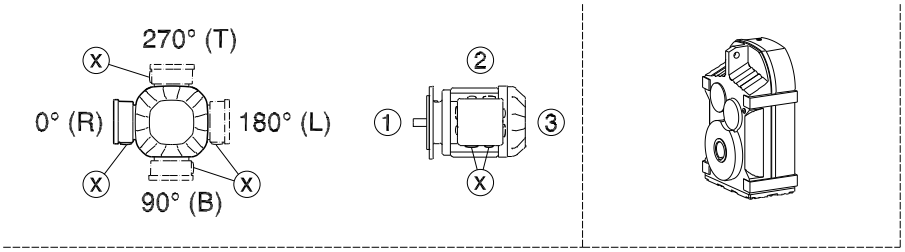
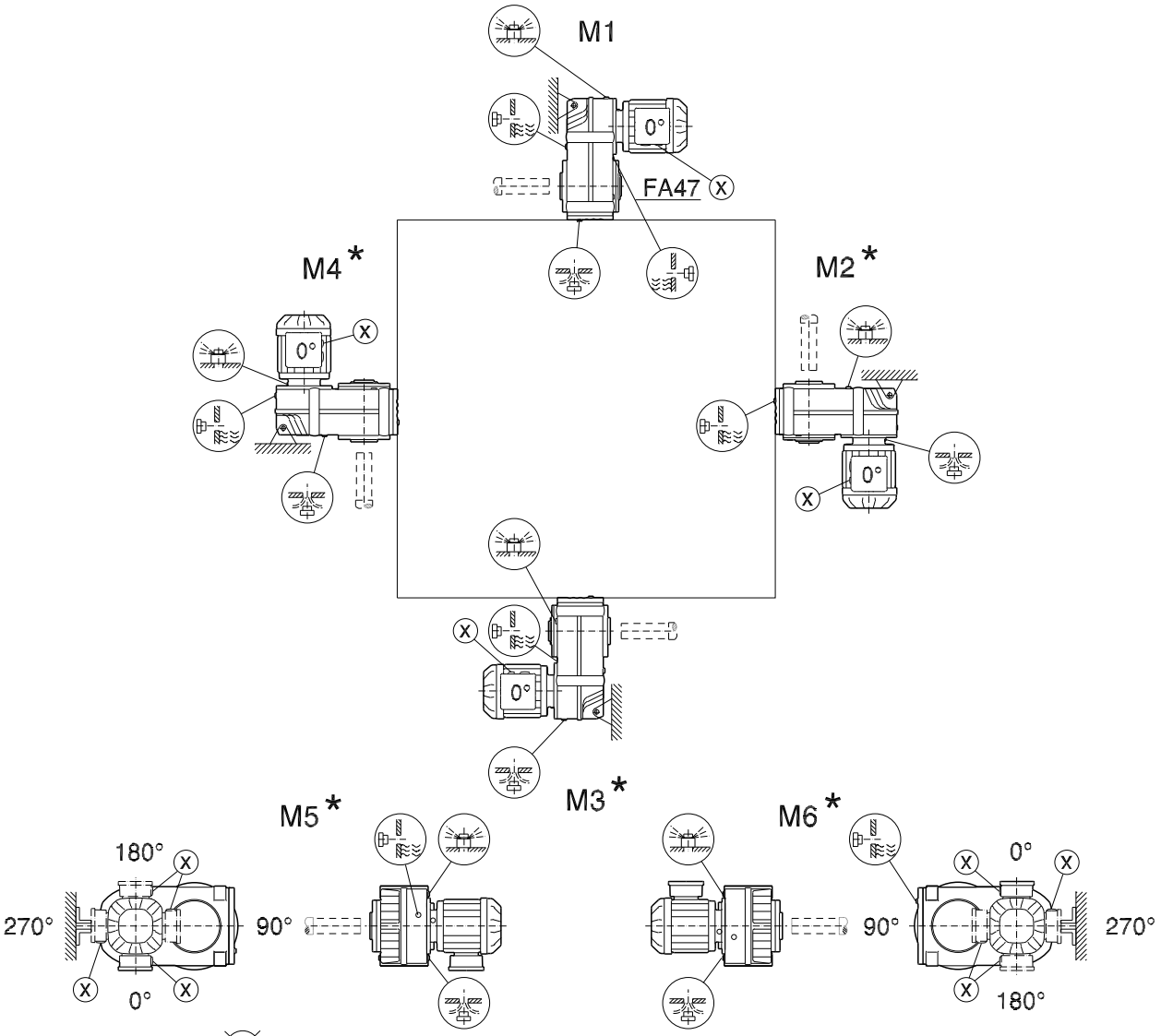
FA/FH27-157, FV27-107, FT37-97

42 044 04 00





F..27		M1, M3, M5, M6
F..27		M1 - M6
F..27		M1, M3, M5, M6

* (→ 🗎 147)

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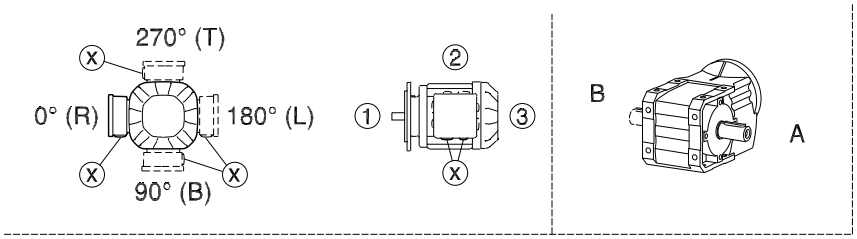
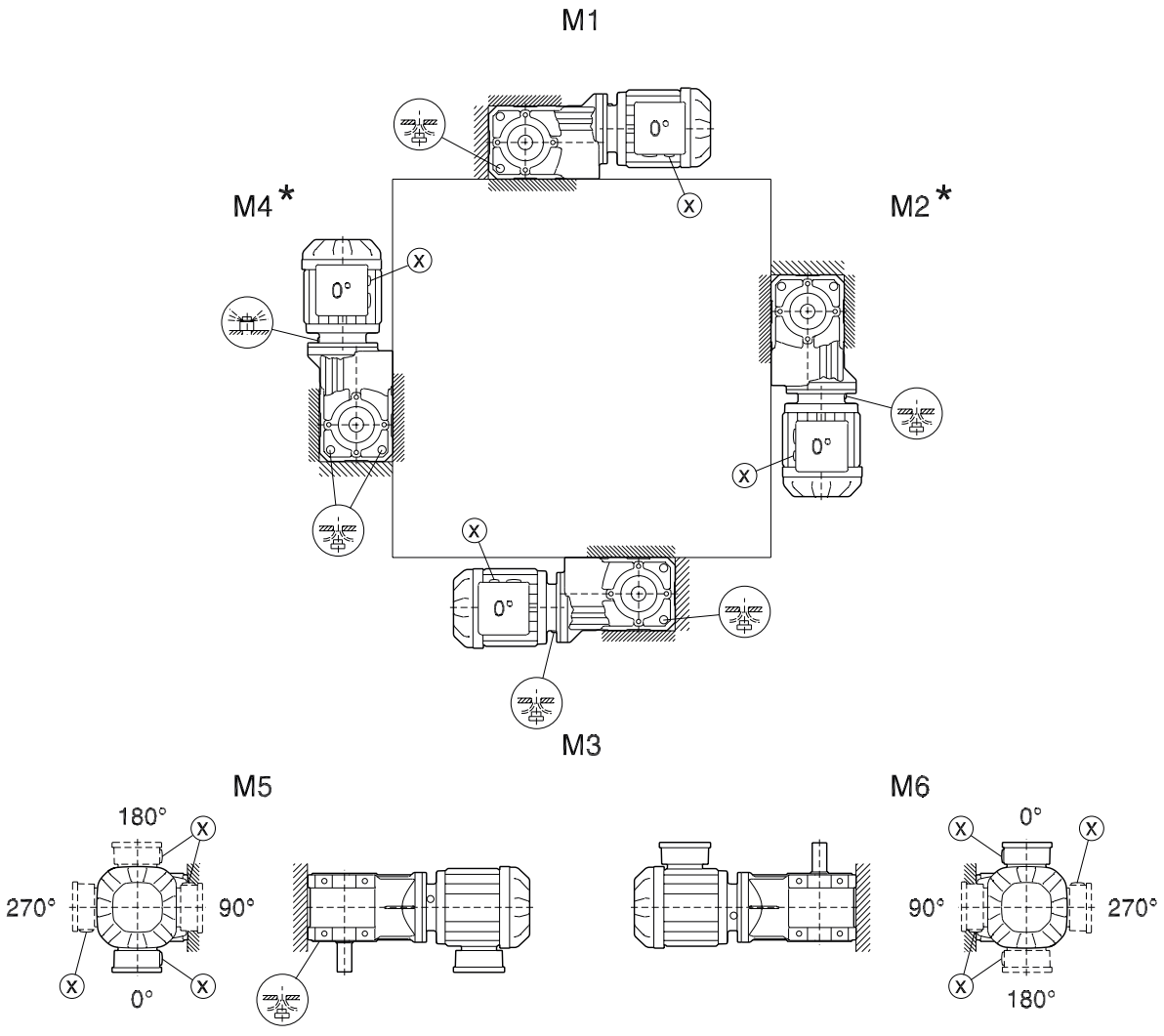
7.9.5 Mounting positions of helical-bevel gearmotors

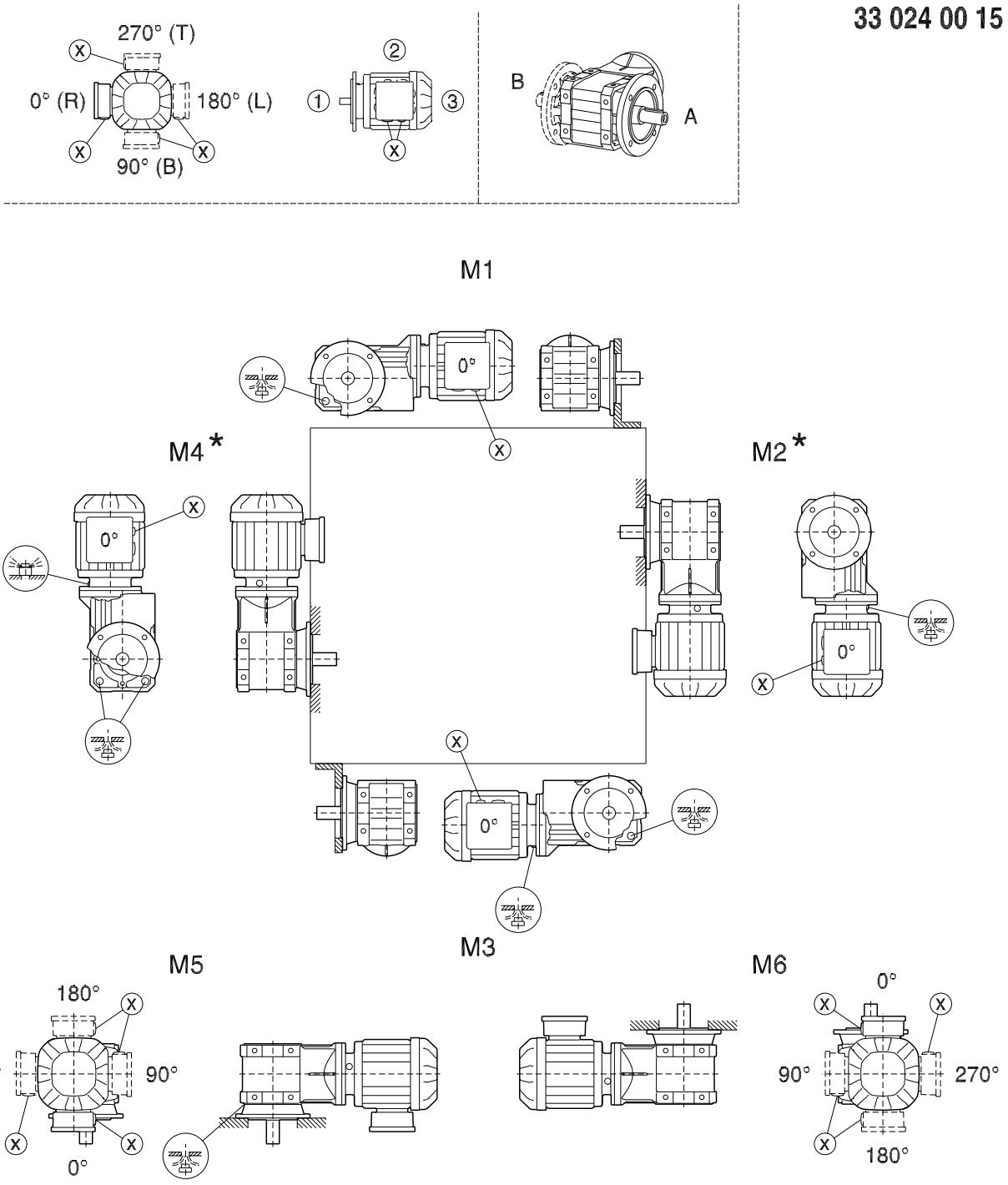
K/KA..B/KH19B-29B





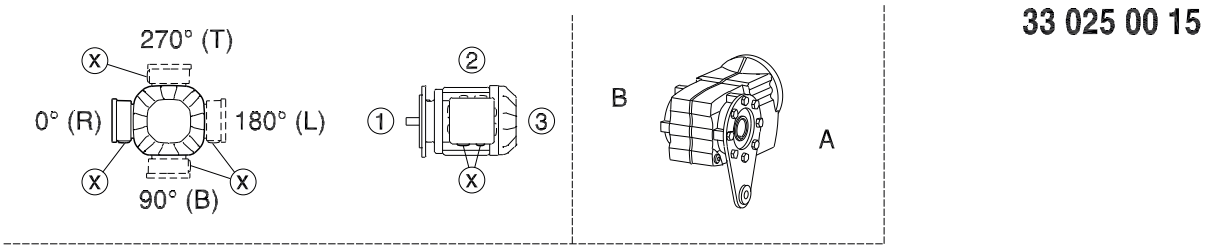
* (→ 🗎 147)

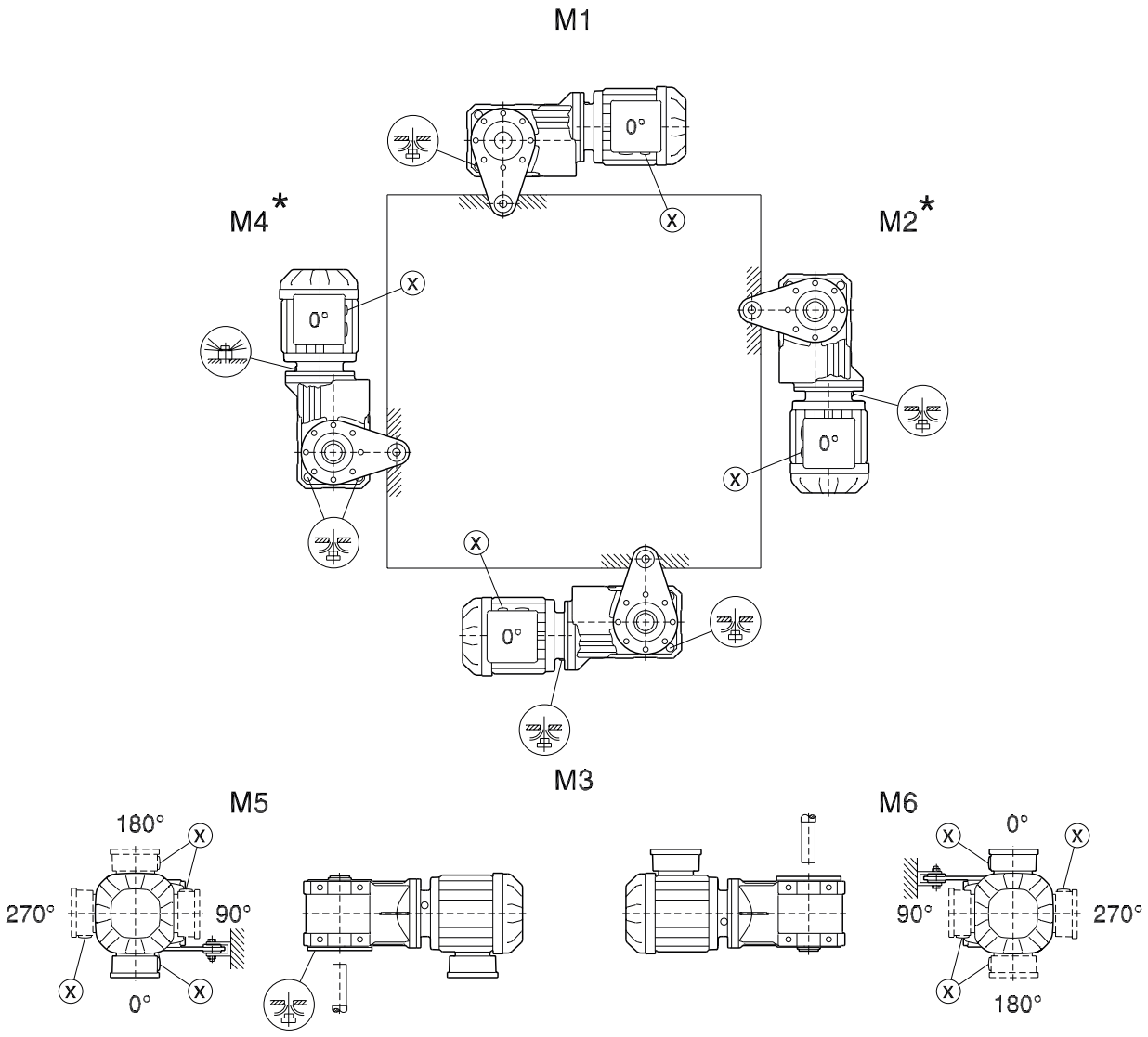
KF..B/KAF..B/KHF19B-29B



* (→ 147)

KA..B/KH19B-29B





* (→ 147)

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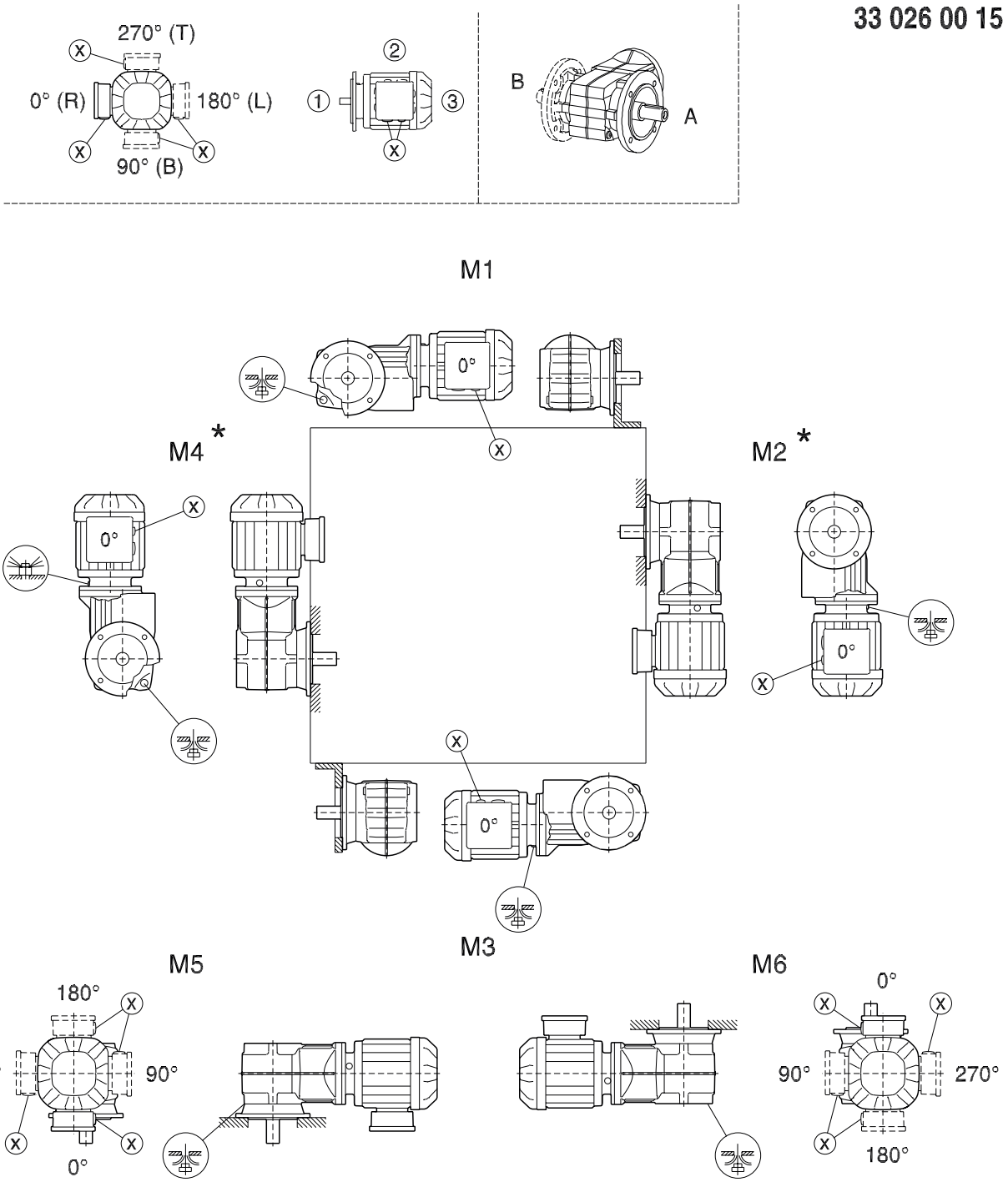
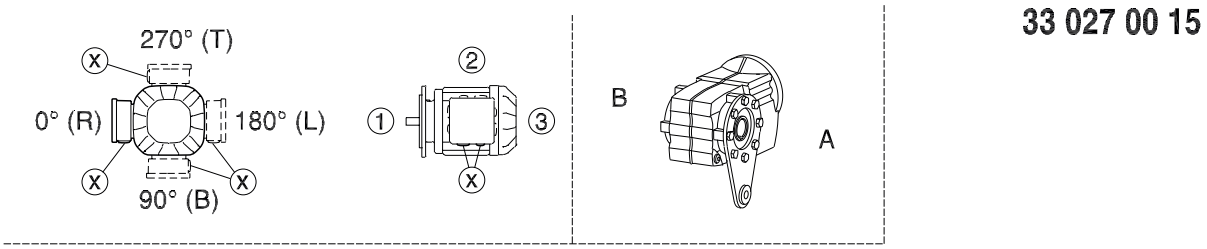
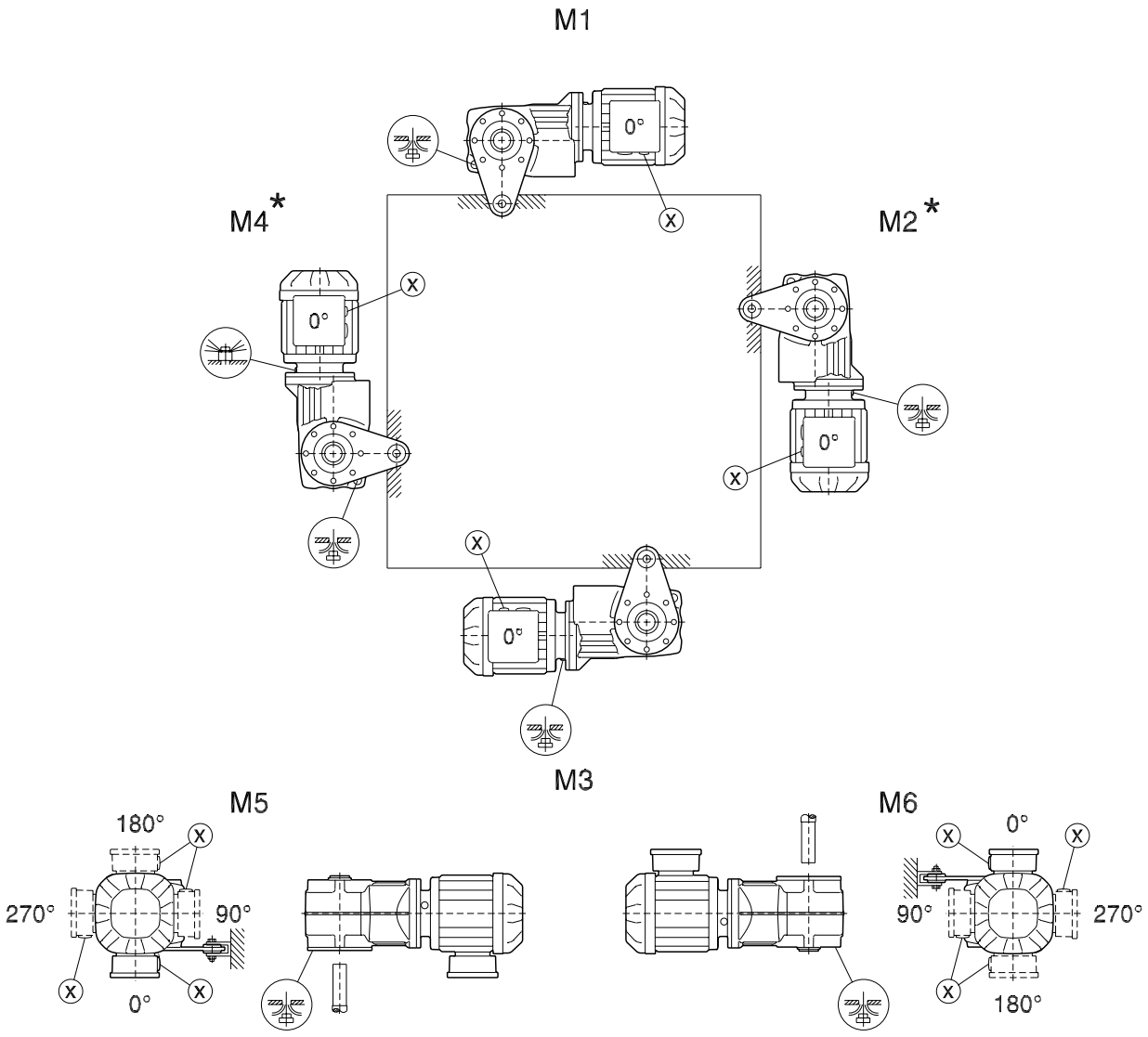
KF/KAF/KHF19-29



* (→ 147)

KA/KH/KT19-29





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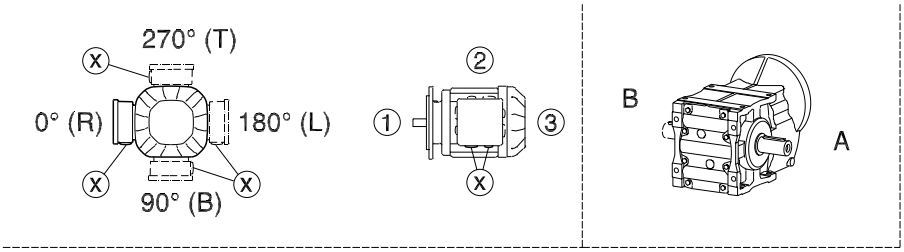
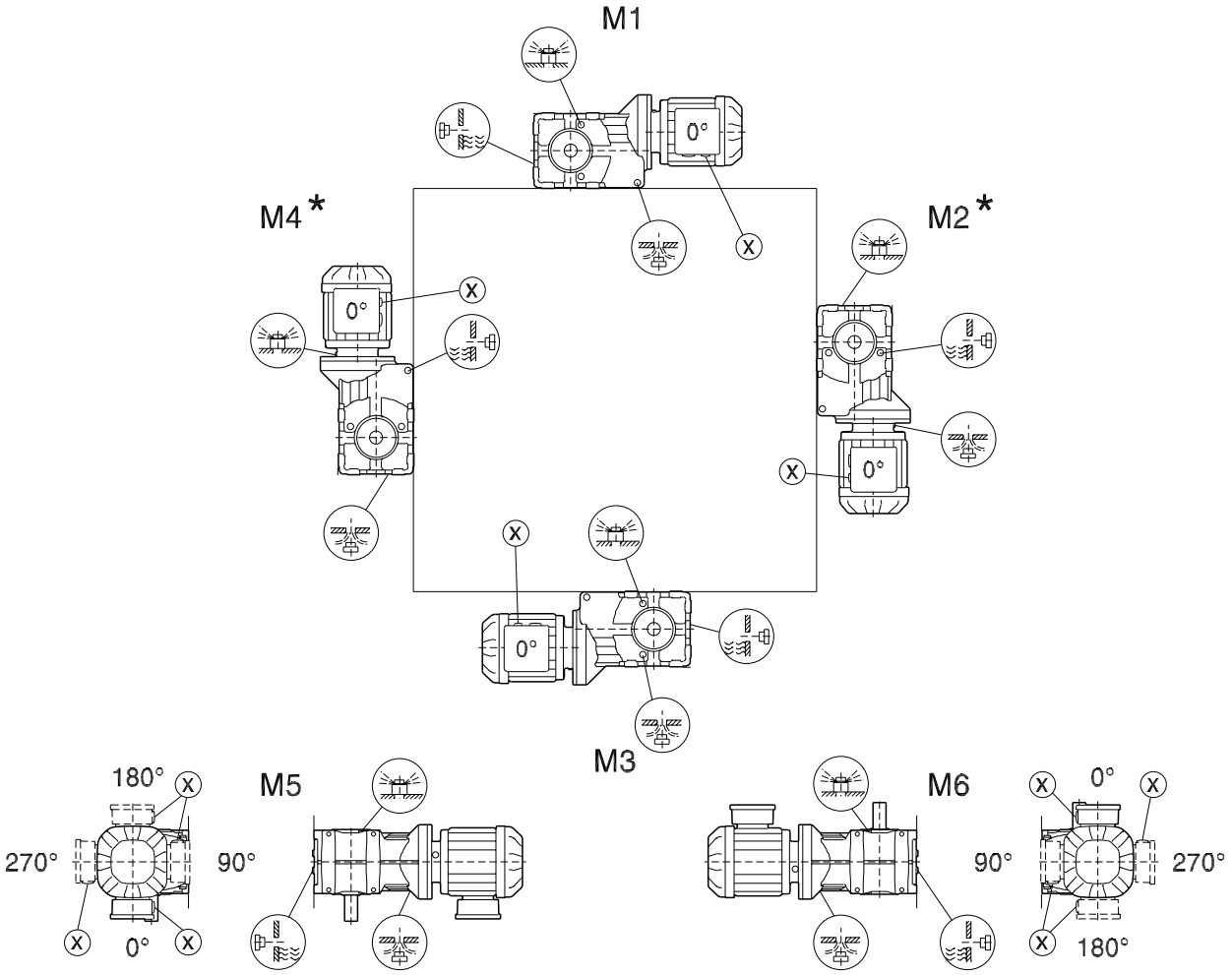
K/KA..B39-49

33 092 03 14





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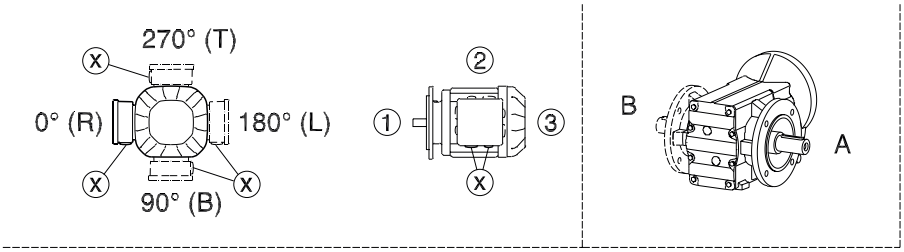
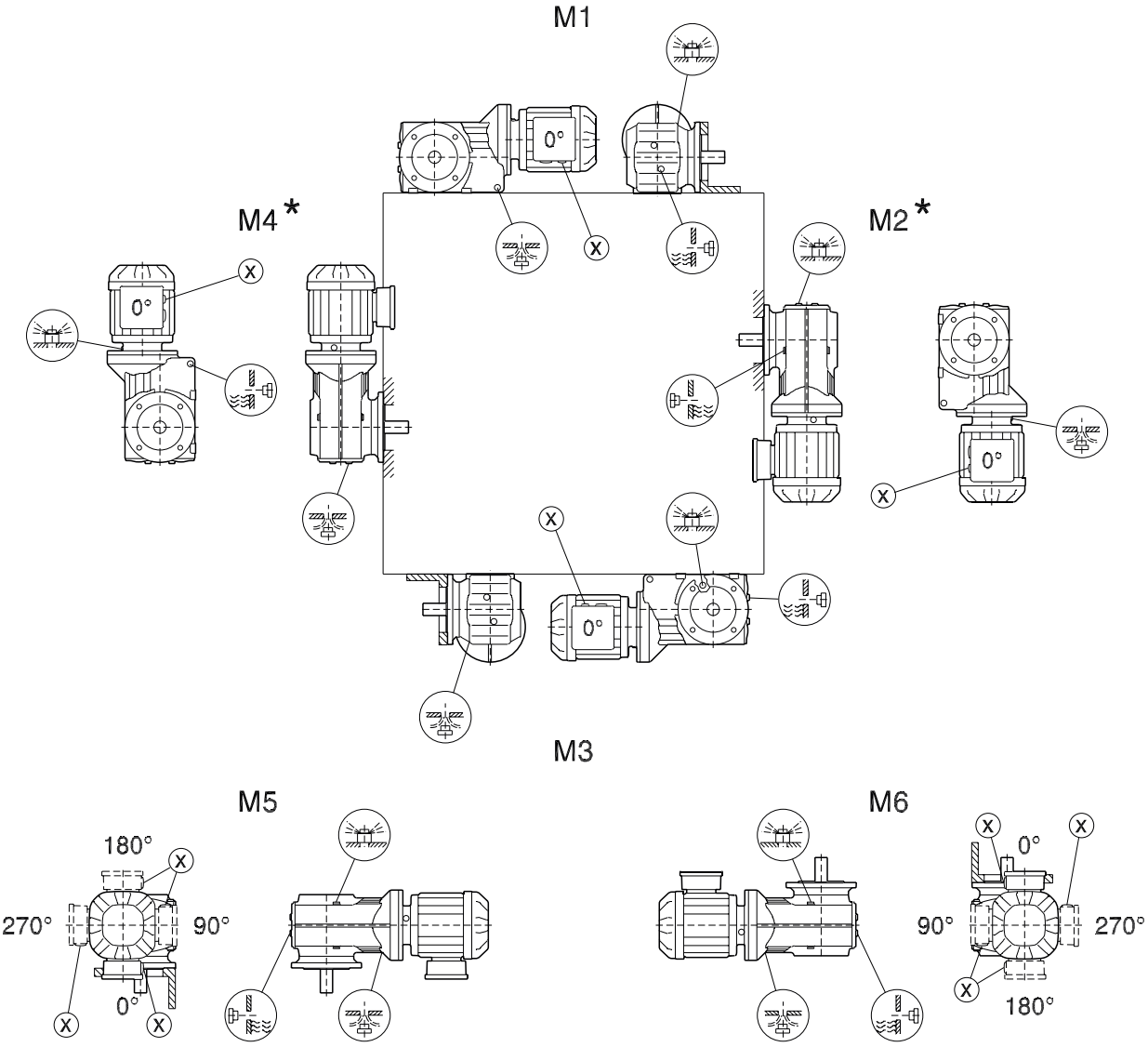
KF/KAF/KHF39-49





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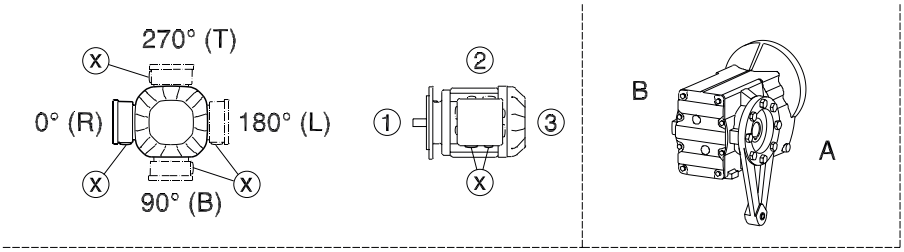
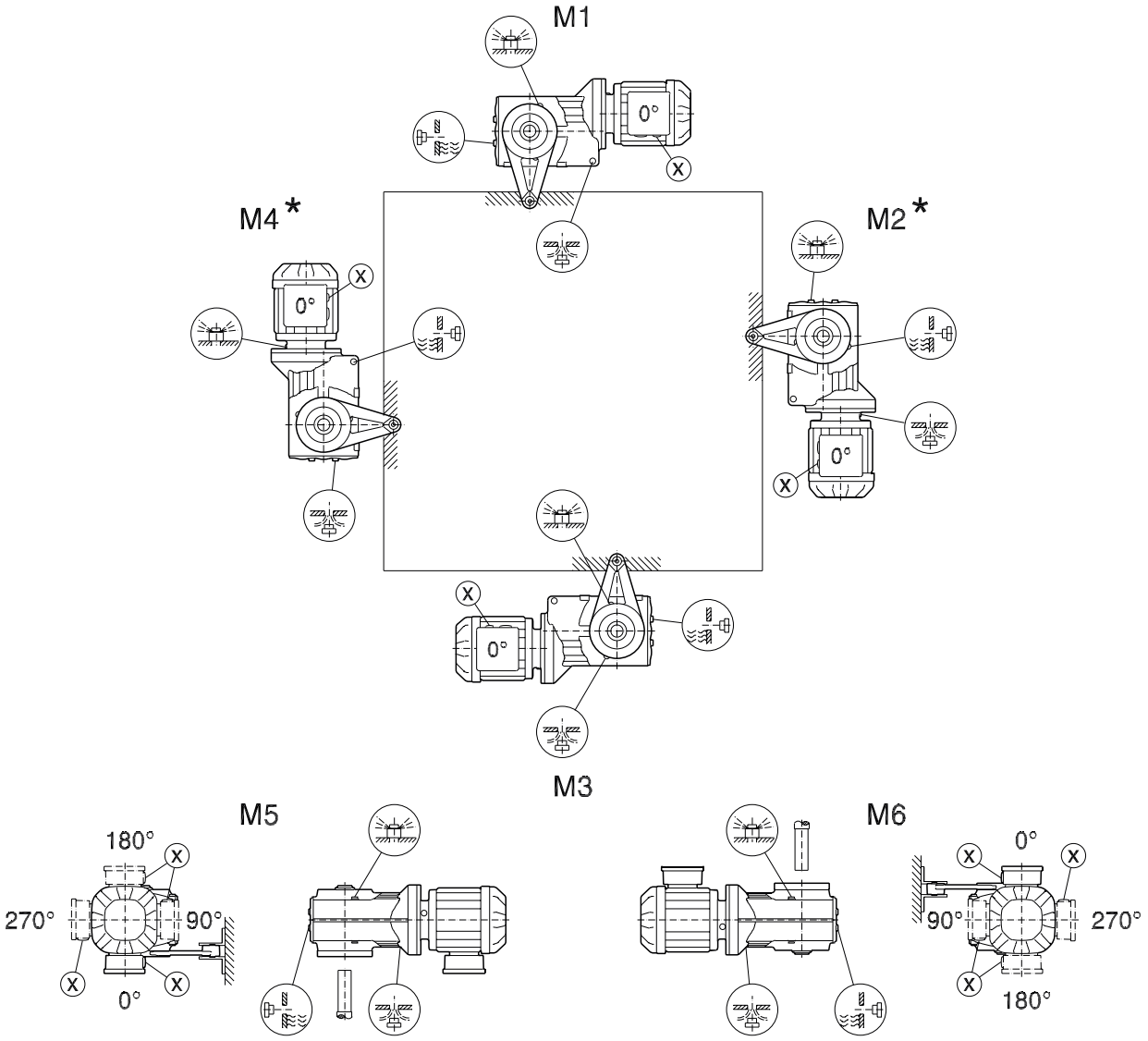
KA/KH/KT39-49





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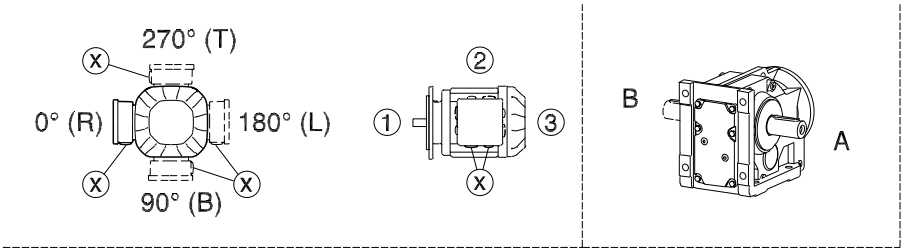
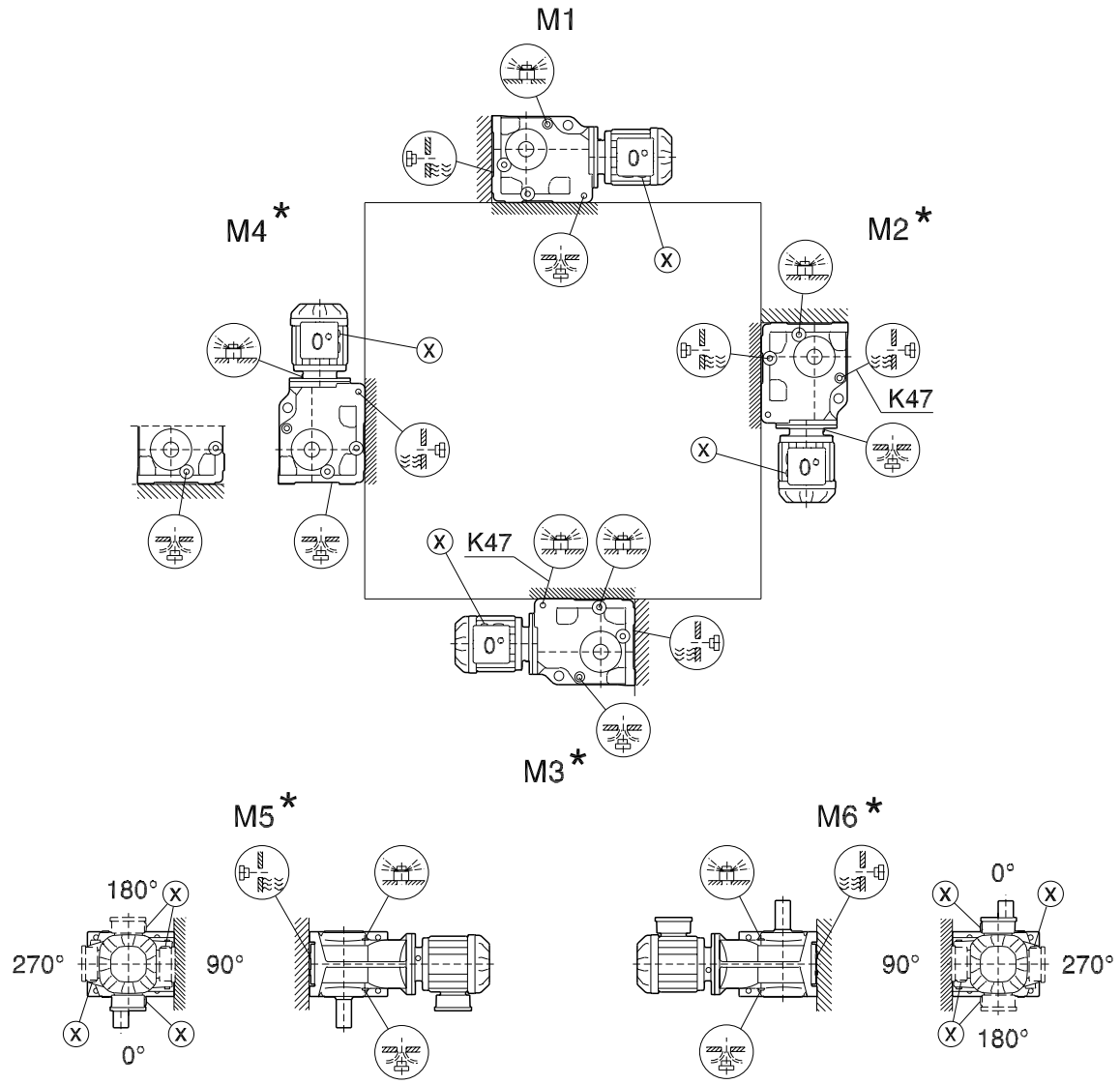
K37-157/KA..B/KH47B-157B, KV47B-107B

34 025 05 00





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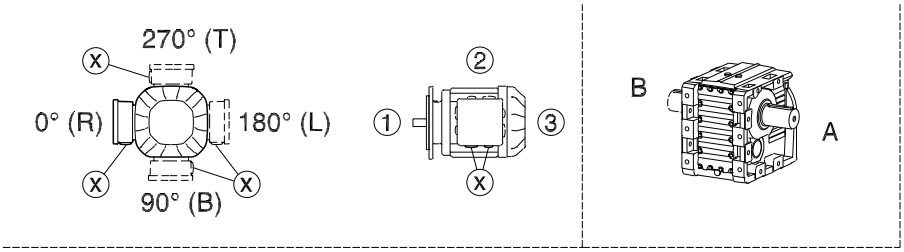
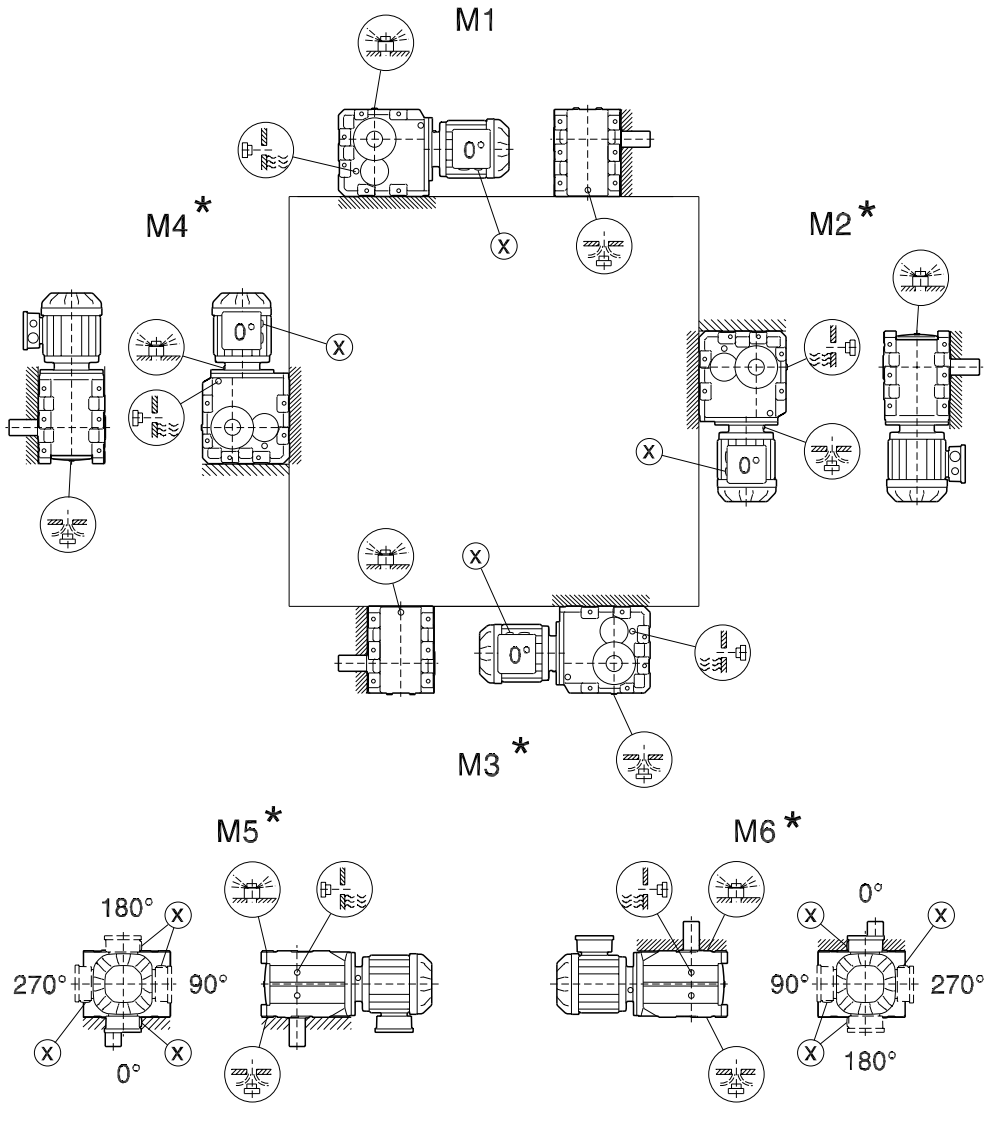
K167-187, KH167B-187B

34 026 05 00





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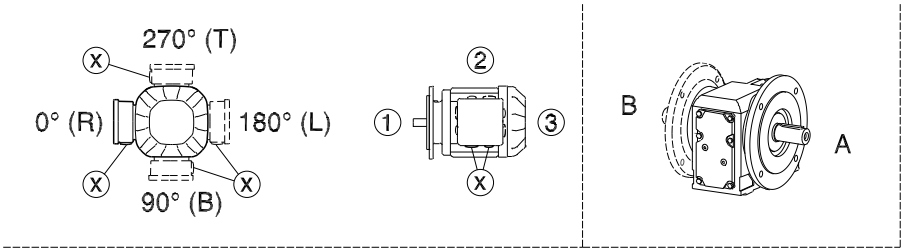
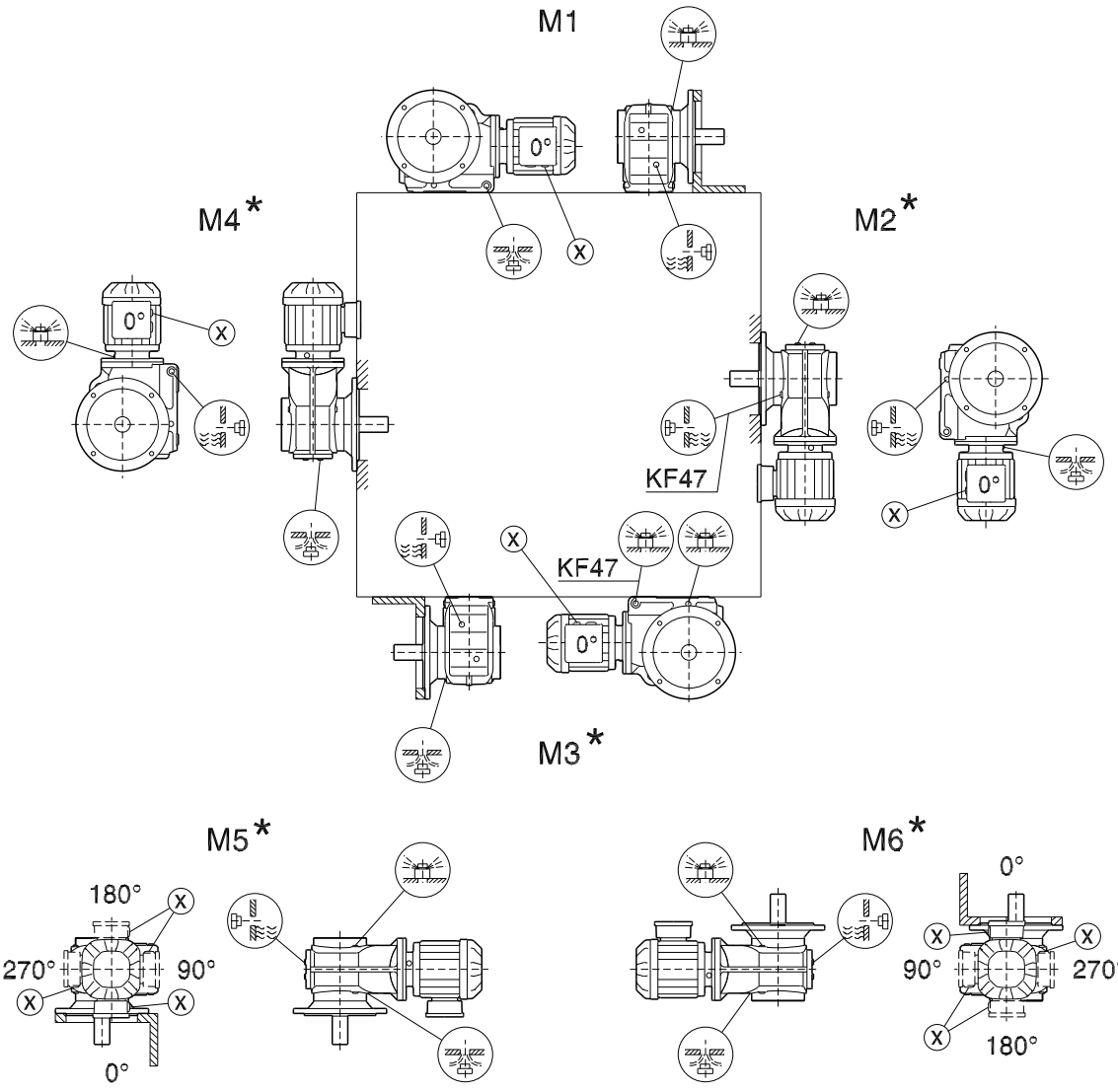
KF/KAF/KHF/KZ/KAZ/KHZ37–157, KVF/KVZ37–107, KM/KAM67–157

34 027 04 00

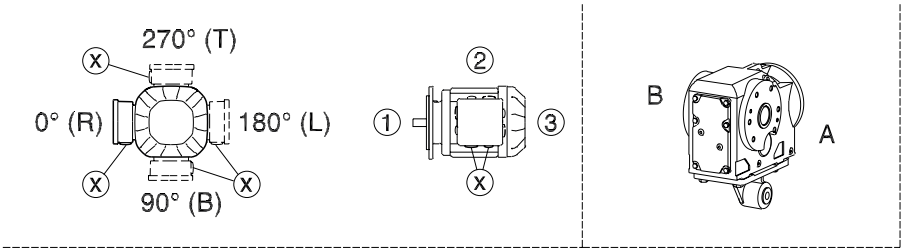


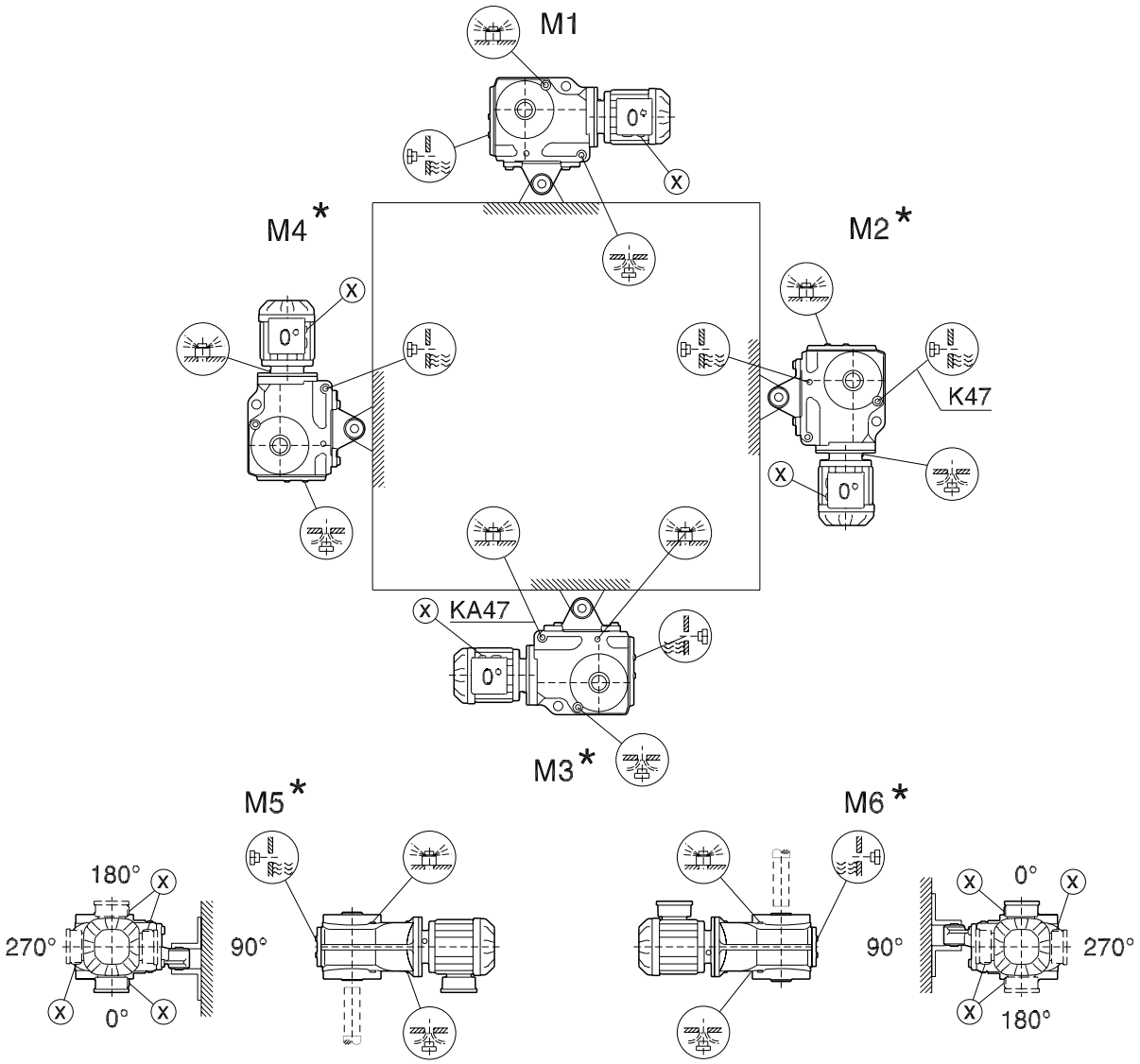


* (→ 🗎 147)

KA/KH37-157, KV37-107, KT37-97

39 025 05 00



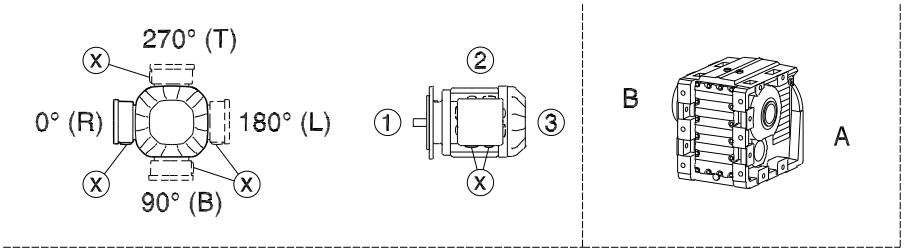


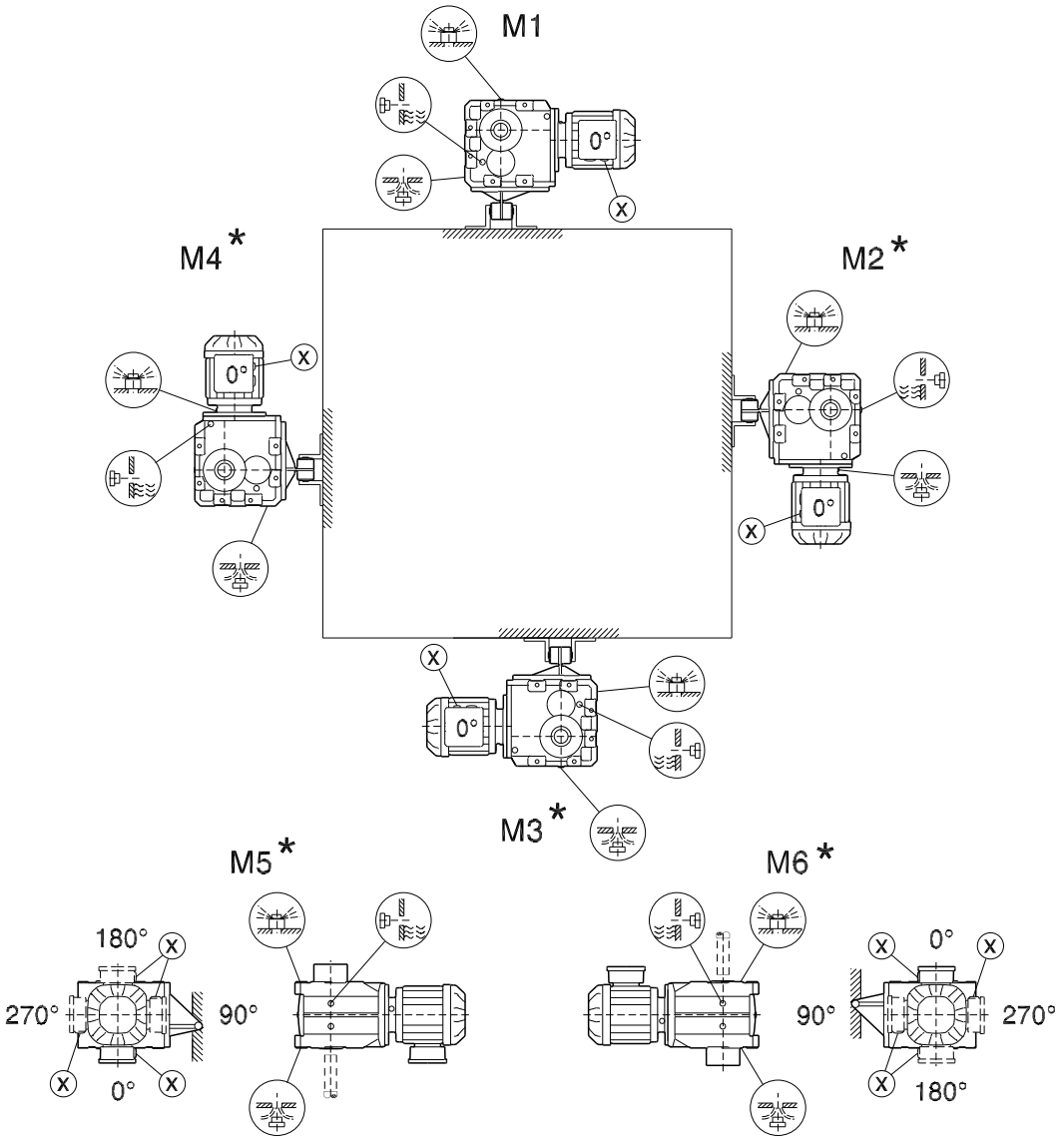
* (→ 🗎 147)

26865351/EN – 05/2021

KH167-187

39 026 05 00





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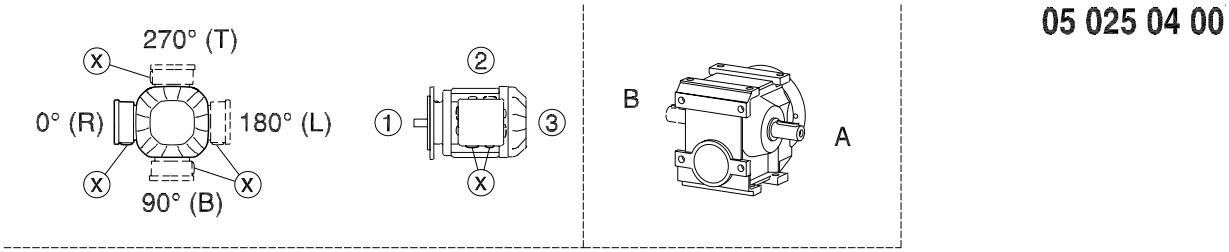
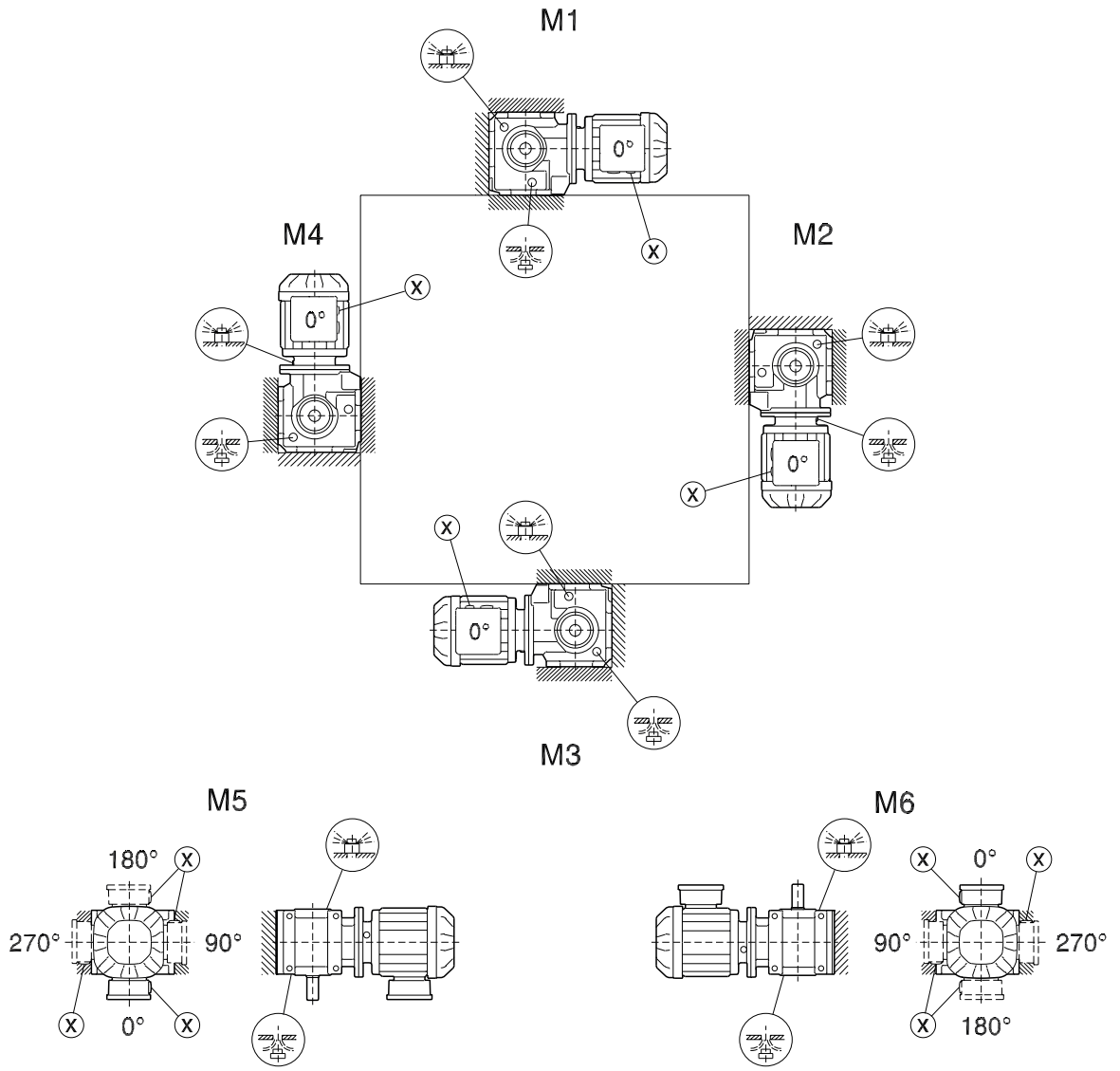
7.9.6 Mounting positions of helical-worm gearmotors

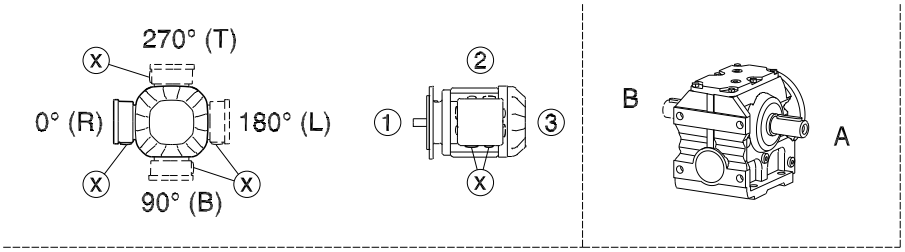
S37

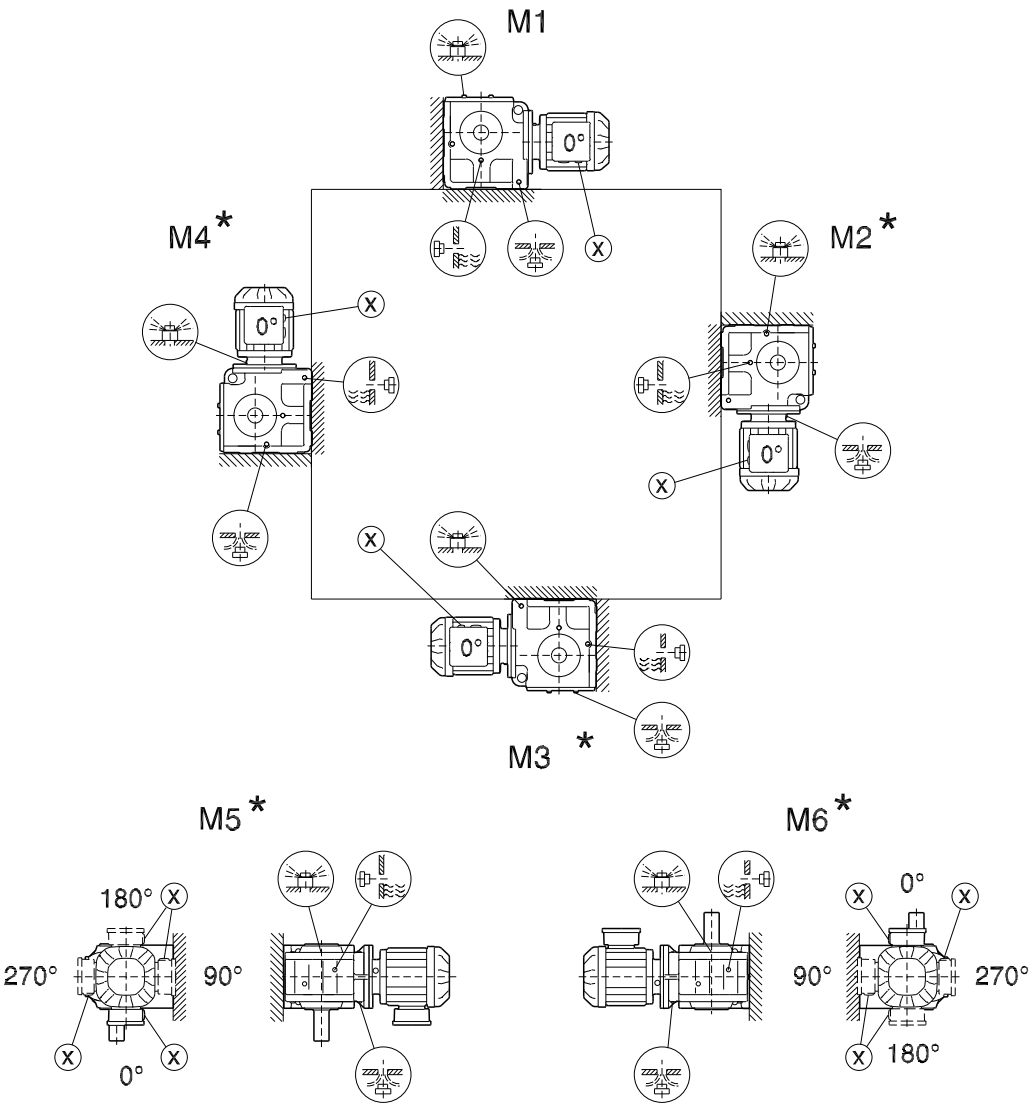




S47-S97

05 026 04 00





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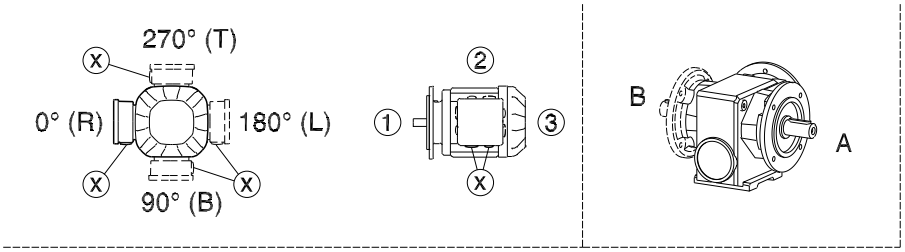
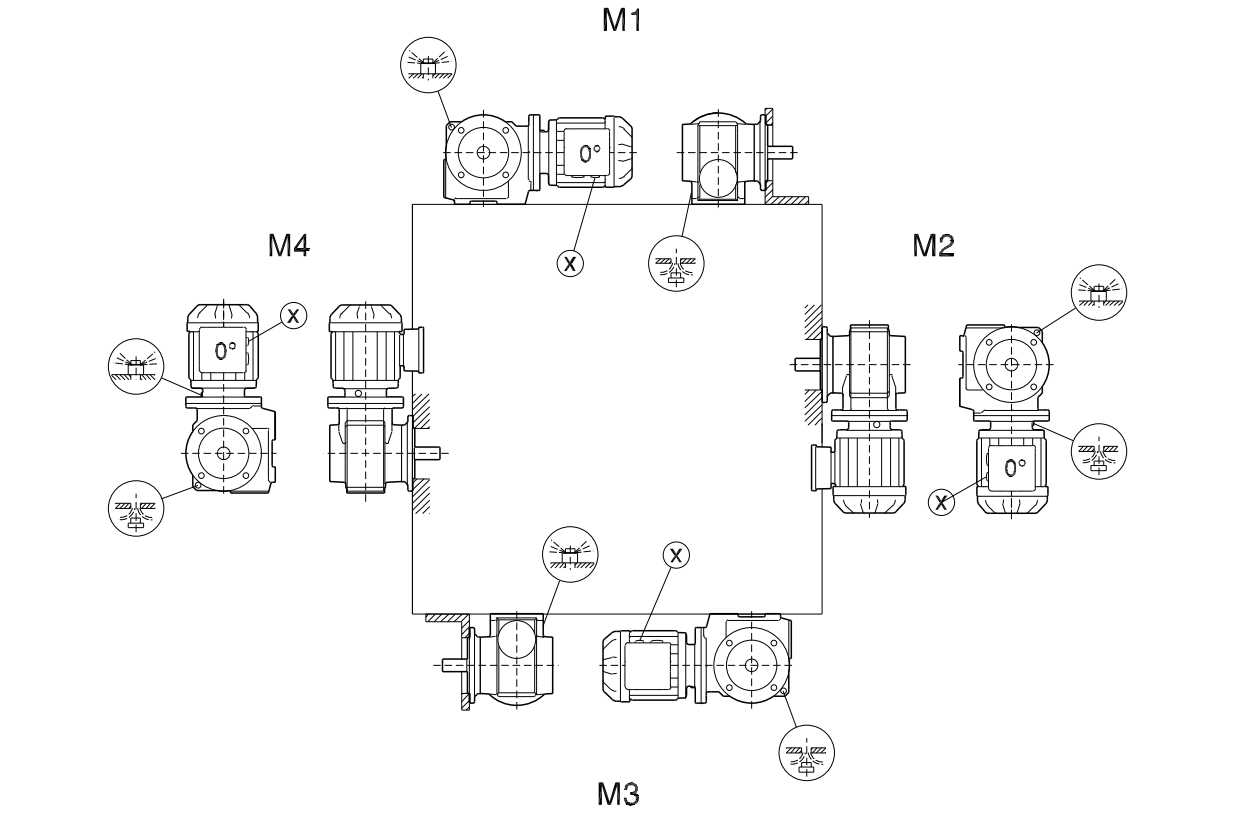
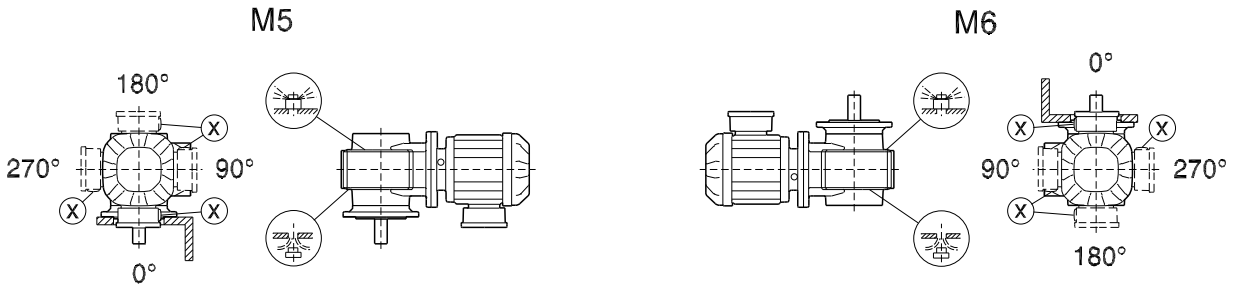
SF/SAF/SHF37







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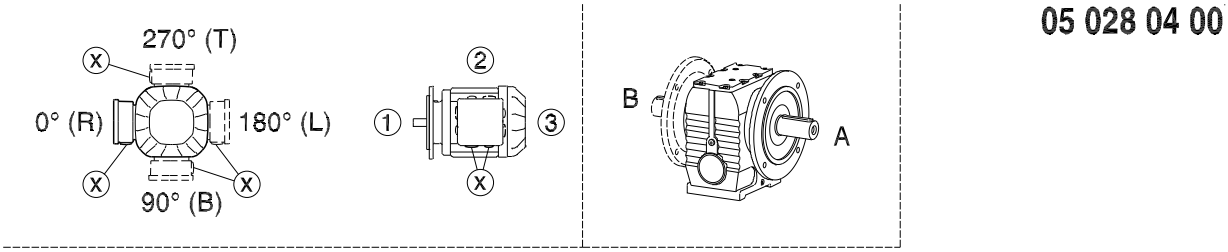
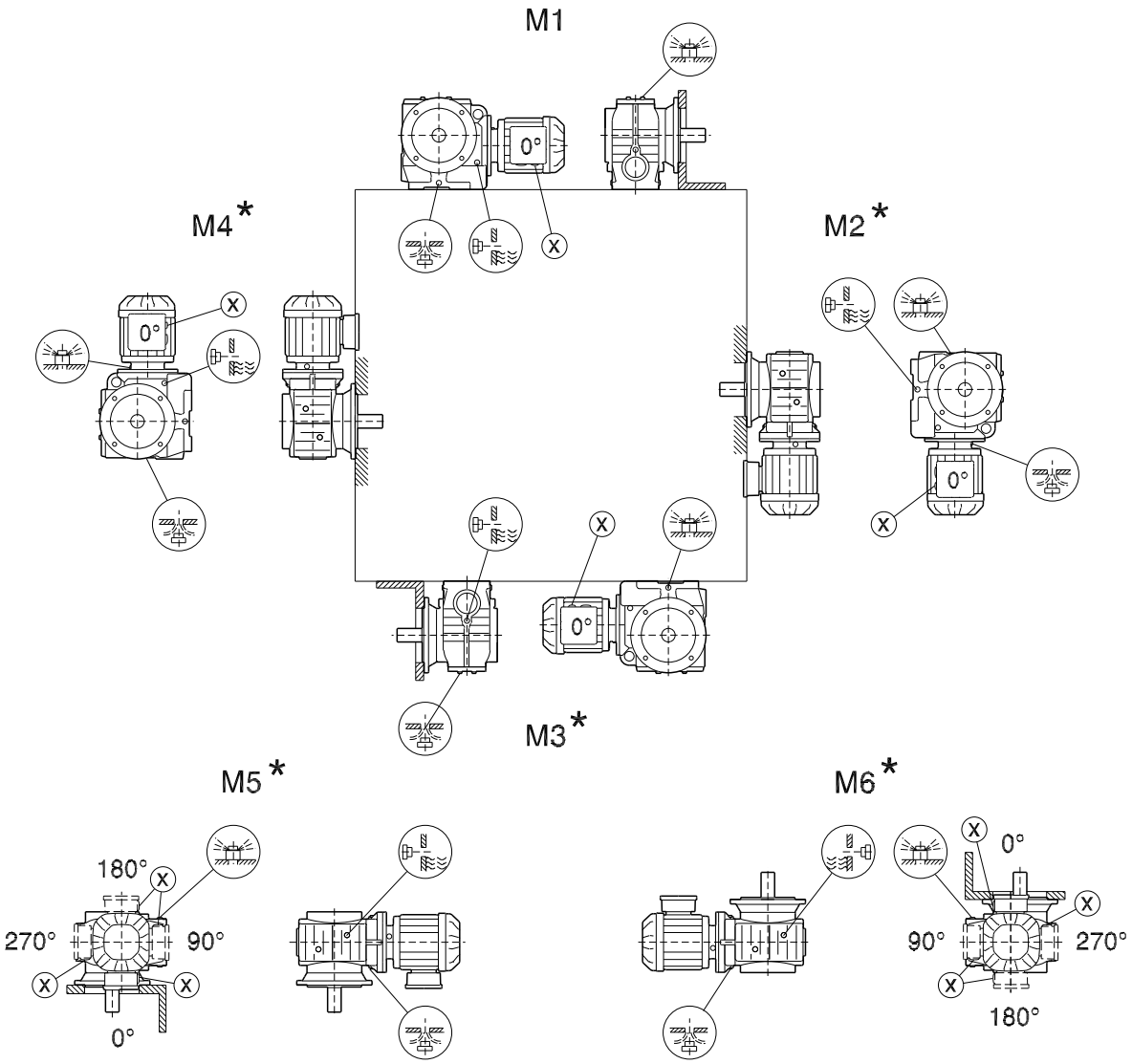
SF/SAF/SHF/SAZ/SHZ47-97





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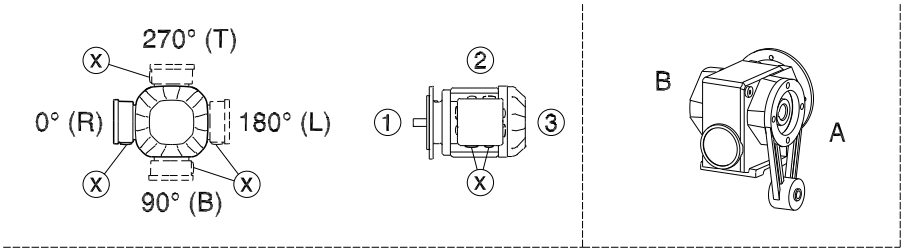
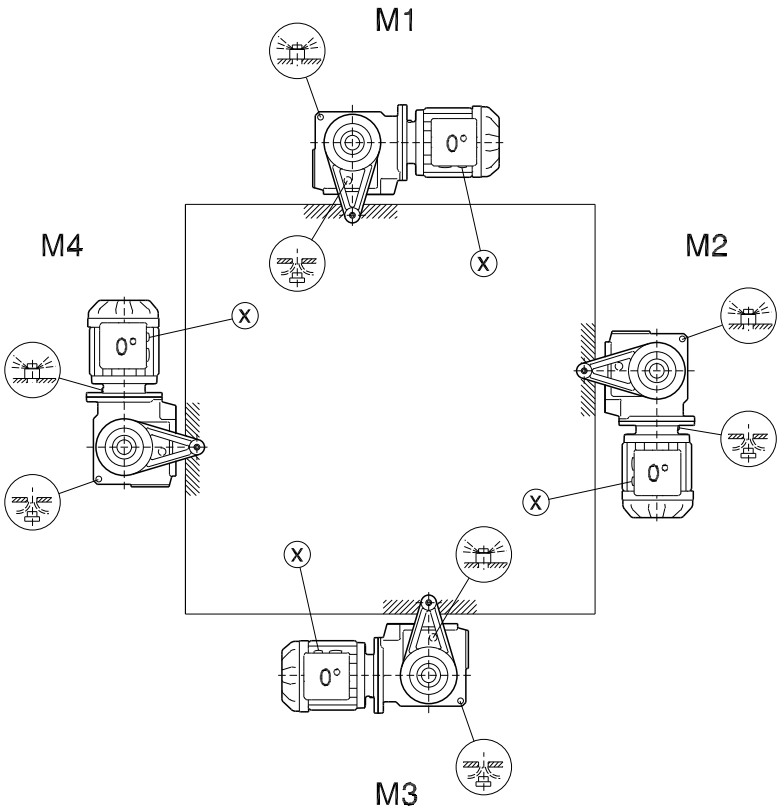
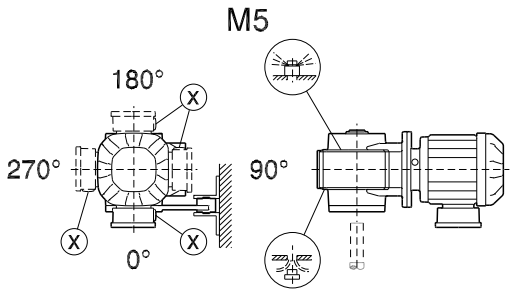
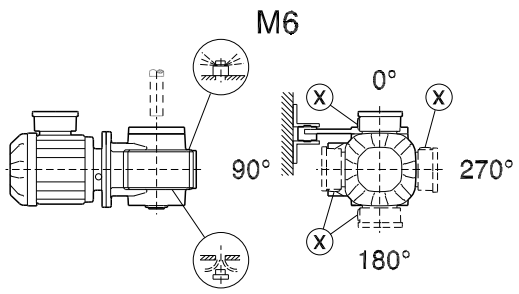
SA/SH/ST37

28 020 05 00









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SA/SH/ST47-97

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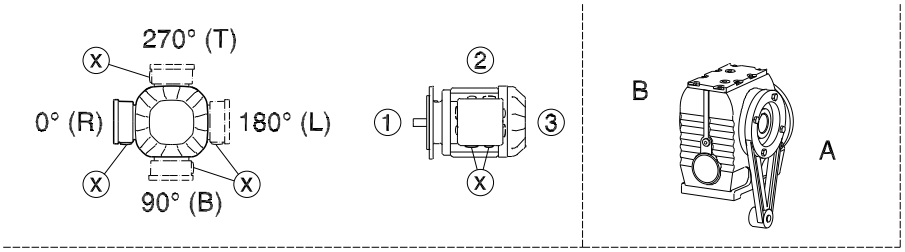
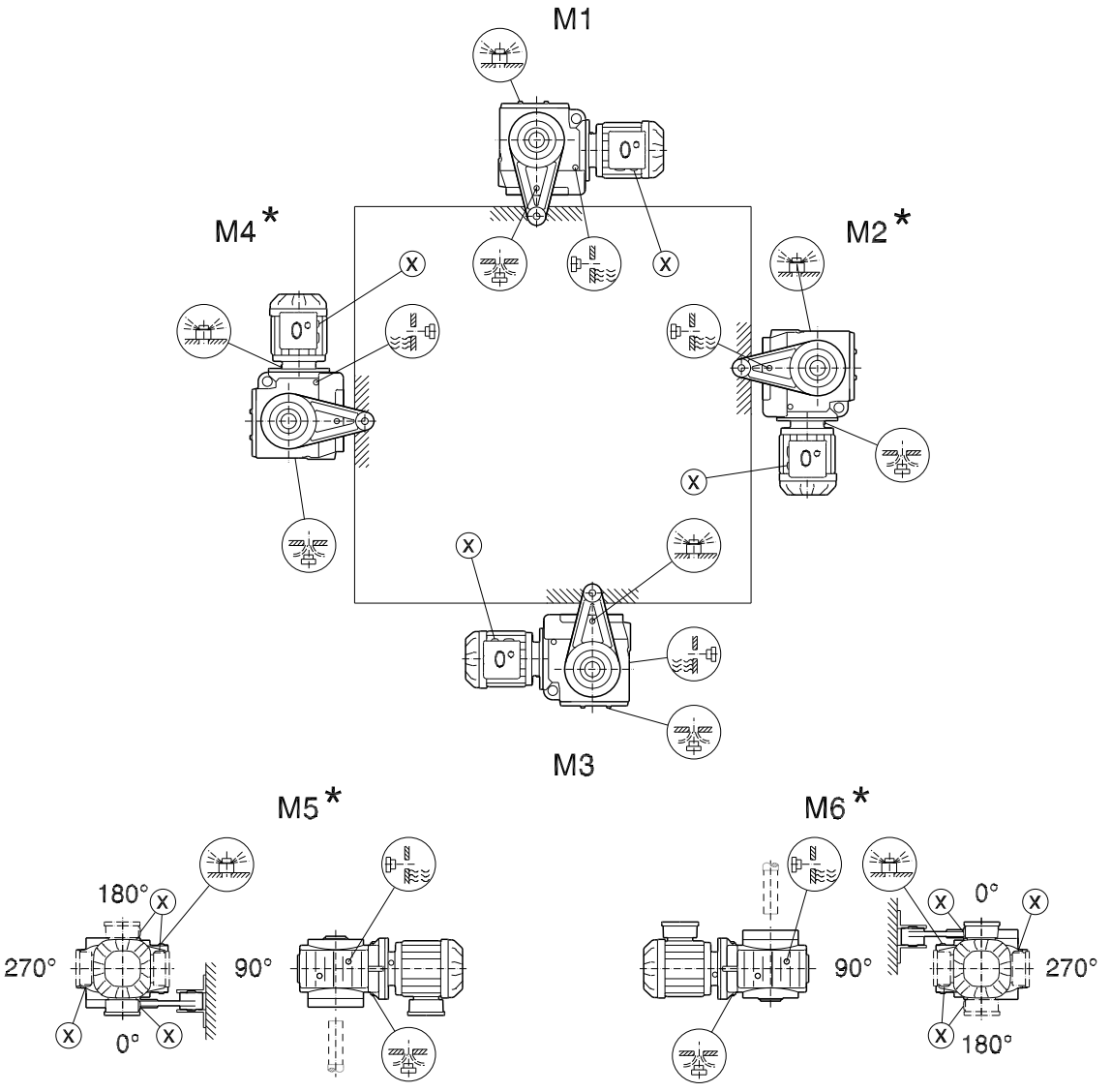
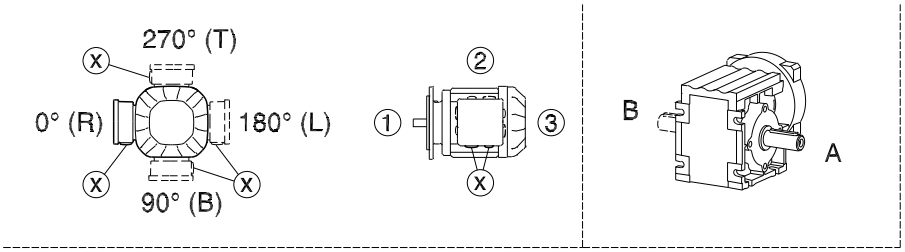




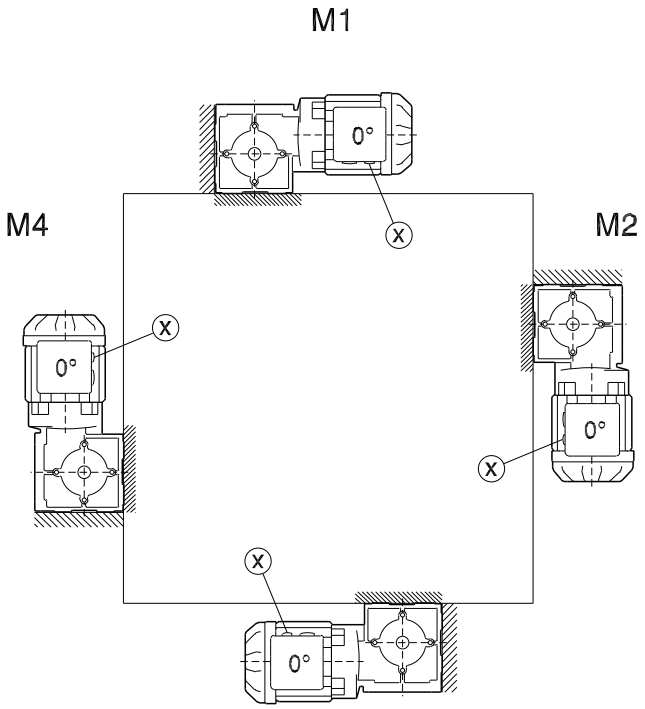
* (→ 147)

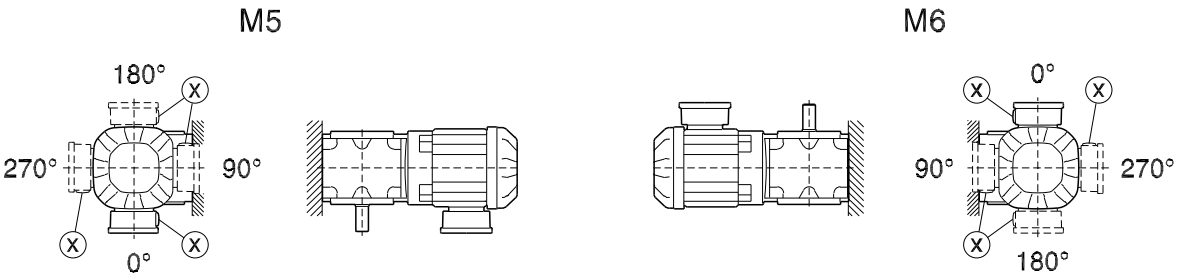
7.9.7 Mounting positions of SPIROPLAN® gearmotors

W10-30



20 001 02 02





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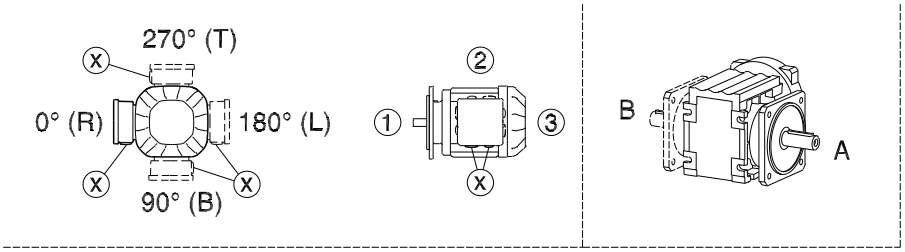
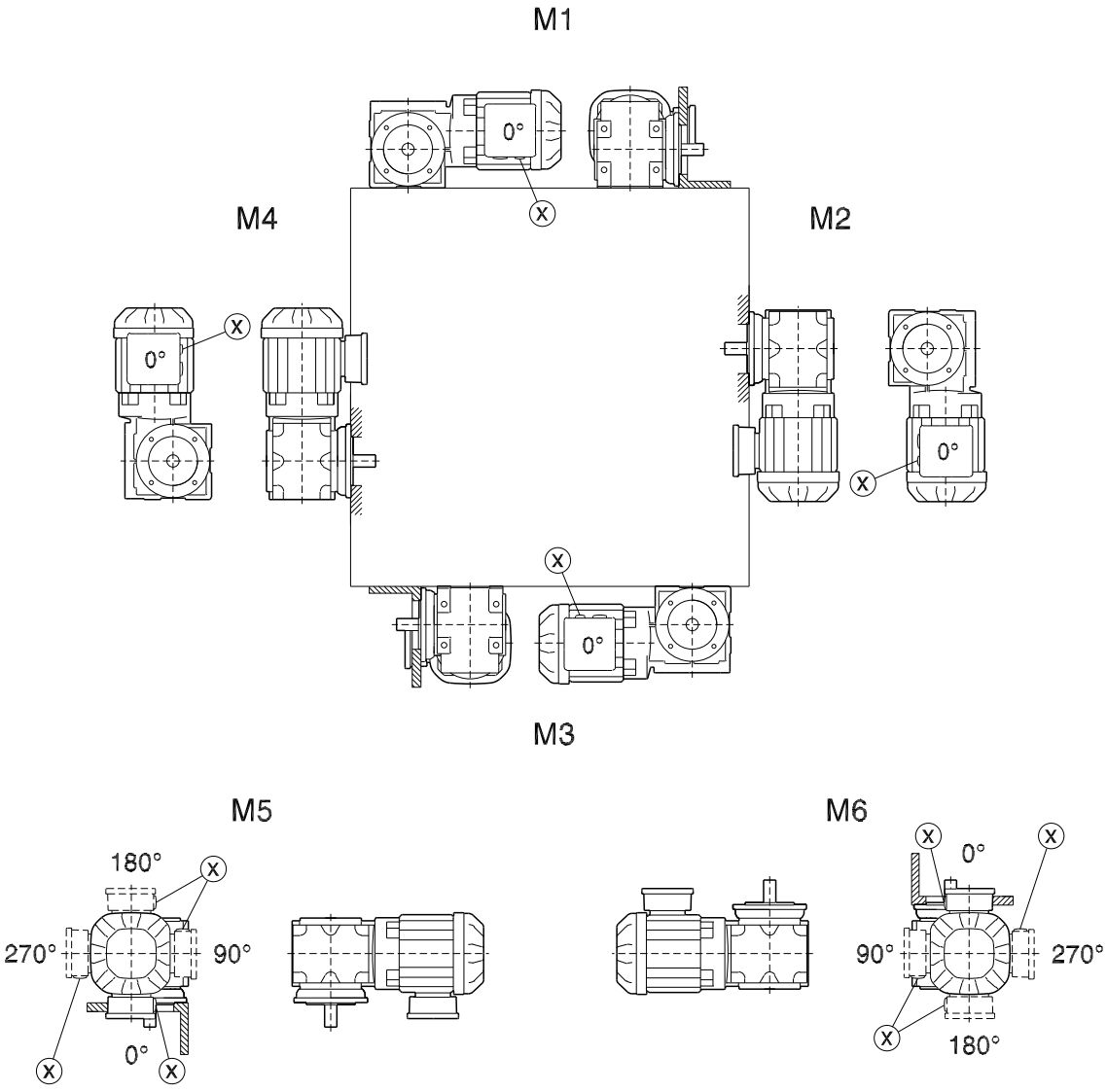
WF10-30

20 002 02 02





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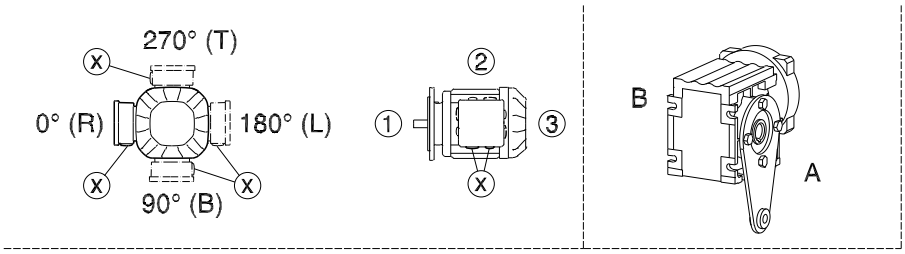
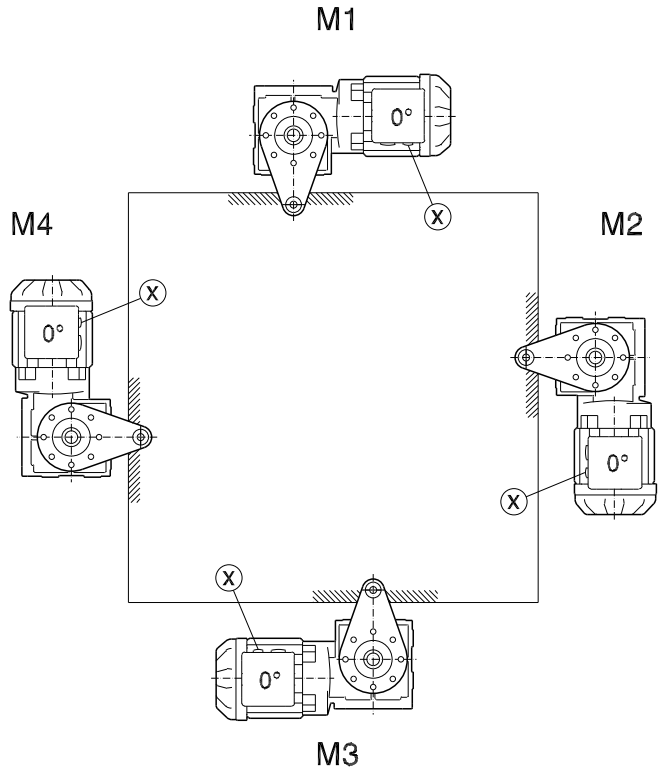
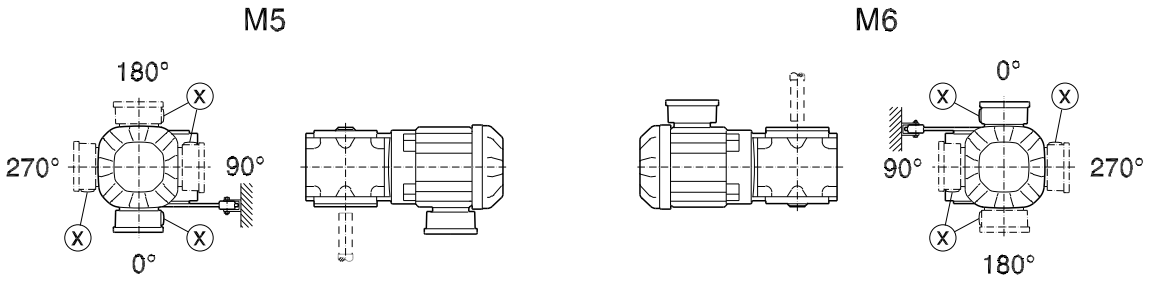
WA10-30



20 003 03 02





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W/WA..B/WH37B-47B

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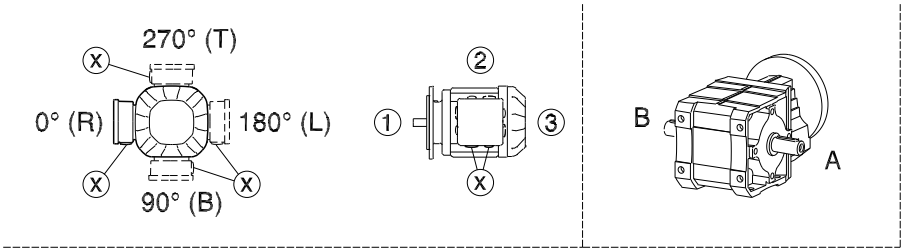
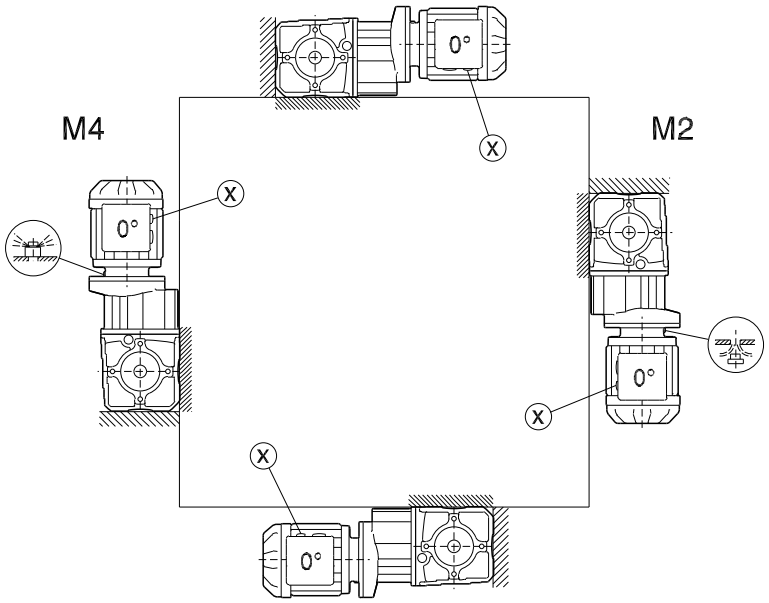


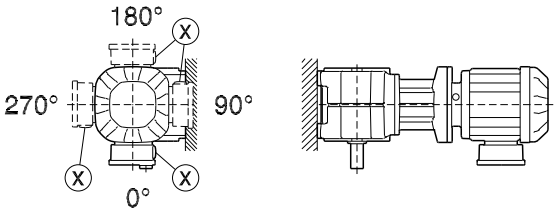
M1



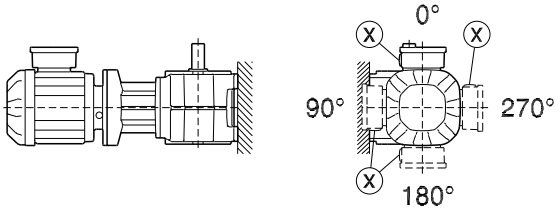
M4 M2

M3

M5



M6



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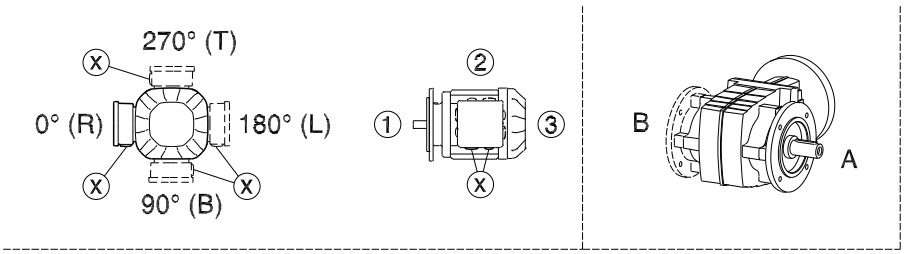
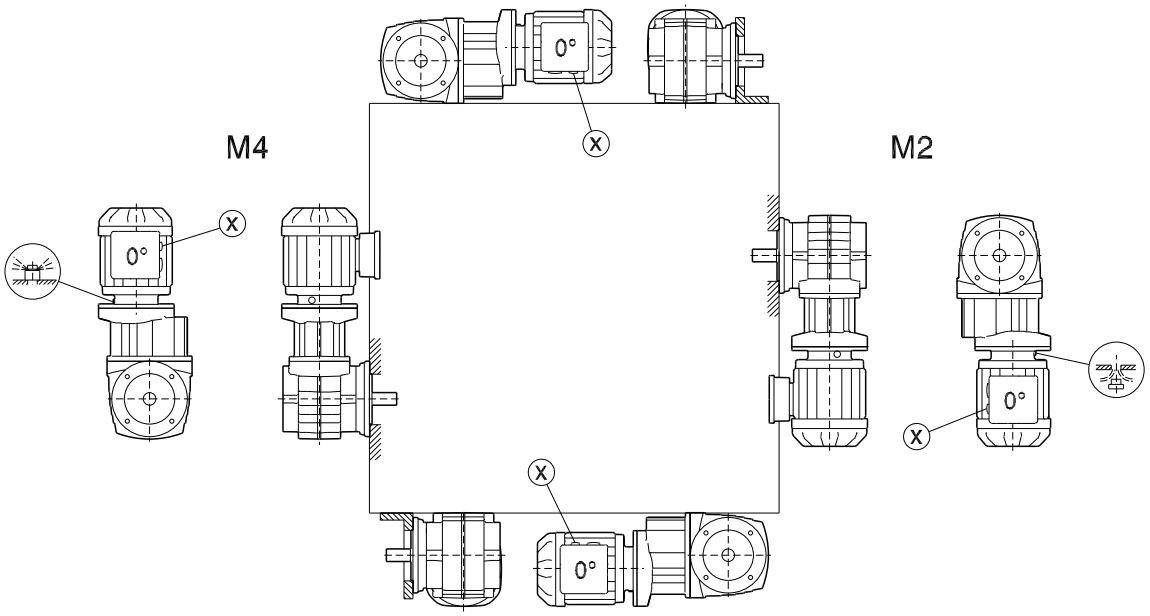
WF/WAF/WHF37-47



M1

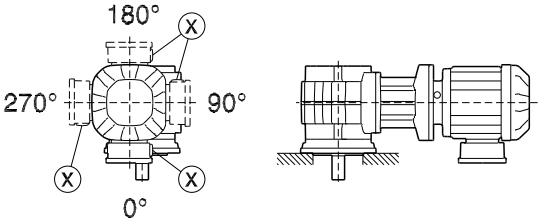


M4

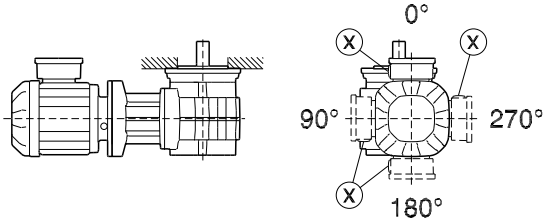
M2

M3

M5



M6



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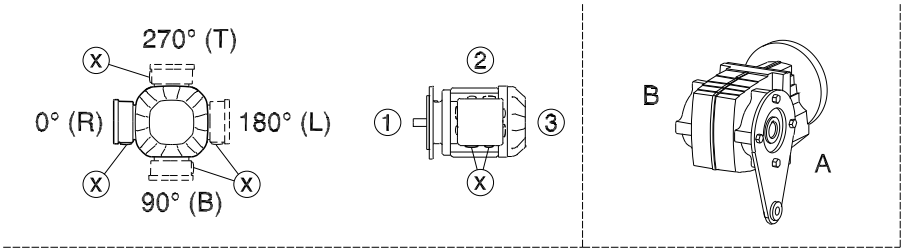
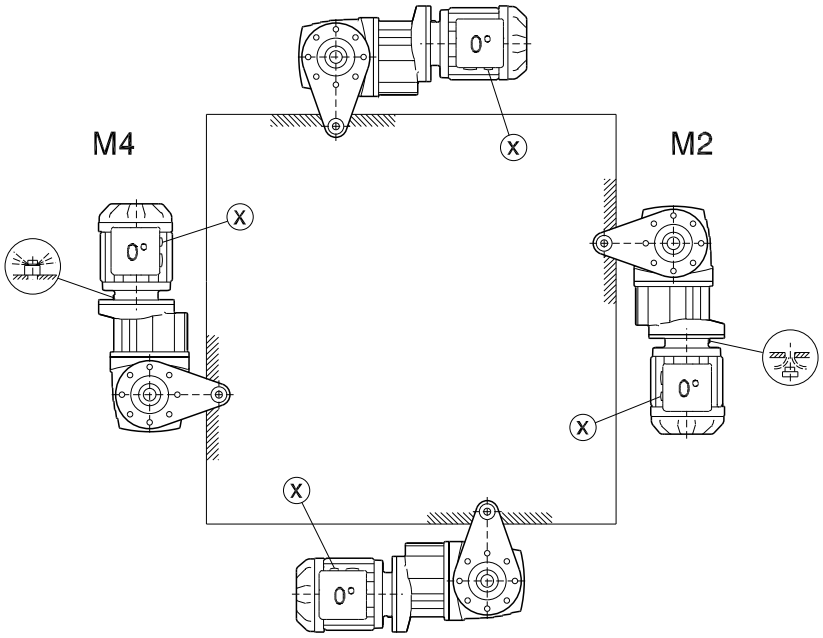
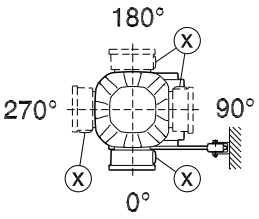
WA/WH/WT37-47

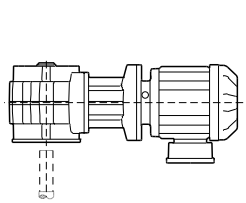


M1

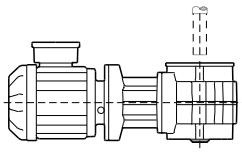


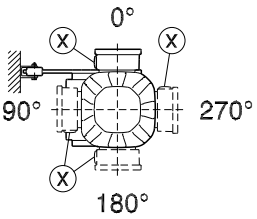
M5





M6





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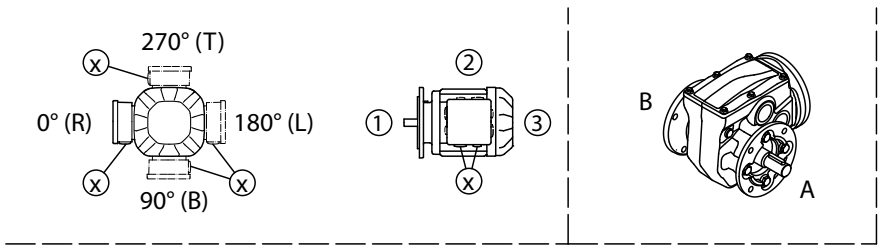
WF/WAF/WHF29-39



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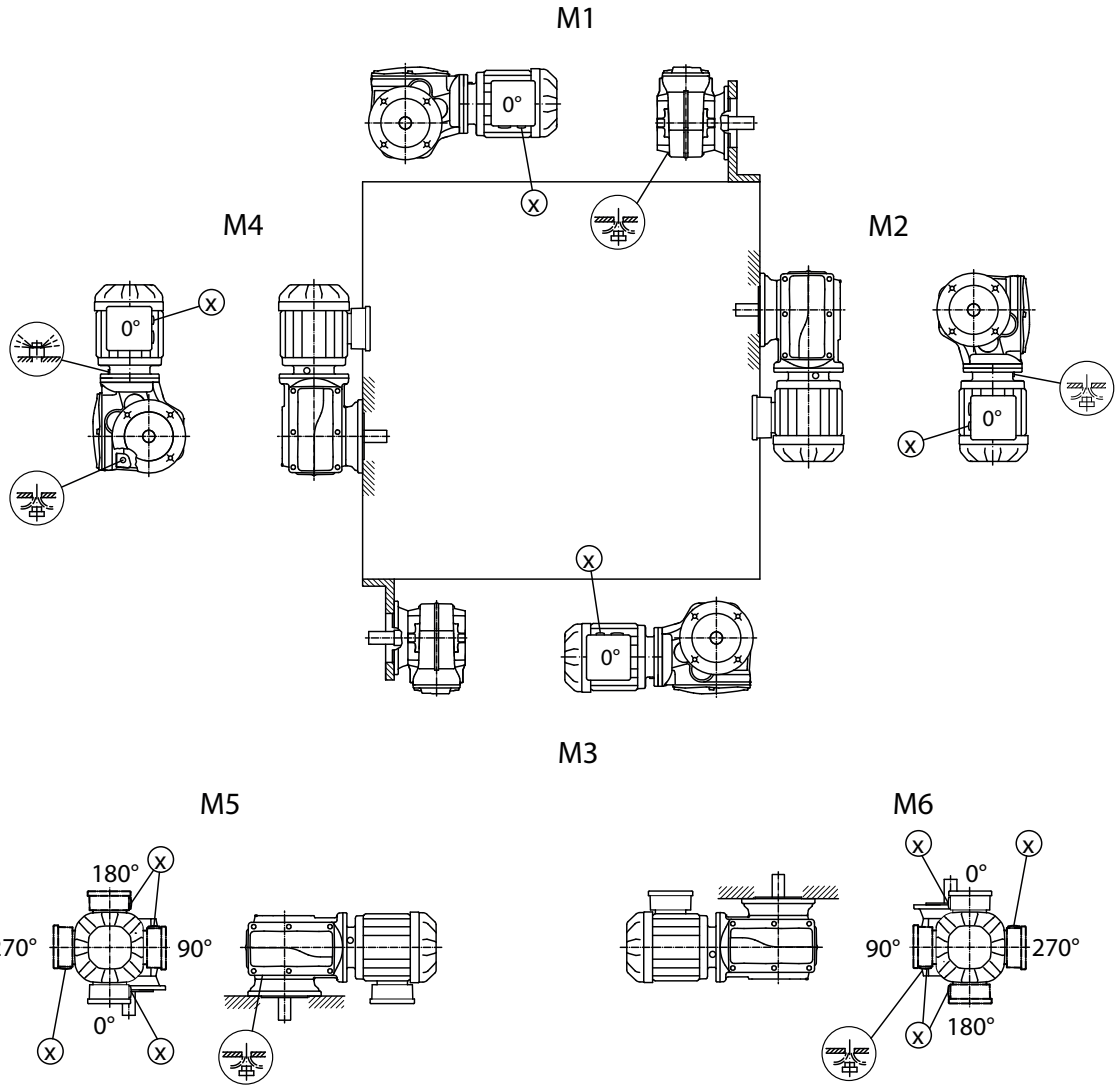

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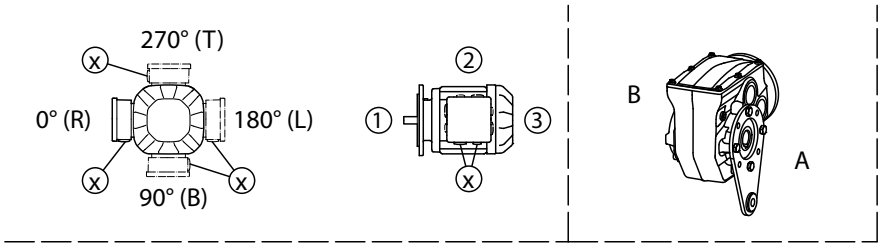

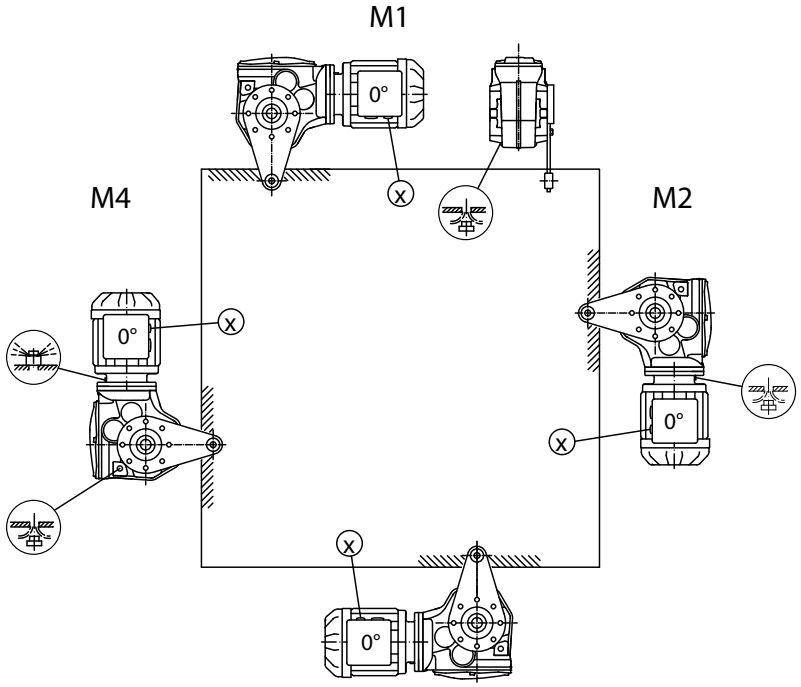

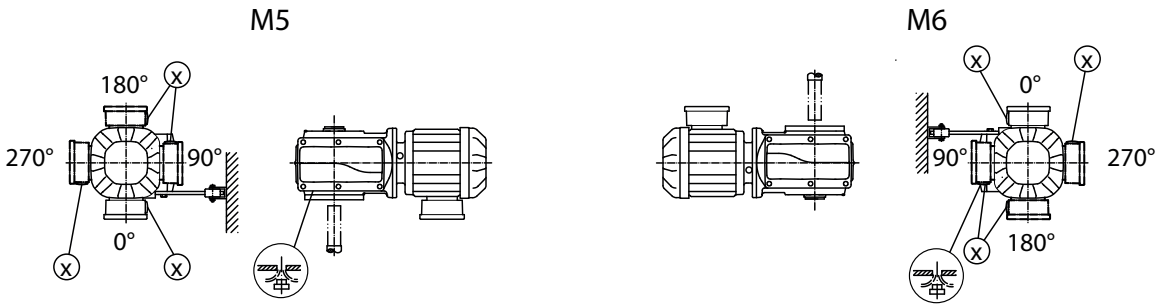

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8 Technical data

8.1 Extended storage

INFORMATION

For storage periods longer than 9 months, SEW-EURODRIVE recommends the "extended storage" gear unit type. Gear units in this design are designated with a corresponding label.

INFORMATION

The gear units must remain tightly sealed until taken into operation to prevent the VCI anti-corrosion agent from evaporating.

For gear units of the "extended storage" design, the following measures are taken:

- A VCI anti-corrosion agent (**v**olatile **c**orrosion **i**nhibitors) is added to the lubricant.

  Please note that this VCI anti-corrosion agent is only effective in a temperature range of -25 °C to +50 °C.
- The flange contact surfaces and shaft ends are also treated with an anti-corrosion agent.

Observe the storage conditions specified in the following table for extended storage.

8.1.1 Storage conditions

Climate zone	Packaging[1)]	Storage[2)]	Storage duration
Temperate (Europe, USA, Canada, China and Russia, excluding tropical zones)	Packed in containers, with desiccant and moisture indicator sealed in the plastic wrap.	Under roof, protected against rain and snow, no shock loads.	Up to 3 years with regular checks on the packaging and moisture indicator (relative atmospheric humidity < 50%).
	Open	Under roof and enclosed at constant temperature and atmospheric humidity (5 °C < ϑ < 50 °C, < 50% relative humidity). No sudden temperature fluctuations. Controlled ventilation with filter (free from dust and dirt). No aggressive vapors, no shocks.	2 years or more with regular inspections. Check for cleanness and mechanical damage during the inspection. Check corrosion protection.

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Climate zone	Packaging[1)]	Storage[2)]	Storage duration
Tropical (Asia, Africa, Central and South America, Australia, New Zealand excluding temperate zones)	Packed in containers, with desiccant and moisture indicator sealed in the plastic wrap. Protected against insect damage and mildew by chemical treatment.	Under roof, protected against rain and shocks.	Up to 3 years with regular checks on the packaging and moisture indicator (relative atmospheric humidity < 50%).
	Open	Under roof and enclosed at constant temperature and atmospheric humidity (5 °C < ϑ < 50 °C, relative humidity < 50%). No sudden temperature fluctuations. Controlled ventilation with filter (free from dust and dirt). No aggressive vapors, no shocks. Protected against insect damage.	2 years or more with regular inspections. Check for cleanness and mechanical damage during the inspection. Check corrosion protection.

1) The packaging must be carried out by an experienced company using the packaging materials that have been explicitly specified for the particular application.

2) SEW-EURODRIVE recommends to store the gear units according to the mounting position.

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8.2 Lubricants

Unless a special arrangement is made, SEW-EURODRIVE supplies the drives with a lubricant fill adapted for the specific gear unit and mounting position. The mounting position (see chapter "Mounting positions" (→ 🗎 146)) must therefore be specified in the drive order. You must adapt the lubricant fill in case of any subsequent changes made to the mounting position (see chapter "Lubricant fill quantities" (→ 🗎 204)).

8.2.1 Bearing greases

The gear unit rolling bearings are given a factory-fill with the greases listed below. SEW-EURODRIVE recommends re-greasing the rolling bearings with a grease filling at the same time as changing the oil.

The table shows the lubricants recommended by SEW-EURODRIVE:

Area of operation	Ambient temperature	Manufacturer	Type
Standard	-40 °C to +80 °C	SEW-EURODRIVE	SEW Grease HL 2 E1[1)]
		Fuchs	Renolit CX-TOM 15[1)]
		Klüber	Petamo GHY 133 N
2)	-40 °C to +40 °C	SEW-EURODRIVE	SEW Grease HL 2 H1 E1
		Bremer & Leguil	Cassida Grease GTS 2
3)	-20 °C to +40 °C	Fuchs	Plantogel 2S

1) Bearing grease based on semi-synthetic base oil.
2) Lubricant for the food processing industry.
3) Easily biodegradable lubricant for environmentally sensitive areas.

INFORMATION

The following grease quantities are required:

- **For fast-running bearings (gear unit input side):** Fill the cavities between the rolling elements one-third full with grease.
- **For slow-running bearings (gear unit output side):** Fill the cavities between the rolling elements two-thirds full with grease.

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8.2.2 Lubrication table (017512104)

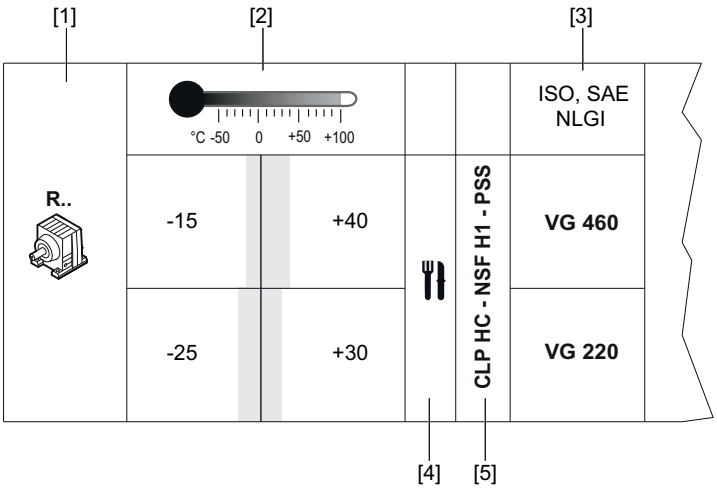
NOTICE

Damage to the gear unit due to improper lubricants.

Possible damage to property.

- The oil viscosity and type (mineral/synthetic) to be used are determined by SEW-EURODRIVE specifically for each order. This information is noted in the order confirmation and on the gear unit's nameplate. If you use other lubricants for the gear units and/or use the lubricants at temperatures outside the recommended temperature range, SEW-EURODRIVE does not assume liability.
- The lubricant recommendation in the lubricant table in no way represents a guarantee regarding the quality of the lubricant delivered by each respective supplier. Each lubricant manufacturer is responsible for the quality of their product.
- Do not mix synthetic lubricants.
- Do not mix synthetic lubricants and mineral lubricants.
- Oils of the same viscosity class from different manufacturers do not have the same characteristics. In particular, the minimally and maximally permitted oil bath temperatures are manufacturer-specific. These temperatures are specified in the lubricant tables.
- The values specified in the lubricant tables apply as of the time of printing of this document. The data of the lubricants is subject to dynamic change on the part of the lubricant manufacturers. For the latest information about the lubricants, visit: **www.sew-eurodrive.de/lubricants**.

Information on table structure



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[1] Gear unit type
[2] Ambient temperature range
[3] Viscosity class
[4] Note on special approvals
[5] Lubricant type

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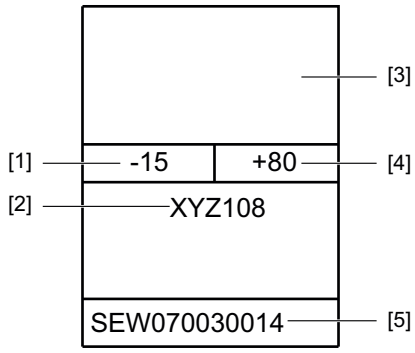
The specified ambient temperatures are guide values for selecting a suitable lubricant. The exact upper and lower temperature limits for project planning are specified in the table with the respective trade name. Bear in mind during project planning that the viscosity increases at low temperatures and that this might influence the starting behavior.

Information on the various lubricants



[1] Lowest oil sump temperature in °C; **going below this value during operation is not permitted**
[2] Trade name
[3] Manufacturer
[4] Highest oil sump temperature in °C. The service life will be considerably reduced when this temperature is exceeded. Observe the lubricant change intervals according to chapter "Lubricant change intervals" (→ 🗎 128).
[5] Approvals regarding compatibility of the lubricant with approved oil seals

Lubricant compatibility with oil seals

Approval	Explanation
SEW07004_ _13:	A lubricant especially recommended with regard to compatibility with the approved oil seals. The lubricant exceeds the state-of-the-art requirements regarding elastomer compatibility.

Approved application temperature range of the oil seals

In the low temperature range, oil seals can withstand shaft deflections (e. g. through overhung load) only to a limited extent. Especially avoid or limit pulsating or changing radial displacements of the shaft. Contact SEW-EURODRIVE, if required.

Oil seal Material class	Permitted Oil sump temperature
NBR	-40 °C to +80 °C
FKM	-25 °C to +115 °C
FKM-PSS	-25 °C to +115 °C

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Limitations of use of oil seals with the specific lubricant are described in the following table:

Material class			Manufacturer		Material	
S	1	NBR	1	Freudenberg		72 NBR 902
			2	Trelleborg		4NV11
	2	FKM	1	Freudenberg	1	75 FKM 585
					2	75 FKM 170055
			2	Trelleborg	1	VCBVR

Examples:

S11: Only the elastomer 72NBR902 of the Freudenberg company meets the requirements of the approval in conjunction with the specific lubricant.

S2: Only the elastomer FKM meets the requirements of the approval in conjunction with the specific lubricant.

Key

The following table shows the abbreviations and symbols used in the lubricant table and explains what they mean:

Abbreviation/symbol	Meaning
	Synthetic lubricant (marked gray)
	Mineral lubricant
CLP	Mineral oil
CLP PG	Polyglycol (PG)
CLP HC	Synthetic hydrocarbons – polyalphaolefins (PAO)
E	Ester-based oil
	Lubricant for the food processing industry and feed industry. Oils are NSF-H1 registered and compliant in accordance with FDA 21 CFR § 178.3570
	Easily biodegradable oil for environmentally sensitive areas
	Lubricant suitable for ATEX environment
1)	Helical-worm gear units with CLP-PG: Contact SEW-EURODRIVE
2)	Low-viscosity grease
3)	With appropriate measures, the gear units can be operated at ambient temperatures as low as -40 °C. Contact SEW-EURODRIVE.
Oil seal	Oil seal
PSS	Oil seal of the Premium Sine Seal type. The addendum "PSS" for the lubricant type indicates compatibility with the sealing system.

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Lubricant table for R.., F.., and K..7 gear units

The lubricant table is valid on the day this document is published. Refer to **www.sew-eurodrive.de/lubricants** for the latest tables.

Observe the thermal limit of the oil seal material, see chapter "Lubricant compatibility with oil seals" (→ 🗎 191).

R.. RES K..7 KES HK.. F..	[3] °C -50 0 +50 +100	[1]	[2]	ISO,SAE NLGI	SEW EURODRIVE	bremer & leguil	Castrol	FUCHS	Mobil	KLÜBER LUBRICATION	Shell	TOTAL
	[4] -15 +40		CLP	VG 220	-15 | +80 SEW GearOil Base 220 E1 / US1 SEW07004031 3		-15 | +80 Optigear BM 220	-15 | +80 Renolin CLP 220 Plus SEW07004031 3	-15 | +80 Mobilgear 600 XP 220 SEW07004031 3	-15 | +80 Klüberoil GEM 1-220 N	-15 | +80 Shell Omala SG 220	-15 | +80 Cater EP 220
	[4] -20 +30		CLP	VG 150	-20 | +80 SEW GearOil Base 150 E1 / US1 SEW07004031 3		-20 | +80 Optigear BM 150	-20 | +80 Renolin CLP150 Plus SEW07004031 3	-20 | +80 Mobilgear 600 XP 150 SEW07004031 3	-20 | +80 Klüberoil GEM 1-150 N	-20 | +80 Shell Omala SG 150	-20 | +80 Cater EP 150
	[4] -15 +40		CLP PSS	VG 220	-15 | +80 SEW GearOil Base 220 E1 / US1 SEW07004031 3			-15 | +80 Renolin CLP 220 Plus SEW07004031 3	-15 | +80 Mobilgear 600 XP 220 SEW07004031 3			
	[4] -20 +30		CLP PSS	VG 150	-20 | +80 SEW GearOil Base 150 E1 / US1 SEW07004031 3			-20 | +80 Renolin CLP150 Plus SEW07004031 3	-20 | +80 Mobilgear 600 XP 150 SEW07004031 3			

[1] Note on special approvals
[2] Oil type
[3] Ambient temperature range
[4] Standard

The lubricant table is valid on the day this document is published. Refer to **www.sew-eurodrive.de/lubricants** for the latest tables.

Observe the thermal limit of the oil seal material, see chapter "Lubricant compatibility with oil seals" (→ 191).

R.., RES, K..7, KES, HK.., F..	[3] °C -50 0 +50 +100	[4]	[1]	[2]	ISO,SAE NLGI	SEW EURODRIVE	bremer & leguil	Castrol	FUCHS	Mobil®	KLÜBER LUBRICATION	Shell	TOTAL
						-25 | +115		-25 | +115	-25 | +115	-25 | +115	-25 | +115	-25 | +115	-25 | +115
						SEW GearOil Poly 220 E1		Optigear Synthetic 800/220	Renolin PG220	Mobil GLyoyle 220	Klübersyth GH 6-220	Shell Omala S4 WE 220	Cater SY 220
						SEW07004003313							
						-30 | +115					-30 | +115		
						SEW GearOil Poly 150 E1					Klübersyth UH1-150		
						SEW07004003313							
						-25 | +115					-25 | +115		
						SEW GearOil Poly 220 E1					Klübersyth GH 6-220		
						SEW07004003313							
						-30a | +115					-30 | +115		
						SEW GearOil Poly 150 E1					Klübersyth UH1 6 - 150		
						SEW07004003313							
						-25 | +95					-25 | +95		
						SEW GearOil Poly 220 H1 E1					Klübersyth UH1 6 - 220		
						SEW07004003313							
						-20 | +115					-20 | +115		
						SEW GearOil Poly 460 H1 E1					Klübersyth UH1 6 - 460		
						SEW07004003313							
						-30 | +80					-30 | +80		
						SEW GearOil Poly 150 H1 E1					Klübersyth UH1 6 - 150		
						SEW07004003313							
	+80	-25	Ex	CLP PG	VG 220								
	+70	-30			VG 150								
	+80	-25	Ex	CLP PG PSS	VG 220								
	+70	-30			VG 150								
	+40	-25		CLP PG NSF H1 (-PSS)	VG 220								
	+80	-20	Ex		VG 460								
	+30	-30			VG 150								

[1] Note on special approvals
[2] Oil type
[3] Ambient temperature range
[4] Standard

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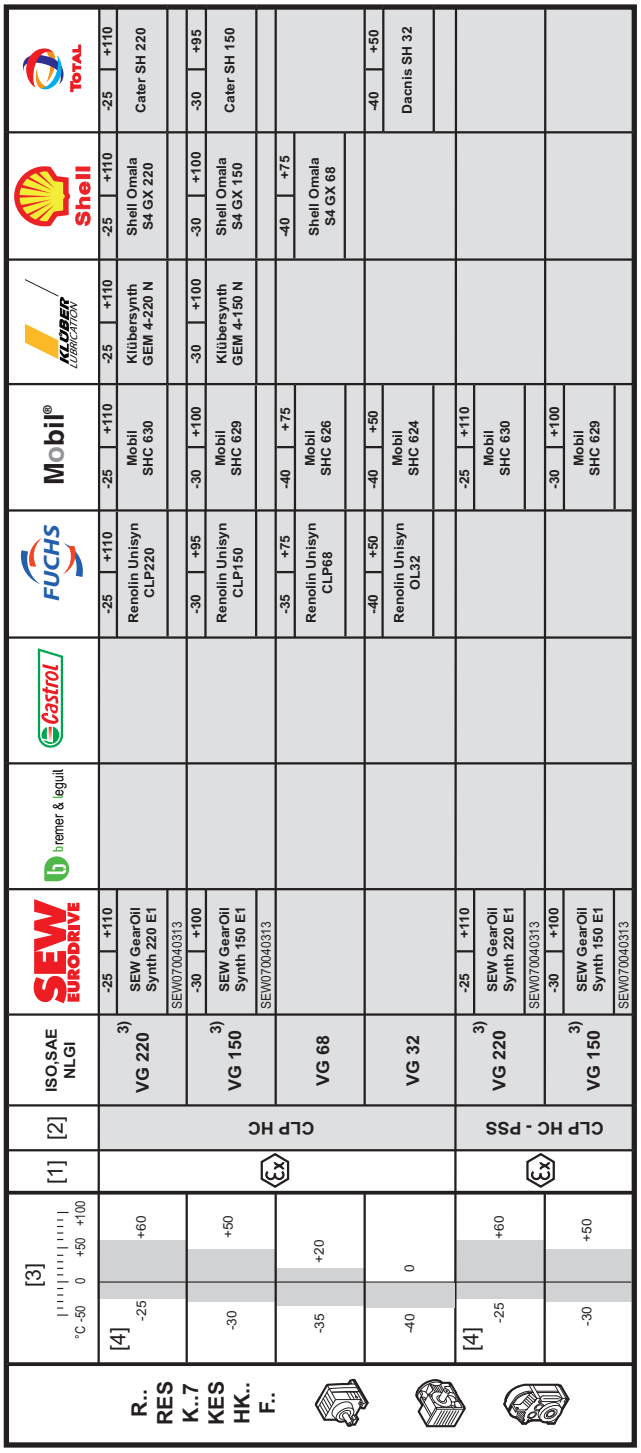
The lubricant table is valid on the day this document is published. Refer to **www.sew-eurodrive.de/lubricants** for the latest tables.

Observe the thermal limit of the oil seal material, see chapter "Lubricant compatibility with oil seals" (→ 🗎 191).



R.. RES K..7 KES HK.. F..	[3] °C -50 0 +50 +100	[1]	[2]	ISO,SAE NLGI	SEW EURODRIVE	bremer & leguil	Castrol	FUCHS	Mobil®	KLÜBER LUBRICATION	Shell	TOTAL
	[4] -25 +60	Ex	CLP HC	3) VG 220	-25 | +110 SEW GearOil Synth 220 E1 SEW07004031 3			-25 | +110 Renolin Unisyn CLP220	-25 | +110 Mobil SHC 630	-25 | +110 Klübersynth GEM 4-220 N	-25 | +110 Shell Omala S4 GX 220	-25 | +110 Cater SH 220
	-30 +50			3) VG 150	-30 | +100 SEW GearOil Synth 150 E1 SEW07004031 3			-30 | +95 Renolin Unisyn CLP150	-30 | +100 Mobil SHC 629	-30 | +100 Klübersynth GEM 4-150 N	-30 | +100 Shell Omala S4 GX 150	-30 | +95 Cater SH 150
	-35 +20			VG 68	SEW07004031 3			-35 | +75 Renolin Unisyn CLP68	-40 | +75 Mobil SHC 626		-40 | +75 Shell Omala S4 GX 68	
	-40 0			VG 32				-40 | +50 Renolin Unisyn OL32	-40 | +50 Mobil SHC 624			-40 | +50 Dacnis SH 32
	[4] -25 +60	Ex	CLP HC - PSS	3) VG 220	-25 | +110 SEW GearOil Synth 220 E1 SEW07004031 3				-25 | +110 Mobil SHC 630			
	-30 +50			3) VG 150	-30 | +100 SEW GearOil Synth 150 E1 SEW07004031 3				-30 | +100 Mobil SHC 629			

[1] Note on special approvals
[2] Oil type
[3] Ambient temperature range
[4] Standard

The lubricant table is valid on the day this document is published. Refer to **www.sew-eurodrive.de/lubricants** for the latest tables.

Observe the thermal limit of the oil seal material, see chapter "Lubricant compatibility with oil seals" (→ 191).

R.., RES, K..7, KES, HK.., F..	[3] °C	[4]	[1]	[2]	ISO,SAE NLGI	SEW EURODRIVE	bremer & leguil	Castrol	FUCHS	Mobil	KLÜBER LUBRICATION	Shell	TOTAL
					VG 460	-20 | +110 SEW GearOil Synth 460 H1 E1 SEW07004031 3	-15 | +100 Cassida Fluid GL 460	-15 | +100 Optileb GT 460 SEW07004031 3	-15 | +100 Cassida Fluid GL 460		-15 | +105 Klüberoil 4UH1-460 N		
					VG 220	-30 | +90 SEW GearOil Synth 220 H1 E1 SEW07004031 3	-25 | +80 Cassida Fluid GL 220	-25 | +80 Optileb GT 220 SEW07004031 3	-25 | +80 Cassida Fluid GL 220		-25 | +80 Klüberoil 4UH1-220 N		
					VG 68	SEW07004031 3	-40 | +50 Cassida Fluid HF 68	-40 | +50 Optileb HY 68 SEW07004031 3	-35 | +50 Cassida Fluid HF 68		-35 | +50 Klüberoil 4UH1-68 N		
					VG 32		-40 | +30 Cassida Fluid HF 32	-40 | +30 Optileb HY 32 SEW07004031 3	-40 | +30 Cassida Fluid HF 32		-40 | +30 KlüberSummit HySynFG32		
				CLP HC - NSF H1									
					VG 460	-20 | +110 SEW GearOil Synth 460 H1 E1 SEW07004031 3	-15 | +100 Cassida Fluid GL 460	-15 | +100 Optileb GT 460 SEW07004031 3	-15 | +100 Cassida Fluid GL 460				
					VG 220	-30 | +90 SEW GearOil Synth 220 H1 E1 SEW07004031 3	-25 | +80 Cassida Fluid GL 220	-25 | +80 Optileb GT 220 SEW07004031 3	-25 | +80 Cassida Fluid GL 220				
				CLP HC - NSF H1 - FDA									
				E	VG 460				-20 | +80 Plantogear 460 S S2		-20 | +80 Klüberbio CA2-460 S2		

[1] Note on special approvals
[2] Oil type
[3] Ambient temperature range
[4] Standard

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Lubricant table for K..9 gear units

The lubricant table is valid on the day this document is published. Refer to **www.sew-eurodrive.de/lubricants** for the latest tables.

Observe the thermal limit of the oil seal material, see chapter "Lubricant compatibility with oil seals" (→ 🗎 191).

K.9	[3] °C -50 0 +50 +100	[1]	[2]	ISO,SAE NLGI	SEW EURODRIVE	bremer & leguil	Castrol	FUCHS	Mobil®	KLÜBER LUBRICATION	Shell	TOTAL
[4]			CLP PG (-PSS)									
-20	+60			VG 460	-20 | +95 SEW GearOil Poly 460 E1 SEW 070040313					-20 | +95 Klübersynth GH 6-460		
-15	+80			VG 680						-15 | +115 Klübersynth GH 6-680		
-25	+40			VG 220	-25 | +70 SEW GearOil Poly 220 E1 SEW 070040313					-25 | +70 Klübersynth GH 6-220		
-30	+30			VG 150	-30 | +60 SEW GearOil Poly 150 E1 SEW 070040313					-30 | +60 Klübersynth GH 6-150		
[4]			CLP PG - NSF H1 (-PSS)									
-20	+60			VG 460	-20 | +95 SEW GearOil Poly 460 H1 E1 SEW 070040313					-20 | +95 Klübersynth UH1 6-460		
-15	+80			VG 680						-15 | +115 Klübersynth UH1 6-680		
-25	+40			VG 220	-25 | +70 SEW GearOil Poly 220 H1 E1 SEW 070040313					-25 | +70 Klübersynth UH1 6-220		
-30	+30			VG 150	-30 | +60 SEW GearOil Poly 150 H1 E1 SEW 070040313					-30 | +60 Klübersynth UH1 6-150		

[1] Note on special approvals
[2] Oil type
[3] Ambient temperature range
[4] Standard

Lubricant table for S.. gear units

The lubricant table is valid on the day this document is published. Refer to **www.sew-eurodrive.de/lubricants** for the latest tables.

Observe the thermal limit of the oil seal material, see chapter "Lubricant compatibility with oil seals" (→ 🗎 191).

S.. HS..	[3] °C -50 0 +50 +100	[1]	[2]	ISO,SAE NLGI	SEW EURODRIVE	bremer & leguil	Castrol	FUCHS	Mobil	KLÜBER LUBRICATION	Shell	TOTAL
					0 | +80		0 | +80	0 | +80	0 | +80	0 | +80	0 | +80
	[4] 0 +40		CLP	VG 680	SEW GearOil Base 680 S E1		Optigear BM 680	Renolin CLP 680 Plus	Mobilgear 600 XP 680	Klüberoil GEM 1-680 N	Shell Omala SG 680	Carter EP 680
					SEW070040313			SEW070040313	SEW070040313			
	-20 +25			VG 150	-20 | +65		-20 | +65	-20 | +65	-20 | +65	-20 | +65	-20 | +65
					SEW GearOil Base 150 E1 / US1		Optigear BM150	Renolin CLP 150 Plus	Mobilgear 600 XP 150	Klüberoil GEM 1-150 N	Shell Omala SG 150	Carter EP 150
					SEW070040313			SEW070040313	SEW070040313			
	[4] 0 +40		CLP - PSS	VG 680	0 | +80			0 | +80	0 | +80			
					SEW GearOil Base 680 S E1			Renolin CLP 680 Plus	Mobilgear 600 XP 680			
					SEW070040313			SEW070040313	SEW070040313			
	-20 +25			VG 150	-20 | +65			-20 | +65	-20 | +65			
					SEW GearOil Base 150 E1 / US1			Renolin CLP 150 Plus	Mobilgear 600 XP 150			
					SEW070040313			SEW070040313	SEW070040313			

[1] Note on special approvals
[2] Oil type
[3] Ambient temperature range
[4] Standard

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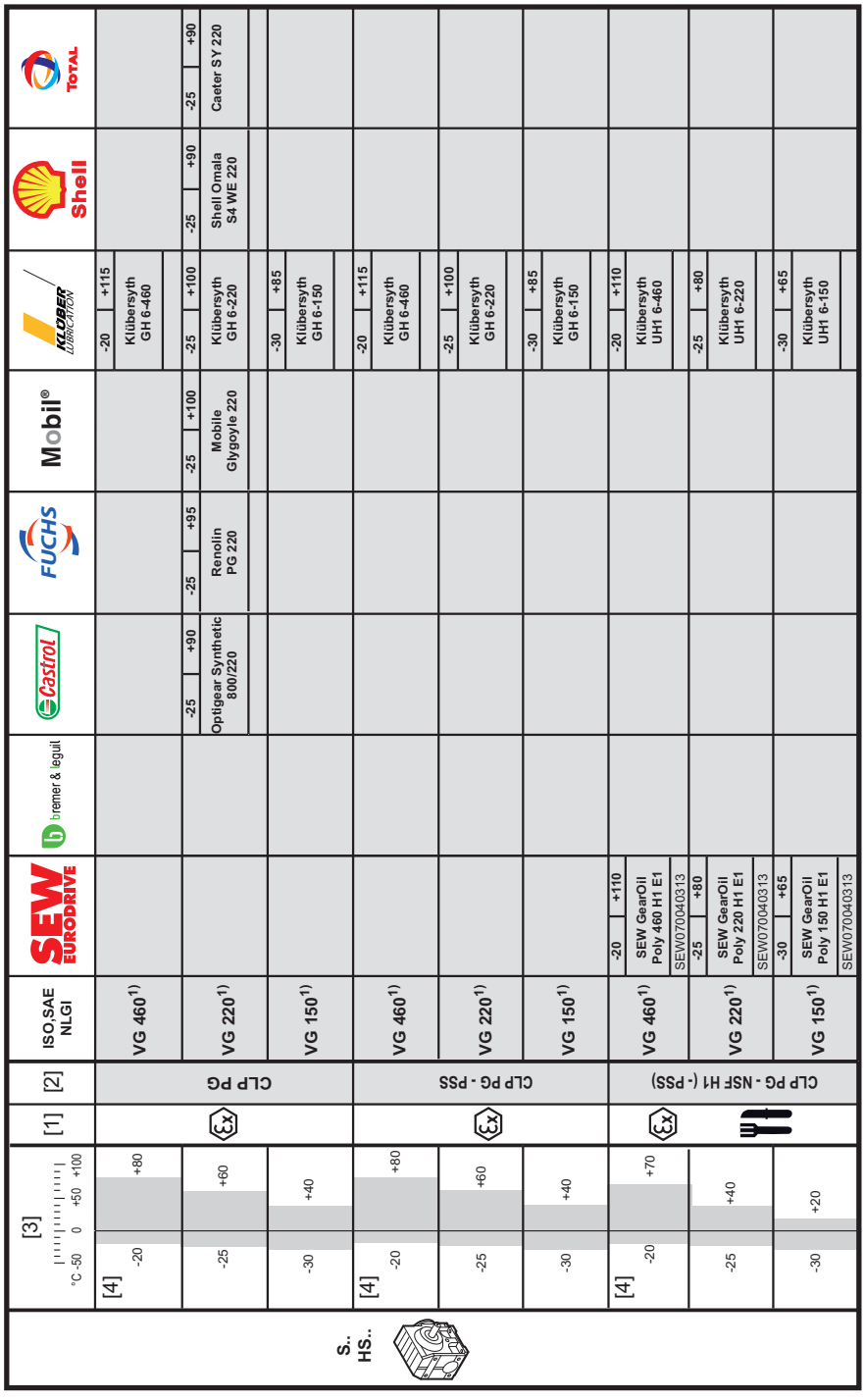
The lubricant table is valid on the day this document is published. Refer to **www.sew-eurodrive.de/lubricants** for the latest tables.

Observe the thermal limit of the oil seal material, see chapter "Lubricant compatibility with oil seals" (→ 🖹 191).



[1] Note on special approvals
[2] Oil type
[3] Ambient temperature range
[4] Standard

The lubricant table is valid on the day this document is published. Refer to **www.sew-eurodrive.de/lubricants** for the latest tables.

Observe the thermal limit of the oil seal material, see chapter "Lubricant compatibility with oil seals" (→ 191).

S.. HS..	[3] °C -50 0 +50 +100	[1]	[2]	ISO, SAE NLGI	SEW EURODRIVE	bremer & leguil	Castrol	FUCHS	Mobil®	KLÜBER LUBRICATION	Shell	TOTAL
	[4] -15 +60	Ex	CLP HC	VG 460				-15 +100 Renolin Unisyn CLP 460	-20 +105 Mobil SHC 634	-15 +105 Klübersynth GEM 4-460 N	-15 +105 Shell Omala S4 GX 460	-15 +105 Carter SH 460
	-30 +30			3) VG 150				-30 +70 Renolin Unisyn CLP 150	-30 +75 Mobil SHC 629	-30 +70 Klübersynth GEM 4-150 N	-30 +75 Shell Omala S4 GX 150	-30 +70 Carter SH 150
	-35 +20			VG 68				-35 +50 Renolin Unisyn CLP 68	-40 +55 Mobil SHC 626		-40 +50 Shell Omala S4 GX 68	
	-40 0			VG 32				-40 +30 Renolin Unisyn OL 32	-40 +30 Mobil SHC 624			-40 +30 Dacnis SH 32
	[4] -15 +60	Ex	CLP HC - PSS	VG 460					-20 +105 Mobil SHC 634			
	-30 +30			3) VG 150					-30 +75 Mobil SHC 629			

[1] Note on special approvals
[2] Oil type
[3] Ambient temperature range
[4] Standard

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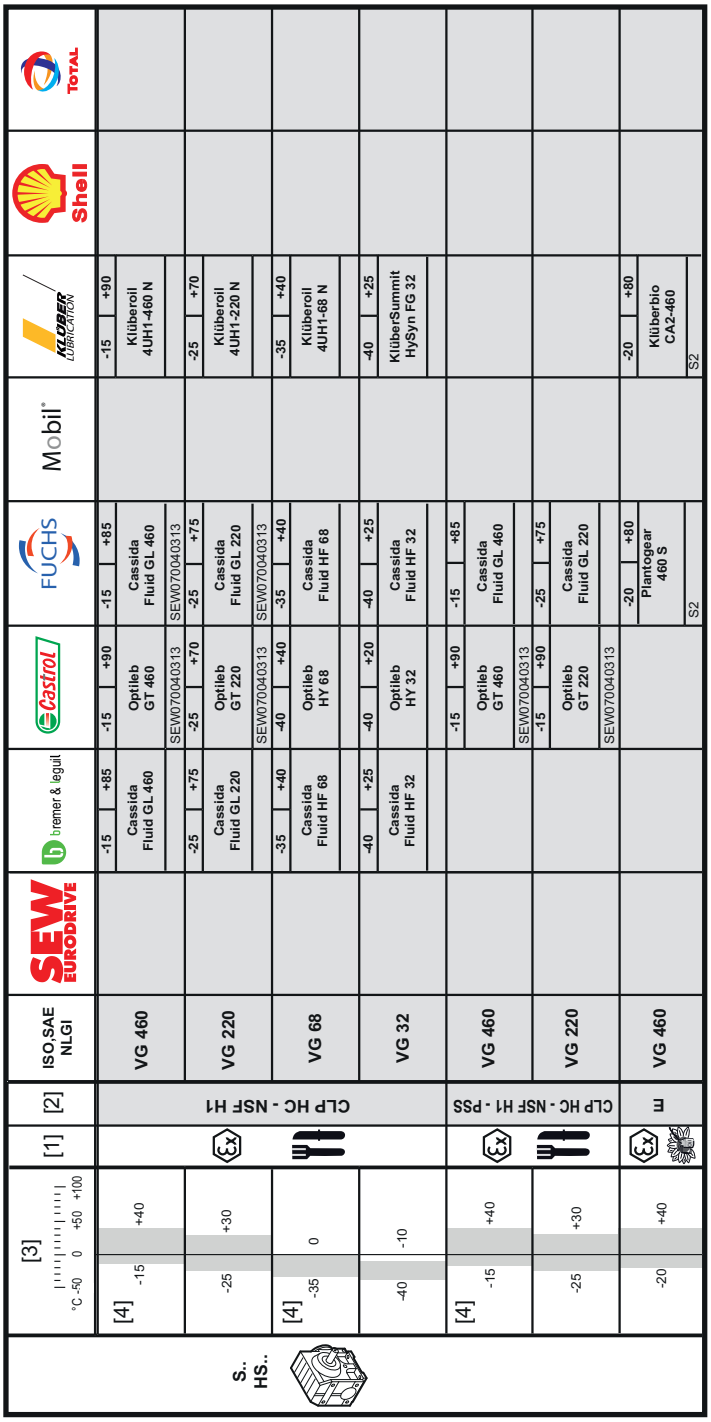
The lubricant table is valid on the day this document is published. Refer to **www.sew-eurodrive.de/lubricants** for the latest tables.

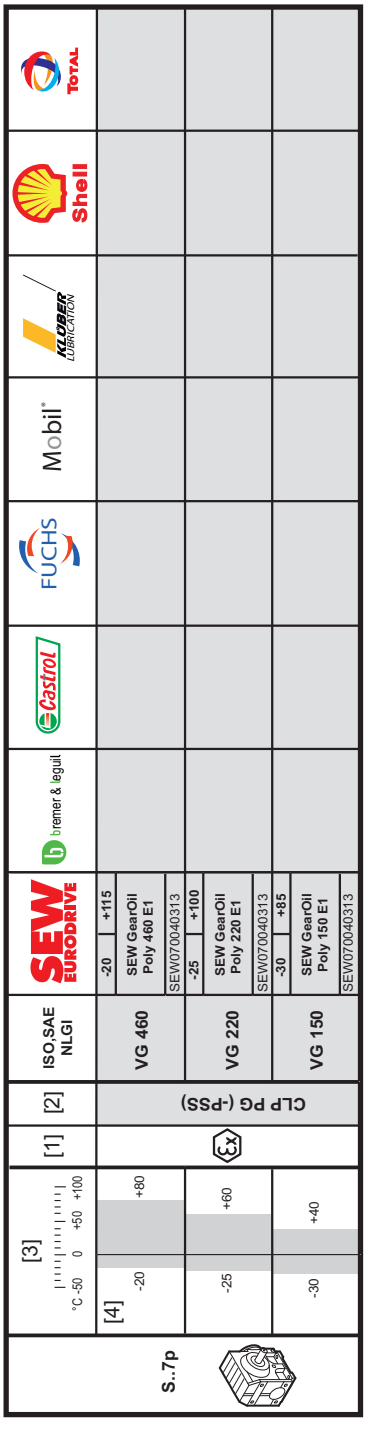
Observe the thermal limit of the oil seal material, see chapter "Lubricant compatibility with oil seals" (→ 191).



[1] Note on special approvals
[2] Oil type
[3] Ambient temperature range
[4] Standard

The lubricant table is valid on the day this document is published. Refer to **www.sew-eurodrive.de/lubricants** for the latest tables.

Observe the thermal limit of the oil seal material, see chapter "Lubricant compatibility with oil seals" (→ 🗎 191).



[1] Note on special approvals
[2] Oil type
[3] Ambient temperature range
[4] Standard

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Lubricant table for W.. gear units

The lubricant table is valid on the day this document is published. Refer to **www.sew-eurodrive.de/lubricants** for the latest tables.

Observe the thermal limit of the oil seal material, see chapter "Lubricant compatibility with oil seals" (→ 191).

W.. HW..	[4] –20	[3] +60	[1]	[2] CLP PG (-PSS)	ISO,SAE NLGI	SEW EURODRIVE	bremer & leguil	Castrol	FUCHS	Mobil	KLÜBER LUBRICATION	Shell	TOTAL
					VG 460	-20 +115 SEW GearOil Poly 460 W E1 SEW07000403 13							
	–20	+60		CLP PG NSF H1(-PSS)	VG 460	-20 +115 SEW GearOil Poly 460 H1 E1 SEW07000403 13					-20 +115 Klübersynth UH1 6-460		
	–30	+20			VG 150	-30 +65 SEW GearOil Poly 1510 H1 E1 SEW07000403 13					-30 +65 Klübersynth UH1 6-150		
	–40	+10		API GL5	SAE 75W90 (~VG 100)					-40 +65 Mobil Synthetic Gear Oil 75 W90			
W.9	[4] –25	+60		CLP PG (- PSS)	VG 220	-25 +100 SEW GearOil Poly 220 E1 SEW07000403 13							
	–20	+80			VG 460	-20 +115 SEW GearOil Poly 460 E1 SEW07000403 13							
	–30	+40			VG 150	-30 +85 SEW GearOil Poly 150 E1 SEW07000403 13							

[1] Note on special approvals
[2] Oil type
[3] Ambient temperature range
[4] Standard

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8.2.3 Lubricant fill quantities

INFORMATION

The specified fill quantities are **guide values**. The exact values vary depending on the number of gear stages and gear ratio. Check the oil level plug for the exact oil quantity.

INFORMATION

Unless a special arrangement is made, SEW-EURODRIVE supplies the drives with a lubricant fill adapted for the specific mounting position. The mounting position (see chapter "Designation of the mounting positions" (→ 🗎 146)) must therefore be specified in the drive order.

When the mounting position is changed, the lubricant fill quantity must be adapted accordingly (see the following chapters). Consequently, a mounting position may only be **changed** after consultation with SEW-EURODRIVE, **otherwise your rights to claim under limited warranty no longer apply.**

The following tables show guide values for lubricant fill quantities in relation to the mounting position M1 – M6.

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Helical (R) gear units

R.., R..F

Gear unit	Fill quantity in liters					
	M1[1]	M2	M3	M4	M5	M6
R07	0.12	0.20				
R17	0.25	0.55	0.35	0.55	0.35	0.40
R27	0.25/0.40	0.70	0.50	0.70	0.50	
R37	0.30/0.95	0.85	0.95	1.05	0.75	0.95
R47	0.70/1.50	1.60	1.50	1.65	1.50	
R57	0.80/1.70	1.90	1.70	2.10	1.70	
R67	1.10/2.30	2.40	2.80	2.90	1.80	2.00
R77	1.20/3.00	3.30	3.60	3.80	2.50	3.40
R87	2.30/6.0	6.2	7.4	7.05	6.4	6.6
R97	4.60/9.8	11.7		13.4	11.3	11.7
R107	6.0/13.7	16.3	16.9	19.2	13.2	15.9
R127	6.4/17	18.3	18.2	22.0	16.8	17.9
R137	10.0/25.0	28.0	29.5	31.5	25.0	
R147	15.4/40.0	46.5	48.0	52.0	39.5	41.0
R167	27.0/70.0	82.0	78.0	88.0	66.0	69.0

1) The larger gear unit of compound gear units must be filled with the larger oil quantity.

RF.., RM.., RZ..

Gear unit	Fill quantity in liters					
	M1[1]	M2	M3	M4	M5	M6
RF07	0.12	0.20				
RF17	0.25	0.55	0.35	0.55	0.35	0.40
RF27	0.25/0.40	0.70	0.50	0.70	0.50	
RF37	0.35/0.95	0.90	0.95	1.05	0.75	0.95
RF47	0.65/1.50	1.60	1.50	1.65	1.50	
RF57	0.80/1.70	1.80	1.70	2.00	1.70	
RF67	1.20/2.50	2.50	2.70	2.80	1.90	2.10
RF77	1.20/2.60	3.10	3.30	3.60	2.40	3.00
RF87	2.40/6.0	6.4	7.1	7.2	6.3	6.4
RF97	5.1/10.2	11.9	11.2	14.0	11.2	11.8
RF107	6.3/14.9	15.9	17.0	19.2	13.1	15.9
RF127	6.6/16.0	18.3	18.2	21.4	15.9	17.0
RF137	9.5/25.0	27.0	29.0	32.5	25.0	
RF147	16.4/42.0	47.0	48.0	52.0	42.0	42.0
RF167	26.0/70.0	82.0	78.0	88.0	65.0	71.0

1) The larger gear unit of compound gear units must be filled with the larger oil quantity.

RX..

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
RX57	0.60	0.80	1.30		0.90	
RX67	0.80		1.70	1.90	1.10	
RX77	1.10	1.50	2.60	2.70	1.60	
RX87	1.70	2.50	4.80		2.90	
RX97	2.10	3.40	7.4	7.0	4.80	
RX107	3.90	5.6	11.6	11.9	7.7	

RXF..

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
RXF57	0.50	0.80	1.10		0.70	
RXF67	0.70	0.80	1.50	1.40	1.00	

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
RXF77	0.90	1.30	2.40	2.00	1.60	
RXF87	1.60	1.95	4.90	3.95	2.90	
RXF97	2.10	3.70	7.1	6.3	4.80	
RXF107	3.10	5.7	11.2	9.3	7.2	

Parallel shaft helical (F) gear units

F.., FA..B, FH..B, FV..B

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
F..27	0.60	0.80	0.65	0.70	0.60	0.60
F..37	0.95	1.25	0.70	1.25	1.00	1.10
F..47	1.50	1.80	1.10	1.90	1.50	1.70
F..57	2.25	3.15	1.65	3.15	2.40	2.50
F..67	2.70	3.80	1.90	3.80	2.90	3.20
F..77	5.90	7.30	4.30	8.00	6.00	6.30
F..87	10.8	13.0	7.70	13.8	10.8	11.0
F..97	18.5	22.5	12.6	25.2	18.5	20.0
F..107	24.5	32.0	19.5	37.0	27.0	27.0
F..127	39.5	51.7	31.5	60.1	45.6	44.2
F..157	69.0	104.0	63.0	105.0	86.0	78.0

FF..

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
FF27	0.60	0.80	0.65	0.70	0.60	0.60
FF37	1.00	1.25	0.70	1.30	1.00	1.10
FF47	1.60	1.85	1.10	1.90	1.50	1.70
FF57	2.30	3.10	1.70	3.10	2.30	2.40
FF67	2.70	3.80	1.90	3.80	2.90	3.20
FF77	5.90	7.30	4.30	8.10	6.00	6.30
FF87	11.0	13.3	7.80	14.1	11.1	11.3
FF97	19.0	22.5	12.6	25.6	18.9	20.5
FF107	25.5	32.0	19.5	38.5	27.5	28.0
FF127	40.6	51.6	31.5	61.2	46.3	44.9
FF157	72.0	105.0	64.0	106.0	87.0	79.0

FA.., FH.., FV.., FAF.., FAZ.., FHF.., FZ.., FHZ.., FVF.., FVZ.., FT.., FM.., FAM..

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
F..27	0.60	0.80	0.65	0.70	0.60	0.60
F..37	0.95	1.25	0.70	1.25	1.00	1.10
F..47	1.50	1.80	1.10	1.90	1.50	1.70
F..57	2.40	3.10	1.70	3.15	2.40	2.50
F..67	2.70	3.80	1.90	3.80	2.90	3.20
F..77	5.90	7.30	4.30	8.00	6.00	6.30
F..87	11.0	13.1	7.70	13.8	10.9	11.1
F..97	18.5	22.5	12.6	25.2	18.5	20.0
F..107	24.5	32.0	19.5	37.5	27.0	27.0
F..127	38.3	50.9	31.5	59.7	44.7	43.3
F..157	68.0	103.0	62.0	104.0	85.0	77.0

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Helical-bevel (K) gear units

INFORMATION

All K..19 and K..29 gear units have a universal mounting position, which means that K..19 and K..29 gear units of the same design are filled with the same oil quantity independent of the mounting position. An exception to this is the M4 mounting position.

K.., KA..B, KH..B, KV..B

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
K..19	0.40			0.45	0.40	
K..29	0.70			0.85	0.70	
K..39	0.90	1.70	1.55	1.9	1.55	1.30
K..49	1.70	3.40	2.80	4.20	3.15	2.80
K..37	0.50	1.00		1.25	0.95	
K..47	0.80	1.30	1.50	2.00	1.60	
K..57	1.10	2.20		2.80	2.30	2.10
K..67	1.10	2.40	2.60	3.45	2.60	
K..77	2.20	4.10	4.40	5.80	4.20	4.40
K..87	3.70	8.20	8.90	10.75	8.20	
K..97	7.0	14.0	15.70	20.0	15.70	15.50
K..107	10.0	21.0	25.50	33.50	24.0	
K..127	21.0	41.50	44.0	54.0	40.0	41.0
K..157	31.0	65.0	68.0	90.0	62.0	63.0
K..167	33.0	97.0	109.0	127.0	89.0	86.0
K..187	53.0	156.0	174.0	207.0	150.0	147.0

KF..

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
KF19	0.40			0.45	0.40	
KF29	0.70			0.85	0.70	
KF39	0.90	1.70	1.55	1.9	1.55	1.30
KF49	1.70	3.40	2.80	4.20	3.15	2.80
KF37	0.50	1.10		1.50	1.00	
KF47	0.80	1.30	1.70	2.20	1.60	
KF57	1.20	2.20	2.40	3.15	2.50	2.30
KF67	1.10	2.40	2.80	3.70	2.70	
KF77	2.10	4.10	4.40	5.90	4.50	
KF87	3.70	8.20	9.0	11.90	8.40	
KF97	7.0	14.70	17.30	21.50	15.70	16.50
KF107	10.0	21.80	25.80	35.10	25.20	
KF127	21.0	41.50	46.0	55.0	41.0	
KF157	31.0	66.0	69.0	92.0	62.0	63.0

KA.., KH.., KV.., KAF.., KHF.., KVF.., KZ.., KAZ.., KHZ.., KVZ.., KT.., KM.., KAM..

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
K..19	0.40			0.45	0.40	
K..29	0.70			0.85	0.70	
K..39	0.90	1.70	1.55	1.9	1.55	1.30
K..49	1.70	3.40	2.80	4.20	3.15	2.80
K..37	0.50	1.00		1.40	1.00	
K..47	0.80	1.30	1.60	2.15	1.60	
K..57	1.20	2.20	2.40	3.15	2.70	2.40

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
K..67	1.10	2.40	2.70	3.70	2.60	
K..77	2.10	4.10	4.60	5.90	4.40	
K..87	3.70	8.20	8.80	11.10	8.0	
K..97	7.0	14.70	15.70	20.0	15.70	
K..107	10.0	20.80	24.5	31.95	24.5	24.3
K..127	21.0	41.50	43.0	52.0	40.0	
K..157	31.0	65.0	68.0	90.0	62.0	63.0
K..167	33.0	97.0	109.0	127.0	89.0	86.0
K..187	53.0	156.0	174.0	207.0	150.0	147.0

Helical-worm (S) gear units

S..

Gear unit	Fill quantity in liters					
	M1	M2	M3[1)]	M4	M5	M6
S37	0.25	0.40	0.50	0.55	0.40	
S47	0.35	0.80	0.70/0.90	1.03	0.80	
S57	0.50	1.20	1.00/1.20	1.43	1.30	
S67	1.00	2.00	2.20/3.10	3.10	2.60	2.60
S77	1.90	4.20	3.70/5.4	5.9	4.40	
S87	3.30	8.1	6.9/10.4	11.3	8.4	
S97	6.8	15.0	13.4/18.0	21.8	17.0	

1) The larger gear unit of compound gear units must be filled with the larger oil quantity.

SF..

Gear unit	Fill quantity in liters						
	M1	M2	M3[1)]	M4		M5	M6
				Output A or B	Output A + B		
SF37	0.25	0.40	0.50	0.55	0.6	0.40	
SF47	0.40	0.90	0.90/1.05	1.08	1.13	1.00	
SF57	0.50	1.20	1.00/1.50	1.48	1.53	1.40	
SF67	1.00	2.20	2.30/3.00	3.20	3.5	2.70	
SF77	1.90	4.10	3.90/5.8	6.5	7.2	4.90	
SF87	3.80	8.0	7.1/10.1	12.0	13.2	9.1	
SF97	7.4	15.0	13.8/18.8	23.1	25.2	18.0	

1) The larger gear unit of compound gear units must be filled with the larger oil quantity.

SA.., SH.., SAF.., SHZ.., SAZ.., SHF.., ST..

Gear unit	Fill quantity in liters					
	M1	M2	M3[1)]	M4	M5	M6
S..37	0.25	0.40	0.50		0.40	
S..47	0.40	0.80	0.70/0.90	1.03	0.80	
S..57	0.50	1.10	1.00/1.50	1.43	1.20	
S..67	1.00	2.00	1.80/2.60	2.90	2.50	
S..77	1.80	3.90	3.60/5.0	5.8	4.50	
S..87	3.80	7.4	6.0/8.7	10.8	8.0	
S..97	7.0	14.0	11.4/16.0	21.0	15.7	

1) The larger gear unit of compound gear units must be filled with the larger oil quantity.

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SPIROPLAN® (W) gear units

INFORMATION

SPIROPLAN® gear units W..10 to W..30 have a universal mounting position, which means that gear units of the same design are filled with the same oil quantity independent of the mounting position.

The oil fill quantity of SPIROPLAN® gear units W..37 and W..47 in mounting position M4 is different from that of the other mounting positions.

W.., WA..B, WH..B

Gear unit	Fill quantity in liters						
	M1	M2	M3	M4		M5	M6
				2	3		
W10	0.16						
W20	0.24						
W30	0.40						
W37	0.50			0.70		0.50	
W47	0.90			1.40		0.90	

WF..

Gear unit	Fill quantity in liters						
	M1	M2	M3	M4		M5	M6
				2	3		
WF10	0.16						
WF20	0.24						
WF30	0.40						
WF37	0.50			0.70		0.50	
WF47	0.90			1.55		0.90	
WF29	0.54			0.93	0.78	0.84	
WF39	0.85			1.5	1.35	1.25	

WA.., WAF..,WH.., WT.., WHF..

Gear unit	Fill quantity in liters						
	M1	M2	M3	M4		M5	M6
				2	3		
W..10	0.16						
W..20	0.24						
W..30	0.40						
W..37	0.50			0.70		0.50	
W..47	0.80			1.40		0.80	
W..29	0.54			0.93	0.78	0.84	
W..39	0.85			1.5	1.35	1.25	

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9 Malfunctions and remedies

⚠ WARNING

Risk of death or injury if the drive starts up unintentionally.

Severe or fatal injuries can occur.

- De-energize the motor before you start working on the unit.
- Secure the motor against unintended power-up.

⚠ CAUTION

Risk of burns due to hot gear unit and hot gear unit oil.

Severe injuries can occur.

- Let the gear unit cool down before you start working on it.
- Carefully remove the oil level plug and the oil drain plug.

NOTICE

Damage to gear unit/gearmotor due to improper operation can occur.

Damage to the gear unit/gearmotor can occur.

- Repair works at SEW-EURODRIVE gear units may only be performed by qualified specialists. In the context of this documentation, qualified specialists are persons who are familiar with the "Technical regulations on operating safety" (TRBS).
- Drive and motor may only be disconnected by qualified specialists.
- Contact SEW-EURODRIVE.

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9.1 Gear units

Fault	Possible cause	Measure
Unusual, regular running noise	• Meshing/grinding noise: Bearing damage	• Check the oil consistency; change bearings
	• Knocking noise: Irregularity in the gearing	• Contact SEW-EURODRIVE. For a better assessment of the failure, send an audio recording of the noise
	• Deformation of the housing upon tightening	• Check the gear unit mounting for possible deformation and correct if necessary
	• Noise generation caused by insufficient rigidity of the gear unit foundation	• Reinforce the gear unit foundation
Unusual, irregular running noises	• Foreign objects in the oil	• Check the oil consistency • Stop the drive, contact SEW-EURODRIVE
Oil leaking from gear unit cover	• Seal of the gear unit cover leaking	• Tighten the screws of the gear unit cover and observe the gear unit. Contact SEW-EURODRIVE if oil is still leaking
	• Seal defective	• Contact SEW-EURODRIVE
Small amounts of oil leak from the oil seal during run-in phase.	• Function-related pseudo-leakage	• There is no failure. Remove with a soft, lint-free cloth and keep monitoring it.
Film of moisture around the dust lip of the oil seal	• Function-related pseudo-leakage	• There is no failure. Remove with a soft, lint-free cloth and keep monitoring it.
Oil leaking from oil seal	• Oil seal leaking/defective	• Check sealing system. It may be necessary to consult SEW-EURODRIVE
Oil leaking from motor (e.g. terminal box or fan)	• Too much oil	• Check oil level, correct if necessary
	• Gear unit not ventilated	• Vent gear unit
	• Oil seal leaking/defective	• Check sealing system. It may be necessary to consult SEW-EURODRIVE
Oil leaking from flange	• Flange gasket leaking/defective	• Check sealing system. It may be necessary to consult SEW-EURODRIVE
	• Too much oil	• Check oil level, correct if necessary
	• Gear unit not ventilated	• Vent gear unit
Oil emerging from breather valve	• Too much oil	• Check oil quantity, correct if necessary
	• Function-related oil mist	• There is no failure.
	• Drive not installed in proper mounting position	• Install breather valve correctly and adjust the oil level.
	• Frequent cold starts (oil foams) and/or high oil level	• Install oil expansion tank

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Fault	Possible cause	Measure
Output shaft does not turn although the motor is running or the input shaft is rotated	• Shaft-hub connection in the gear unit interrupted	• Send in the gear unit/gearmotor for repair

9.2 AMS../AQS../AL../EWH.. adapter

Fault	Possible cause	Measure
Unusual, regular running noise	• Meshing/grinding noise: Bearing damage	• Contact SEW-EURODRIVE
Oil leaking.	• Seal defective	• Contact SEW-EURODRIVE
Output shaft does not turn although the motor is running or the input shaft is rotated	• Shaft-hub connection in the gear unit interrupted	• Send in the gear unit/gearmotor for repair
Change in running noise and/or vibrations	• Coupling ring wear, short-term torque transmission due to metal contact	• Replace coupling ring.
	• Screws to secure hub axially are loose	• Tighten the screws
Premature coupling ring wear	• Contact with aggressive fluids/ oils; ozone influence; excessive ambient temperatures, etc. that can change the physical properties of the coupling ring.	• Contact SEW-EURODRIVE
	• Non-permissibly high coupling ring ambient/contact temperatures; max. permissible: -20 °C to +80 °C.	• Contact SEW-EURODRIVE
	• Overload	• Contact SEW-EURODRIVE

9.3 AD input shaft assembly

Fault	Possible cause	Measure
Unusual, regular running noise	• Meshing/grinding noise: Bearing damage	• Contact SEW-EURODRIVE
Oil leaking	• Seal defective	• Contact SEW-EURODRIVE
Output shaft does not turn although the input shaft is rotated	• Connection between shaft and hub in gear unit or cover interrupted.	• Send the gear unit to SEW-EURODRIVE for repair.

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9.4 Service

If you require customer service, include the following information:

- Nameplate data (complete)
- Type and extent of the failure
- Time the failure occurred and any accompanying circumstances
- Assumed cause
- A digital picture of the failure, if possible

9.5 Waste disposal

Dispose of gear units in accordance with the material structure and the regulations in force:

- As scrap steel/stainless steel
  - Housing parts
  - Gear wheels
  - Shafts
  - Rolling bearings
- Parts of the worm gears are made of non-ferrous metals. Dispose of the worm gear accordingly.
- Collect used oil and dispose of it according to the regulations in force.

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10 Address list

Argentina			
Assembly Sales	Buenos Aires	SEW EURODRIVE ARGENTINA S.A. Ruta Panamericana Km 37.5, Lote 35 (B1619IEA) Centro Industrial Garín Prov. de Buenos Aires	Tel. +54 3327 4572-84 Fax +54 3327 4572-21 http://www.sew-eurodrive.com.ar sewar@sew-eurodrive.com.ar
Australia			
Assembly Sales Service	Melbourne	SEW-EURODRIVE PTY. LTD. 27 Beverage Drive Tullamarine, Victoria 3043	Tel. +61 3 9933-1000 Fax +61 3 9933-1003 http://www.sew-eurodrive.com.au enquires@sew-eurodrive.com.au
	Sydney	SEW-EURODRIVE PTY. LTD. 9, Sleigh Place, Wetherill Park New South Wales, 2164	Tel. +61 2 9725-9900 Fax +61 2 9725-9905 enquires@sew-eurodrive.com.au
Austria			
Assembly Sales Service	Vienna	SEW-EURODRIVE Ges.m.b.H. Richard-Strauss-Straße 24 1230 Wien	Tel. +43 1 617 55 00-0 Fax +43 1 617 55 00-30 http://www.sew-eurodrive.at sew@sew-eurodrive.at
Bangladesh			
Sales	Bangladesh	SEW-EURODRIVE INDIA PRIVATE LIMITED 345 DIT Road East Rampura Dhaka-1219, Bangladesh	Tel. +88 01729 097309 salesdhaka@seweurodrivebangladesh.com
Belarus			
Sales	Minsk	Foreign unitary production enterprise SEW-EURODRIVE RybalkoStr. 26 220033 Minsk	Tel. +375 17 319 47 56 / +375 17 378 47 58 Fax +375 17 378 47 54 http://www.sew-eurodrive.by sew@sew-eurodrive.by
Belgium			
Assembly Sales Service	Brussels	SEW-EURODRIVE n.v./s.a. Researchpark Haasrode 1060 Evenementenlaan 7 3001 Leuven	Tel. +32 16 386-311 Fax +32 16 386-336 http://www.sew-eurodrive.be info@sew-eurodrive.be
Service Competence Center	Industrial Gears	SEW-EURODRIVE n.v./s.a. Rue du Parc Industriel, 31 6900 Marche-en-Famenne	Tel. +32 84 219-878 Fax +32 84 219-879 http://www.sew-eurodrive.be info@sew.be
Brazil			
Production Sales Service	São Paulo	SEW-EURODRIVE Brasil Ltda. Estrada Municipal José Rubim, 205 – Rodovia Santos Dumont Km 49 Indaiatuba – 13347-510 – SP	Tel. +55 19 3835-8000 sew@sew.com.br
Assembly Sales Service	Rio Claro	SEW-EURODRIVE Brasil Ltda. Rodovia Washington Luiz, Km 172 Condomínio Industrial Conpark Caixa Postal: 327 13501-600 – Rio Claro / SP	Tel. +55 19 3522-3100 Fax +55 19 3524-6653 montadora.rc@sew.com.br
	Joinville	SEW-EURODRIVE Brasil Ltda. Jvl / Ind Rua Dona Francisca, 12.346 – Pirabeiraba 89239-270 – Joinville / SC	Tel. +55 47 3027-6886 Fax +55 47 3027-6888 filial.sc@sew.com.br
Bulgaria			
Sales	Sofia	BEVER-DRIVE GmbH Bogdanovetz Str.1 1606 Sofia	Tel. +359 2 9151160 Fax +359 2 9151166 bever@bever.bg

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Cameroon			
Sales	Douala	SEW-EURODRIVE SARLU Ancienne Route Bonabéri P.O. Box B.P 8674 Douala-Cameroun	Tel. +237 233 39 12 35 Fax +237 233 39 02 10 www.sew-eurodrive.ci/ info@sew-eurodrive.cm
Canada			
Assembly Sales Service	Toronto	SEW-EURODRIVE CO. OF CANADA LTD. 210 Walker Drive Bramalea, ON L6T 3W1	Tel. +1 905 791-1553 Fax +1 905 791-2999 http://www.sew-eurodrive.ca l.watson@sew-eurodrive.ca
	Vancouver	SEW-EURODRIVE CO. OF CANADA LTD. Tilbury Industrial Park 7188 Honeyman Street Delta, BC V4G 1G1	Tel. +1 604 946-5535 Fax +1 604 946-2513 b.wake@sew-eurodrive.ca
	Montreal	SEW-EURODRIVE CO. OF CANADA LTD. 2001 Ch. de l'Aviation Dorval Quebec H9P 2X6	Tel. +1 514 367-1124 Fax +1 514 367-3677 n.paradis@sew-eurodrive.ca
Chile			
Assembly Sales Service	Santiago de Chile	SEW-EURODRIVE CHILE LTDA Las Encinas 1295 Parque Industrial Valle Grande LAMPA Santiago de Chile P.O. Box Casilla 23 Correo Quilicura - Santiago - Chile	Tel. +56 2 2757 7000 Fax +56 2 2757 7001 http://www.sew-eurodrive.cl ventas@sew-eurodrive.cl
China			
Production Assembly Sales Service	Tianjin	SEW-EURODRIVE (Tianjin) Co., Ltd. No. 78, 13th Avenue, TEDA Tianjin 300457	Tel. +86 22 25322612 Fax +86 22 25323273 http://www.sew-eurodrive.cn info@sew-eurodrive.cn
Assembly Sales Service	Suzhou	SEW-EURODRIVE (Suzhou) Co., Ltd. 333, Suhong Middle Road Suzhou Industrial Park Jiangsu Province, 215021	Tel. +86 512 62581781 Fax +86 512 62581783 suzhou@sew-eurodrive.cn
	Guangzhou	SEW-EURODRIVE (Guangzhou) Co., Ltd. No. 9, JunDa Road East Section of GETDD Guangzhou 510530	Tel. +86 20 82267890 Fax +86 20 82267922 guangzhou@sew-eurodrive.cn
	Shenyang	SEW-EURODRIVE (Shenyang) Co., Ltd. 10A-2, 6th Road Shenyang Economic Technological Development Area Shenyang, 110141	Tel. +86 24 25382538 Fax +86 24 25382580 shenyang@sew-eurodrive.cn
	Taiyuan	SEW-EURODRIVE (Taiyuan) Co,. Ltd. No.3, HuaZhang Street, TaiYuan Economic & Technical Development Zone ShanXi, 030032	Tel. +86-351-7117520 Fax +86-351-7117522 taiyuan@sew-eurodrive.cn
	Wuhan	SEW-EURODRIVE (Wuhan) Co., Ltd. 10A-2, 6th Road No. 59, the 4th Quanli Road, WEDA 430056 Wuhan	Tel. +86 27 84478388 Fax +86 27 84478389 wuhan@sew-eurodrive.cn
	Xi'An	SEW-EURODRIVE (Xi'An) Co., Ltd. No. 12 Jinye 2nd Road Xi'An High-Technology Industrial Development Zone Xi'An 710065	Tel. +86 29 68686262 Fax +86 29 68686311 xian@sew-eurodrive.cn
Sales Service	Hong Kong	SEW-EURODRIVE LTD. Unit No. 801-806, 8th Floor Hong Leong Industrial Complex No. 4, Wang Kwong Road Kowloon, Hong Kong	Tel. +852 36902200 Fax +852 36902211 contact@sew-eurodrive.hk

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Colombia			
Assembly Sales Service	Bogota	SEW-EURODRIVE COLOMBIA LTDA. Calle 17 No. 132-18 Interior 2 Bodega 6, Manzana B Santafé de Bogotá	Tel. +57 1 54750-50 Fax +57 1 54750-44 http://www.sew-eurodrive.com.co sew@sew-eurodrive.com.co
Croatia			
Sales Service	Zagreb	KOMPEKS d. o. o. Zeleni dol 10 10 000 Zagreb	Tel. +385 1 4613-158 Fax +385 1 4613-158 kompeks@inet.hr
Czech Republic			
Assembly Sales Service	Hostivice	SEW-EURODRIVE CZ s.r.o. Floriánova 2459 253 01 Hostivice	Tel. +420 255 709 601 Fax +420 235 350 613 http://www.sew-eurodrive.cz sew@sew-eurodrive.cz
Denmark			
Assembly Sales Service	Copenhagen	SEW-EURODRIVEA/S Geminivej 28-30 2670 Greve	Tel. +45 43 95 8500 Fax +45 43 9585-09 http://www.sew-eurodrive.dk sew@sew-eurodrive.dk
Service	Vejle	SEW-EURODRIVE A/S Bødkervej 2 7100 Vejle	Tel. +45 43 9585 00 http://www.sew-eurodrive.dk sew@sew-eurodrive.dk
Egypt			
Sales Service	Cairo	Copam Egypt for Engineering & Agencies Building 10, Block 13005, First Industrial Zone, Obour City Cairo	Tel. +202 44812673 / 79 (7 lines) Fax +202 44812685 http://www.copam-egypt.com copam@copam-egypt.com
Estonia			
Sales	Tallin	ALAS-KUUL AS Loomäe tee 1, Lehmja küla 75306 Rae vald Harjumaa	Tel. +372 6593230 Fax +372 6593231 http://www.alas-kuul.ee info@alas-kuul.ee
Finland			
Assembly Sales Service	Hollola	SEW-EURODRIVE OY Vesimäentie 4 15860 Hollola	Tel. +358 201 589-300 Fax +358 3 780-6211 http://www.sew-eurodrive.fi sew@sew.fi
Service	Hollola	SEW-EURODRIVE OY Keskikankaantie 21 15860 Hollola	Tel. +358 201 589-300 Fax +358 3 780-6211 http://www.sew-eurodrive.fi sew@sew.fi
	Tornio	SEW-EURODRIVE Oy Lossirannankatu 5 95420 Tornio	Tel. +358 201 589 300 Fax +358 3 780 6211 http://www.sew-eurodrive.fi sew@sew.fi
Production Assembly	Karkkila	SEW Industrial Gears Oy Santasalonkatu 6, PL 8 03620 Karkkila, 03601 Karkkila	Tel. +358 201 589-300 Fax +358 201 589-310 http://www.sew-eurodrive.fi sew@sew.fi
France			
Production Sales	Hagenau	SEW USOCOME 48-54 route de Soufflenheim B. P. 20185 67506 Haguenau Cedex	Tel. +33 3 88 73 67 00 http://www.usocome.com sew@usocome.com
Production	Forbach	SEW USOCOME Zone industrielle Technopôle Forbach Sud B. P. 30269 57604 Forbach Cedex	Tel. +33 3 87 29 38 00
	Brumath	SEW USOCOME 1 Rue de Bruxelles 67670 Mommenheim Cedex	Tel. +33 3 88 37 48 00

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France			
Assembly Sales Service	Bordeaux	SEW USOCOME Parc d'activités de Magellan 62 avenue de Magellan – B. P. 182 33607 Pessac Cedex	Tel. +33 5 57 26 39 00 dtcbordeaux@usocome.com
	Hagenau	SEW USOCOME 48-54 route de Soufflenheim B. P. 20185 67506 Haguenau Cedex	Tel. +33 3 88 73 67 00 dtchaguenau@usocome.com
	Lyon	SEW USOCOME 75 rue Antoine Condorcet 38090 Vaulx-Milieu	Tel. +33 4 74 99 60 00 dtclyon@usocome.com
	Nantes	SEW USOCOME Parc d'activités de la forêt 4 rue des Fontenelles 44140 Le Bignon	Tel. +33 2 40 78 42 00 dtcnantes@usocome.com
	Paris	SEW USOCOME Zone industrielle 2 rue Denis Papin 77390 Verneuil l'Étang	Tel. +33 1 64 42 40 80 dtcparis@usocome.com

Gabon
Representation: Cameroon

Germany			
Headquarters Production Sales	Bruchsal	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 42 76646 Bruchsal	Tel. +49 7251 75-0 Fax +49 7251 75-1970 http://www.sew-eurodrive.de sew@sew-eurodrive.de
Production / Industrial Gears	Bruchsal	SEW-EURODRIVE GmbH & Co KG Christian-Pähr-Str. 10 76646 Bruchsal	Tel. +49 7251 75-0 Fax +49 7251 75-2970
Production / Precision Gear Units	Bruchsal	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 42 76646 Bruchsal	Tel. +49 7251 75-0 Fax +49 7251 75-1970 sew@sew-eurodrive.de
Production	Graben	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 1 76676 Graben-Neudorf	Tel. +49 7251 75-0 Fax +49 7251-2970
Service Competence Center	Mechanics / Mechatronics	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 1 76676 Graben-Neudorf	Tel. +49 7251 75-1710 Fax +49 7251 75-1711 scc-mechanik@sew-eurodrive.de
	Electronics	SEW-EURODRIVE GmbH & Co KG Christian-Pähr-Straße 12 76646 Bruchsal	Tel. +49 7251 75-1780 Fax +49 7251 75-1769 scc-elektronik@sew-eurodrive.de
	MAXOLUTION® Factory Automation	SEW-EURODRIVE GmbH & Co KG Eisenbahnstraße 11 76646 Bruchsal	Tel. +49 7251 75-0 Fax +49 7251 75-1970 sew@sew-eurodrive.de
Drive Technology Center	North	SEW-EURODRIVE GmbH & Co KG Alte Ricklinger Straße 43 30823 Garbsen (Hannover)	Tel. +49 5137 8798-30 Fax +49 5137 8798-55 dtc-nord@sew-eurodrive.de
	East	SEW-EURODRIVE GmbH & Co KG Dänkritzer Weg 1 08393 Meerane (Zwickau)	Tel. +49 3764 7606-0 Fax +49 3764 7606-20 dtc-ost@sew-eurodrive.de
	South	SEW-EURODRIVE GmbH & Co KG Domagkstraße 5 85551 Kirchheim (München)	Tel. +49 89 909551-21 Fax +49 89 909551-50 dtc-sued@sew-eurodrive.de
	West	SEW-EURODRIVE GmbH & Co KG Siemensstraße 1 40764 Langenfeld (Düsseldorf)	Tel. +49 2173 8507-10 Fax +49 2173 8507-50 dtc-west@sew-eurodrive.de
Drive Center	Berlin	SEW-EURODRIVE GmbH & Co KG Alexander-Meißner-Straße 44 12526 Berlin	Tel. +49 306331131-30 Fax +49 306331131-36 dc-berlin@sew-eurodrive.de
	Bremen	SEW-EURODRIVE GmbH & Co KG Allerkai 4 28309 Bremen	Tel. +49 421 33918-10 Fax +49 421 33918-22 tb-bremen@sew-eurodrive.de

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Germany			
	Hamburg	SEW-EURODRIVE GmbH & Co KG Hasselbinnen 11 22869 Schenefeld	Tel. +49 40298109-60 Fax +49 40298109-70 dc-hamburg@sew-eurodrive.de
	Saarland	SEW-EURODRIVE GmbH & Co KG Gottlieb-Daimler-Straße 4 66773 Schwalbach Saar – Hülzweiler	Tel. +49 6831 48946 10 Fax +49 6831 48946 13 dc-saarland@sew-eurodrive.de
	Ulm	SEW-EURODRIVE GmbH & Co KG Dieselstraße 18 89160 Dornstadt	Tel. +49 7348 9885-0 Fax +49 7348 9885-90 dc-ulm@sew-eurodrive.de
	Würzburg	SEW-EURODRIVE GmbH & Co KG Nürnbergerstraße 118 97076 Würzburg-Lengfeld	Tel. +49 931 27886-60 Fax +49 931 27886-66 dc-wuerzburg@sew-eurodrive.de
Drive Service Hotline / 24 Hour Service			0 800 SEWHELP 0 800 7394357
Great Britain			
Assembly Sales Service	Normanton	SEW-EURODRIVE Ltd. DeVilliers Way Trident Park Normanton West Yorkshire WF6 1GX	Tel. +44 1924 893-855 Fax +44 1924 893-702 http://www.sew-eurodrive.co.uk info@sew-eurodrive.co.uk
Greece			
Sales	Athens	Christ. Boznos & Son S.A. 12, K. Mavromichali Street P.O. Box 80136 18545 Piraeus	Tel. +30 2 1042 251-34 Fax +30 2 1042 251-59 http://www.boznos.gr info@boznos.gr
Hungary			
Sales Service	Budapest	SEW-EURODRIVE Kft. Csillaghegyí út 13. 1037 Budapest	Tel. +36 1 437 06-58 Fax +36 1 437 06-50 http://www.sew-eurodrive.hu office@sew-eurodrive.hu
Iceland			
Sales	Reykjavik	Varma & Vélaverk ehf. Knarrarvogi 4 104 Reykjavík	Tel. +354 585 1070 Fax +354 585)1071 https://vov.is/ vov@vov.is
India			
Registered Office Assembly Sales Service	Vadodara	SEW-EURODRIVE India Private Limited 302, NOTUS IT PARK, Sarabhai Campus, Beside Notus Pride, Genda Circle, Vadodara 390023 Gujarat	Tel. +91 265 3045200 Fax +91 265 3045300 http://www.seweurodriveindia.com salesvadodara@seweurodriveindia.com
Assembly Sales Service	Chennai	SEW-EURODRIVE India Private Limited Plot No. K3/1, Sipcot Industrial Park Phase II Mambakkam Village Sriperumbudur - 602105 Kancheepuram Dist, Tamil Nadu	Tel. +91 44 37188888 Fax +91 44 37188811 saleschennai@seweurodriveindia.com
	Pune	SEW-EURODRIVE India Private Limited Plant: Plot No. D236/1, Chakan Industrial Area Phase- II, Warale, Tal- Khed, Pune-410501, Maharashtra	Tel. +91 21 35 628700 Fax +91 21 35 628715 salespune@seweurodriveindia.com
Sales Service	Gurgaon	SEW-EURODRIVE India Private Limited Drive Center Gurugram Plot no 395, Phase-IV, UdyogVihar Gurugram , 122016 Haryana	Tel. +91 99588 78855 salesgurgaon@seweurodriveindia.com

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Indonesia			
Sales	Medan	PT. Serumpun Indah Lestari Jl.Pulau Solor no. 8, Kawasan Industri Medan II Medan 20252	Tel. +62 61 687 1221 Fax +62 61 6871429 / +62 61 6871458 / +62 61 30008041 sil@serumpunindah.com serumpunindah@yahoo.com http://www.serumpunindah.com
	Jakarta	PT. Cahaya Sukses Abadi Komplek Rukan Puri Mutiara Blok A no 99, Sunter Jakarta 14350	Tel. +62 21 65310599 Fax +62 21 65310600 csajkt@cbn.net.id
	Jakarta	PT. Agrindo Putra Lestari JL.Pantai Indah Selatan, Komplek Sentra Industri Terpadu, Pantai indah Kapuk Tahap III, Blok E No. 27 Jakarta 14470	Tel. +62 21 2921-8899 Fax +62 21 2921-8988 aplindo@indosat.net.id http://www.aplindo.com
	Surabaya	PT. TRIAGRI JAYA ABADI Jl. Sukosemolo No. 63, Galaxi Bumi Permai G6 No. 11 Surabaya 60111	Tel. +62 31 5990128 Fax +62 31 5962666 sales@triagri.co.id http://www.triagri.co.id
	Surabaya	CV. Multi Mas Jl. Raden Saleh 43A Kav. 18 Surabaya 60174	Tel. +62 31 5458589 Fax +62 31 5317220 sianhwa@sby.centrin.net.id http://www.cvmultimas.com
Ireland			
Sales Service	Dublin	Alperton Engineering Ltd. 48 Moyle Road Dublin Industrial Estate Glasnevin, Dublin 11	Tel. +353 1 830-6277 Fax +353 1 830-6458 http://www.alperton.ie info@alperton.ie
Israel			
Sales	Tel Aviv	Liraz Handasa Ltd. Ahofer Str 34B / 228 58858 Holon	Tel. +972 3 5599511 Fax +972 3 5599512 http://www.liraz-handasa.co.il office@liraz-handasa.co.il
Italy			
Assembly Sales Service	Milan	SEW-EURODRIVE S.a.s. di SEW S.r.l. & Co. Via Bernini,12 20033 Solaro (Milano)	Tel. +39 02 96 980229 Fax +39 02 96 980 999 http://www.sew-eurodrive.it milano@sew-eurodrive.it
Ivory Coast			
Sales	Abidjan	SEW-EURODRIVE SARL Ivory Coast Rue des Pêcheurs, Zone 3 26 BP 916 Abidjan 26	Tel. +225 27 21 21 81 05 Fax +225 27 21 25 30 47 info@sew-eurodrive.ci http://www.sew-eurodrive.ci
Japan			
Assembly Sales Service	Iwata	SEW-EURODRIVE JAPAN CO., LTD 250-1, Shimoman-no, Iwata Shizuoka 438-0818	Tel. +81 538 373811 Fax +81 538 373814 http://www.sew-eurodrive.co.jp sewjapan@sew-eurodrive.co.jp
Kazakhstan			
Sales Service	Almaty	SEW-EURODRIVE LLP 291-291A, Tole bi street 050031, Almaty	Tel. +7 (727) 350 5156 Fax +7 (727) 350 5156 http://www.sew-eurodrive.kz sew@sew-eurodrive.kz
	Tashkent	Representative Office SEW-EURODRIVE Representative office in Uzbekistan 95A Amir Temur ave, office 401/3 100084 Tashkent	Tel. +998 97 134 01 99 http://www.sew-eurodrive.uz sew@sew-eurodrive.uz
	Ulaanbaatar	IM Trading LLC Olympic street 28B/3 Sukhbaatar district, Ulaanbaatar 14230, MN	Tel. +976-77109997 Fax +976-77109997 imt@imt.mn

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Latvia			
Sales	Riga	SIA Alas-Kuul Katlakalna 11C 1073 Riga	Tel. +371 6 7139253 Fax +371 6 7139386 http://www.alas-kuul.lv info@alas-kuul.com
Lebanon			
Sales (Lebanon)	Beirut	Gabriel Acar & Fils sarl B. P. 80484 Bourj Hammoud, Beirut	Tel. +961 1 510 532 Fax +961 1 494 971 ssacar@inco.com.lb
Sales (Jordan, Kuwait , Saudi Arabia, Syria)	Beirut	Middle East Drives S.A.L. (offshore) Sin El Fil. B. P. 55-378 Beirut	Tel. +961 1 494 786 Fax +961 1 494 971 http://www.medrives.com info@medrives.com
Lithuania			
Sales	Alytus	UAB Irseva Statybininku 106C 63431 Alytus	Tel. +370 315 79204 Fax +370 315 56175 http://www.irseva.lt irmantas@irseva.lt
Luxembourg			
Representation: Belgium			
Macedonia			
Sales	Skopje	Boznos DOOEL Dime Anicin 2A/7A 1000 Skopje	Tel. +389 23256553 Fax +389 23256554 http://www.boznos.mk
Malaysia			
Assembly Sales Service	Johor	SEW-EURODRIVE SDN BHD No. 95, Jalan Seroja 39, Taman Johor Jaya 81000 Johor Bahru, Johor West Malaysia	Tel. +60 7 3549409 Fax +60 7 3541404 sales@sew-eurodrive.com.my
Mexico			
Assembly Sales Service	Quéretaro	SEW-EURODRIVE MEXICO S.A. de C.V. SEM-981118-M93 Tequisquiapan No. 102 Parque Industrial Quéretaro C.P. 76220 Querétaro, México	Tel. +52 442 1030-300 Fax +52 442 1030-301 http://www.sew-eurodrive.com.mx scmexico@seweurodrive.com.mx
Sales Service	Puebla	SEW-EURODRIVE MEXICO S.A. de C.V. Calzada Zavaleta No. 3922 Piso 2 Local 6 Col. Santa Cruz Buenavista C.P. 72154 Puebla, México	Tel. +52 (222) 221 248 http://www.sew-eurodrive.com.mx scmexico@seweurodrive.com.mx
Mongolia			
Technical Office	Ulaanbaatar	IM Trading LLC Olympic street 28B/3 Sukhbaatar district, Ulaanbaatar 14230, MN	Tel. +976-77109997 Tel. +976-99070395 Fax +976-77109997 http://imt.mn/ imt@imt.mn
Morocco			
Sales Service Assembly	Bouskoura	SEW-EURODRIVE Morocco SARL Parc Industriel CFCIM, Lot. 55/59 27182 Bouskoura Grand Casablanca	Tel. +212 522 88 85 00 Fax +212 522 88 84 50 http://www.sew-eurodrive.ma sew@sew-eurodrive.ma
Namibia			
Sales	Swakopmund	DB MINING & INDUSTRIAL SUPPLIES CC Einstein Street Strauss Industrial Park Unit1 Swakopmund	Tel. +264 64 462 738 Fax +264 64 462 734 anton@dbminingnam.com

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Netherlands			
Assembly Sales Service	Rotterdam	SEW-EURODRIVE B.V. Industrieweg 175 3044 AS Rotterdam Postbus 10085 3004 AB Rotterdam	Tel. +31 10 4463-700 Fax +31 10 4155-552 Service: 0800-SEWHELP http://www.sew-eurodrive.nl info@sew-eurodrive.nl
New Zealand			
Assembly Sales Service	Auckland	SEW-EURODRIVE NEW ZEALAND LTD. P.O. Box 58-428 82 Greenmount drive East Tamaki Auckland	Tel. +64 9 2745627 Fax +64 9 2740165 http://www.sew-eurodrive.co.nz sales@sew-eurodrive.co.nz
	Christchurch	SEW-EURODRIVE NEW ZEALAND LTD. 30 Lodestar Avenue, Wigram Christchurch	Tel. +64 3 384-6251 Fax +64 3 384-6455 sales@sew-eurodrive.co.nz
Nigeria			
Sales	Lagos	Greenpeg Nig. Ltd Plot 296A, Adeyemo Akapo Str. Omole GRA Ikeja Lagos-Nigeria	Tel. +234-701-821-9200-1 http://www.greenpegltd.com sales@greenpegltd.com
Norway			
Assembly Sales Service	Moss	SEW-EURODRIVE A/S Solgaard skog 71 1599 Moss	Tel. +47 69 24 10 20 Fax +47 69 24 10 40 http://www.sew-eurodrive.no sew@sew-eurodrive.no
Pakistan			
Sales	Karachi	Industrial Power Drives Al-Fatah Chamber A/3, 1st Floor Central Commercial Area, Sultan Ahmed Shah Road, Block 7/8, Karachi	Tel. +92 21 452 9369 Fax +92-21-454 7365 seweurodrive@cyber.net.pk
Paraguay			
Sales	Fernando de la Mora	SEW-EURODRIVE PARAGUAY S.R.L Nu Guazu No. 642 casi Campo Esperanza Santisima Trinidad Asuncion	Tel. +595 991 519695 Fax +595 21 3285539 sewpy@sew-eurodrive.com.py
Peru			
Assembly Sales Service	Lima	SEW EURODRIVE DEL PERU S.A.C. Los Calderos, 120-124 Urbanizacion Industrial Vulcano, ATE, Lima	Tel. +51 1 3495280 Fax +51 1 3493002 http://www.sew-eurodrive.com.pe sewperu@sew-eurodrive.com.pe
Philippines			
Sales	Makati	P.T. Cerna Corporation 4137 Ponte St., Brgy. Sta. Cruz Makati City 1205	Tel. +63 2 519 6214 Fax +63 2 890 2802 mech_drive_sys@ptcerna.com http://www.ptcerna.com
Poland			
Assembly Sales Service	Łódź	SEW-EURODRIVE Polska Sp.z.o.o. ul. Techniczna 5 92-518 Łódź	Tel. +48 42 293 00 00 Fax +48 42 293 00 49 http://www.sew-eurodrive.pl sew@sew-eurodrive.pl
	Service	Tel. +48 42 293 0030 Fax +48 42 293 0043	24 Hour Service Tel. +48 602 739 739 (+48 602 SEW SEW) serwis@sew-eurodrive.pl
Portugal			
Assembly Sales Service	Coimbra	SEW-EURODRIVE, LDA. Av. da Fonte Nova, n.º 86 3050-379 Mealhada	Tel. +351 231 20 9670 Fax +351 231 20 3685 http://www.sew-eurodrive.pt infosew@sew-eurodrive.pt

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Romania			
Sales Service	Bucharest	Sialco Trading SRL str. Brazilia nr. 36 011783 Bucuresti	Tel. +40 21 230-1328 Fax +40 21 230-7170 http://www.sialco.ro sialco@sialco.ro
Russia			
Assembly Sales Service	St. Petersburg	ЗАО «СЕВ-ЕВРОДРАЙФ» 188660, Russia, Leningrad Region, Vse-volozhsky District, Korabselki, Aleksandra Nevskogo str. building 4, block 1 P.O. Box 36 195220 St. Petersburg	Tel. +7 812 3332522 / +7 812 5357142 Fax +7 812 3332523 http://www.sew-eurodrive.ru sew@sew-eurodrive.ru
Senegal			
Sales	Dakar	SENEMECA Mécanique Générale Km 8, Route de Rufisque B.P. 3251, Dakar	Tel. +221 338 494 770 Fax +221 338 494 771 http://www.senemeca.com senemeca@senemeca.sn
Serbia			
Sales	Belgrade	DIPAR d.o.o. Ustanicka 128a PC Košum, IV floor 11000 Beograd	Tel. +381 11 347 3244 / +381 11 288 0393 Fax +381 11 347 1337 office@dipar.rs
Singapore			
Assembly Sales Service	Singapore	SEW-EURODRIVE PTE. LTD. No 9, Tuas Drive 2 Jurong Industrial Estate Singapore 638644	Tel. +65 68621701 Fax +65 68612827 http://www.sew-eurodrive.com.sg sewsingapore@sew-eurodrive.com
Slovakia			
Sales	Bernolákovo	SEW-Eurodrive SK s.r.o. Priemyselná ulica 6267/7 900 27 Bernolákovo	Tel.+421 2 48 212 800 http://www.sew-eurodrive.sk sew@sew-eurodrive.sk
Slovenia			
Sales Service	Celje	Pakman - Pogonska Tehnika d.o.o. UI. XIV. divizije 14 3000 Celje	Tel. +386 3 490 83-20 Fax +386 3 490 83-21 pakman@siol.net
South Africa			
Assembly Sales Service	Johannesburg	SEW-EURODRIVE (PROPRIETARY) LIMITED Eurodrive House Cnr. Adcock Ingram and Aerodrome Roads Aeroton Ext. 2 Johannesburg 2013 P.O.Box 90004 Bertsham 2013	Tel. +27 11 248-7000 Fax +27 11 248-7289 http://www.sew.co.za info@sew.co.za
	Cape Town	SEW-EURODRIVE (PROPRIETARY) LIMITED Rainbow Park Cnr. Racecourse & Omuramba Road Montague Gardens Cape Town P.O.Box 36556 Chempet 7442	Tel. +27 21 552-9820 Fax +27 21 552-9830 Telex 576 062 bgriffiths@sew.co.za
	Durban	SEW-EURODRIVE (PROPRIETARY) LIMITED 48 Prospecton Road Isipingo Durban P.O. Box 10433, Ashwood 3605	Tel. +27 31 902 3815 Fax +27 31 902 3826 cdejager@sew.co.za
	Nelspruit	SEW-EURODRIVE (PROPRIETARY) LIMITED 7 Christie Crescent Vintonia P.O.Box 1942 Nelspruit 1200	Tel. +27 13 752-8007 Fax +27 13 752-8008 robermeyer@sew.co.za

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South Korea			
Assembly Sales Service	Ansan	SEW-EURODRIVE Korea Co., Ltd. 7, Dangjaengi-ro, Danwon-gu, Ansan-si, Gyeonggi-do, Zip 425-839	Tel. +82 31 492-8051 Fax +82 31 492-8056 http://www.sew-eurodrive.kr master.korea@sew-eurodrive.com
	Busan	SEW-EURODRIVE Korea Co., Ltd. 28, Noksansandan 262-ro 50beon-gil, Gangseo-gu, Busan, Zip 618-820	Tel. +82 51 832-0204 Fax +82 51 832-0230
Assembly Service	Siheung	SEW-EURODRIVE Korea Co., Ltd. 35, Emtibeui 26-ro 58beon-gil, Siheung-si, Gyeonggi-do	http://www.sew-eurodrive.kr
Spain			
Assembly Sales Service	Bilbao	SEW-EURODRIVE ESPAÑA, S.L. Parque Tecnológico, Edificio, 302 48170 Zamudio (Vizcaya)	Tel. +34 94 43184-70 http://www.sew-eurodrive.es sew.spain@sew-eurodrive.es
Sri Lanka			
Sales	Colombo	SM International (Pte) Ltd 254, Galle Raod Colombo 4, Sri Lanka	Tel. +94 1 2584887 Fax +94 1 2582981
Swaziland			
Sales	Manzini	C G Trading Co. (Pty) Ltd Simunye street Matsapha, Manzini	Tel. +268 7602 0790 Fax +268 2 518 5033 charles@cgtrading.co.sz www.cgtradingswaziland.com
Sweden			
Assembly Sales Service	Jönköping	SEW-EURODRIVE AB Gnejsvägen 6-8 553 03 Jönköping Box 3100 S-550 03 Jönköping	Tel. +46 36 34 42 00 Fax +46 36 34 42 80 http://www.sew-eurodrive.se jonkoping@sew.se
Switzerland			
Assembly Sales Service	Basel	Alfred Imhof A.G. Jurastrasse 10 4142 Münchenstein bei Basel	Tel. +41 61 417 1717 Fax +41 61 417 1700 http://www.imhof-sew.ch info@imhof-sew.ch
Taiwan			
Sales	Taipei	Ting Shou Trading Co., Ltd. 6F-3, No. 267, Sec. 2 Tung Huw S. Road Taipei	Tel. +886 2 27383535 Fax +886 2 27368268 Telex 27 245 sewtwn@ms63.hinet.net http://www.tingshou.com.tw
	Nan Tou	Ting Shou Trading Co., Ltd. No. 55 Kung Yeh N. Road Industrial District Nan Tou 540	Tel. +886 49 255353 Fax +886 49 257878 sewtwn@ms63.hinet.net http://www.tingshou.com.tw
Tanzania			
Sales	Daressalam	SEW-EURODRIVE PTY LIMITED TANZANIA Plot 52, Regent Estate PO Box 106274 Dar Es Salaam	Tel. +255 0 22 277 5780 Fax +255 0 22 277 5788 http://www.sew-eurodrive.co.tz info@sew.co.tz
Thailand			
Assembly Sales Service	Chonburi	SEW-EURODRIVE (Thailand) Ltd. 700/456, Moo.7, Donhuaroh Muang Chonburi 20000	Tel. +66 38 454281 Fax +66 38 454288 sewthailand@sew-eurodrive.com
Tunisia			
Sales	Tunis	T. M.S. Technic Marketing Service Zone Industrielle Mghira 2 Lot No. 39 2082 Fouchana	Tel. +216 79 40 88 77 Fax +216 79 40 88 66 http://www.tms.com.tn tms@tms.com.tn

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Turkey			
Assembly Sales Service	Kocaeli-Gebze	SEW-EURODRIVE Ana Merkez Gebze Organize Sanayi Böl. 400 Sok No. 401 41480 Gebze Kocaeli	Tel. +90 262 9991000 04 Fax +90 262 9991009 http://www.sew-eurodrive.com.tr sew@sew-eurodrive.com.tr
Ukraine			
Assembly Sales Service	Dnipropetrovsk	SEW-EURODRIVE, LLC Robochya str., bld. 23-B, office 409 49008 Dnipro	Tel. +380 56 370 3211 Fax +380 56 372 2078 http://www.sew-eurodrive.ua sew@sew-eurodrive.ua
United Arab Emirates			
Drive Technology Center	Dubai	SEW-EURODRIVE FZE PO Box 263835 Jebel Ali Free Zone – South, P.O. Box Dubai, United Arab Emirates	Tel. +971 (0)4 8806461 Fax +971 (0)4 8806464 info@sew-eurodrive.ae
Uruguay			
Assembly Sales	Montevideo	SEW-EURODRIVE Uruguay, S. A. Jose Serrato 3569 Esqina Corumbe CP 12000 Montevideo	Tel. +598 2 21181-89 Fax +598 2 21181-90 sewuy@sew-eurodrive.com.uy
USA			
Production Assembly Sales Service	Southeast Region	SEW-EURODRIVE INC. 1295 Old Spartanburg Highway P.O. Box 518 Lyman, S.C. 29365	Tel. +1 864 439-7537 Fax Sales +1 864 439-7830 Fax Production +1 864 439-9948 Fax Assembly +1 864 439-0566 Fax Confidential/HR +1 864 949-5557 http://www.seweurodrive.com cslyman@seweurodrive.com
Assembly Sales Service	Northeast Region	SEW-EURODRIVE INC. Pureland Ind. Complex 2107 High Hill Road, P.O. Box 481 Bridgeport, New Jersey 08014	Tel. +1 856 467-2277 Fax +1 856 845-3179 csbridgeport@seweurodrive.com
	Midwest Region	SEW-EURODRIVE INC. 2001 West Main Street Troy, Ohio 45373	Tel. +1 937 335-0036 Fax +1 937 332-0038 cstroy@seweurodrive.com
	Southwest Region	SEW-EURODRIVE INC. 3950 Platinum Way Dallas, Texas 75237	Tel. +1 214 330-4824 Fax +1 214 330-4724 csdallas@seweurodrive.com
	Western Region	SEW-EURODRIVE INC. 30599 San Antonio St. Hayward, CA 94544	Tel. +1 510 487-3560 Fax +1 510 487-6433 cshayward@seweurodrive.com
	Wellford	SEW-EURODRIVE INC. 148/150 Finch Rd. Wellford, S.C. 29385	Tel. +1 864 439-7537 Fax +1 864 661 1167 IGOrders@seweurodrive.com
	Additional addresses for service provided on request!		
Vietnam			
Sales	Ho Chi Minh City	SEW-EURODRIVE PTE. LTD. RO at Hochiminh City Floor 8, KV I, Loyal building, 151-151 Bis Vo Thi Sau street, ward 6, District 3, Ho Chi Minh City, Vietnam	Tel. +84 937 299 700 huytam.phan@sew-eurodrive.com
	Hanoi	MICO LTD Quảng Trị - North Vietnam / All sectors except Construction Materials 8th Floor, Ocean Park Building, 01 Dao Duy Anh St, Ha Noi, Viet Nam	Tel. +84 4 39386666 Fax +84 4 3938 6888 nam_ph@micogroup.com.vn http://www.micogroup.com.vn
Zambia			
Representation: South Africa			

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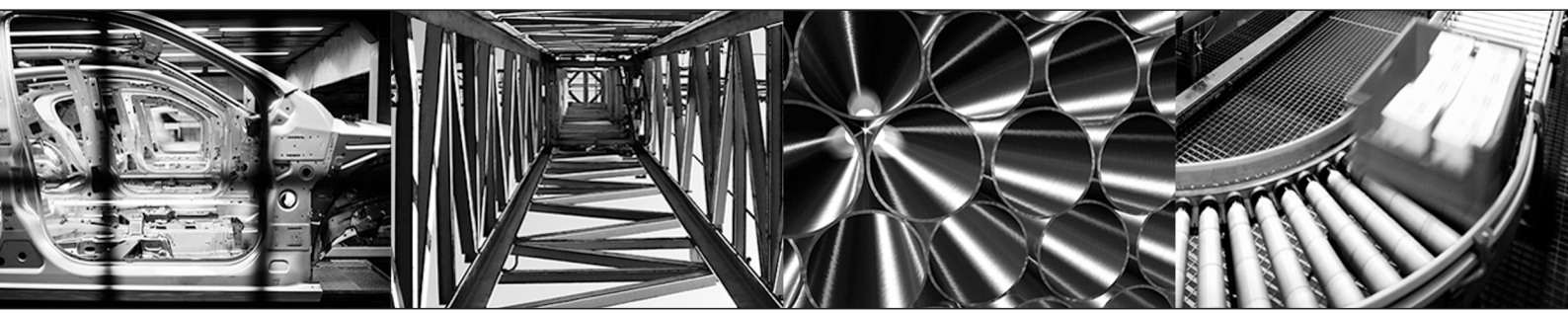

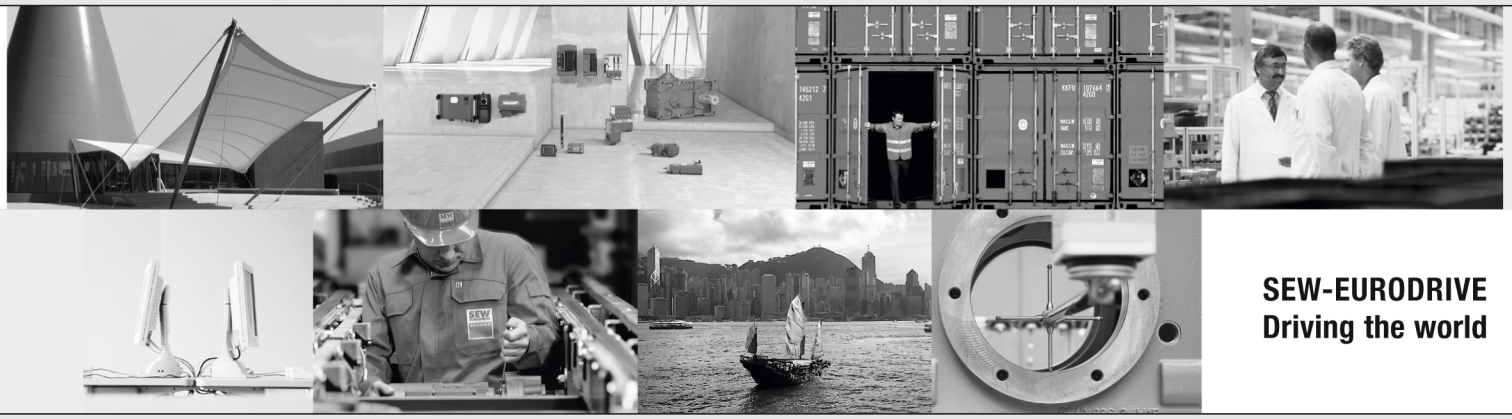

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7. Motor Operating Instructions and Wiring Diagram

SEW EURODRIVE

Operating Instructions

AC Motors

DR..71 – 315, DRN63 – 315, DR2..56 – 80

Edition 06/2019

25957074/EN

Contents

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1 General information

1.1 About this documentation

The current version of the documentation is the original.

This documentation is an integral part of the product. The documentation is intended for all employees who perform work on the product.

Make sure this documentation is accessible and legible. Ensure that persons responsible for the systems and their operation as well as persons who work on the product independently have read through the documentation carefully and understood it. If you are unclear about any of the information in this documentation, or if you require further information, contact SEW-EURODRIVE.

1.2 Structure of the safety notes

1.2.1 Meaning of signal words

The following table shows the grading and meaning of the signal words for safety notes.

Signal word	Meaning	Consequences if disregarded
⚠ **DANGER**	Imminent hazard	Severe or fatal injuries
⚠ **WARNING**	Possible dangerous situation	Severe or fatal injuries
⚠ **CAUTION**	Possible dangerous situation	Minor injuries
NOTICE	Possible damage to property	Damage to the product or its environment
INFORMATION	Useful information or tip: Simplifies handling of the product.	

1.2.2 Structure of section-related safety notes

Section-related safety notes do not apply to a specific action but to several actions pertaining to one subject. The hazard symbols used either indicate a general hazard or a specific hazard.

This is the formal structure of a safety note for a specific section:

SIGNAL WORD

Type and source of hazard.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the hazard.

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Meaning of the hazard symbols

The hazard symbols in the safety notes have the following meaning:

Hazard symbol	Meaning
	General hazard
	Warning of dangerous electrical voltage
	Warning of hot surfaces
	Warning of automatic restart

1.2.3 Structure of embedded safety notes

Embedded safety notes are directly integrated into the instructions just before the description of the dangerous action.

This is the formal structure of an embedded safety note:

⚠ **SIGNAL WORD** Type and source of hazard. Possible consequence(s) if disregarded. Measure(s) to prevent the hazard.

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1.3 Rights to claim under limited warranty

Read the information in this documentation. This is essential for fault-free operation and fulfillment of any rights to claim under limited warranty. Read the documentation before you start working with the product.

1.4 Product names and trademarks

The brands and product names in this documentation are trademarks or registered trademarks of their respective titleholders.

1.5 Copyright notice

1.6 Other applicable documentation

Observe the corresponding documentation for all further components.

1.6.1 DR..71 – 315, DRN63 – 315, DR2..56 – 80 AC motors

The following publications and documents have to be observed as well:

- Wiring diagrams provided with the motor
- "Gear Unit Series R..7, F..7, K..7, K..9, S..7, SPIROPLAN® W" operating instructions for gearmotors
- Catalogs for AC motors
- Catalogs for gearmotors
- Addendum to the operating instructions "Safety Encoders and Safety Brakes, AC Motors DR.., DRN.., DR2.., EDR.., EDRN.. – Functional Safety"
- "Project Planning for BE.. Brakes" manual – DR.., DRN.., DR2.., EDR.., EDRN.. AC Motors – Standard Brake/Safety Brake"
- If required, "MOVIMOT® MM..D Functional Safety" manual

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2 Safety notes

2.1 Preliminary information

The following general safety notes serve the purpose of preventing injury to persons and damage to property. They primarily apply to the use of products described in this documentation. If you use additional components, also observe the relevant warning and safety notes.

2.2 Duties of the user

As the user, you must ensure that the basic safety notes are observed and complied with. Make sure that persons responsible for the machinery and its operation as well as persons who work on the device independently have read through the documentation carefully and understood it.

As the user, you must ensure that all of the work listed in the following is carried out only by qualified specialists:

- Setup and installation
- Installation and connection
- Startup
- Maintenance and repairs
- Shutdown
- Disassembly

Ensure that the persons who work on the product pay attention to the following regulations, conditions, documentation, and information:

- National and regional safety and accident prevention regulations
- Warning and safety signs on the product
- All other relevant project planning documents, installation and startup instructions, and wiring diagrams
- Do not assemble, install or operate damaged products
- All system-specific specifications and conditions

Ensure that systems in which the product is installed are equipped with additional monitoring and protection devices. Observe the applicable safety regulations and legislation governing technical work equipment and accident prevention regulations.

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2.3 Target group

Specialist for mechanical work

Any mechanical work may only be performed by adequately qualified specialists. Specialists in the context of this documentation are persons familiar with the design, mechanical installation, troubleshooting, and maintenance of the product who possess the following qualifications:

- Qualification in the mechanical area in accordance with the national regulations
- Familiarity with this documentation

Specialist for electrotechnical work

Any electrotechnical work may only be performed by electrically skilled persons with a suitable education. Electrically skilled persons in the context of this documentation are persons familiar with electrical installation, startup, troubleshooting, and maintenance of the product who possess the following qualifications:

- Qualification in the electrotechnical area in accordance with the national regulations
- Familiarity with this documentation

Additional qualification

In addition to that, these persons must be familiar with the valid safety regulations and laws, as well as with the requirements of the standards, directives, and laws specified in this documentation.

The persons must have the express authorization of the company to operate, program, parameterize, label, and ground devices, systems, and circuits in accordance with the standards of safety technology.

Instructed persons

All work in the areas of transportation, storage, operation and waste disposal must be carried out by persons who are trained appropriately. The purpose of the instruction is that the persons are capable of performing the required tasks and work steps in a safe and correct manner.

2.4 Designated use

The product is intended for use in industrial and commercial systems.

In the case of installation in electrical systems or machines, it is prohibited to start the proper operation of the product until it is determined that the machine meets the requirements stipulated in the local laws and directives.

The standards given in the declaration of conformity apply to the product.

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2.5 Transportation/storage

Inspect the shipment for damage as soon as you receive the delivery. Inform the shipping company immediately about any damage. If the product is damaged, it must not be assembled, installed or started up.

The lifting eyebolts are designed to carry only the weight of the motor without gear unit. Tighten installed lifting eyebolts. Mounted gear units have separate suspension attachments, which must be used according to the gear unit operating instructions when lifting the gearmotor. Do not mount any additional loads.

The installed lifting eyebolts are in accordance with DIN 580. Observe the loads and regulations specified there. The tension force vector of the slings must not exceed a 45° angle in accordance with DIN 580.

If necessary, use suitable, sufficiently dimensioned handling equipment.

Observe the following notes when transporting the device:

- Always use all attachment points if available. The attachment points are designed to carry only the mass of the product. Severe or fatal injuries. Do not apply any additional loads.
- Ensure that the product is not subject to mechanical impact.

If the product is not immediately installed, it must be stored in a dry and dust-free location. The product can be stored for up to 9 months without requiring any special measures before startup. Do not store the product outdoors.

Do not transport or store the product on the fan guard.

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2.6 Installation/assembly

Note the following points during installation:

- Make sure that the supports are even, the foot and flange mounting is correct and if there is direct coupling, align with precision.
- Avoid resonance between the rotational frequency and the double supply system frequency.
- Release brake (for motors with mounted brake).
- Turn the rotor by hand and listen for unusual grinding noise.
- Check the direction of rotation in decoupled state.
- Only install or remove belt pulleys and couplings using suitable devices (heat up). Cover the belt pulleys and couplings with a touch guard. Avoid unacceptable belt tension.
- Establish any necessary pipe connections.
- Mounting positions with the shaft end pointing upward must be equipped with a cover to prevent foreign objects from falling into the fan. Ensure that ventilation openings are not obstructed and that used air cannot be drawn in again straight away. The same applies to air from adjacent units.

See also the information in chapter "Mechanical installation" (→ 🗎 32).

2.6.1 Restrictions of use

The following applications are prohibited unless the device is explicitly designed for such use:

- Use in potentially explosive atmospheres
- Use in areas exposed to harmful oils, acids, gases, vapors, dust, and radiation

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2.7 Electric work

2.7.1 Carrying out electric work safely

Observe the following information to carry out electric work safely during installation and maintenance:

- Electric work may only be carried out by electrically skilled persons.
- Always adhere to the 5 safety rules for working on electrical components:
  - Disconnect
  - Secure the drive against restart
  - Check that no voltage is applied
  - Ground and short-circuit it
  - Cover or safeguard neighboring live parts
- When the device is switched on, dangerous voltages are present at all power connections as well as at any connected cables and terminals. This also applies even when the product is inhibited and the motor is at standstill.

2.7.2 Electrical connection

Exceeding the stated tolerances in EN 60034-1 (VDE 0530, Part 1) – voltage ± 5%, frequency ± 2%, curve shape, symmetry – increases the heating and influences electromagnetic compatibility. Adhere to the standard EN 50110. Observe other applicable national regulations, such as DIN VDE 0105 for Germany.

Observe the wiring information and differing data on the nameplate as well as the provided wiring diagram.

The connection must be a permanently secure electrical connection (no protruding wire ends). Use the corresponding cable end equipment. Establish a safe PE connection. When the motor is connected, the distances to non-insulated and live parts must not be shorter than the minimum values according to IEC 60664 and national regulations. With low voltage, the distances should be no shorter than the following values, in compliance with IEC 60664:

Nominal voltage V_N	Distance
≤ 500 V	3 mm
≤ 690 V	5.5 mm

The terminal box must be free from foreign objects, dirt and humidity. Unused cable entry openings and the connection box itself must be sealed so that they are dust- and water-proof.

Secure the key(s) for the test run without output elements.

When operating low-voltage machines with brakes, check that the brake is functioning properly before startup.

Observe the notes in chapter "Electrical installation".

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2.8 Startup/operation

Risk of burns: The surface temperature of the product can exceed 60 °C during operation. Do not touch the product during operation. Let the product cool down before touching it.

Do not deactivate monitoring and protection devices of the machine or system even for a test run.

Depending on the degree of protection, products may have live, uninsulated, and sometimes moving or rotating parts, as well as hot surfaces during operation.

Make sure that any existing transport protection is removed.

In the event of deviations from normal operation, switch the product off. Possible deviations are increased temperatures, noise, or vibration, for example. Determine the cause. Contact SEW-EURODRIVE if necessary.

Ensure that the terminal box is closed and screwed down before applying the supply voltage.

Additional preventive measures may be required for applications with increased hazard potential. Be sure to check the effectiveness of the protection devices after every modification.

Mechanical blocking or internal protective functions of the product can cause a motor standstill. Removing the cause of this problem can result in the drive re-starting. Disconnect the product from the power supply before you start with troubleshooting.

Overheating of motors with backstop /RS

With low motor speeds, the centrifugal forces are so low that the backstop sprags brush against the inner and outer ring. This causes overheating of the friction surfaces.

- Do not permanently operate motors with backstop /RS below lift-off speed.

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3 Motor structure

3.1 Basic structure

The following figures are schematic representations. Motor size and design may cause deviations.

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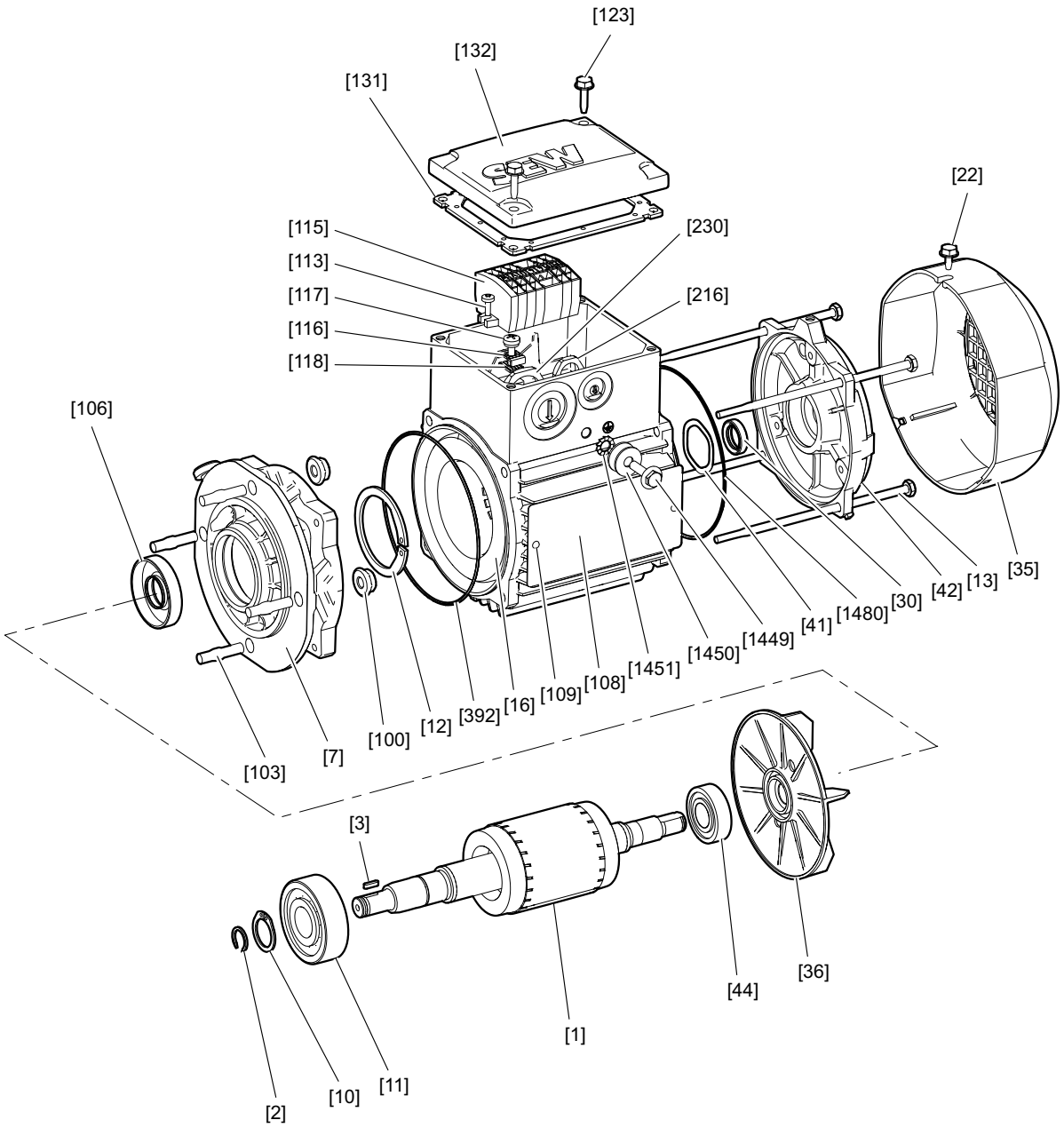
3.2 Basic design of DR2..56 motors



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[1]	Rotor	[22]	Hex head screw	[106]	Oil seal	[131]	Gasket for cover
[2]	Retaining ring	[30]	Oil seal	[108]	Nameplate	[132]	Terminal box cover
[3]	Key	[35]	Fan guard	[109]	Grooved pin	[216]	Hex nut
[7]	Flanged endshield	[36]	Fan	[113]	Cylinder head screw	[230]	Hex nut
[10]	Retaining ring	[41]	Equalizing ring	[115]	Terminal board	[392]	O-ring
[11]	Deep groove ball bearing	[42]	Rear endshield	[116]	Terminal clip	[1449]	Hex head screw
[12]	Retaining ring	[44]	Deep groove ball bearing	[117]	Flat head screw	[1450]	Washer
[13]	Cap screw	[100]	Hex nut	[118]	Washer	[1451]	Serrated lock washer
[16]	Stator	[103]	Stud	[123]	Hex head screw	[1480]	O-ring

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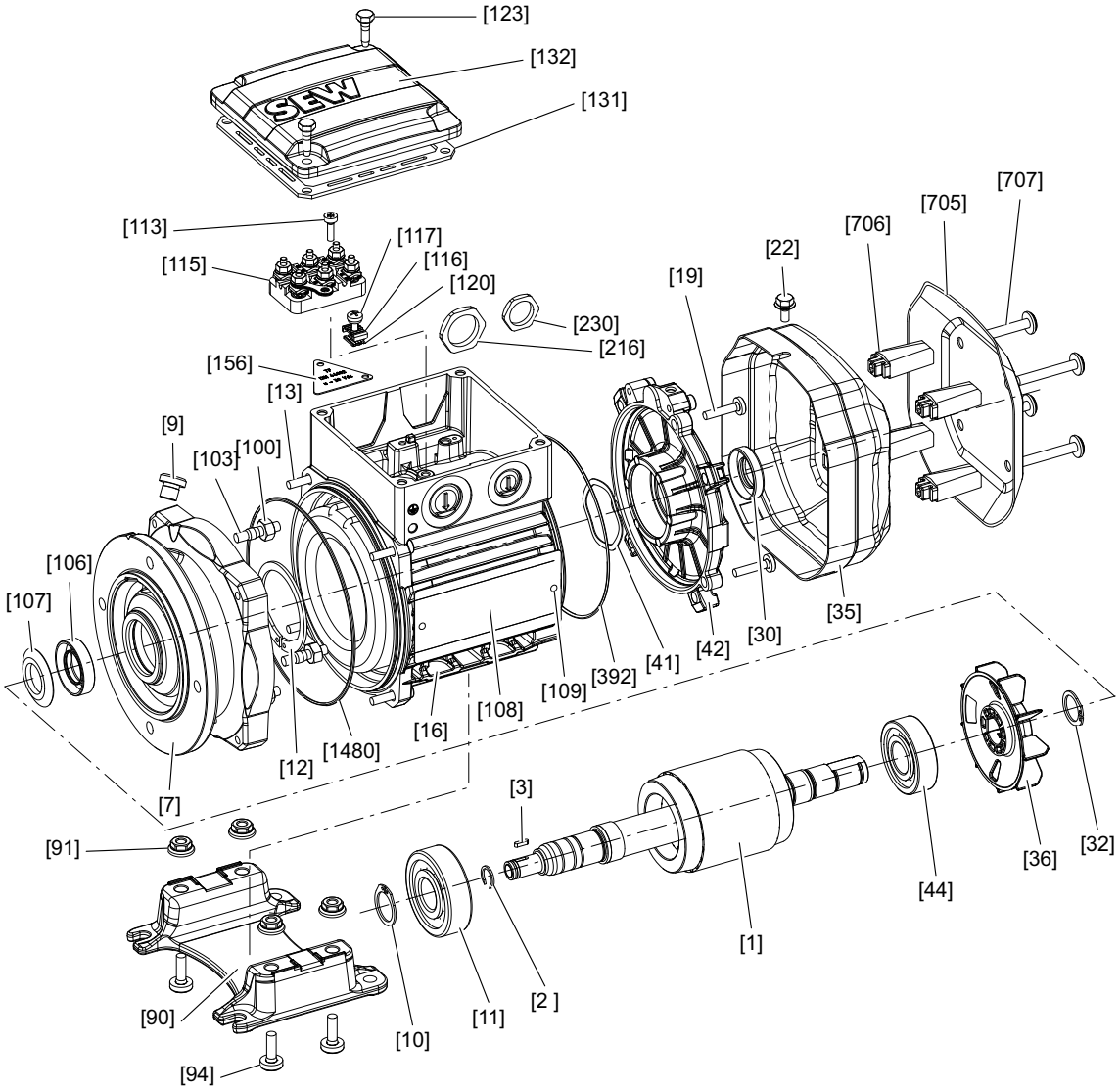
3.3 Basic design of DRN63, DR2..63 motors



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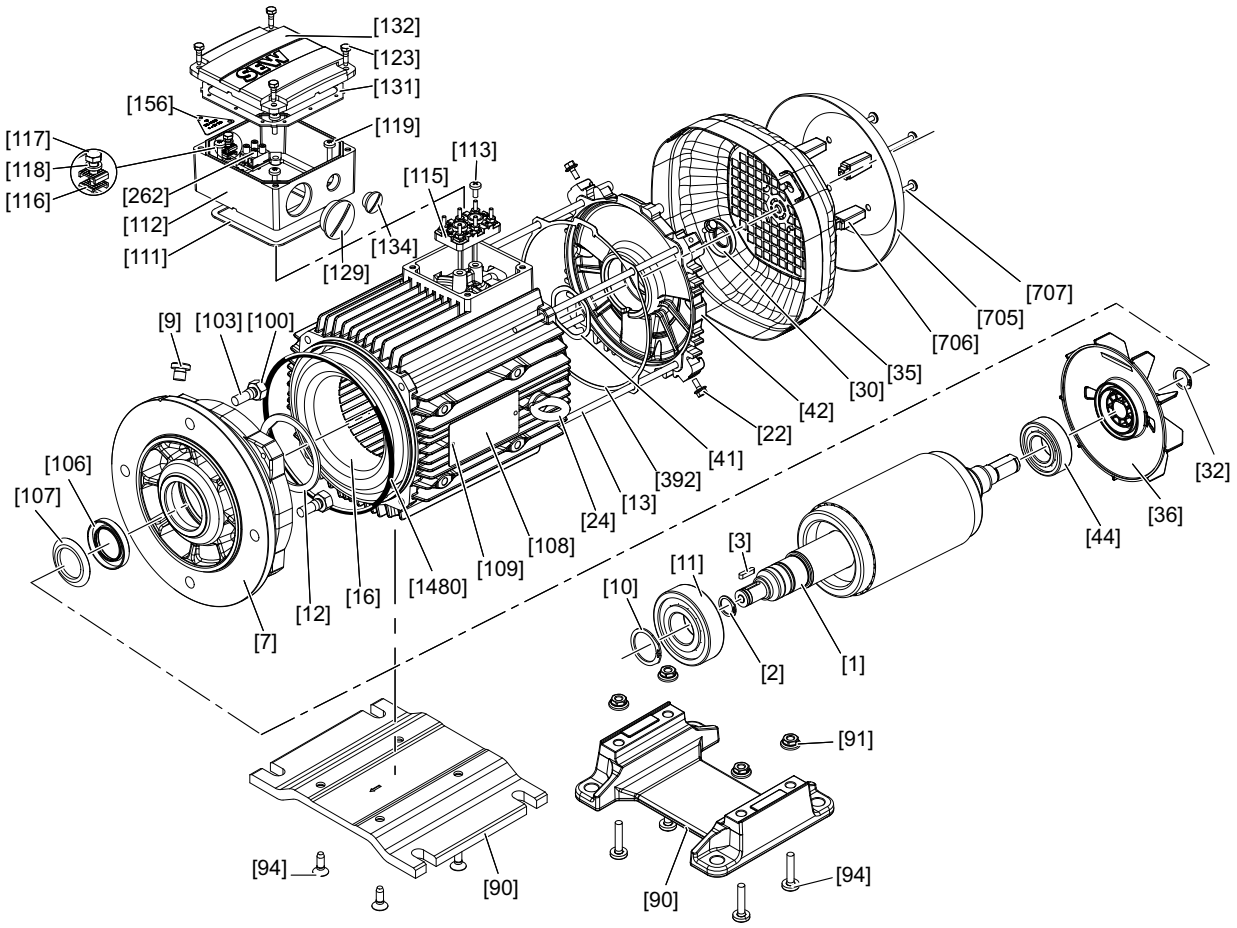
[1]	Rotor	[22]	Hex head screw	[100]	Hex nut	[123]	Hex head screw
[2]	Retaining ring	[30]	Oil seal	[103]	Stud	[131]	Gasket for cover
[3]	Key	[32]	Retaining ring	[106]	Oil seal	[132]	Terminal box cover
[7]	Flanged endshield	[35]	Fan guard	[107]	Oil flinger	[156]	Information sign
[9]	Screw plug	[36]	Fan	[108]	Nameplate	[216]	Hex nut
[10]	Retaining ring	[41]	Equalizing ring	[109]	Grooved pin	[230]	Hex nut
[11]	Deep groove ball bearing	[42]	B-side endshield	[113]	Cylinder head screw	[392]	O-ring
[12]	Retaining ring	[44]	Deep groove ball bearing	[115]	Terminal board	[705]	Canopy
[13]	Cap screw	[90]	Bed plate	[116]	Terminal clip	[706]	Spacer
[16]	Stator	[91]	Hex nut	[117]	Flat head screw	[707]	Hex head screw
[19]	Pan head screw	[94]	Flat head screw	[120]	Support plate	[1480]	O-ring

3.4 Basic design of DR..71 – 132, DRN71 – 132S, DR2..71 – 80 motors



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[1]	Rotor	[32]	Retaining ring	[107]	Oil flinger	[123]	Hex head screw
[2]	Retaining ring	[35]	Fan guard	[108]	Nameplate	[129]	Screw plug with O-ring
[3]	Key	[36]	Fan	[109]	Grooved pin	[131]	Gasket for cover
[7]	Flanged endshield	[41]	Equalizing ring	[111]	Gasket for lower part	[132]	Terminal box cover
[9]	Screw plug	[42]	B-side endshield	[112]	Terminal box lower part	[134]	Screw plug with O-ring
[10]	Retaining ring	[44]	Deep groove ball bearing	[113]	Pan head screw	[156]	Information sign
[11]	Deep groove ball bearing	[90]	Bed plate	[115]	Terminal board	[262]	Terminal clip
[12]	Retaining ring	[91]	Hex nut	[116]	Terminal clip	[392]	Gasket
[13]	Cap screw	[94]	Screw			[705]	Canopy
[16]	Stator	[100]	Hex nut	[117]	Hex head screw	[706]	Spacer
[22]	Hex head screw	[103]	Stud	[118]	Lock washer	[707]	Pan head screw
[24]	Lifting eyebolt	[106]	Oil seal	[119]	Pan head screw	[1480]	O-ring
[30]	Oil seal						

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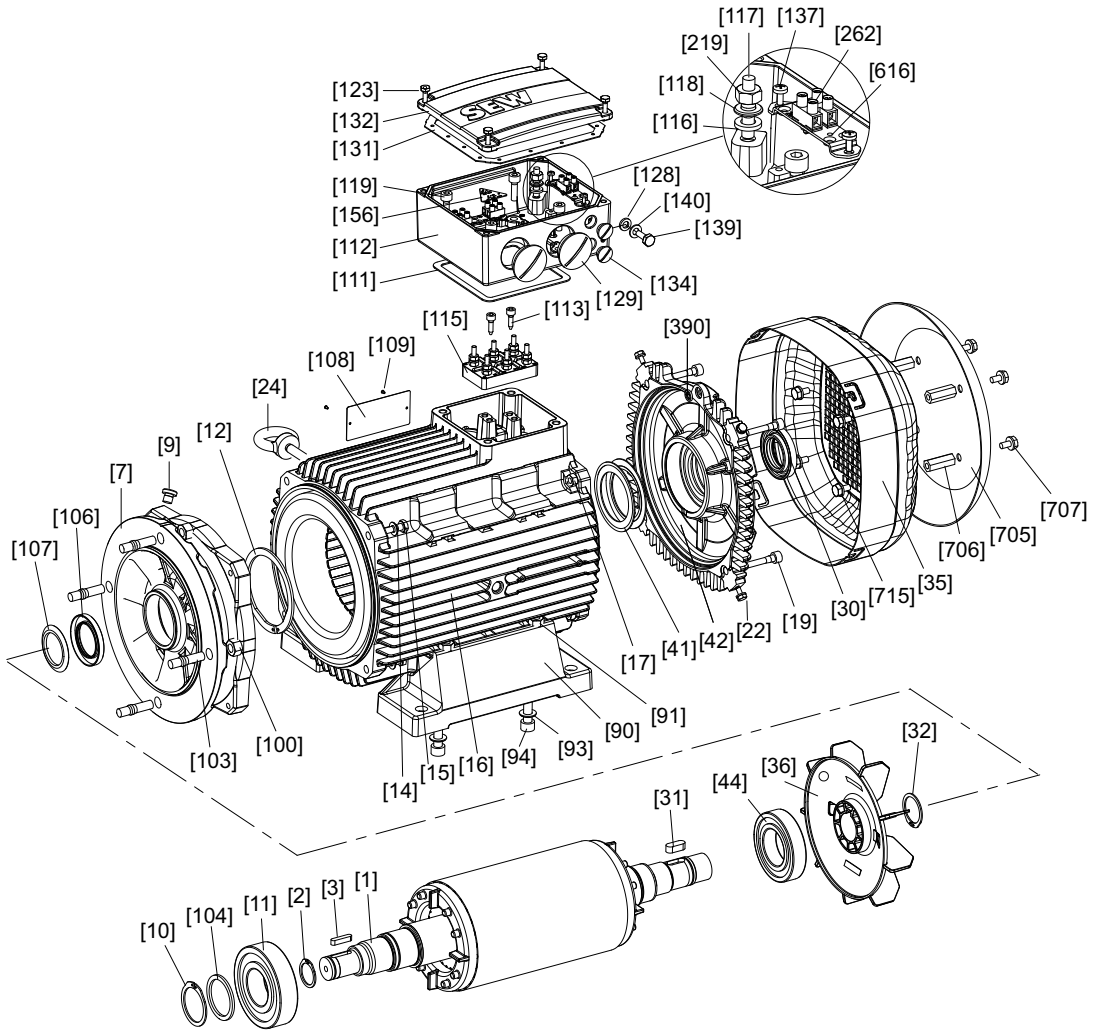
3.5 Basic structure DR..160 – 180, DRN132M – 180 motors



18014399036804619

[1]	Rotor	[31]	Key	[108]	Nameplate	[132]	Terminal box cover
[2]	Retaining ring	[32]	Retaining ring	[109]	Grooved pin	[134]	Screw plug with O-ring
[3]	Key	[35]	Fan guard	[111]	Gasket for lower part	[137]	Screw
[7]	Flange	[36]	Fan	[112]	Terminal box lower part	[139]	Hex head screw
[9]	Screw plug	[41]	Cup spring	[113]	Screw	[140]	Washer
[10]	Retaining ring	[42]	Rear endshield	[115]	Terminal board	[156]	Information label
[11]	Deep groove ball bearing	[44]	Deep groove ball bearing	[116]	Serrated lock washer	[219]	Hex nut
[12]	Retaining ring	[90]	Foot	[117]	Stud	[262]	Connection terminal
[14]	Washer	[91]	Hex nut	[118]	Washer	[390]	O-ring
[15]	Hex head screw	[93]	Washer	[119]	Cap screw	[616]	Retaining plate
[16]	Stator	[94]	Cap screw	[123]	Hex head screw	[705]	Canopy
[17]	Hex nut	[100]	Hex nut	[128]	Serrated lock washer	[706]	Spacer
[19]	Cap screw	[103]	Stud	[129]	Screw plug with O-ring	[707]	Hex head screw
[22]	Hex head screw	[104]	Supporting ring	[131]	Gasket for cover	[715]	Hex head screw
[24]	Eyebolt	[106]	Oil seal				
[30]	Sealing ring	[107]	Oil flinger				

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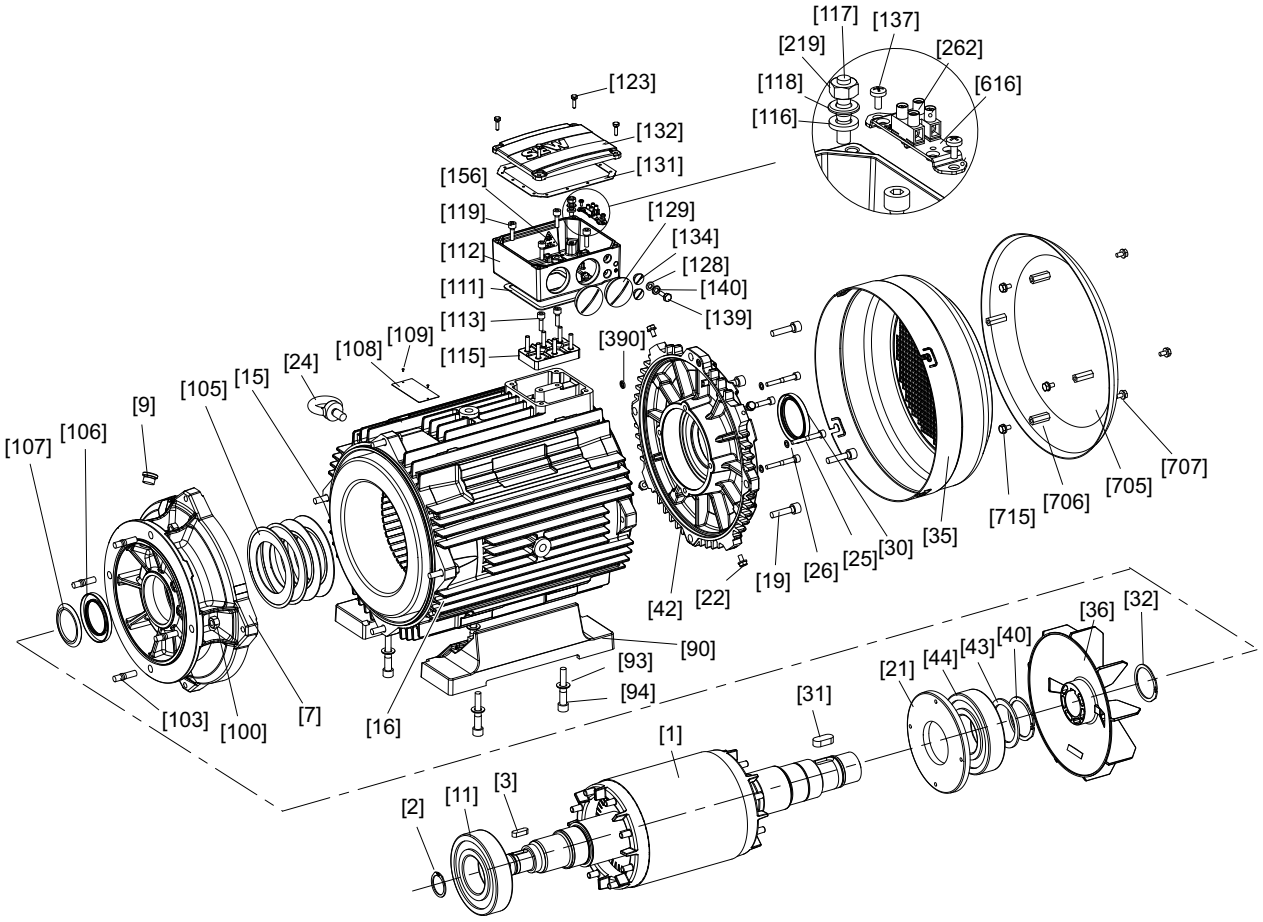
3.6 Basic structure DR..200 – 225, DRN200 – 225 motors



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[1]	Rotor	[31]	Key	[107]	Oil flinger	[132]	Terminal box cover
[2]	Retaining ring	[32]	Retaining ring	[108]	Nameplate	[134]	Screw plug
[3]	Key	[35]	Fan guard	[109]	Grooved pin	[137]	Screw
[7]	Flange	[36]	Fan	[111]	Gasket for lower part	[139]	Hex head screw
[9]	Screw plug	[40]	Retaining ring	[112]	Terminal box lower part	[140]	Washer
[11]	Deep groove ball bearing	[42]	Rear endshield	[113]	Cap screw	[156]	Information label
[15]	Hex head screw	[43]	Supporting ring	[115]	Terminal board	[219]	Hex nut
[16]	Stator	[44]	Deep groove ball bearing	[116]	Serrated lock washer	[262]	Connection terminal
[19]	Cap screw	[90]	Foot	[117]	Stud	[390]	O-ring
[21]	Oil seal flange	[93]	Washer	[118]	Washer	[616]	Retaining plate
[22]	Hex head screw	[94]	Cap screw	[119]	Cap screw	[705]	Canopy
[24]	Eyebolt	[100]	Hex nut	[123]	Hex head screw	[706]	Spacer bolt
[25]	Cap screw	[103]	Stud	[128]	Serrated lock washer	[707]	Hex head screw
[26]	Shield ring	[105]	Cup spring	[129]	Screw plug	[715]	Hex head screw
[30]	Oil seal	[106]	Oil seal	[131]	Gasket for cover		

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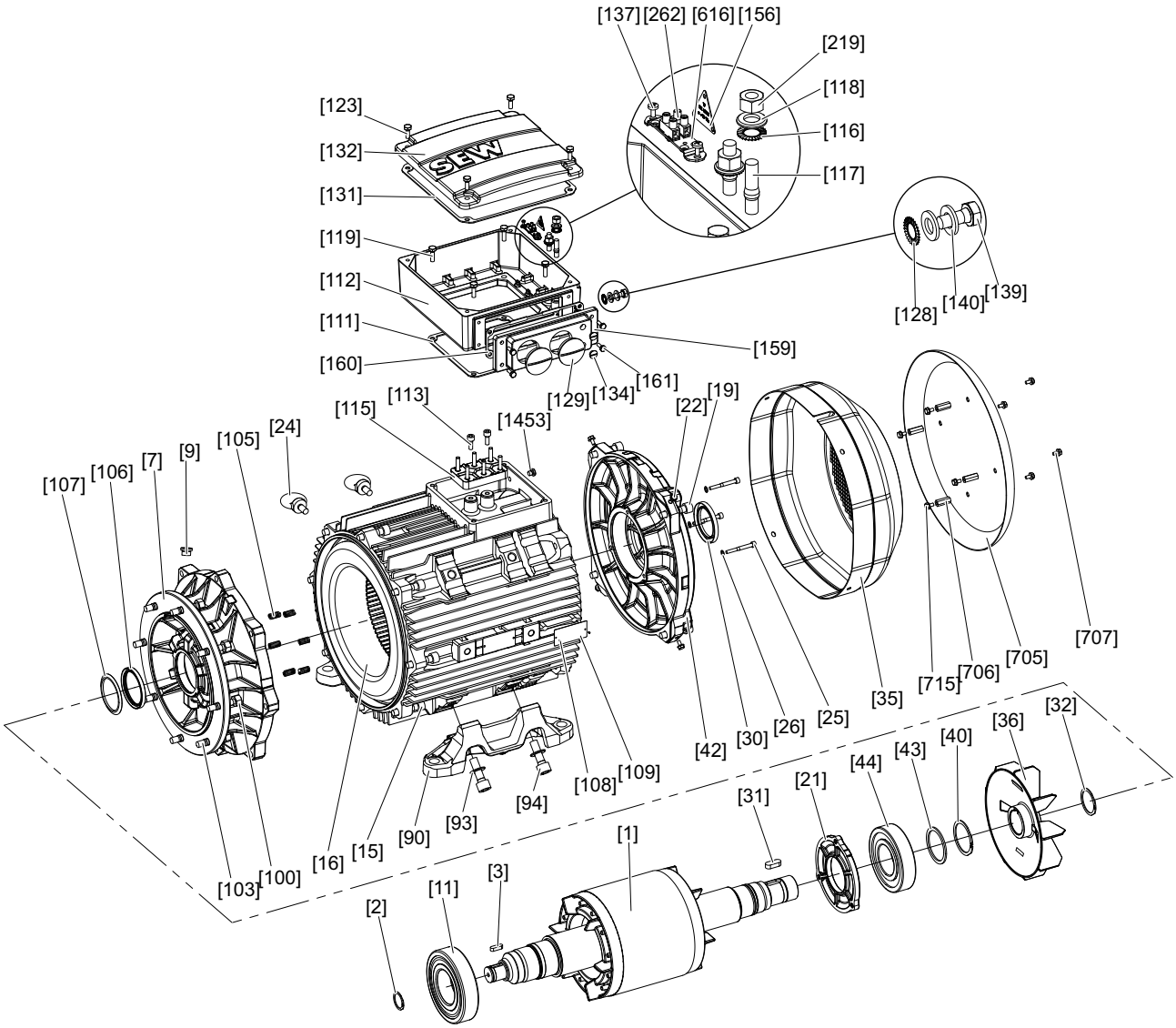
3.7 Basic structure DR..250 – 280, DRN250 – 280 motors



9007206690410123

[1]	Rotor	[32]	Retaining ring	[108]	Nameplate	[134]	Screw plug
[2]	Retaining ring	[35]	Fan guard	[109]	Grooved pin	[137]	Screw
[3]	Key	[36]	Fan	[111]	Gasket for lower part	[139]	Hex head screw
[7]	Flange	[40]	Retaining ring	[112]	Terminal box lower part	[140]	Washer
[9]	Screw plug	[42]	B-side endshield	[113]	Cap screw	[156]	Information sign
[11]	Deep groove ball bearing	[43]	Supporting ring	[115]	Terminal board	[159]	Connection piece
[15]	Cap screw	[44]	Deep groove ball bearing	[116]	Serrated lock washer	[160]	Connection piece seal
[16]	Stator	[90]	Foot	[117]	Stud	[161]	Hex head screw
[19]	Cap screw	[93]	Washer	[118]	Washer	[219]	Hex nut
[21]	Oil seal flange	[94]	Cap screw	[119]	Hex head screw	[262]	Connection terminal
[22]	Hex head screw	[100]	Hex nut	[123]	Hex head screw	[616]	Retaining plate
[24]	Lifting eyebolt	[103]	Stud	[128]	Serrated lock washer	[705]	Canopy
[25]	Cap screw	[105]	Compression spring	[129]	Screw plug	[706]	Spacer bolt
[26]	Shield ring	[106]	Oil seal	[131]	Gasket for cover	[707]	Hex head screw
[30]	Oil seal	[107]	Oil flinger	[132]	Terminal box cover	[715]	Hex head screw
[31]	Key					[1453]	Screw plug

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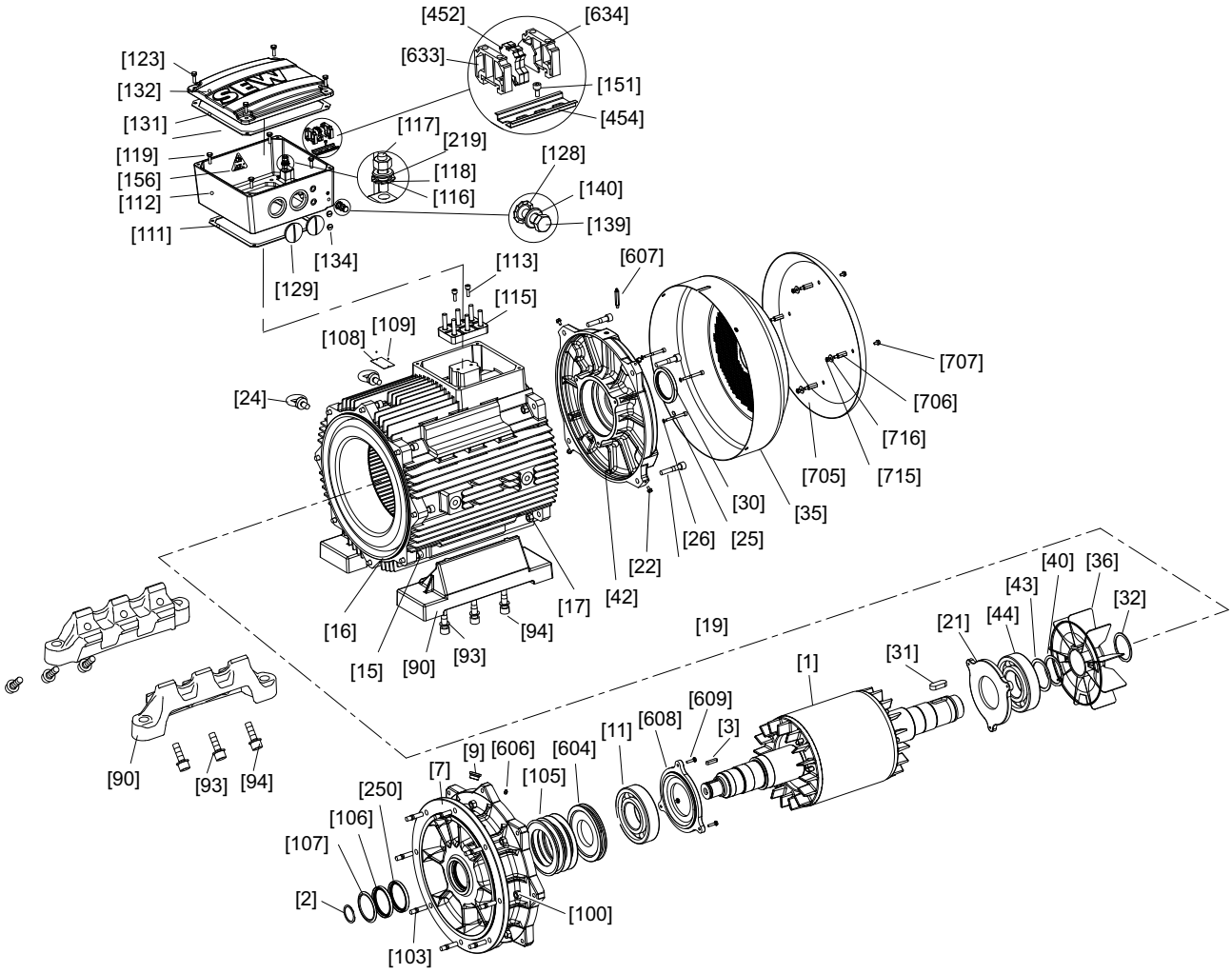
3.8 Basic structure DR..315, DRN315 motors



45035996625703563

[1]	Rotor	[32]	Retaining ring	[111]	Gasket for lower part	[156]	Information sign
[2]	Retaining ring	[35]	Fan guard	[112]	Terminal box lower part	[219]	Hex nut
[3]	Key	[36]	Fan	[113]	Cap screw	[250]	Oil seal
[7]	Flange	[40]	Retaining ring	[115]	Terminal board	[452]	Terminal strip
[9]	Screw plug	[42]	B-side endshield	[116]	Serrated lock washer	[454]	Mounting rail
[11]	Rolling bearing	[43]	Supporting ring	[117]	Stud	[604]	Lubrication ring
[15]	Cap screw	[44]	Rolling bearing	[118]	Washer	[606]	Grease nipple
[16]	Stator	[90]	Foot	[119]	Hex head screw	[607]	Grease nipple
[17]	Hex nut	[93]	Washer	[123]	Hex head screw	[608]	Oil seal flange
[19]	Cap screw	[94]	Cap screw	[128]	Serrated lock washer	[609]	Hex head screw
[21]	Oil seal flange	[100]	Hex nut	[129]	Screw plug	[633]	End bracket
[22]	Hex head screw	[103]	Stud	[131]	Gasket for cover	[634]	End plate
[24]	Eyebolt	[105]	Cup spring	[132]	Terminal box cover	[705]	Canopy
[25]	Cap screw	[106]	Oil seal	[134]	Screw plug	[706]	Spacer bolt
[26]	Shield ring	[107]	Oil flinger	[139]	Hex head screw	[707]	Hex head screw
[30]	Oil seal	[108]	Nameplate	[140]	Washer	[715]	Hex nut
[31]	Key	[109]	Grooved pin	[151]	Cap screw	[716]	Washer

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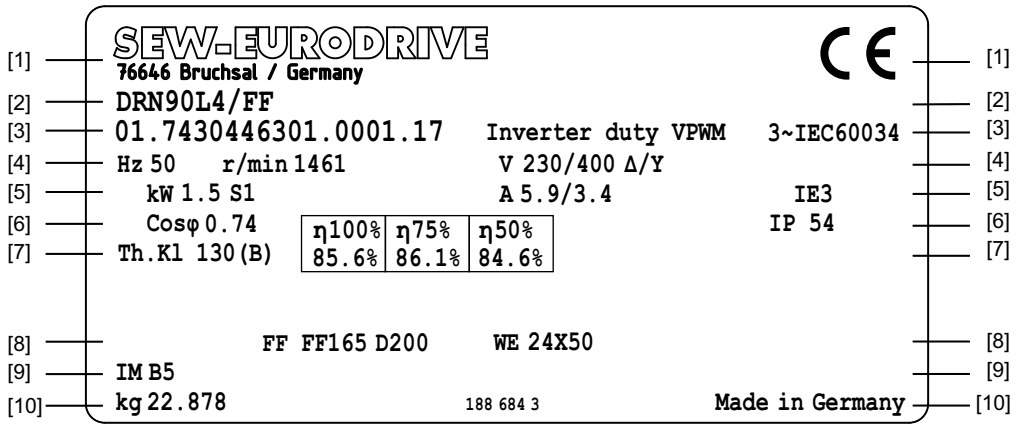
3.9 Nameplate

3.9.1 DRN.. motor nameplate

The following figure shows an example of a nameplate:



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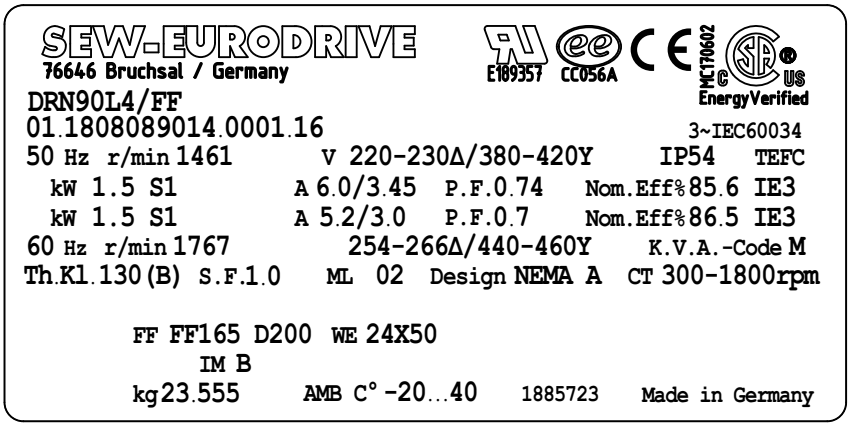
Line	Information
[1]	• Manufacturer, address • CE label
[2]	• Type designation
[3]	• Serial number • Suitability for inverter operation • Number of phases and underlying rating and performance standard
[4]	• Rated frequency • Rated speed • Nominal voltage
[5]	• Rated power and operating mode • Rated current • IE class
[6]	• Power factor • Degree of protection according to IEC 60034-5
[7]	• Thermal class • Rated efficiency for motors included in the validity of the IEC 60034-30-1 standard
[8]	• Flange • Shaft end
[9]	• Mounting position
[10]	• Weight • Part number nameplate • Country of manufacture

3.9.2 DRN.. global motor nameplate



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3.9.3 Markings

The following table lists all the markings that can be provided on a nameplate or attached to the motor, and an explanation of what they mean.

CE	CE mark to state compliance with European guidelines, such as the Low Voltage Directive.
UR	UR logo to confirm that UL (Underwriters Laboratory) is informed about the registered components; register number by UL: E189357
CC056A	DoE mark to confirm compliance with US-American efficiency limit values for AC motors.
c UL us LISTED	UL logo to confirm that a component is UL (Underwriters Laboratory) tested, also valid for CSA in conjunction with the register number
MC170602 c SA us Energy Verified	CSAe mark to confirm compliance with the Canadian efficiency limit values for AC motors
CCC	CCC logo to confirm the adherence to the Chinese regulation for small appliances
VIK	VIK mark to confirm the compliance with the directive of the German Association of Energy and Power Industry (V.I.K.)
FS 02	FS logo with 2-digit number for identification of installed functional safety motor options
EAC	EAC mark (EurAsian Conformity) Confirms compliance with the technical regulations of the economic and customs union of Russia, Belarus, Kazakhstan, Armenia.

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UA.TR. 013	UA.TR mark to confirm compliance with the technical regulations of the country Ukraine.
IE2 EU REGULATION 640/2009 USE WITH VARIABLE SPEED DRIVE ONLY! 1364 171 9	Motors with this mark may only be operated with frequency inverter (VSD = Variable Speed Drive) according to regulation 640/2009.
	BIS mark Confirmation of compliance with the Indian standard IS 12615.
	CEL mark showing energy efficiency in the Chinese grade classification.
	KEL mark confirming the requirements of REELS (Regulation of Energy Efficiency and Labeling Standard).
RENDIMENTO E FATOR DE POTÊNCIA APROVADOS PELO INMETRO PROCEL NBR - 17094-1 INMETRO Registro INMETRO no: 005431/2015	ENCE mark (Brazil) Confirmation of compliance with the Brazilian efficiency limit values for AC motors.

3.9.4 Serial number

The following table lists the structure of a serial number:

Example: 01. 12212343 01. 0001. 18	
01.	Sales organization
12212343	Order number (8 digits)
01.	Order item (2 digits)
0001	Quantity (4 digits)
18	End digits of the year of manufacture (2 digits)

3.10 Type designation

The following table shows the structure of a motor type designation:

DRN132M4/BE11/HR/FI/TF	
DR	Product family
N	Code for product line identification
132M	Size
4	Number of poles
/**BE11**	Brake
/HR	Manual brake release
/FI	Output option
/TF	Thermal motor protection

3.10.1 Designation of the motors

Designation	
DRS..	Standard motor, Standard Efficiency IE1
DR2S..	Standard motor, Standard Efficiency IE1 (2nd generation)
DRE..	Energy-efficient motor, High Efficiency IE2
DRP..	Energy-efficient motor, Premium Efficiency IE3
DRN..	Energy-efficient motor, Premium Efficiency IE3
DRU..	Energy-efficient motor, Super Premium Efficiency IE4
DRL..	Asynchronous servomotor
DR2L..	Asynchronous servomotor (2nd generation)
DRK..	Single-phase operation with running capacitor
DRM..	Torque motor: AC motor for operation at speed n = 0
DR2M..	Torque motor: AC motor for operation at speed n = 0 (2nd generation)
DR..J	Line start permanent magnet motor
56 – 315	Nominal sizes: 56, 63, 71, 80, 90, 100, 112, 132, 160, 180, 200, 225, 250, 280, 315
K, S, M, L, MC, LC, ME, MS, MK, H, LS, LM	Lengths
R, Q P, I B	Power designation (identification of motors with the same size but with different power)
2, 4, 6, 8, 8/2, 8/4, 4/2, 12	Number of poles

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3.11 Designs and options

3.11.1 Output variants

Designation	Description
/FI	IEC foot-mounted motor
/F.A /F.B	Universal foot-mounted motor
/FG	7series integral motor, as stand-alone motor
/FF	IEC flange-mounted motor with bore
/FT	IEC flange-mounted motor with threads
/FL	General flange-mounted motor (other than IEC)
/FM	7-series integral motor with IEC feet
/FE	IEC flange-mounted motor with bore and IEC feet
/FY	IEC flange-mounted motor with threads and IEC feet
/FK	General flange-mounted motor (deviating from IEC) with feet
/FC	C-face flange-mounted motor, dimensions in inch

3.11.2 Mechanical attachments

Designation	Description
/BE..[1)]	Spring-loaded brake with specification of size
/HR	Manual brake release of the brake, re-engaging
/HF	Manual brake release, lockable
/RS	Backstop
/MSW	MOVISWITCH®
/MM03 – MM40	MOVIMOT®
/MO	MOVIMOT® option(s)
/MI	Motor identification module for MOVIMOT®

1) Also available in design for functional safety

3.11.3 Temperature sensor / temperature detection

Designation	Description
/TF	Temperature sensor (PTC thermistor or PTC resistor)
/TH	Thermostat (bimetallic switch)
/KY	1 KTY84 – 130 sensor
/PT	1 or 3 PT100 sensor(s)
/PK	PT1000 temperature sensor

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3.11.4 Encoder

Designation	Description
/ES7S[1], /EG7S[1], /EH7S	Add-on speed sensor with sin/cos interface
/EV7S	Add-on speed sensor ES7S with sin/cos interface, spread shaft via mounting adapter for third-party encoders
/ES7R, /EG7R, /EH7R	Add-on speed sensor with TTL(RS422) interface, U = 9 – 26 V
/EV7R	Add-on speed sensor ES7S with TTL(RS422) interface, spread shaft via mounting adapter for third-party encoders
/ES7C, /EG7C, /EH7C	Add-on speed sensor with HTL interface
/EI7C[1], /EI76, /EI72, /EI71	Built-in incremental encoder with HTL interface and 24/6/2/1 period(s)
/EI8C, /EI8R	Built-in incremental encoder with HTL interface and 1024 periods
/AS7W[1], /AG7W[1]	Add-on absolute encoder, RS485 interface (multi-turn) and sin/cos interface
/AV7W	Add-on absolute encoder AS7W with RS485 interface (multi-turn), spread shaft via mounting adapter for third-party encoders
/AS7Y[1], /AG7Y[1], /AH7Y[1]	Add-on absolute encoder, SSI interface (multi-turn) and sin/cos interface
/AV7Y	Add-on absolute encoder AS7Y with SSI interface (multi-turn), spread shaft via mounting adapter for third-party encoders
/ES7A, /EG7A	Mounting adapter for speed sensors with solid shaft
/EV2T, /EV2R, /EV2S, /EV2C	Add-on incremental encoder with solid shaft
/EH7T	Add-on speed sensor with TTL(RS422) interface
/EK8S, /EK8R, /EK8C	Incremental encoder
/AK8Y, /AK8W, /AK8H	Multi-turn absolute encoder
/EV8S, /EV8R, /EV8C	Incremental encoder
/AV8Y, /AV8W, /AV8H	Multi-turn absolute encoder
/XV.A	Mounting adapter for third-party speed sensors
/XV..	Mounted third-party speed sensors
/XH.A	Mounting adapter for third-party hollow-shaft encoders

1) Also available in design for functional safety

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3.11.5 Connection alternatives

Designation	Description
/IS	Integrated plug connector
/ISU	Integrated plug connector – Design with only the lower part of the plug connector
/ASE.	HAN 10ES plug connector on terminal box with single-locking latch (cage clamp contacts on the motor side)
/ASB.	HAN 10ES plug connector on terminal box with double-locking latch (cage clamp contacts on the motor side)
/ACE.	HAN 10E plug connector on terminal box with single-locking latch (crimp contacts on the motor side)
/ACB.	HAN 10E plug connector on terminal box with double-locking latch (crimp contacts on the motor side)
/AME. /ABE. /ADE. /AKE.	HAN Modular 10B plug connector on terminal box with single-locking latch (crimp contacts on the motor side)
/AMB. /ABB. /ADB. /AKB.	HAN Modular 10B plug connector on terminal box with double-locking latch (crimp contacts on the motor side)
/KCC	6 or 10-pole terminal strip with cage clamp contacts
/KC1	C1-profile-compliant connection of the electrified monorail drive (VDI guideline 3643), for more compact connection areas.
/IV	Other industrial plug connectors according to customer specifications

3.11.6 Ventilation

Designation	Description
/V	Forced cooling fan
/Z	Additional inertia (flywheel fan)
/AL	Metal fan
/U	Non-ventilated (without fan)
/OL	Non-ventilated (closed B-side)
/C	Canopy for the fan guard
/LF	Air filter
/LN	Low-noise fan guard

3.11.7 Bearing

Designation	Description
/NS	Relubrication device
/ERF	Reinforced bearings on A-side with rolling bearing
/NIB	Insulated bearing B-side

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3.11.8 Condition monitoring

Designation	Description
/DUB	Mount-on microswitch for monitoring function and wear of the brake (Diagnostic Unit Brake)
/DUE	Eddy-current sensor for function and wear monitoring of the brake (Diagnostic Unit Eddy Current)

3.11.9 Other additional features

Designation	Description
/DH	Condensation drain hole
/RI	Reinforced winding insulation
/RI2	Reinforced winding insulation with increased resistance against partial discharge
/2W	2nd shaft end on the motor/brakemotor

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3.12 Functional safety

Motors from SEW-EURODRIVE are optionally available with functionally safe motor options. These are designed for implementing safety functions.

SEW-EURODRIVE labels a functionally safe motor option at the drive with an FS logo and a 2-digit number on the motor nameplate. The number is a code that indicates which components in the drive are safety-related. This allows to uniquely identify an available functionally safe motor option via the motor nameplate.

FS logo	Available functionally safe motor option		
	Decentralized inverters	Safety brake	Safety encoder
FS 01	X		
FS 02		X	
FS 04			X
FS 07	X		X
FS 11		X	X

If the FS logo, e.g. with the code "FS-11" is present on the motor nameplate, the combination of safety encoder and safety brake is available for the motor. If an FS logo is available, adhere to the information specified in the corresponding documentation.

If the drive bears the FS logo on the nameplate, adhere to the information in the following document:

- Addendum to the operating instructions "Safety Encoders and Safety Brakes, AC Motors DR.., DRN.., DR2.., EDR.., EDRN.. – Functional Safety"

To determine the safety level for systems and machines yourself, refer to the characteristic safety values in chapter "Characteristic safety values".

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4 Mechanical installation

4.1 Before you start

INFORMATION

Observe the safety notes in chapter 2 of this documentation for the mechanical installation.

INFORMATION

The mounting position for installation must correspond with the specifications on the nameplate.

Install the drive only if the following conditions are met:

- The specifications on the nameplate of the drive correspond to the supply system or the output voltage of the inverter.
- The drive is undamaged (no damage caused by transportation or storage).
- All transport protection has been removed.
- You are certain that the following requirements have been met:
  - Ambient temperature according to the nameplate.

    Note that the temperature range of the gear unit may also be restricted (see "Gear unit" operating instructions).

    Any differing specifications on the nameplate must be observed.
  - No oils, acids, gases, vapors, dusts, radiations, etc.
  - Max. installation altitude 1000 m above sea level.

    Observe the section "Designated use" in chapter 2.
  - Note the restrictions for encoders.
  - Special design: Drive configured in accordance with ambient conditions.

The aforementioned information refers to standard orders. The conditions might be different when you order drives other than the standard. Refer to the order confirmation for deviating conditions.

Functional safety

If the drive has the FS logo on the nameplate, observe the information on mechanical installation in the corresponding addendum to the operating instructions.

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4.2 Preliminary work after longer periods of storage

Depending on the duration and ambient conditions during storage, corrosion, aging of lubricants, embrittlement of sealing elements, and moisture absorption in the insulation can occur.

Perform the described measures on any drives that have been stored for longer than 9 months.

Corrosion

- Check for damage to the motor and/or components (coating, shafts, connection and fastening parts).
- Correct the corrosion damage.

Embrittlement of seals

- Visually inspect seals and look for fissures, hardening, and embrittlement.
- Replace any damaged seals.

Reduced grease service life

If the drives are stored for longer than a year, the service life of the bearing grease is reduced due to aging and de-oiling of the lubricant.

- Check the condition and usability of the rolling bearings.
- Replace any damaged rolling bearings.

Reduced grease quantity

- If motors are stored for longer than 5 years, regrease them according to the specifications on the motor nameplate using a relubrication device.

Moisture absorption

- Check to see that the wiring space of the motor is dry and clean.
- Remove moisture and dirt.
- If the motor has absorbed moisture, measure the insulation resistance (see chapter "Measuring the insulation resistance" (→ 🗎 34)) and dry the motor (see chapter "Drying the motor" (→ 🗎 35)).

4.2.1 Checking the brake

If motors with brake have been stored or non-operational for longer than 9 months, check their function before taking them into operation.

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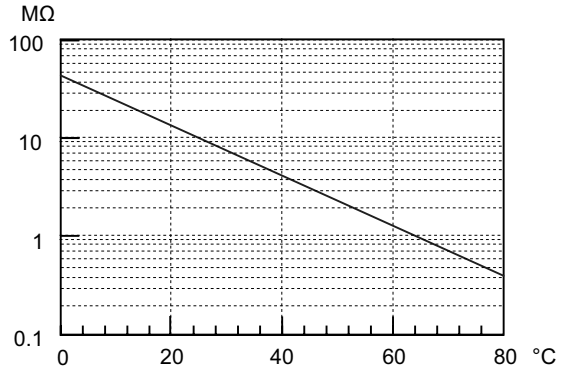
4.2.2 Measuring the insulation resistance

The insulation resistance (see following figure) varies greatly depending on the temperature.

If the measured resistance is within the range of the limit characteristic curve (depending on the ambient temperature), the insulation resistance is sufficient. If the value is below the limit characteristic curve, dry the motor.



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4.2.3 Drying the motor

Use either warm air or an isolation transformer to dry the motor.

INFORMATION

The motors of size 56 and DR..J motors must be dried only by warm air.

⚠ WARNING

Risk of crushing due to torque at the motor shaft.

Severe or fatal injuries.

- Only use warm air for drying DR..J motors.

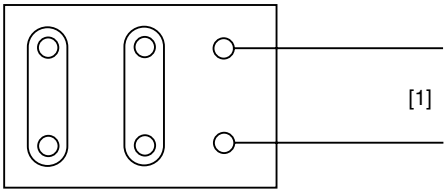
Drying the motor with warm air

1. Dry the motor with warm air.
2. End the drying process when the minimum insulation resistance is exceeded.

Dry the motor with an isolation transformer

1. Connect the windings in series.
2. Auxiliary AC voltage supply max. 10% of the nominal voltage with max. 20% of the rated current

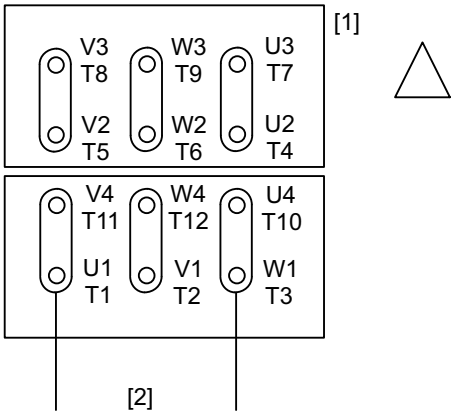
Connect the windings in series: R13 wiring diagram



2336250251

[1] Transformer

Connect the windings in series: wiring diagram R72



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[1] Motor terminal boards [2] Transformer

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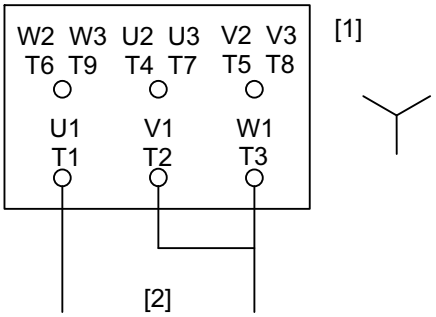
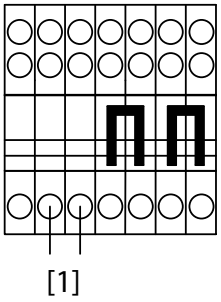
Connect the windings in series: Wiring diagram R76



2343047179

[1] Motor terminal boards [2] Transformer

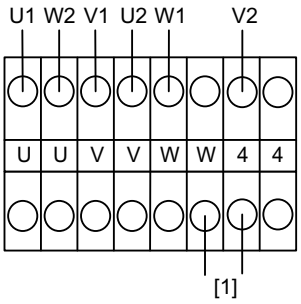
Connect the windings in series: Wiring diagram C13



3955447819

[1] Transformer

Connect the windings in series: Wiring diagram A13



27511350155

[1] Transformer

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4.3 Motor installation notes

⚠ CAUTION

Sharp edges due to open keyway.

Risk of cutting injuries.

- Insert the key into the keyway.
- Pull a protective tubing over the shaft.

NOTICE

Improper assembly may damage the drive and corresponding components.

The drive system might be damaged.

- Observe the following information.

- Remove any anti-corrosion agent and dirt from motor shaft ends and flange surfaces. Use a commercially available solvent. Do not allow the solvent to come in contact with the bearings or sealing rings.
- Only install the gearmotor in the specified mounting position on a level, vibration-free and torsionally rigid support structure.
- The mounting position for installation must correspond with the specifications on the nameplate.
- Make sure that there is sufficient clearance around the motor to provide an adequate cooling air supply, and that the motor does not draw in warm exhaust air from other units.
- Align the motor and the driven machine carefully in order to prevent the output shaft from being exposed to unacceptable strain. Observe the permitted overhung and axial forces.
- Do not jolt or hammer the shaft end.
- Use an appropriate cover, e.g. option /C "Canopy", to prevent objects or fluids entering motors in vertical mounting positions (M4/V1).
- Balance components for subsequent mounting on the shaft with a half key (motor shafts are balanced with a half key).
- Existing condensation drain holes are sealed with closing plugs. If contaminated, the condensation drain holes must be checked for proper functioning on a regular basis and cleaned if required.

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4.3.1 Mounting the motor with aluminum feet

To mount motors with a foot made of aluminum, you have to use washers with an outer diameter that is at least twice the screw diameter (e.g. DIN EN ISO 7090).

Use bolts of strength class 8.8 up to max. 10.9.

Tightening torque according to VDI 2230-1.

Motors	Maximum permitted screw lengths
DRN63 – DRN71	M6 × 20
DR2..63 – DR2..71MS	M6 × 20
DRN80 – 90	M8 × 20
DR2..71M – DR2..80	M10 × 25
DRN100 – 132S	M10 × 25

DRN/DR2..63 motors

With DRN/DR2..63 motors, the aluminum foot is slotted in the front due to the limited space.

Position the screws beforehand or fasten the foot with stud bolts.

4.3.2 Installation in damp locations or outdoors

- Use suitable cable glands for the incoming cable (use reducing adapters if necessary) according to the installation instructions.
- If possible, arrange the terminal box in such a way that the cable entries are pointing downwards.
- Seal the cable entry properly.
- Clean the sealing surfaces of the terminal box and the terminal box cover carefully before re-assembly; replace embrittled gaskets.
- If required, touch up the corrosion protection (especially at the eyebolts).
- Check the degree of protection.
- Protect the shaft against corrosion using a suitable anti-corrosion agent.

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4.4 Installation tolerances

Shaft end	Flanges
Diameter tolerance according to EN 50347 • ISO j6 with Ø ≤ 28 mm • ISO k6 with Ø ≥ 38 mm up to ≤ 48 mm • ISO m6 at Ø ≥ 55 mm • Centering bore according to DIN 332, shape DR	Centering shoulder tolerance according to EN 50347 • ISO j6 with Ø ≤ 250 mm • ISO h6 with Ø ≥ 300 mm

4.5 Assembling the input elements

Drive components that are installed on the motor shaft end, e.g. pinions, must be warmed up prior to assembly in order to prevent damage, e.g. to the encoder of stand-alone motors.

⚠ WARNING

Unsecured key skidding out of the keyway.

Severe or fatal injuries due to flying parts.

- Only operate the motor with attached customer output element (e.g. gear unit), or with a suitably secured key.

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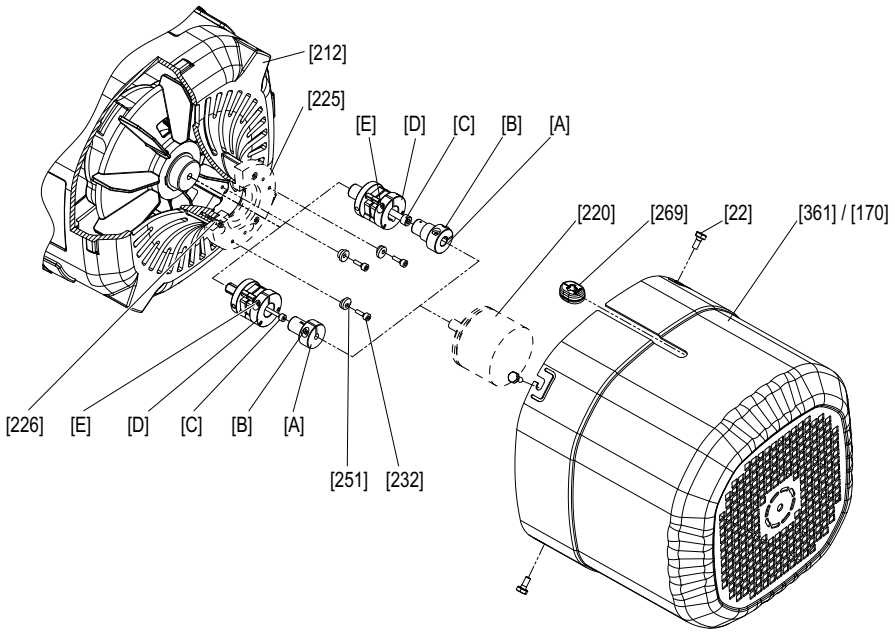
4.6 Encoder mounting adapter

If a drive was ordered with encoder mounting adapter, SEW-EURODRIVE will deliver the drive with enclosed coupling. Do not connect the coupling for operation without the encoder.

4.6.1 Mounting the XV../EV.. encoder mounting adapter to DR..71 – 225, DRN80 – 225 motors

If you have ordered the XV.. or EV.. encoder mounting adapter, the adapter [A] and the coupling [B – E] are enclosed with the motor and are to be assembled by the customer.

The following figure shows how to assemble the coupling and the adapter:



9007202887904779

[22] Screw
[170] Forced cooling fan guard
[212] Fan guard with encoder mount
[220] Encoder
[225] Intermediate flange (XV1A)
[232] Screws (XV1A, XV2A)
[251] Conical spring washers (XV1A, XV2A)
[361] Safety cover
[269] Cable grommet
[A] Adapters
[B] Retaining screw
[C] Central retaining screw
[D] Coupling (spread- or solid shaft coupling)
[E] Retaining screw
[226] Screw

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Mounting the XV../EV.. encoder mounting adapter to DR..71 – 225, DRN80 – 225 motors

1. Remove the safety cover [361], or the forced cooling fan if required.
2. **For XV2A, XV3A, and XV4A:** Remove the intermediate flange [225].
3. Screw the coupling [D] to the bore at the shaft end using screw [C].
4. Plug the adapter [A] onto the pin of the encoder [220].
5. Tighten the central retaining screw [B].
6. **For XV2A, XV3A, XV4A:** Mount the intermediate flange [225] using the screws [226].
7. Plug the encoder [220] with adapter [A] onto the coupling [D].
8. Tighten the retaining screw [E].
9. **For XV1A, XV2A:** Re-install the retaining screws [232] with conical spring washers.
10. **For XV3A, XV4A:** Installed by the customer via bores in the encoder plate.

Motor	Screw	Tightening torque
DR..71 – 132 DRN80 – 132S	[C]	3 Nm
DR..160 – 225 DRN132M – 225:	[C]	8 Nm
All	[226]	3 Nm
All	[B]	3 Nm
All	[E]	3 Nm
All	[232]	3 Nm

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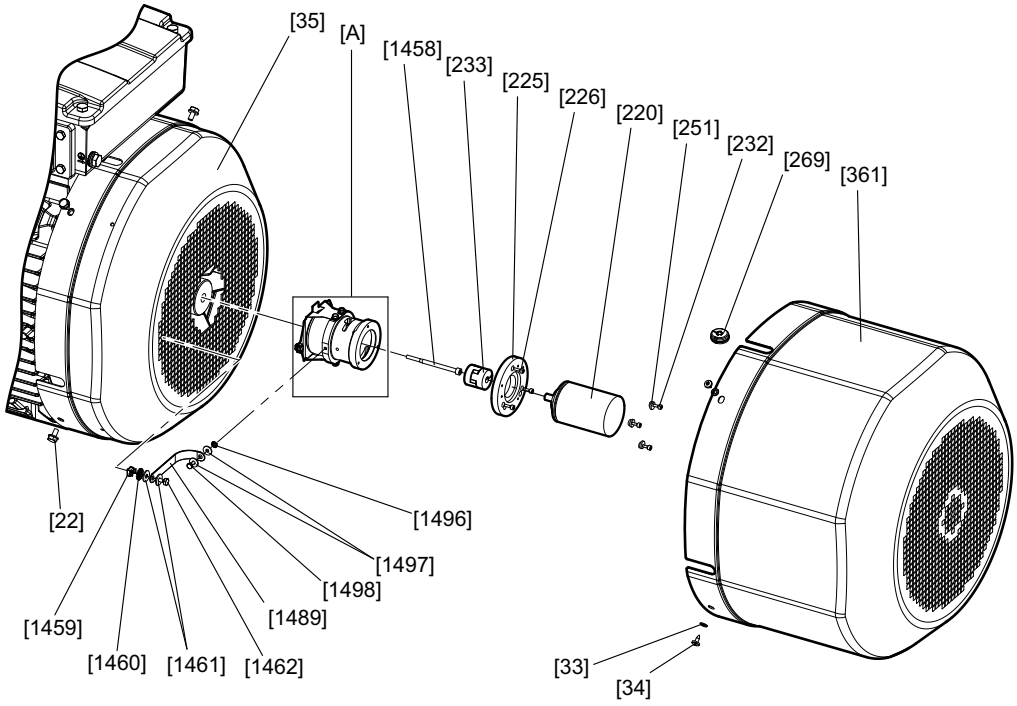
4.6.2 Mounting the XV../EV.. encoder mounting adapter to DR..250 – 280, DRN250 – 280 motors

If you have ordered the XV../EV.. encoder mounting adapter, the coupling [233] is enclosed with the motor and must be installed by the customer.

The following figure shows an example of how the coupling is installed:



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[22]	Screw	[361]	Safety cover (normal/long)
[33]	Washer	[1458]	Screw
[34]	Screw	[1459]	Cage nut
[35]	Fan guard	[1460]	Serrated lock washer
[220]	Encoder	[1461]	Washer
[225]	Intermediate flange (optional)	[1462]	Screw
[226]	Screw	[1489]	Ground strap
[232]	Screws (.V1A, .V2A)	[1496]	Serrated lock washer
[233]	Coupling	[1497]	Washer
[251]	Conical spring washers (.V1A, .V2A)	[1498]	Screw
[269]	Cable grommet	[A]	Encoder mounting adapter

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Mounting encoders to XV../EV.. encoder mounting adapters at DR..250 – 280, DRN250 – 280 motors

1. Remove the safety cover [361], or the forced cooling fan if required.
2. Place the coupling [233] onto the pin of the encoder mounting adapter [A].
3. Tighten the screw of the coupling [233] via the slots in the encoder mounting adapter.
4. **For XV2A, XV3A, XV4A:** Mount the intermediate flange [225] to the encoder mounting adapter [A] using screw [226].
5. **For XV1A, XV2A:** Insert the screws [232] with eccentric disk spring washers [251] in the encoder mounting adapter [A].
6. Fasten the encoder [220] to the encoder mounting adapter [A] or the intermediate flange [225].
7. Plug the encoder [220] into the coupling [233].
8. To secure the eccentric disks [251], insert the screws [232].
9. **For XV1A, XV2A:** Tighten the screws [232] while turning the eccentric disks [251] in clockwise direction into the groove of the encoder [220].
10. Tighten the screw of the coupling [233].
11. Insert the encoder cable into the cable grommet [269].
12. Insert the cable grommet [269] into the recess of the safety cover [361] or the forced cooling fan.
13. Mount the safety cover [361] onto the forced cooling fan.

Motor	Screw	Tightening torque
DR..250 – 280 DRN250 – 280	Screw of the coupling [233]	3 Nm
DR..250 – 280 DRN250 – 280	[226]	3 Nm
DR..250 – 280 DRN250 – 280	[232]	3 Nm

4.6.3 XH.A encoder mounting adapter

The XH1A, XH7A and XH8A encoder mounting adapters for hollow shaft encoders are premounted on delivery.

To mount the encoder, proceed as described in chapter "Motor and brake maintenance – preliminary work" (→ 🗎 127).

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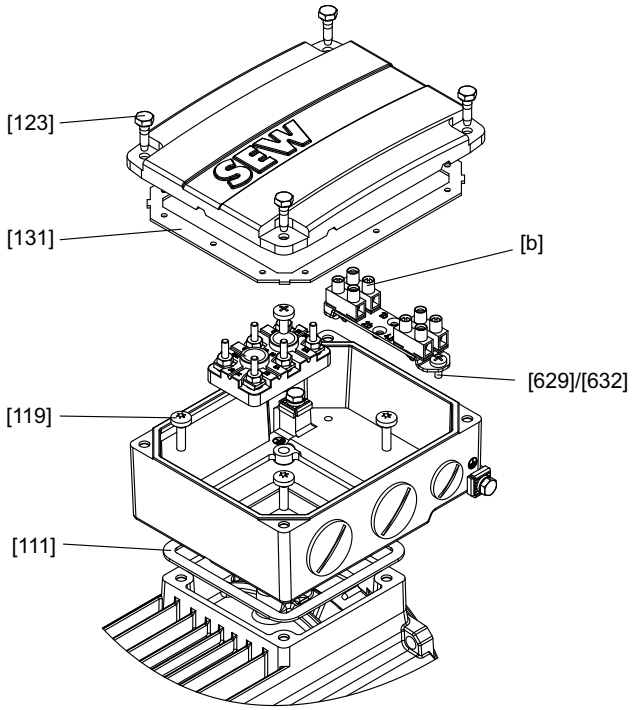
4.7 Terminal box

4.7.1 Turning the terminal box

The following figure shows the structure of the terminal box variant with terminal board:



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[111] Gasket
[119] Terminal box lower part hex head screws (4 x)
[123] Terminal box cover hex head screws (4 x)
[131] Gasket
[b] Terminal
[629]/ [632] Screws

Proceed as follows to turn the terminal box:

1. Loosen the screws [123] of the terminal box cover. Remove the terminal box cover.
2. Remove the screws [629]/[632].
3. Remove the terminal [b].
4. Remove the retaining screws [119] of the terminal box.
5. Clean the sealing surfaces at the stator shoulder, terminal box lower part and terminal box cover.
6. Check the gaskets [111] and [131] for damages.
7. Replace any damaged seals.
8. ⚠ **DANGER!** Electric shock due to damaged cables. Severe or fatal injuries. When installing the terminal box lower part or the terminal board, make sure the cables are not crushed or twisted. Do not use sharp or pointed objects to align the cables.
   Turn the terminal box to the required position.
9. Make sure that the gasket is positioned correctly [111].

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10. Attach the terminal box lower part.
11. Apply the corresponding tightening torque to tighten the screws [119] of the terminal box lower part.
12. Refer to chapter "Appendix" (→ 🗎 269) for the arrangement of the auxiliary terminals.
13. Secure terminal [b] with screws [629]/[632].
14. Make sure that the gasket is positioned correctly [131].
15. Attach the terminal box cover to the terminal box lower part.
16. Apply the corresponding tightening torque to tighten the screw [123] of the terminal box cover.
17. To make sure that the cables have not been damaged, perform an insulation test after reassembly, see chapter "Preliminary work after longer periods of storage" (→ 🗎 33).

Tightening torques of the terminal box lower part

Motor	Screw	Tightening torque
		Nm
DR..71 – 132 DRN71 – 132S DR2..71– 80	[119]	5
DR..160 – 225 DRN132M – 225	[119]	27.3
DR..250 – 315 DRN250 – 315	[119]	54

Tightening torques of the terminal box cover

Motor	Screw	Tightening torque
		Nm
DR2..56	[123]	3
DR..71 – 132 DRN63 – 132S DR2..63– 80	[123]	4
Aluminum DR..160 – 225 DRN132M – 225	[123]	11.3
Gray cast iron DR..160 – 225 DRN132M – 225	[123]	27.3
DR..250 – 315 DRN250 – 315	[123]	54

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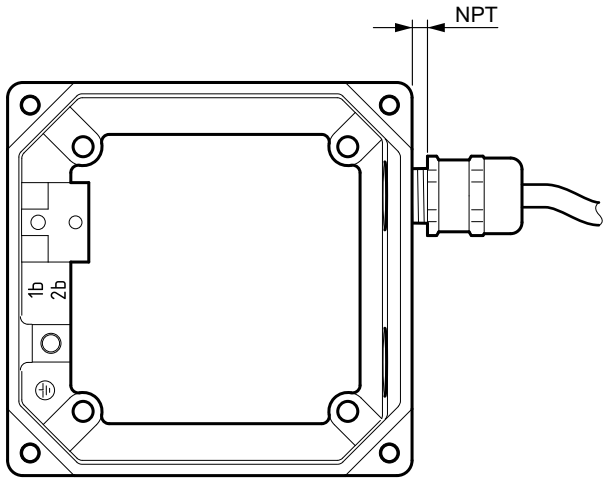
4.7.2 Terminal box with NPT thread

In terminal boxes with NPT thread, cable glands cannot always be screwed in all the way (up to the O-ring).



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For applications in wet areas, SEW-EURODRIVE recommends using metric screw fittings.

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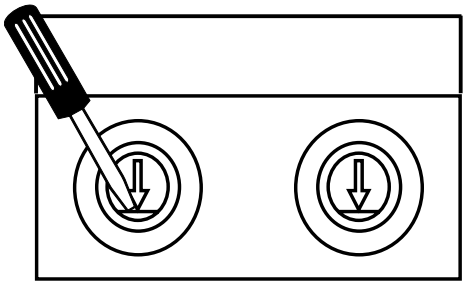
4.7.3 Breaking open knock-outs

In order to be able to insert cables into the terminal box, the prepared knock-outs must be broken open.

✓ Required tools: Screwdriver or chisel.

1. **NOTICE!** Damage to the terminal box or fragments inside the motor. Possible physical damage. Exercise caution when breaking open the knock-outs.
   Break open the knock-out [K] by using a chisel or screwdriver.
2. Check the opening for residual burr. If any residual burr is present, remove it by using a suitable tool.



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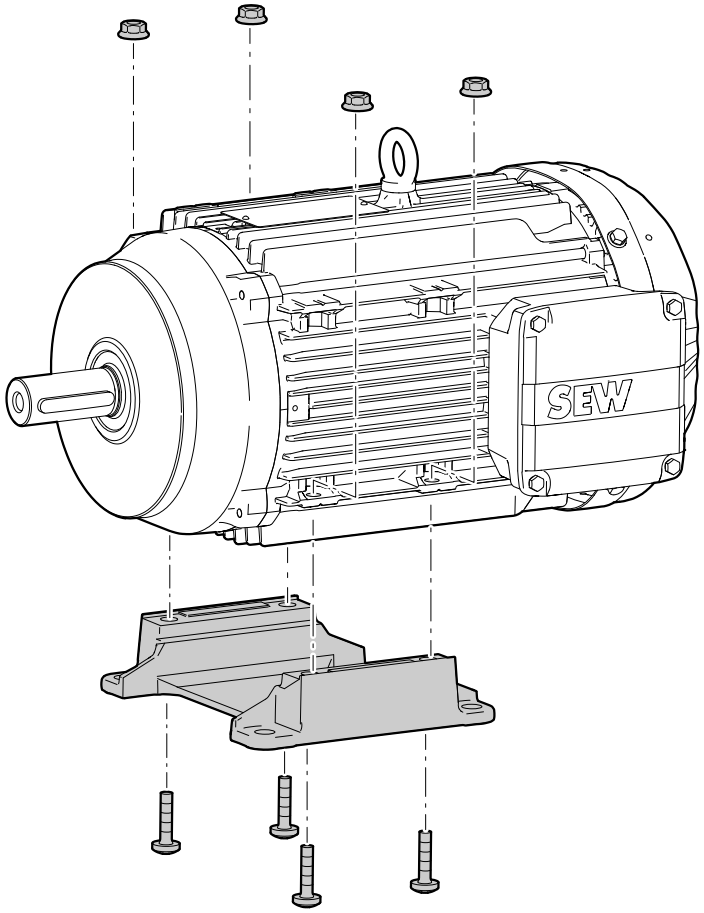
4.8 Retrofitting (option /F.A) or modifying (option /F.B) motor feet

4.8.1 DRN71 – 132S, DR2..71 – 80 motors

The following figure shows a motor with option /F.A (retrofit foot).



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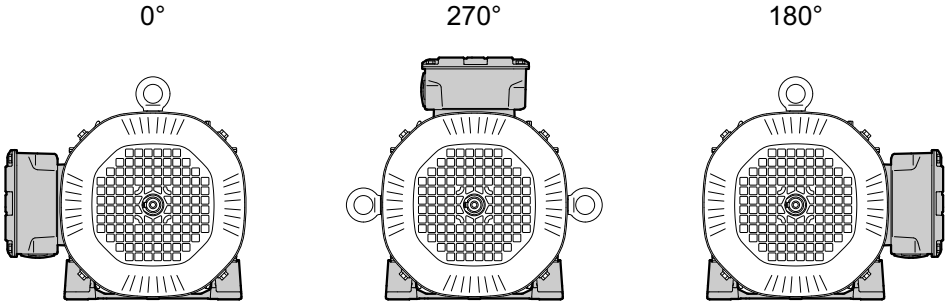
✓ The contact surfaces at the foot [90] and stator [16] are painted.

1. Observe the following figure when selecting the contact surfaces. The figure illustrates the possible terminal box positions with reference to the retrofittable motor feet.



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2. Remove the paint from the stator [16] contact surface where the foot is to be screwed on.
3. Apply a thin layer of corrosion protection to the contact surfaces after the paint has been removed.
4. Remove the paint from the contact surfaces of the foot [90].

5. Apply a thin layer of corrosion protection to the contact surfaces after the paint has been removed.
6. Attach the foot [90] to the motor using the screws [94] and washers [91]. Tighten the screws in diametrically opposite sequence. The screws are micro-encapsulated. This is why you have to screw in and tighten the screws quickly.
7. If necessary, you can apply paint or corrosion protection at the joint after attaching the foot [90].

Changing the motor foot position

For converting the motor foot to another position, observe the following points:

- After removing the screws [94], check for damage to the thread or other similar damage.
- When changing the position of the motor foot, apply corrosion protection to unpainted surfaces.

Tightening torques

Motor	Screw	Tightening torque
DRN71 – 90, DR2..71 – 80	M6	11.3 Nm
DRN100 – 132S	M8	27.3 Nm

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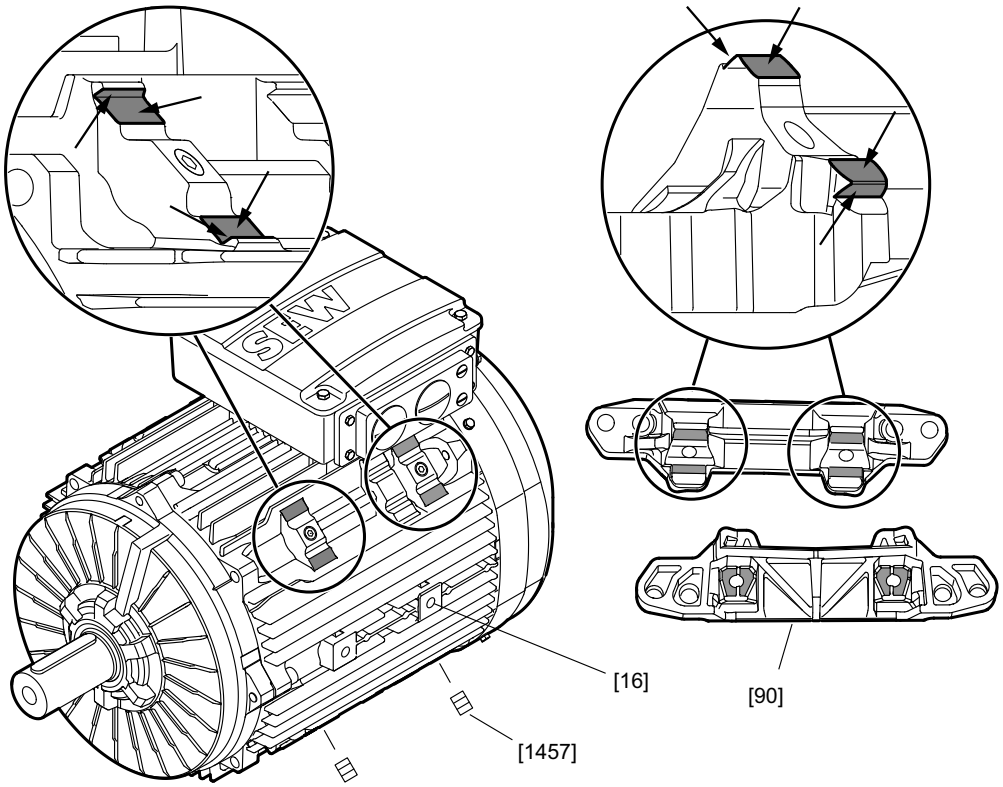
4.8.2 DR..250 – 315, DRN..225 – 315 motors

The following figure shows a motor with option /F.A (retrofit feet).



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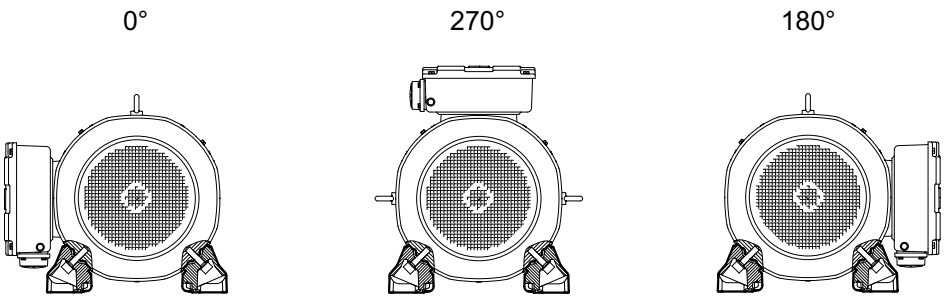
[16]	Stator	[1457]	Set screw
[90]	Foot		Remove the paint from the marked surfaces.

✓ The tapped holes of the foot mounting surfaces are closed with set screws [1457]. The contact surfaces at the feet [90] and stator [16] are painted.

1. Observe the following figure when selecting the contact surfaces. The figure illustrates the possible terminal box positions with reference to the retrofittable motor feet.



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2. Remove the set screws [1457] from those threads into which you will screw the foot screws [94].
   - ⇨ Sizes 250 – 280: 8 set screws
   - ⇨ Size 315: 12 set screws

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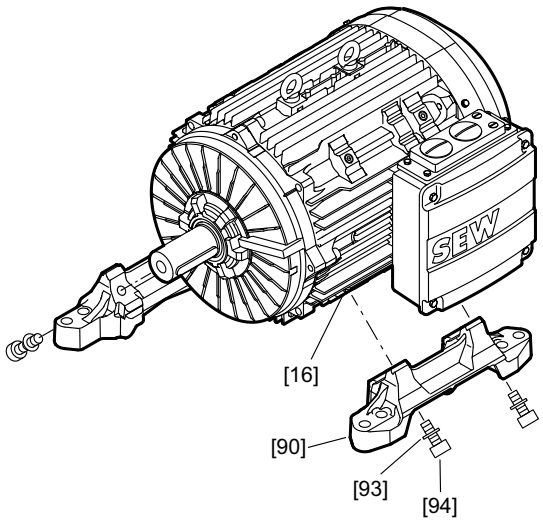
3. Remove the paint from the contact surfaces of the stator [16] where the feet are to be screwed on.
   ⇨ Sizes 250 – 280: 8 surfaces
   ⇨ Size 315: 12 surfaces
4. Apply a thin layer of corrosion protection to the contact surfaces after the paint has been removed.
5. Remove the paint from the contact surfaces of the feet [90].
6. Apply a thin layer of corrosion protection to the contact surfaces after the paint has been removed.
7. Attach the feet [90] to the motor using the screws [94] and washers [93]. The screws are micro-encapsulated. This is why you have to screw in and tighten the screws quickly.
8. Apply paint or corrosion protection at the parting line after attaching the feet [90].

Changing motor feet positions



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[16] Stator
[90] Foot
[93] Washer
[94] Screw

For converting the motor feet to another position, observe the following points:

- After removing the screws [94], check for damage to the thread or other similar damage.
- Remove the old micro-encapsulation.
- Clean the threads of the screws [94].
- Apply a high-strength thread locker to the screw threads [94] before inserting the screws again.
- The set screws removed from the new mounting position can be reused for the bores of the old mounting position. After inserting the set screw [1457] into the open tapped holes in the stator [16], paint or corrosion protection can be applied on the bare joining surfaces of the stator.
- When the position of the motor feet is changed, apply corrosion protection to the unpainted surfaces.

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Tightening torques

Motor	Screw	Tightening torque
DRN225	M16	230 Nm
DR..250/DRN250	M20	464 Nm
DR..280/DRN280	M20	464 Nm
DR..315/DRN315	M20	464 Nm

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4.9 Direct mounting of a motor on a gear unit

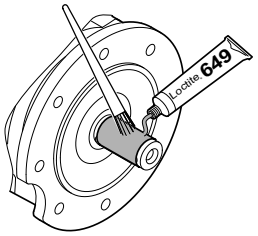
INFORMATION

Secure all pinions on the motor or input shaft with Loctite® 649 even if a retaining ring is additionally present.

If the pinion is already fastened to the shaft, start cleaning the sealing surface (step 6).

Joining the pinion to the motor or input shaft

1. Clean and degrease the shaft and the bore of the pinion.
2. Apply Loctite® 649 to the shaft after the securing hole over the entire area of the circumference.



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3. Warm the pinion up to **at least** 100 °C to a **maximum of** 130 °C.
4. Push the pinion onto the shaft.
5. Secure the pinion on the shaft with the retaining ring.

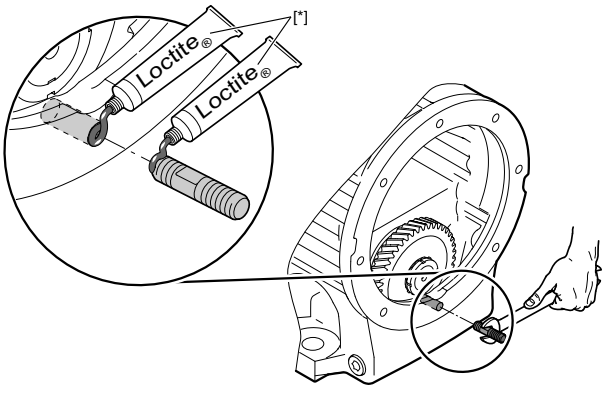
Cleaning the sealing surfaces

6. Remove oils, grease, irregularities of the surface, rust and old Loctite® residue from the flange surfaces.

Sealing threads that lead into the housing interior

To prevent oil from escaping after installation, flange threads that lead into the housing interior must be sealed!

7. Clean and degrease thread through bores that lead into the housing interior and their studs.
8. Apply Loctite® 574 or Loctite® 5188 (selection according to the table at the end of the chapter) in a continuous ring on the upper threads of the flange thread and the stud.



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[*] Loctite® according to the table at the end of the chapter

Screwing in the studs

9. Screw the studs into the thread up to the shoulder.

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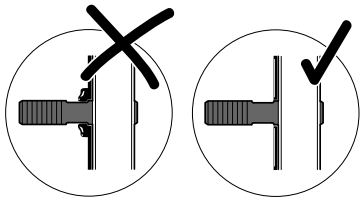
10. Remove any excess Loctite® (see following diagram) from the sealing surface 60 minutes after screwing in at the latest.



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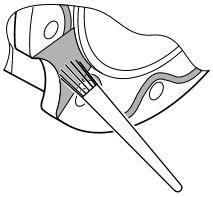
Sealing the flange surface

INFORMATION

Always apply the sealant over a large area in narrow places and on the gear units R97, R107, R127, F97 or F107.



11. Only distribute Loctite® 574 or Loctite® 5188 (selection according to the table at the end of the chapter) to one of the sealing surfaces. Apply the sealant in beads or over a large area without gaps. Use a suitable application tool that does not contaminate the sealing surface, for example, a non-shedding brush or a short-hair lamb's wool roller.

Joining flange surfaces

12. Join the flange surfaces together. Next, **immediately** tighten the nuts with the specified torque (see the table at the end). If you tighten the nuts too late, the sealing film can tear.
13. The sealant must harden for 30 minutes and must not come into contact with the gear oil.

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4.9.1 Tightening torques

Screw/nut	Tightening torque Nm
M6	11.3
M8	27.3
M10	54
M12	93
M16	230

4.9.2 Selection and use of Loctite®

Sealant	Use	Suitability	Batch size	Part number
Loctite® 649	Locking agent for pinions	All gear units	50 ml	09120998
Loctite® 574	Surface sealing agent	All gear units except for R97 – R127, F97, F107	7 ml	09102558
Loctite® 5188		R97 – R127, F97, F107	50 ml	03207013

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4.10 Options

4.10.1 /HR, /HF Manual brake release

The option manual brake release /HR, /HF is preinstalled and set at the factory for some brake sizes. If your drive was not delivered with manual brake release and you wish to retrofit it, observe the instructions in chapter "Retrofitting the /HR, /HF manual brake release" (→ 🗎 203).

Activating and loosening the /HF manual brake release

⚠ WARNING

No brake function due to activated manual brake release.

Severe or fatal injuries.

- Before startup, make sure that the hand lever has been removed or secured against unintentional activation to prevent unintentional brake release during operation.

You can use the option /HF (lockable manual brake release) to continuously mechanically release the BE.. brake with a set screw and a releasing lever.

On delivery, the set screw is inserted far enough to not fall out and to not affect the brake performance. The set screw is self-locking. This prevents it from unintended turning in or from falling out.

In case of BE03 brakes, the set screw is stored in the grommets between the stator fins.

Activating the /HF manual brake release with BE03 brake

Proceed as follows:

1. Screw in the set screw until there is no more clearance at the releasing lever.
2. To release the brake manually, screw in the set screw by 1/2 – 1 turn.

Activating the /HF manual brake release with BE05 – BE122 brake

Proceed as follows:

1. Screw in the set screw until there is no more clearance at the releasing lever.
2. To release the brake manually, screw in the set screw by 1/4 – 1/2 turn.

Loosening the /HF manual brake release with BE03 brake

Proceed as follows:

1. Remove the set screw completely from the thread.
2. Fasten the set screw between the stator fins with both grommets.

Loosening the /HF manual brake release with BE05 – BE122 brake

Proceed as follows:

1. Loosen the set screw at least until the floating clearance of the manual brake release has completely returned, see chapter "Retrofitting the /HR, /HF manual brake release".

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Activating and loosening the /HR manual brake release

⚠ WARNING

No brake function due to activated manual brake release.

Severe or fatal injuries.

- Before startup, make sure that the hand lever has been removed or secured against unintentional activation to prevent unintentional brake release during operation.

You can use the option /HF manual brake release to mechanically release the BE.. brake for a short time via a combination of releasing lever and hand lever. It is designed with a spring mechanism, so that it reengages automatically.

During assembly, the mechanics inside the fan guard is preset at the factory. A hand lever is included in the delivery that is attached to the stator housing.

Activating the /HR manual brake release

Proceed as follows:

1. Remove the hand lever from the stator housing.
2. Screw the thread of the hand lever completely into the thread of the releasing lever.
3. To release the brake, pull the hand lever in the direction away from the terminal box. The correct direction of use is indicated by an arrow symbol on the fan guard or on the closing part on the fan guard opening.

Loosening the /HR manual brake release

INFORMATION

The releasing procedure can be performed with usual force application, do not apply too much force to the lever to avoid damage to the drive.

Proceed as follows:

1. Let go of the lever in the actuated state. The lever automatically reengages to the initial position and the brake is applied.
2. Screw out the hand lever and keep it safe. With motors of sizes 63 – 280, you can attach the hand lever to the stator housing with the provided grommets or clamps.

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4.10.2 Air filter /LF

The air filter is a filter fleece that is installed in front of the fan grille. It can be easily removed and installed for cleaning purposes.

The attached air filter prevents dust and other particles that are drawn in by the air flow from being distributed. It also prevents that the ducts between the cooling fins become clogged with dust.

In very dusty environments, the air filter protects the cooling fins from dirt or from becoming clogged.

The air filter must be cleaned or replaced depending on the amount of dust in the environment. No maintenance intervals can be specified due to the individuality of each drive and the environment where it is installed.

Technical data	Air filter
Approvals	All certifications
Ambient temperature	-40 °C to +100 °C
Filter material	Viledon PSB290SG4

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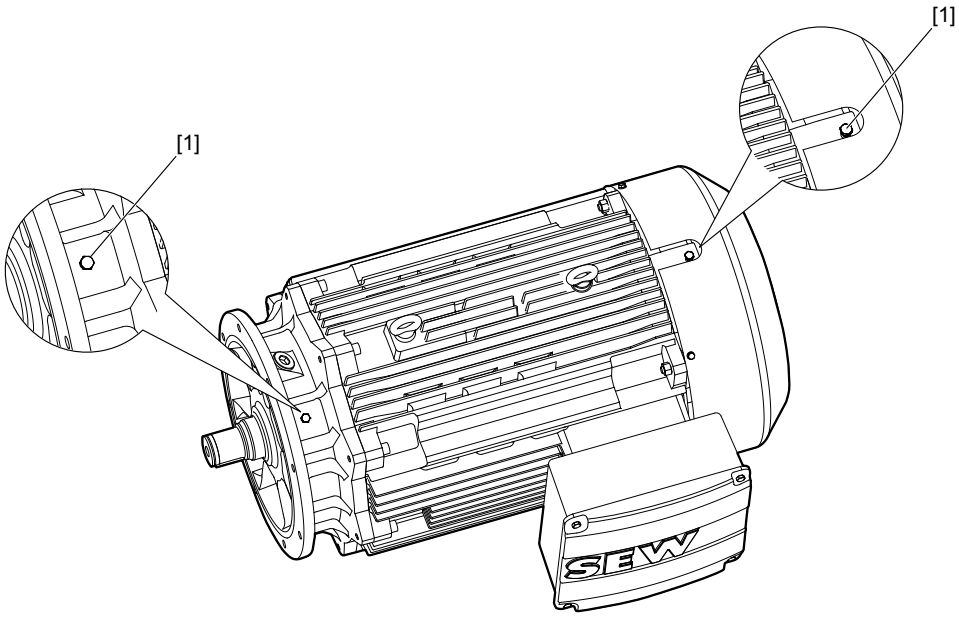
4.10.3 Mounting adapter for measuring nipple

Depending on the respective order specifications, SEW-EURODRIVE delivers the drives as follows:

- With bore
- With bore and included measuring nipples for vibration measurement.

The following figure shows a motor with bores and inserted measuring nipples [1]:



9007201960947467

[1] Bore with inserted measuring nipples

Proceed as follows to connect the customer measuring device:

1. Remove the protective plugs from the bores.
2. Insert the measuring nipple in the bores of the motor and screw in the measuring nipple with a tightening torque of 15 Nm.
3. Plug the mounting adapter of the measuring unit into the measuring nipple.

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4.10.4 Second shaft end with optional cover

SEW-EURODRIVE delivers motors with the 2nd shaft end option /2W with the key inserted and secured by transport protection.

⚠ WARNING

Unsecured key skidding out of the keyway.

Severe or fatal injuries due to flying parts.

- Only operate the motor with a suitably secured key.

⚠ WARNING

Rotating shaft end or attachments.

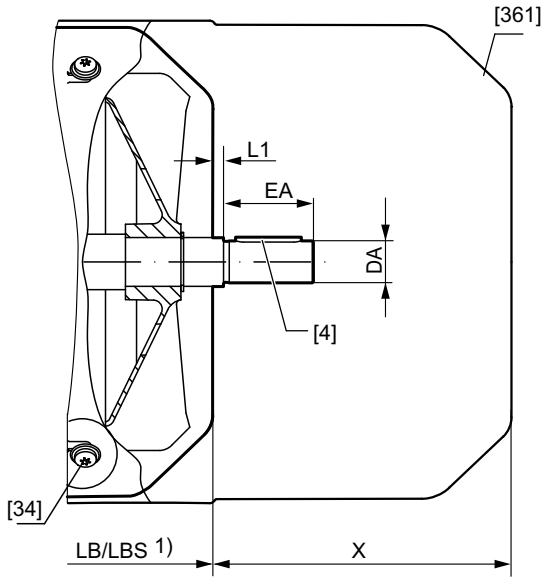
Severe or fatal injuries.

- Only start the motor with installed protective cover at the second shaft end.

The protection cover must meet the impact resistance requirements of EN 60079-0 (VDE 0170-1):2014-06, chapter 26.4.2.

As an option, SEW-EURODRIVE can also provide the safety cover [361] for the 2nd motor shaft end already installed at the DR..71 – 280 and DRN63 – 280 motors. This is not included in the delivery as standard.

The following figure shows the dimensions of the optional cover.



18014402029073931

[4] Keyway
[34] Tapping screw
[361] Safety cover
LB/LBS Length of the motor/brakemotor
1) Refer to the "AC Motors" catalog for dimensions

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Dimensions

Motors			DA	EA	L1	X
DR..	DRN..	DR2..	mm	mm	mm	mm
–	DRN63	DR2..63	11	23	2	78
–	DRN63 /BE	DR2..63 /BE				
DR..71	DRN71	DR2..71	11	23	2	91.5
DR..71 /BE	DRN71 /BE	DR2..71 /BE				88
DR..80	DRN80	DR2..80	14	30	2	95.5
DR..80 /BE	DRN80 /BE	DR2..80 /BE				94.5
DR..90	DRN90	–	14	30	2	88.5
DR..90 /BE	DRN90 /BE	–				81
DR..100	DRN100	–	14	30	2	87.5
DR..100 /BE	DRN100 /BE	–				81
DR..112 – 132	DRN112 – 132S	–	19	40	3.5	125
DR..112 – 132 /BE	DRN112 – 132S /BE	–				120.5
DR..160	DRN132M/L	–	28	60	4	193
DR..160 /BE	DRN132M/L /BE	–				187
DR..180	DRN160 – 180	–	38	80	4	233
DR..180 /BE	DRN160 – 180 /BE	–				236
DR..200 – 225	DRN200 – 225	–	48	110	5	230
DR..200 – 225 /BE	DRN200 – 225 /BE	–				246
DR..250 – 280	DRN250 – 280	–	55	110	3	243.5
DR..250 – 280 /BE	DRN250 – 280 /BE	–				

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5 Electrical installation

5.1 General information

⚠ WARNING

Electric shock due to incorrect installation.

Severe or fatal injuries.

- Use switch contacts in utilization category AC-3 according to EN 60947-4-1 for switching the motor.
- Use switch contacts to switch the brake. Depending on brake type and type design, the switch contacts meet the specifications in the following utilization categories:
  - Switch contacts for the supply voltage for operation with AC voltage: AC-3 according to EN 60947-4-1, or AC-15 according to EN 60947-5-1.
  - Switch contact for the supply voltage for operation with DC voltage: Preferably AC-3 or DC-3 according to EN 60947-4-1. As an alternative, contacts in utilization category DC-13 according to EN 60947-5-1 are also permitted.
  - Switch contacts for optional cut-off in the DC circuit: AC-3 according to EN 60947-4-1.
- When motors are powered by inverters, you must adhere to the wiring instructions in the frequency inverter operating instructions.

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5.2 Wiring diagrams and terminal assignment diagrams

Connect the motor as shown in the wiring connection diagrams provided with the motor. You can obtain the valid wiring diagrams free of charge from SEW-EURODRIVE.

INFORMATION

Do not connect or start up the motor if the wiring diagram is missing.

5.3 Wiring notes

During installation observe the safety notes in chapter 2 and 5.

5.3.1 Protecting the brake control system against interference

Brake cables must always be routed separately from other unshielded power cables with phased currents to prevent interference with brake control. In particular, power cables with phased currents include:

- Output cables from frequency inverters and servo inverters, soft start units and brake units
- Supply cables for braking resistors and similar options

For line-operated motors and when using AC and DC circuit cut-off, the connection between the brake rectifier and the external switch contact must be in a different power cable that is separate from the motor power supply.

5.3.2 Protecting the motor protection devices against interference

Adhere to the following points to protect motor protection devices by SEW-EURODRIVE against interference:

- You may route separately shielded supply cables together with switched-mode power cables in one cable.
- Do not route unshielded supply cables together with switched-mode power lines in one cable.

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5.4 Special aspects for operation with a frequency inverter

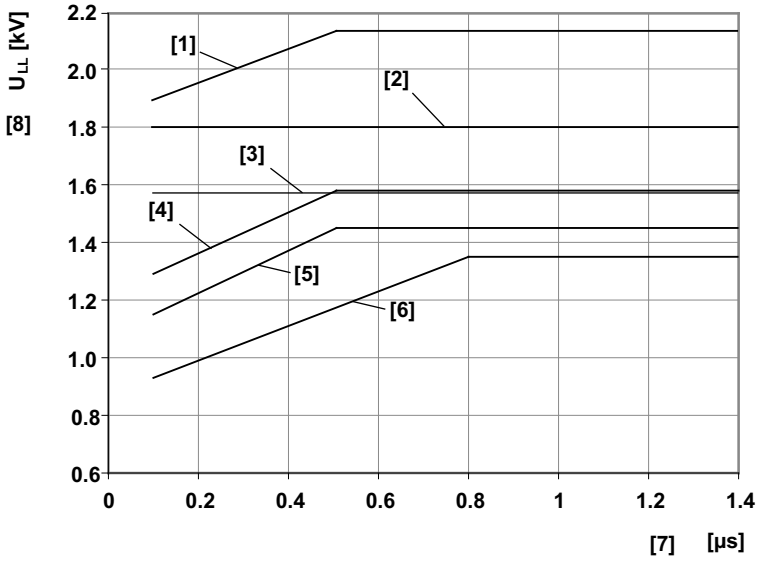
When motors are powered from inverters, you must observe the wiring instructions issued by the inverter manufacturer. You must also observe the operating instructions for the frequency inverter.

5.4.1 Motors with SEW-EURODRIVE frequency inverter

Operation of the motor on SEW-EURODRIVE frequency inverters has been tested. The required dielectric strength values of the motors were confirmed and the startup routines adjusted to the motor data. You can operate the motor with any frequency inverter from SEW-EURODRIVE. To do this, start up the motor as described in the operating instructions for the frequency inverter.

5.4.2 Motor with non-SEW inverter

Operating SEW-EURODRIVE motors on third-party frequency inverters is permitted if the pulse voltages at the motor terminals indicated in the following figure are not exceeded.



9007203235332235

[1] Permitted pulse voltage for DR.., DRN.. motors with reinforced insulation and increased resistance against partial discharge (/RI2)
[2] Permitted pulse voltage for DR.., DRN.. motors with reinforced insulation (/RI)
[3] Permitted pulse voltage according to NEMA MG1 part 31, $V_N \leq 500$ V
[4] Permitted pulse voltage according IEC 60034-25, limit value curve A for nominal voltage $V_N \leq 500$ V, star connection
[5] Permitted pulse voltage according IEC 60034-25, limit value curve A for nominal voltage $V_N \leq 500$ V, delta connection
[6] Permitted pulse voltage according to IEC 60034-17
[7] Voltage rise time
[8] Permitted pulse voltage

The insulation class depends on the voltage.

- ≤ 500 V = standard insulation
- ≤ 600 V = /RI
- > 600 V – 690 V = /RI2

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INFORMATION

Compliance with the following limit values must be checked and considered:

- The supply voltage level at the third-party inverter
- The threshold of the brake chopper voltage
- The operating mode of the motor (motor mode/generator mode)

→ If the permitted pulse voltage is exceeded, you must install limiting measures, such as filters, chokes or special motor cables. Consult the manufacturer of the frequency inverter.

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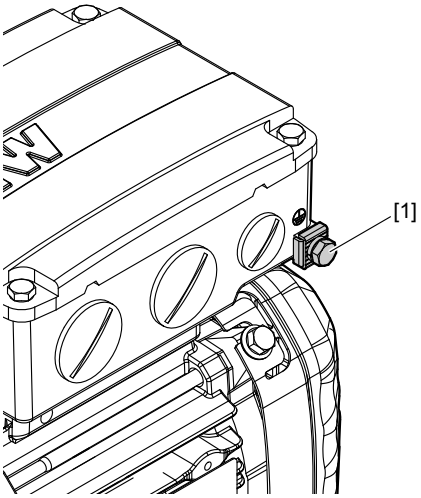
5.5 Exterior grounding at the terminal box, LF grounding

In addition to the interior PE connection, a LF grounding cable can be attached to the outside of the terminal box. It is not installed as standard.

LF grounding can be ordered as completely pre-installed at the factory. For this, an aluminum or gray cast iron terminal box designed for brake connections is required for DR..71 – 132, DRN71 – 132S, DR2..71 – 80 motors. For DR..160 – 225, DRN132M – 225 motors, this option can be combined with all terminal box types.

The option can be combined with "HF grounding" (→ 🗎 67).

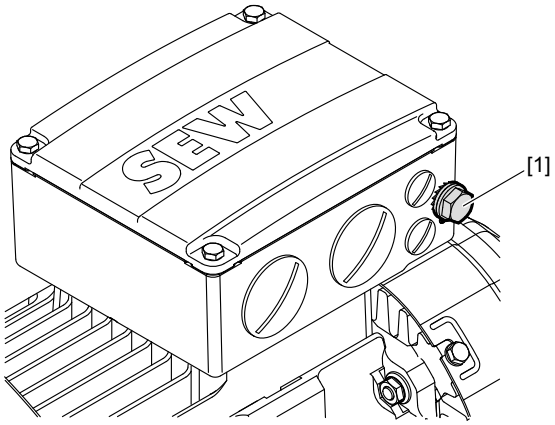
DR..71 – 132, DRN71 – 132S, DR2..71 – 80 motors



9007207279069579

[1] LF grounding at the terminal box

DR..160 – 225, DRN132M – 225 motors



8026938379

[1] LF grounding at the terminal box

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5.6 Improving the grounding (EMC), HF grounding

For improved, low-impedance grounding at high frequencies, we recommend using the following connections with corrosion protected connection elements:

HF grounding is not installed as standard.

The HF grounding option can be combined with LF grounding at the terminal box.

If you require LF grounding in addition to HF grounding, you can connect the conductor to the same point.

The HF grounding option can be ordered as follows:

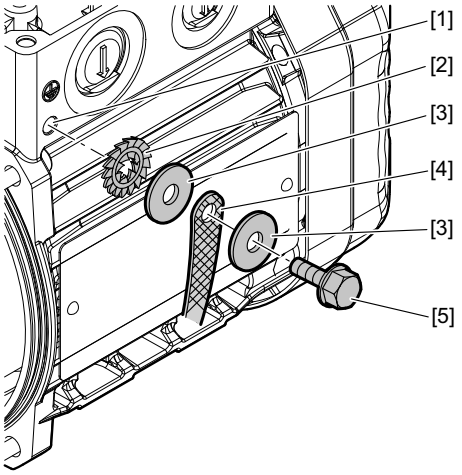
- Completely pre-assembled at the factory
- As "grounding terminal" kit for customer installation; part numbers listed in the following table.

Motors	Part number of "Grounding terminal" kit
DRN63, DR2..56 – 63	21014817
DR..71 – 100M, DRN71 – 100LS, DR2..71 – 80	21015988
DR..100L – 132, DRN100L – 132S	13633945
DR..160 – 225, DRN132M – 225 with aluminum terminal box	

INFORMATION

If 2 or more ground straps are used, you have to attach them with a longer screw. The specified tightening torques refer to a strap thickness of t ≤ 3 mm.

5.6.1 DRN63, DR2..56 – 63 motors with HF(+LF) grounding



22297406859

[1] Use of the pre-cast bore at the stator housing
[2] Serrated lock washer
[3] Disk ISO 7093
[4] Ground strap (not included in the delivery)
[5] Self-tapping screw DIN 7500 M5 × 16, tightening torque 5 Nm

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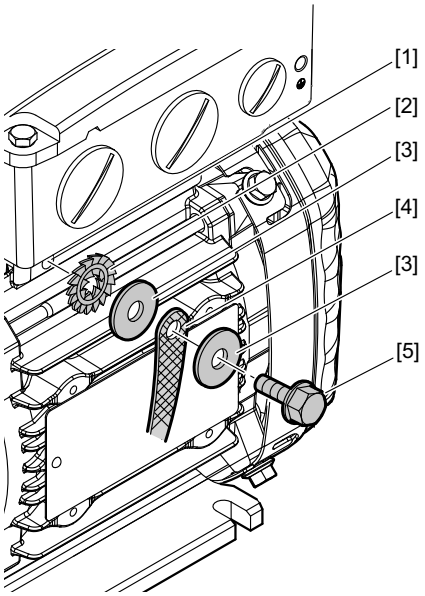
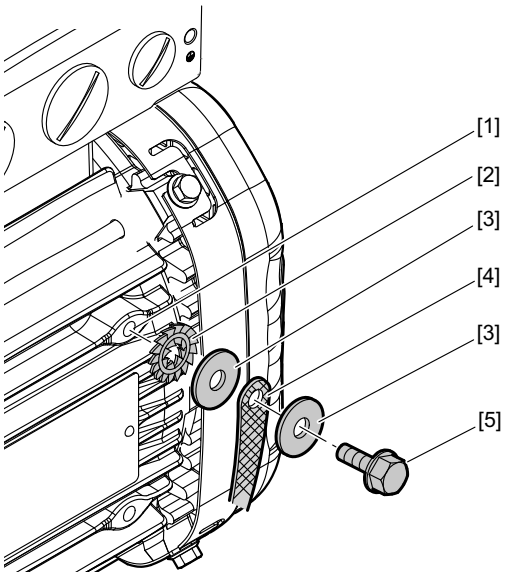
5.6.2 DR..71 – 80, DRN71 – 80, DR2..71 – 80 motors with HF(+LF) grounding



8026768011

[1] Use of the pre-cast bore at the stator housing
[2] Serrated lock washer
[3] Disk ISO 7093
[4] Ground strap (not included in the delivery)
[5] Self-tapping screw DIN 7500 M6 × 16, tightening torque 10 Nm

5.6.3 DR..90, DRN90 motors with HF(+LF) grounding



8026773131

[1] Use of the pre-cast bore at the stator housing
[2] Serrated lock washer
[3] Disk ISO 7093
[4] Ground strap (not included in the delivery)
[5] Self-tapping screw DIN 7500 M6 × 16, tightening torque 10 Nm

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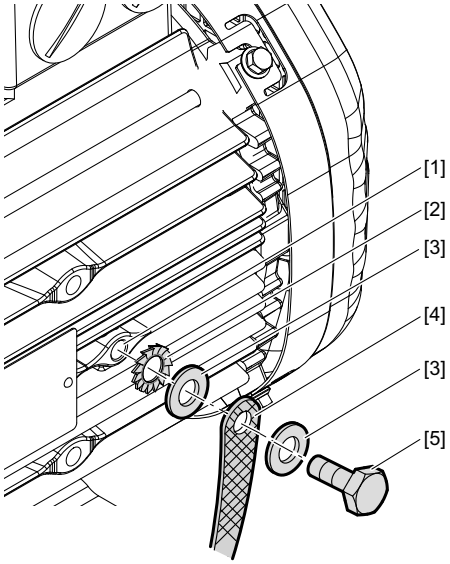
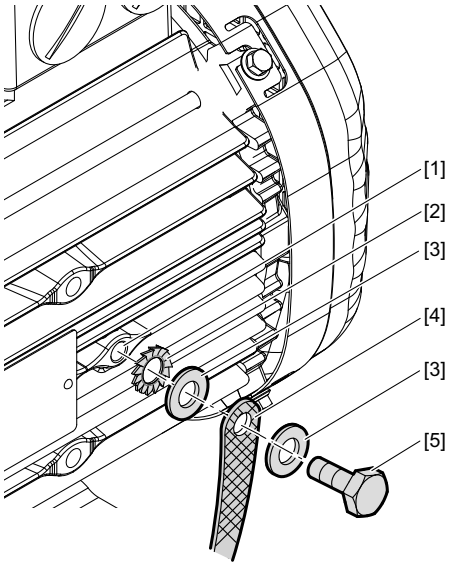
5.6.4 DR..100M, DRN100LS motors with HF(+LF) grounding



18014402064551947

[1] Use of the pre-cast bore at the stator housing
[2] Serrated lock washer
[3] Disk ISO 7093
[4] Ground strap (not included in the delivery)
[5] Self-tapping screw DIN 7500 M6 × 16, tightening torque 10 Nm

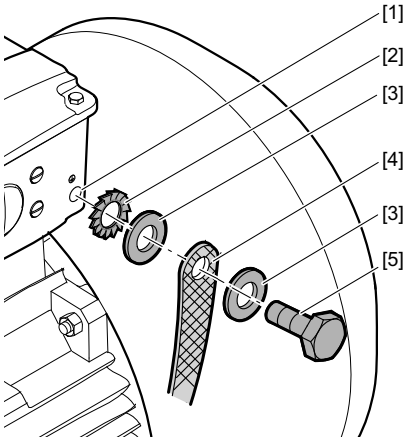
5.6.5 DR..100L – 132, DRN100LM – 132S motors with HF(+LF) grounding



18014402064551947

[1] Use of tapped hole for lifting eyes
[2] Serrated lock washer DIN 6798
[3] Washer ISO 7089/ISO 7090
[4] Ground strap (not included in the delivery)
[5] Hex head screw ISO 4017 M8 × 18, tightening torque 10 Nm

5.6.6 DR..160 – 315, DRN132M – 315 motors with HF(+LF) grounding



9007202821668107

[1] Use of the tapped holes at the terminal box
[2] Serrated lock washer DIN 6798
[3] Washer ISO 7089/ISO 7090
[4] Ground strap (not included in the delivery)
[5]
- Hex head screw ISO 4017 M8 × 18 (with aluminum terminal boxes of DR..160 – 225, DRN132M – 225 motors), tightening torque 10 Nm
- Hex head screw ISO 4017 M10 × 25 (with gray cast iron terminal boxes of DR..160 – 225, DRN132M – 225 motors), tightening torque 10 Nm
- Hex head screw ISO 4017 M12 x 30 (terminal boxes of DR../DRN250 – 315 motors), tightening torque 15.5 Nm

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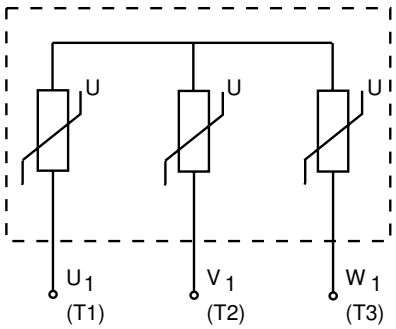
5.7 Special aspects in switching operation

When the motors are used in switching operation, possible interference of the switchgear must be excluded by ensuring suitable wiring. According to EN 60204 (electrical equipment of machines), motor windings must have interference suppression to protect the numerical or programmable logic controllers. As it is primarily switching operations that cause interference, SEW-EURODRIVE recommends installing protective circuit in the switching devices.

If the drive has been delivered with a suppressor circuitry in the motor, you must observe the provided wiring diagram.

5.8 Special aspects of torque motors and low-speed motors

Due to the design of DRM.., DR2M.. torque motors and low-speed motors, very high induction voltages may be generated when they are switched off. Consequently, SEW-EURODRIVE recommends using the varistor circuit shown below for protection. The size of the varistors depends, amongst other factors, on the starting frequency.

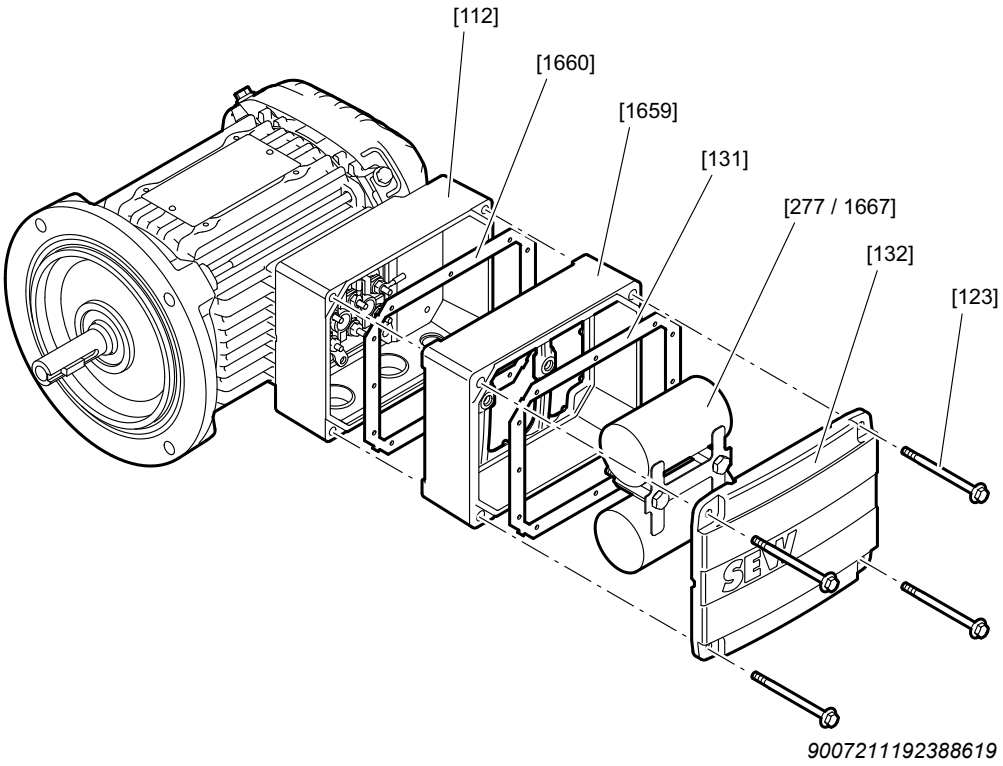


2454566155

5.9 Special aspects of DRK.. single-phase motors

Scope of delivery and motor design

DRK.. single-phase motors are delivered with installed running capacitor in the terminal box. Starting relay, centrifugal switch or start-up capacitor are not supplied.



9007211192388619

[112]	Terminal box	[277]/[1667]	Capacitor
[1660]	Seal	[132]	Terminal box cover
[1659]	Adapter piece	[123]	Screw
[131]	Seal		

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5.9.1 Connecting DRK.. single-phase motors

⚠ WARNING

Electric shock due to charged capacitor.

Severe or fatal injuries.

- After disconnection from the power supply, wait 5 seconds before opening the terminal box.

DRK.. single-phase motors are delivered with 1 or 2 installed and connected running capacitors. The data specified in chapter "Technical data" (→ 🗎 262) apply.

INFORMATION

If a running capacitor installed by SEW-EURODRIVE must be replaced, only use capacitors with the same technical data.

INFORMATION

Start-up against the complete rated torque is not possible with only the running capacitors.

Parts which are not supplied must be ordered from specialist retailers and must be connected according to the corresponding instructions and "wiring diagrams" (→ 🗎 284).

Proceed as follows during connection:

- Remove terminal box cover [132]
- Remove adapter piece [1659] with the running capacitors [277]/[1667]
- Perform the connection according to supplied wiring diagrams.

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5.10 Notes regarding the connection of the motor

INFORMATION

It is essential to comply with the valid wiring diagram. Do not connect or start up the motor if this wiring diagram is missing. You can obtain the valid wiring diagrams free of charge from SEW-EURODRIVE.

⚠ WARNING

Danger due to contaminated terminal box.

Severe or fatal injuries.

- Seal the terminal box and unused cable entries against dust and humidity.
- Remove present foreign objects, dirt and humidity from the terminal box.

Observe the following points when connecting the motor:

- Check cable cross section
- Arrange terminal links correctly
- Screw on the connections and the PE conductor correctly
- Make sure that the connection cables are not cramped to avoid damage to the cable insulation.
- Observe air gaps, see chapter "Electrical connection" (→ 🗎 13)
- In the terminal box: Check winding connections and tighten them if necessary
- Perform the connection in accordance with the enclosed wiring diagram
- Avoid protruding wire ends
- Connect the motor according to the prescribed direction of rotation

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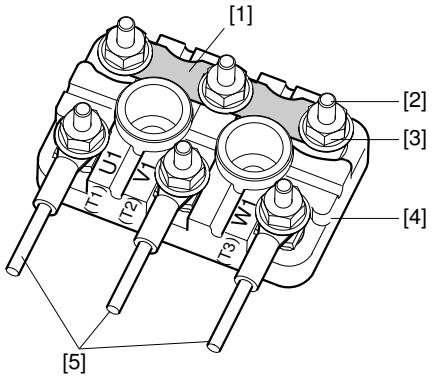
5.11 Connecting the motor via terminal block

5.11.1 According to wiring diagram R13

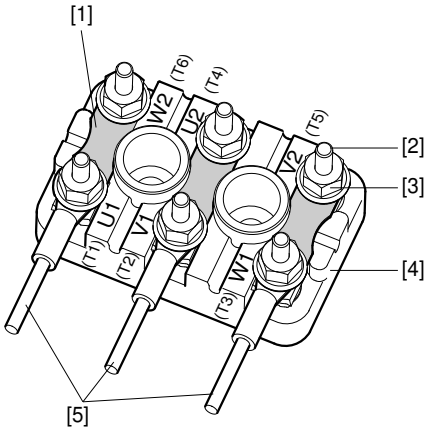
Arrangement of terminal links with ⅄ connection



27021598003155723

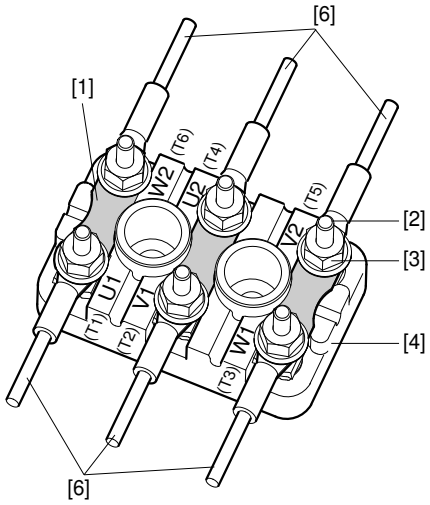
Arrangement of terminal links with △ connection

DR..71 – 280, DRN63 – 280, DR2..63 – 80 motors
(single-sided supply):



9007199493672075

DR../DRN250 – 315 motors
(double-sided supply):



9007199734852747

[1] Terminal link
[2] Terminal studs
[3] Flange nut
[4] Terminal board
[5] Customer connection
[6] Customer connection with divided connection cable

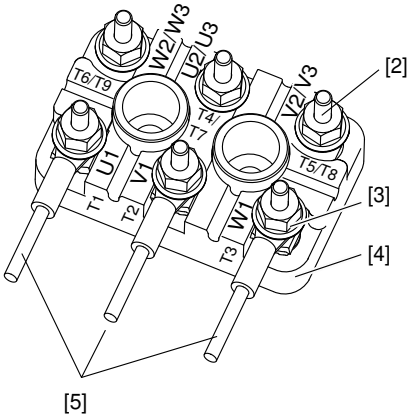
INFORMATION

For DR../DRN250 – 315 motors, SEW-EURODRIVE recommends a double-sided supply for load currents higher than

- M12: 250 A
- M16: 315 A

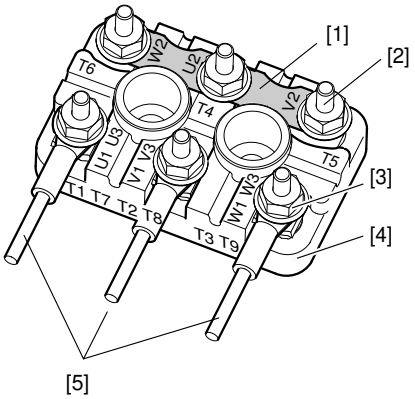
5.11.2 According to wiring diagram R76

Arrangement of terminal links with ⅄ connection



2319075083

Arrangement of terminal links with ⅄⅄ connection



9007201591100811

[1] Terminal link
[2] Terminal studs
[3] Flange nut
[4] Terminal board
[5] Customer connection

INFORMATION

Three winding lead ends must be rewired to change from high to low voltage:

The lines designated U3 (T7), V3 (T8) and W3 (T9) must be reconnected.

- U3 (T7) from U2 (T4) to U1 (T1)
- V3 (T8) from V2 (T5) to V1 (T2)
- W3 (T9) from W2 (T6) to W1 (T3)

→ Changing from low to high voltage is carried out in reverse order. In both cases, the customer connection is made to U1 (T1), V1 (T2) and W1 (T3). You can change the direction of rotation by interchanging 2 supply cables.

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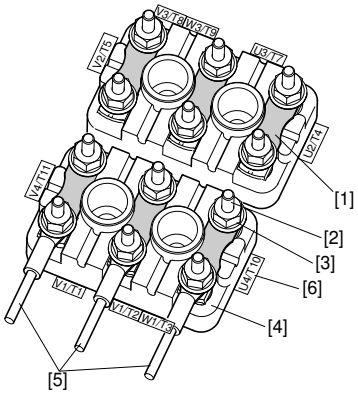
5.11.3 According to wiring diagram R72

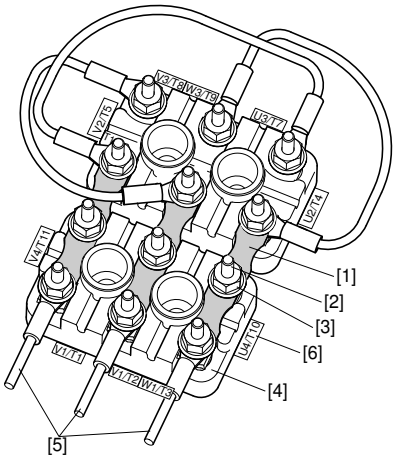
Arrangement of terminal links with △ connection



18014400828555147

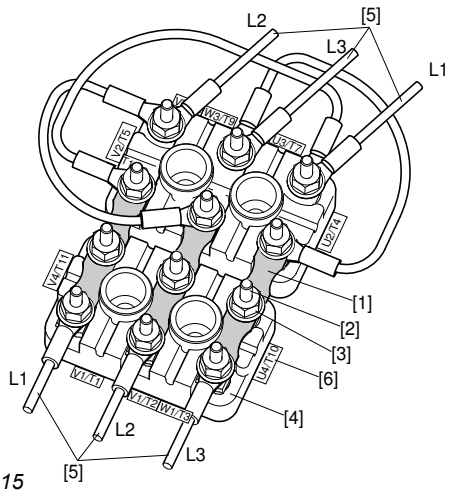
Arrangement of terminal links with △△ connection

DR..71 – 280, DRN63 – 280, DR2..63 – 80 motors
(single-sided supply):



18014400845874315

DR../DRN250 – 315 motors
(double-sided supply):



9007208157343883

[1] Terminal link
[2] Terminal studs
[3] Flange nut
[4] Terminal board
[5] Customer connection
[6] Wiring designation plate
L1 Conductor 1
L2 Conductor 2
L3 Conductor 3

INFORMATION

For DR../DRN250 – 315 motors, SEW-EURODRIVE recommends a double-sided supply for load currents higher than

- M10: 160 A

5.11.4 Connection variants via terminal block

The motors are supplied and connected differently depending on the electrical design. Arrange the terminal links as shown in the wiring diagram and screw them on firmly. Observe the tightening torques specified in the following tables.

DRN63, DR2..63 motors							
Terminal stud	**Tightening torque hex nut**	**Connection**	**Design**	**Connection type**	**Scope of delivery**	**PE connection screw**	**PE design**
Ø		**Cross section**				**Ø**	
M4	**1.6 Nm**	**≤ 1.5 mm²**	**1a**	**Conductor end sleeve**	**Preassembled terminal links**	M4	6
		≤ 2.5 mm²	**1a**	**Solid wire**	**Preassembled terminal links**		
		≤ 6 mm²	**1b**	**Ring cable lug**	**Preassembled terminal links**		
		≤ 6 mm²	2	Ring cable lug	Connection accessories enclosed		
DR..71 – 100, DRN71 – 100, DR2..71 – 80 motors							
Terminal stud	**Tightening torque hex nut**	**Connection**	**Design**	**Connection type**	**Scope of delivery**	**PE connection screw**	**PE design**
Ø		**Cross section**				**Ø**	
M4	**1.6 Nm**	**≤ 1.5 mm²**	**1a**	**Conductor end sleeve**	**Preassembled terminal links**	M5	4
		≤ 2.5 mm²	**1a**	**Solid wire**	**Preassembled terminal links**		
		≤ 6 mm²	**1b**	**Ring cable lug**	**Preassembled terminal links**		
		≤ 6 mm²	2	Ring cable lug	Connection accessories enclosed		
M5	2.0 Nm	≤ 2.5 mm²	1a	Solid wire Conductor end sleeve	Preassembled terminal links		
		≤ 16 mm²	1b	Ring cable lug	Preassembled terminal links		
		≤ 16 mm²	2	Ring cable lug	Connection accessories enclosed		
M6	3.0 Nm	≤ 35 mm²	3	Ring cable lug	Connection accessories enclosed		
DR..112 – 132, DRN112 – 132M motors							
Terminal stud	**Tightening torque hex nut**	**Connection by customer**	**Design**	**Connection type**	**Scope of delivery**	**PE connection screw**	**PE design**
Ø		**Cross section**				**Ø**	
M5	**2.0 Nm**	**≤ 2.5 mm²**	**1a**	**Solid wire Conductor end sleeve**	**Preassembled terminal links**	M5	4
		≤ 16 mm²	**1b**	**Ring cable lug**	**Preassembled terminal links**		
		≤ 16 mm²	2	Ring cable lug	Connection accessories enclosed		
M6	3.0 Nm	≤ 35 mm²	3	Ring cable lug	Connection accessories enclosed		
DR..160, DRN132L motors							
Terminal stud	**Tightening torque hex nut**	**Connection by customer**	**Design**	**Connection type**	**Scope of delivery**	**PE connection screw**	**PE design**
Ø		**Cross section**				**Ø**	
M6	**3.0 Nm**	**≤ 35 mm²**	**3**	**Ring cable lug**	**Connection accessories enclosed**	M8	5
M8	6.0 Nm	≤ 70 mm²	3	Ring cable lug	Connection accessories enclosed	M10	5

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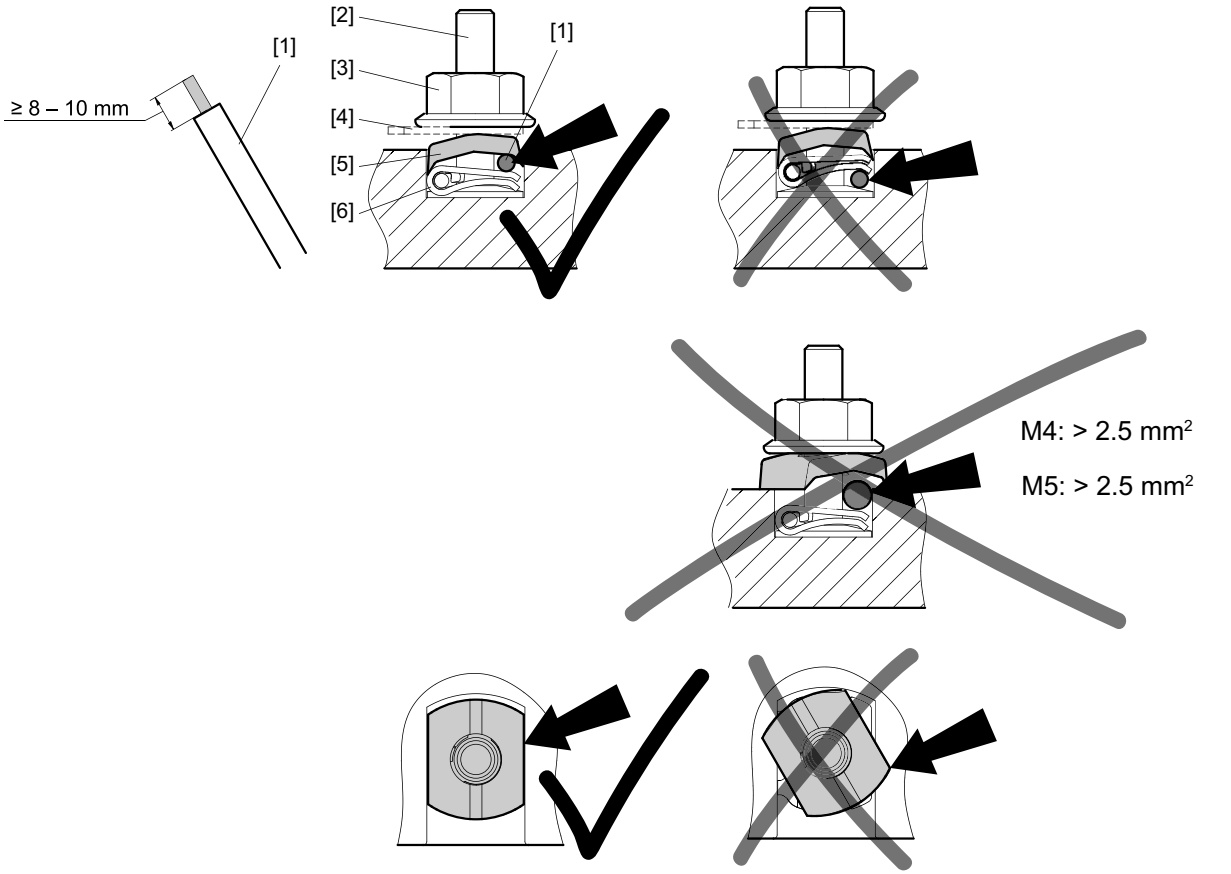
DR..180 – 225, DRN160 – 225 motors							
Terminal stud Ø	**Tightening torque hex nut**	**Connection by customer Cross section**	**Design**	**Connection type**	**Scope of delivery**	**PE terminal stud Ø**	**PE design**
M8	**6.0 Nm**	**≤ 70 mm²**	**3**	**Ring cable lug**	**Connection accessories enclosed**	M8	5
M10	10 Nm	≤ 95 mm²	3	Ring cable lug	Connection accessories enclosed	M10	5
M12	15.5 Nm	≤ 95 mm²	3	Ring cable lug	Connection accessories enclosed	M10	5
DR../DRN250 – 280 motors							
Terminal stud Ø	**Tightening torque hex nut**	**Connection by customer Cross section**	**Design**	**Connection type**	**Scope of delivery**	**PE terminal stud Ø**	**PE design**
M10	**10 Nm**	**≤ 95 mm²**	**3**	**Ring cable lug**	**Connection accessories enclosed**	M12	5
M12	**15.5 Nm**	**≤ 95 mm²**	**3**	**Ring cable lug**	**Connection accessories enclosed**	M12	5
DR../DRN315 motors							
Terminal stud Ø	**Tightening torque hex nut**	**Connection by customer Cross section**	**Design**	**Connection type**	**Scope of delivery**	**PE terminal stud Ø**	**PE design**
M12	**15.5 Nm**	**≤ 95 mm²**	**3**	**Ring cable lug**	**Premounted connection pieces**	M12	5
M16	**30 Nm**	**≤ 120 mm²**					

The designs in bold print apply to S1 operation for the standard voltages and standard frequencies according to the data in the catalog. Other designs may have different connections, for example, different terminal stud diameters and/or a different scope of delivery.

Variant 1a



36028797107830923

[1] External connection
[2] Terminal stud
[3] Flange nut
[4] Terminal link
[5] Terminal washer
[6] Winding connection with Stocko terminal

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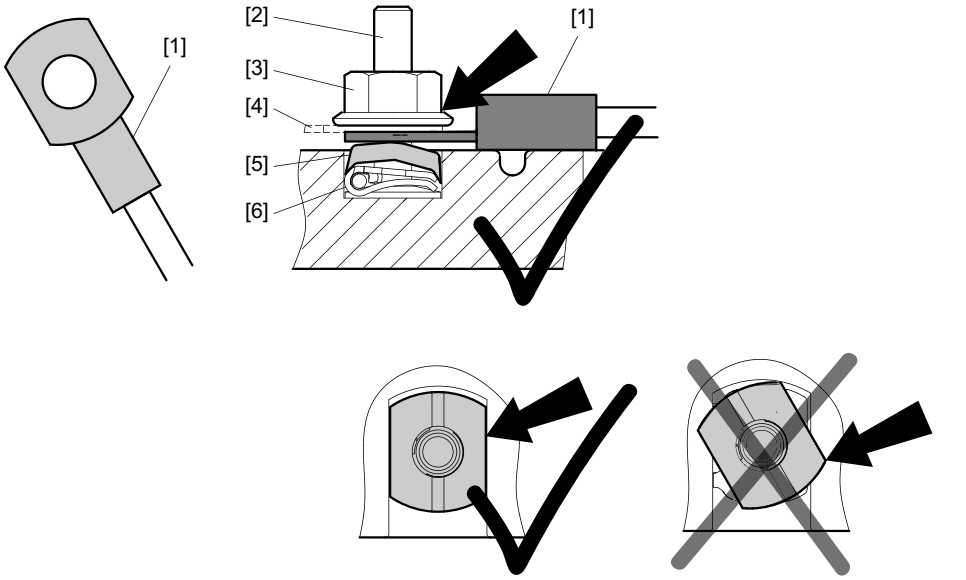
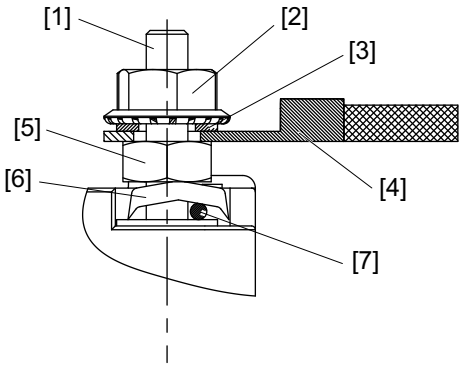
Variant 1b:



18014398598346763

[1] External connection with ring cable lug, according to DIN 46237 or DIN 46234, for example
[2] Terminal stud
[3] Flange nut
[4] Terminal link
[5] Terminal washer
[6] Winding connection with Stocko terminal

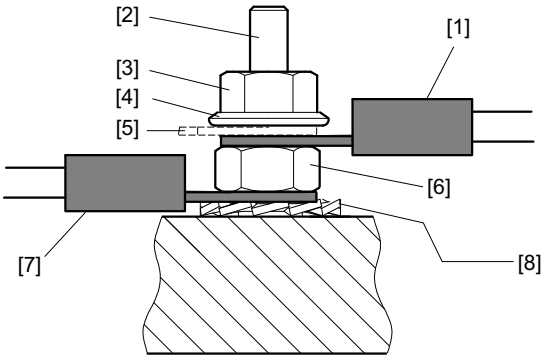
Variant 2



9007199440180363

[1] Terminal board
[2] Flange nut
[3] Terminal link
[4] External connection with ring cable lug, according to DIN 46237 or DIN 46234, for example
[5] Bottom nut
[6] Terminal washer
[7] Winding connection

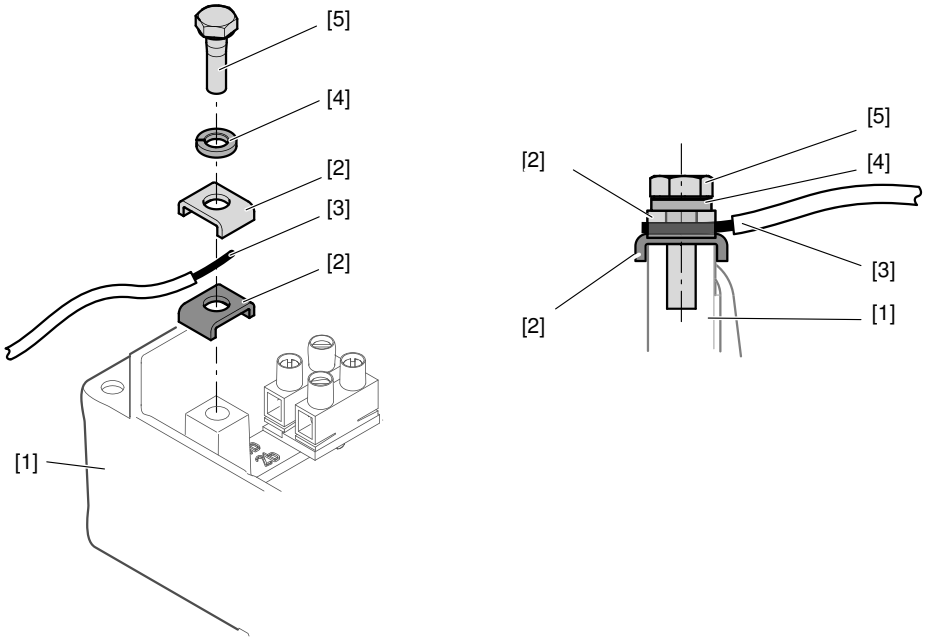
Variant 3



9007199454382091

[1] External connection with ring cable lug, according to DIN 46237 or DIN 46234, for example
[2] Terminal stud
[3] Upper nut
[4] Washer
[5] Terminal link
[6] Bottom nut
[7] Winding connection with ring cable lug
[8] Serrated lock washer

Variant 4



18014399649088651

[1] Terminal box
[2] Terminal clip
[3] PE conductor
[4] Lock washer
[5] Hex head screw

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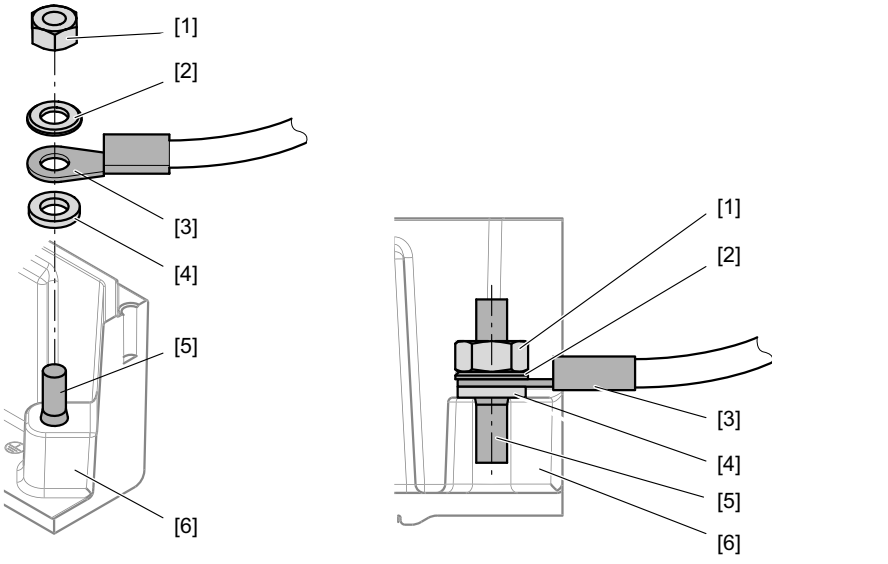
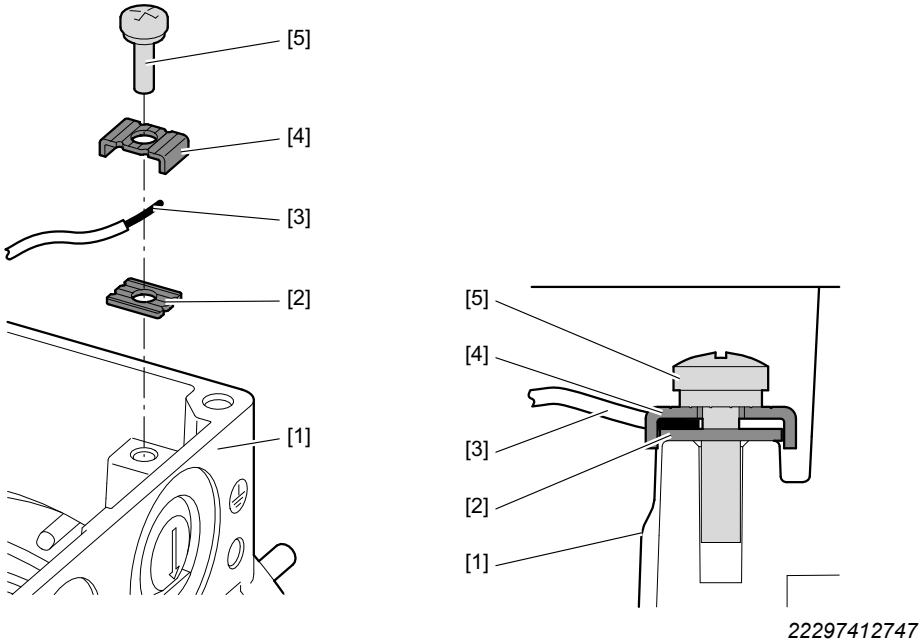
Variant 5



[1] Hex nut
[2] Washer
[3] PE conductor on cable lug
[4] Serrated lock washer
[5] Stud
[6] Terminal box

Variant 6



[1] Terminal box
[2] Support plate
[3] PE conductor
[4] Terminal clip
[5] Flat head screw

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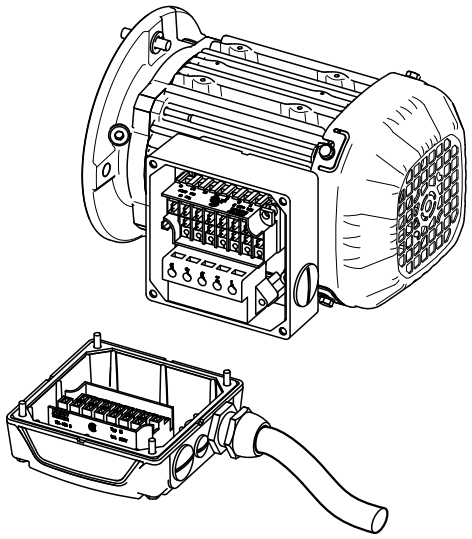
5.12 Connecting the motor plug connector

5.12.1 IS/ISU plug connector



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The lower part of the /IS, /ISU plug connector option is completely prewired at the factory, including the additional features such as brake control.

The upper connector section of the /IS option is included in the scope of delivery. It must be connected according to the wiring diagram.

The /ISU option is delivered without the upper connector section.

The /IS, /ISU plug connector option has CSA approval up to 600 V. Note for application according to CSA regulations: Tighten the M3 clamping screws with a tightening torque of 0.5 Nm.

Cable cross section

Make sure that the type of cable complies with the applicable regulations. The rated currents are specified on the nameplate. The cable cross sections that can be used are listed in the following table.

Without variable terminal link	With variable terminal link	Link cable	Double assignment (Motor and brake/SR)
0.25 – 4.0 mm^2	0.25 – 2.5 mm^2	Max. 1.5 mm^2	max. 1 × 2.5 and 1 × 1.5 mm^2

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Wiring the upper section of the plug connector

- Loosen the housing cover screws:
  - Remove the housing cover
- Loosen the screws from the upper section of the plug connection:
  - Remove upper connector section from the cover
- Strip the insulation off the connection cable:
  - Strip off about 9 mm of insulation
- Pass the cable through the cable gland

Wiring up as shown in wiring diagram R83

- Connect the lines as shown in the wiring diagram:
  - Tighten the clamping screws with a tightening torque of 0.5 Nm.
- Install the plug connector (see chapter "Installing the connector" (→ 🗎 87))

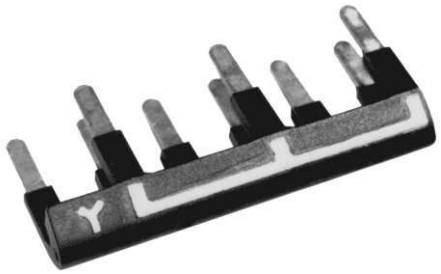
Wiring up as shown in wiring diagram R81

For ⅄/△ startup:

- Connect with 6 lines:
  - Tighten the clamping screws carefully.
  - Motor contactors in the control cabinet
- Install the plug connector (see chapter "Installing the connector" (→ 🗎 87))

For ⅄ or △ operation:

- Connect as shown in the wiring diagram
- Install the variable terminal link as shown in the following figures according to the desired motor operation (⅄ or △)
- Install the plug connector (see chapter "Installing the connector" (→ 🗎 87))



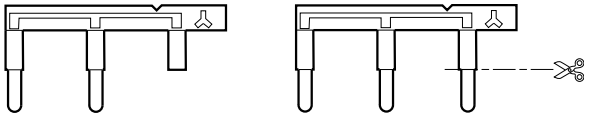
9007200053347851

9007200053349515

Brake control system BSR – preparing the variable terminal link

For ⅄operation:

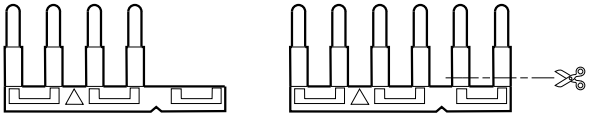
On the ⅄ side of the variable terminal link as shown in the following figure: Remove only the bare metal pin of the marked prong horizontally – install a touch guard!



9007200053520139

For △operation:

On the △ side of the variable terminal link as shown in the following figure: Completely remove two prongs horizontally.



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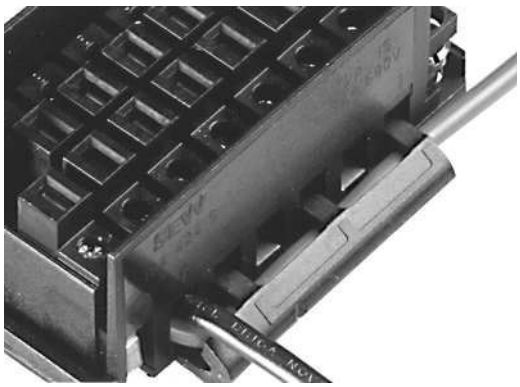
Wiring according to the R81 wiring diagram for ⅄ or △ operation with double terminal assignment

- At terminal for double assignment:
  - Connect the link cable
- When operation is as required:
  - Insert the link cable in the variable terminal link
- Installing the variable terminal link
- At terminal for double assignment:
  - Connect the motor lead above the variable terminal link
- Connect the other lines as shown in the wiring diagram
- Install the plug connector (see chapter "Installing the connector" (→ 🗎 87))



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Installing the plug connector

The housing cover of the IS plug connector can be screwed onto the lower housing part depending on the required position of the cable lead. You have to install the upper part in the housing cover according to the position of the lower part:

1. Define the required mounting position.
2. Install the upper section of the plug connector into the housing cover in accordance with the mounting position.
3. Close the plug connector.
4. Tighten the cable gland.
5. Check all screws of tightening and contact connections for tight fit.

⚠ WARNING

No grounding due to incorrect installation.

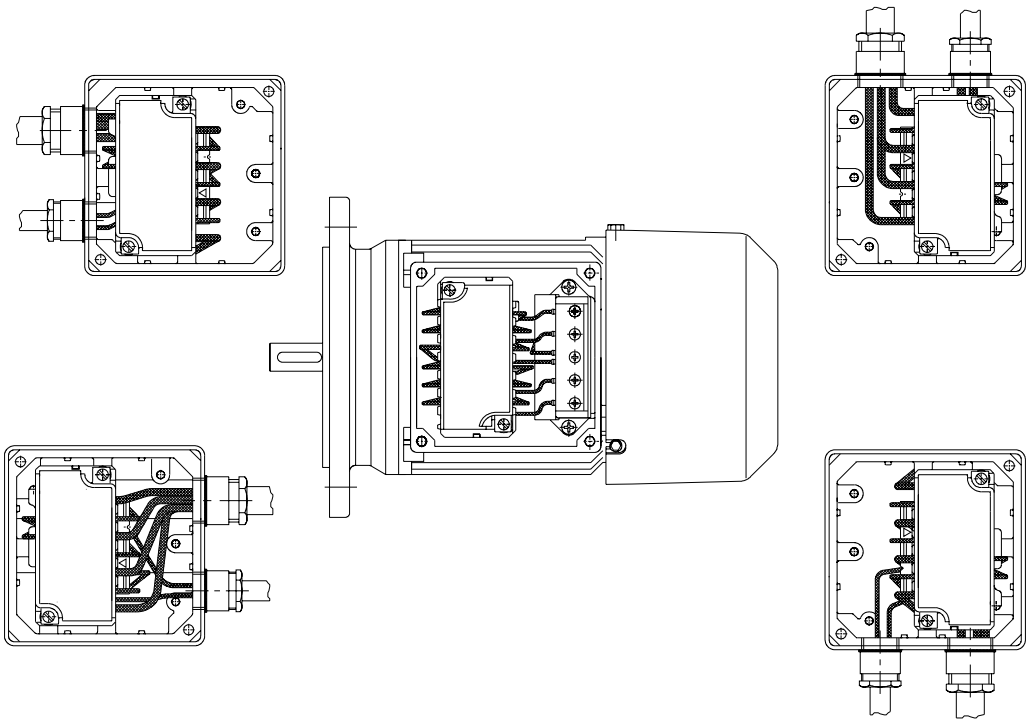
Severe or fatal injuries.

- Tighten the retaining screws of the IS plug connector properly with 2 Nm as these screws also act as protective earth contacts.

IS female connector

9007200053719819

Mounting position of the upper section of the plug connector in the housing cover



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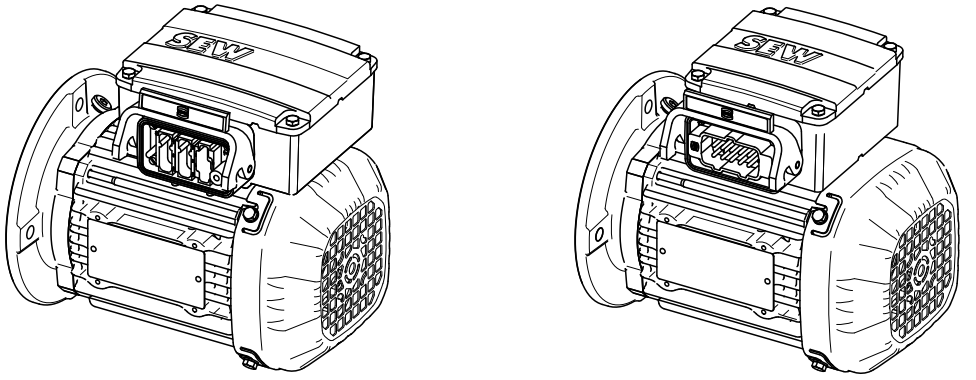
5.12.2 AB.., AD.., AM.., AK.., AC.., AS.. plug connectors



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The installed AB.., AD.., AM.., AK.., AC.. and AS.. connector systems are based on the connector systems made by Harting.

- AB.., AD.., AM.., AK.. Han Modular®
- AC.., AS.. Han 10E / 10ES

The connectors are located at the side of the terminal box. They are locked either using two clamps or one clamp on the terminal box.

The internal motor wiring is performed at the factory according to the order information. The mating connector must be prefabricated by the user.

The mating connector (grommet housing) with socket contacts is not included in the delivery.

INFORMATION

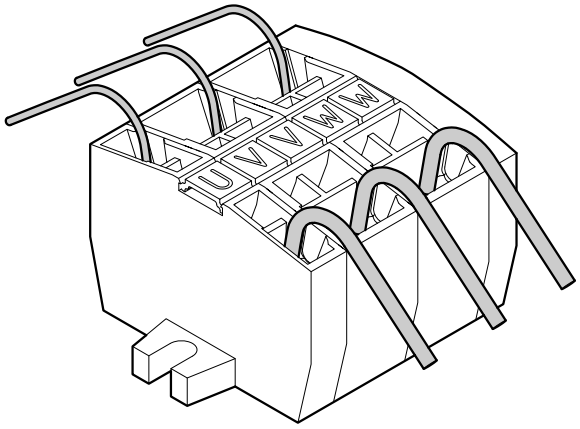
The degree of protection is only guaranteed if the mating connector is plugged in and locked.

5.13 Connecting the motor via terminal strip

5.13.1 According to wiring diagram R10

1. Connect the motor according to the enclosed wiring diagram.
2. Check the maximum cable cross section.
   - ⇨ 2.5 mm² rigid
   - ⇨ 2.5 mm² flexible
   - ⇨ 1.5 mm² flexible with conductor end sleeve
3. The stripping length must be 8 – 9 mm.
4. Connect the protective earth as described in chapter "Variant 6" (→ 🗎 83).

Arrangement of the terminal leads for 人 connection



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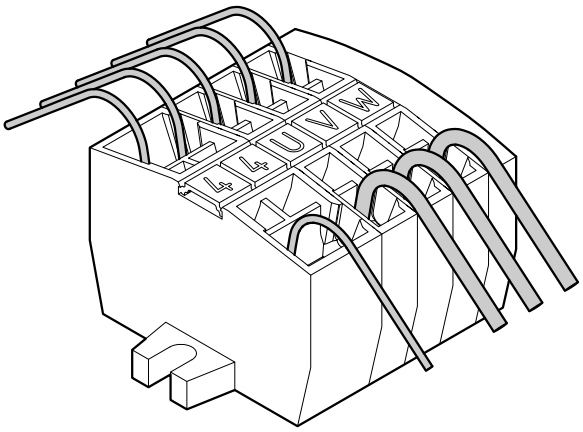
5.13.2 According to wiring diagram R12

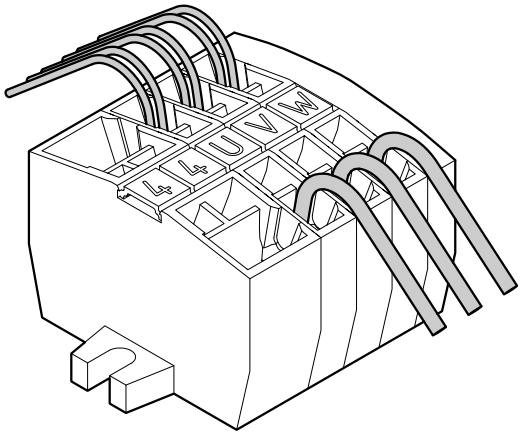
1. Connect the motor according to the enclosed wiring diagram.
2. Check the maximum cable cross section.
   - ⇨ 2.5 mm² rigid
   - ⇨ 2.5 mm² flexible
   - ⇨ 1.5 mm² flexible with conductor end sleeve
3. The stripping length must be 8 – 9 mm.
4. Connect the protective earth as described in chapter "Variant 6" (→ 🗎 83).

Arrangement of the terminal leads for ⅄ connection



27830161547

Arrangement of the terminal leads for △ connection



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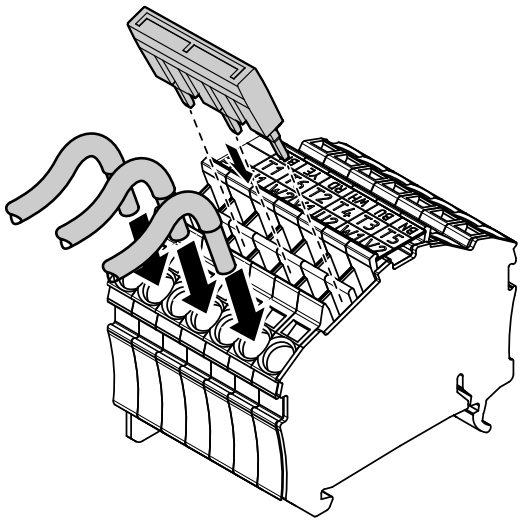
5.13.3 According to wiring diagram C13 with terminal strip /KCC

1. Connect the motor according to the enclosed wiring diagram.
2. Check the maximum cable cross section.
   - ⇨ 4 mm² rigid
   - ⇨ 4 mm² flexible
   - ⇨ 2.5 mm² flexible with conductor end sleeve
3. Check the winding connections in the terminal box and tighten them, if necessary.
4. The stripping length must be 10 – 12 mm.

Arrangement of terminal links with ⅄ connection



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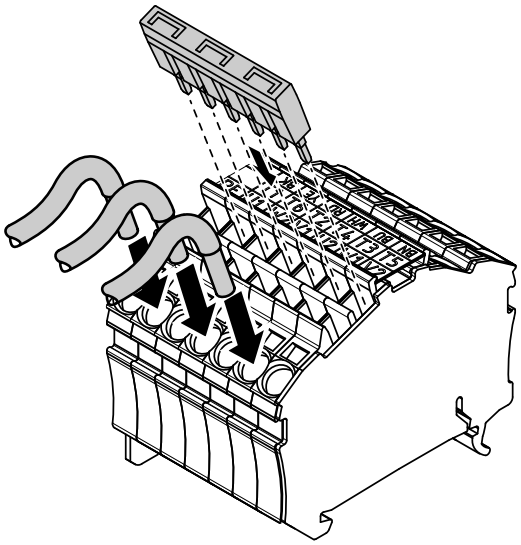
Arrangement of terminal links with △ connection



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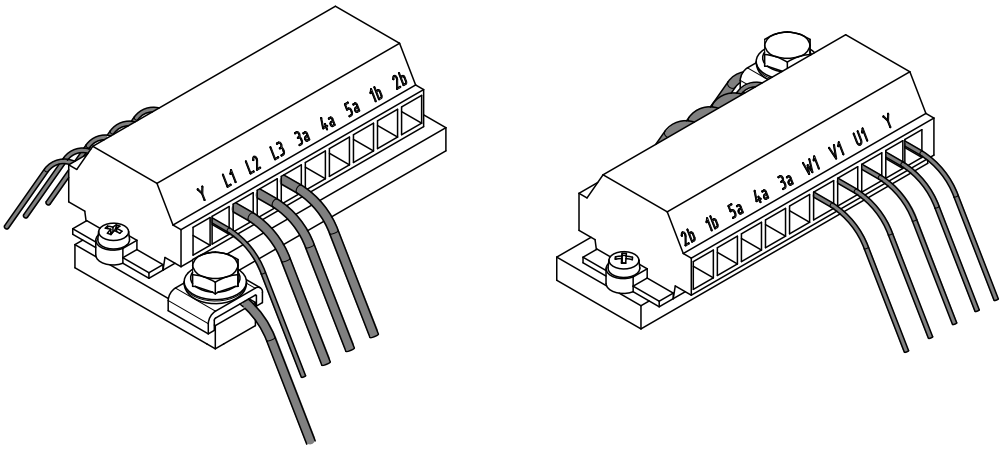
5.13.4 According to wiring diagram C12 with KC1 terminal strip

1. Connect the motor according to the enclosed wiring diagram.
2. Check the maximum cable cross section.
   - ⇨ 2.5 mm² rigid
   - ⇨ 2.5 mm² flexible
   - ⇨ 1.5 mm² flexible with conductor end sleeve
3. The stripping length must be 8 – 9 mm.

Arrangement of the terminal leads for ⅄ connection



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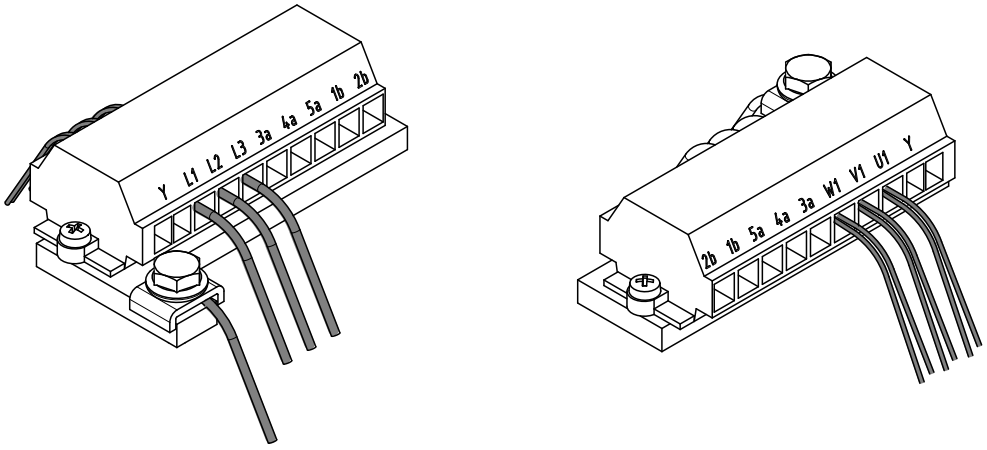
Arrangement of the terminal leads for △ connection



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5.14 Connecting the brake

The BE.. brakes are powered by energized DC voltage and are released electrically. The brake is applied mechanically when the voltage supply is disconnected.

⚠ WARNING

Delayed brake application or unintentional brake release due to incorrect control or connection.

Severe or fatal injuries, e.g. due to falling hoist.

- Comply with the applicable regulations issued by the relevant employer's liability insurance association regarding phase failure protection and the associated circuit/circuit modification.
- Connect the brake according to the enclosed wiring diagram.
- In case of emergency off, always disconnect all poles of the brake control from the supply voltage.
- Only use suitable contactors with sufficient contact rating (utilization category according to EN 60947-4-1/EN 60947-5-1, see chapter "Brake voltage supply" (→ 🗎 96)).
- For contactor selection, observe the inductive load to switch, and the high current load while switching the brake.

5.14.1 Connecting the brake control

The brake is powered by a brake control system with protection circuit. The brake control is either installed in the motor's terminal box or in the control cabinet. If the motor is prepared for the brake control in the control cabinet, the brake supply cables are connected to a terminal strip in the motor terminal box.

Screw terminals are usually used as terminals on the terminal strip or on the brake control. Terminals with cage clamp technology can also be used.

The connectable cable cross sections are restricted to 2.5 mm^2. If you use larger cable cross sections due to application reasons, additional intermediate terminals must be used.

The brake is internally connected to the motor PE. An additional connection for the brake is not necessary.

⚠ WARNING

Delayed brake application or unintentional brake release due to incorrect control or connection.

Severe or fatal injuries, e.g. due to falling hoist.

- Observe the specifications of this documentation for connecting the brake.
- If you are uncertain about brake control, voltage supply type and design, or overvoltage and short circuit protection, contact the plant manufacturer or SEW-EURODRIVE.

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5.14.2 Permitted brake controls

INFORMATION

The following specifications refer to motors designed for operation at ambient temperatures of -20 °C to +40 °C, and with thermal class 130 (B) or 155 (F). Deviations may occur depending in the installed motor options.

In individual cases, always also observe the additional specifications in the order confirmation and on the motor nameplate.

The brake is designed for operation with AC voltage or DC voltage, depending on the design. A brake control by SEW-EURODRIVE is used that is either installed in the motor terminal box or in the control cabinet.

BE02 – 2 brakes can also be operated without brake control by SEW-EURODRIVE with DC voltage. Observe the information on the motor nameplate. In this case, a suitable overvoltage protection must be installed at the terminal strips in the terminal box using varistors. The varistors are not included in the scope of delivery of the motor. Observe the project planning notes from SEW-EURODRIVE.

The following brake control types are not permitted:

- Operation with AC voltage without brake control by SEW-EURODRIVE with BE02 – 122 brakes.
- Operation with DC voltage without brake control by SEW-EURODRIVE with BE5 – BE122 brakes.
- Operation with third-party brake control systems.

For an overview of available brake controls by SEW-EURODRIVE and of the technical data, refer to chapter "Brake control" (→ 🗎 234).

⚠ WARNING

Severe or fatal injuries

Great and unexpected elongation of the stopping distance.

- Operate each brake with a separate brake control.
- Observe the notes on dimensioning in the catalog, or contact SEW-EURODRIVE.

5.14.3 Optional separation of DC and AC circuits

In case of brakes operated with AC voltage, make sure the disconnection type designated by the manufacturer is applied correctly during the brake connection. The following types are distinguished:

- Cut-off in the AC circuit with normal application time
- Cut-off in AC circuit and DC circuit with shortened application time

The correct switch-off type must be ensured by a respective wiring. Certain brake controls by SEW-EURODRIVE realize the same AC and DC cut-off via integrated switching relays (e.g. BMP1.5), or via mounted relays (e.g. BSR or BUR).

The switch-off type is specified on the included wiring diagrams by a pictogram.

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⚠ WARNING

Delayed brake application or unintentional ongoing brake release due to incorrect switch-off.

Severe or fatal injuries, e.g. due to falling hoist or extended coasting.

- During project planning, consider the required cut-off type and the effects on the expected stopping distance in particular.
- Only use the faster cut-off in the DC and AC circuit for hoists and hoist-like applications.
- When you are not sure if the application is a hoist-like application, contact SEW-EURODRIVE.
- Make sure that the configured cut-off type (AC or AC-DC) is implemented correctly during startup, regardless of the type of application.

5.14.4 Brake voltage supply

The brake voltage supply must match the values specified on the nameplate of the motor. The brake must be supplied via the designated brake control.

The specifications on the nameplate have a tolerance of +/-5% of the stated nominal value, or of the mean value of the stated connection range. Observe order-specific deviations.

Make sure the voltage supply is sufficiently stable by using cable cross sections and voltage sources that are dimensioned accordingly. Make sure the supply voltage does not drop below 90% of the nominal value during starting. This could be caused by an increased inrush current, see chapter "Operating currents" (→ 🗎 226).

In case of single-speed drives (not pole-changing) operated directly at the supply system (meaning without frequency inverter or soft start devices), the brake supply voltage can also be taken from the terminal board of the motor. Adhere to the following restrictions:

- The nominal brake voltage must either match the phase-to-neutral voltage, or the phase-to-phase voltage of the motor (observe nameplate and motor switching type).
- In case of hoists or hoist-like applications, the BSR.. brake control must be used for cut-off in the DC and AC circuits.
- For combinations with BMP3.1 brake control (BE60 – 122) a voltage supply via the terminal board is not permitted.

INFORMATION

In variable-speed motors and motors operated with soft start devices, the brake voltage must not be picked up at the motor terminal board because the voltage there is not constant.

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5.14.5 Switching equipment

The high current utilization during switching the brake (inductive load) requires suitable contactors/switch contacts, to obtain the correct function of the brake.

Depending on brake type and type design, the switch contacts must meet the specifications in the following utilization categories:

- Switch contacts for the supply voltage at AC voltage operation: AC-3 according to EN 60947-4-1, or AC-15 according to EN 60947-5-1.
- Switch contact for the supply voltage at DC voltage operation: Preferably AC-3 or DC-3 according to EN 60947-4-1. As an alternative, contacts in utilization category DC-13 according to EN 60947-5-1 are also permitted.
- Switch contacts for optional separation on DC side: AC-3 according to EN 60947-4-1.

Observe the specifications on the provided wiring diagram.

Using a semi-conductor relay is not permitted.

5.14.6 Brake controls with functional control input

In addition to the voltage supply, the optional brake controls of the BMK.., BMKB.. and BMV.. series offer a control input for a DC 24 V signal with which the brakes can be switched via a PLC.

It is a purely functional input that is not "functionally safe" with respect to safety technology.

Due to their operating principle, fault states can occur in these devices that lead to unintentional ongoing brake release, even if the control voltage has been switched off.

⚠ WARNING

Unintentional ongoing brake release due to unrecognized malfunction of the brake control.

Severe or fatal injuries, e.g. due to falling hoist or extended coasting.

- Always disconnect all poles of the supply and control voltage for hoists and hoist-like applications.
- Ensure that a malfunction of the control input can be detected through additional, suitable diagnostic measures e.g. by monitoring the braking current to meet increased safety and reliability requirements.
- Use the BST.. brake control for functional safety applications.
- If you have any questions regarding the handling of the control input, contact SEW-EURODRIVE.

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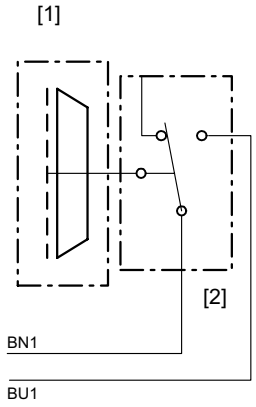
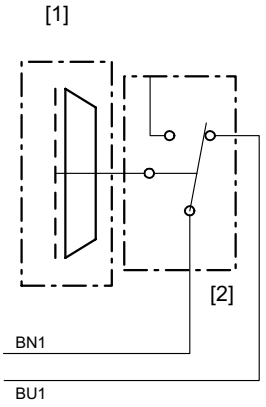
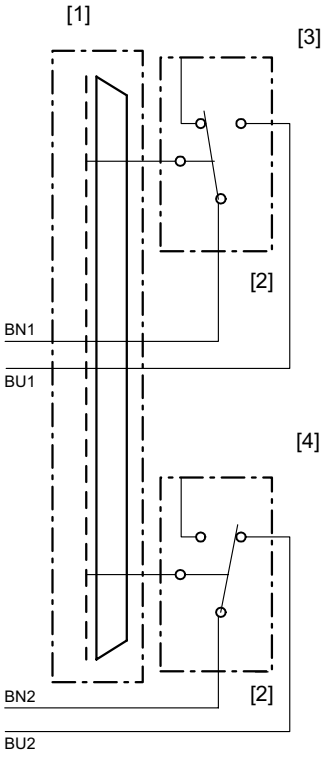
5.14.7 Damage protection against overvoltage and short circuit

To obtain protection against overvoltage damages (e.g. due to short circuit), a sufficiently dimensioned fusing must be used at the supply cables.

Observe the notes on dimensioning in the catalog, or contact SEW-EURODRIVE.

5.14.8 Connecting diagnostic unit /DUB

Connect the diagnostic unit as shown in the wiring connection diagrams provided with the motor. The maximum permitted connection voltage is AC 250 V with a maximum current of 6 A. With low voltage, the maximum voltage is AC 24 V or DC 24 V with max. 0.1 A. A subsequent change to low voltage is not permitted.

Function monitoring	Wear monitoring	Function and wear monitoring
		

[1]	Brake	[1]	Brake	[1]	Brake
[2]	Microswitch MP321-1MS	[2]	Microswitch MP321-1MS	[2]	Microswitch MP321-1MS
				[3]	Function monitoring
				[4]	Wear monitoring

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5.14.9 Connecting the diagnostic unit /DUE option for function and wear monitoring

The /DUE diagnostic unit (Diagnostic Unit Eddy Current) is a contactless measuring system for function and wear monitoring of the brake and the continuous measurement of the current working air gap.

The measuring system consists of:

- Sensor, integrated in the magnet body of the brake
- Evaluation unit in the motor terminal box that is supplied via a DC 24 V voltage.

If the diagnostic unit /DUE was ordered, the function and wear monitoring is preinstalled and calibrated at the factory. The customer must connect the diagnostic unit, see wiring diagram. The switching point of the wear monitoring is preset to the maximum permitted value. According to the table in chapter "Evaluation unit" (→ 🗎 210), a reduced value can also be set.

For the status of the evaluation unit, refer to chapter "Retrofitting the /DUE diagnostic unit for function and wear monitoring" (→ 🗎 209).

Information on retrofitting the /DUE diagnostic unit can be found in chapter "Retrofitting the /DUE diagnostic unit for function and wear monitoring" (→ 🗎 209).

Connecting the evaluation unit

The maximum permitted cable cross section at terminals "k" of the evaluation unit is 1.5 mm^2 with conductor end sleeve without plastic collar, 0.75 mm^2 with plastic collar. The recommended cable cross section at terminals "k" is 0.5 mm^2 with conductor end sleeve with plastic collar.

INFORMATION

Use shielded cables to wire the evaluation unit. Connect the shield to the GND potential, or use the shield plate at the user's signal evaluation.

SEW-EURODRIVE recommends routing the power cable of the drive and the cable of the diagnostic unit separately.

- Unless they are shielded, sensor cables must always be routed separately from other power cables with phased currents.
- Provide the appropriate equipotential bonding between drive and control cabinet.

Important characteristics of the cable to be used are:

- Total shielding (outer shield) of the cable
- 100 m maximum length for fixed installation
- 50 m maximum length for cable carrier installation

The required number of cores depends on the type of function/signals that are to be transferred to the higher-level controller and then processed.

At the factory, the diagnostic unit /DUE is pre-installed, calibrated and set to the wear limit permitted for the brake. The diagnostic unit has to be calibrated again after service or maintenance work such as sensor replacement or replacement of the evaluation electronics. The calibration can be take place directly at the evaluation electronics (at the terminal box) or alternatively via the higher-level controller. In the second case, the required signals for calibration have to be routed to the higher-level controller.

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The reference ground GND and the reference ground analog output AGND have the same potential. In case this potential is not treated separately in the application, AGND is not necessary.

Number of required cores	Function	Abbreviation
3	Voltage supply	DC 24 V
	Reference ground	GND
	Digital output function	FCT
3	Voltage supply	DC 24 V
	Reference ground	GND
	Digital output wear	WEAR
4	Voltage supply	DC 24 V
	Reference ground	GND
	Digital output function	FCT
	Digital output wear	WEAR
4	Voltage supply	DC 24 V
	Reference ground	GND
	Analog output current air gap	OUT
	Reference ground analog output	AGND
6	Voltage supply	DC 24 V
	Reference ground	GND
	Digital output function	FCT
	Digital output wear	WEAR
	Analog output current air gap	OUT
	Reference ground analog output	AGND
8	Voltage supply	DC 24 V
	Reference ground	GND
	Digital output function	FCT
	Digital output wear	WEAR
	Analog output current air gap	OUT
	Reference ground analog output	AGND
	Calibration zero value	ZERO
	Calibration of infinite value	INF

INFORMATION

If the calibration inputs ZERO and/or INF are routed to the outside to a PLC or a controller, they have to be continuously connected to AGND in normal operation to avoid EMC interferences in the calibration cables.

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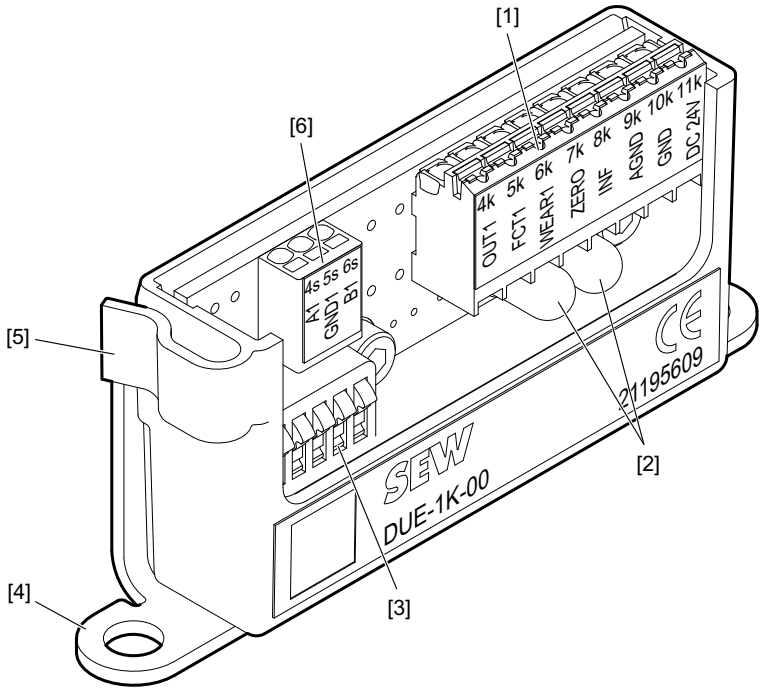
INFORMATION

Signal outputs of the evaluation unit /DUE that are switched may not be used as voltage supply for other evaluation units /DUE or comparable systems. Each evaluation unit /DUE has to be supplied with voltage separately.

Designation of the components

The system comprises a sensor and single-channel evaluation unit. The function monitoring of the brake is realized via a digital signal (NO contact). A digital output (NC contact) signals if the wear limit was reached. Further, a current output allows for continuous monitoring of the brake wear.



14950549515

[1] Terminals 4k – 11k
[2] LEDs for function and wear, brake
[3] DIP switches S1 – S5
[4] Fastening of terminal box (PE)
[5] Line clip
[6] Terminals 4s – 6s

The connection designation of the terminals are as follows:

Terminal	Designation	Description	Color coding
4s	A1	Sensor 1 connection 1	Brown (BN)
5s	GND1	Sensor 1 shield	Black (BK)
6s	B1	Sensor 1 connection 2	White (WH)

Terminal	Designation	Description
4k	OUT1	Analog output working air gap brake
5k	FCT1	Digital output function brake
6k	WEAR1	Digital output wear brake

Terminal	Designation	Description
7k	ZERO	Input calibration zero value
8k	INF	Input calibration infinite value
9k	AGND	Signal ground AGND
10k	GND	Ground potential GND
11k	DC 24 V	DC 24 V supply

The LEDs have the follow meaning:

LEDs	Designation	Description
Green [2]	FCT1	The brake is open. Electromagnet is active. Pressure plate is in contact with magnet body.
Red [2]	WEAR1	The current working air gap of the brake reached or exceeded the preset maximum working air gap.

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5.15 Options

Connect the options as shown in the wiring connection diagrams provided with the motor. You can obtain the valid wiring diagrams free of charge from SEW-EURODRIVE.

INFORMATION

Do not connect any options if the wiring diagram is missing.

5.15.1 Temperature sensor /TF

NOTICE

Impermissible heating of the motor due to defective /TF temperature sensor.

Damage to property.

- Do not connect any voltages > 30 V to the /TF temperature sensor.
- Observe the provided wiring diagram for the connection of the temperature sensor /TF.

The PTC thermistors comply with DIN 44082.

Resistance measurement check (measuring instrument with V ≤ 2.5 V or I < 1 mA):

- Standard measured values: 20 – 500 Ω, hot resistance > 4000 Ω

When using the temperature sensor for thermal monitoring, the evaluation function must be activated to maintain reliable isolation of the temperature sensor circuit. The thermal protection function must become active in case of overtemperature.

If there is a 2nd terminal box for the /TF temperature sensor, this is where you must connect the temperature sensor.

Observe the provided wiring diagram for connecting the temperature sensor /TF. If the wiring diagram is not enclosed, you can obtain it from SEW-EURODRIVE free of charge.

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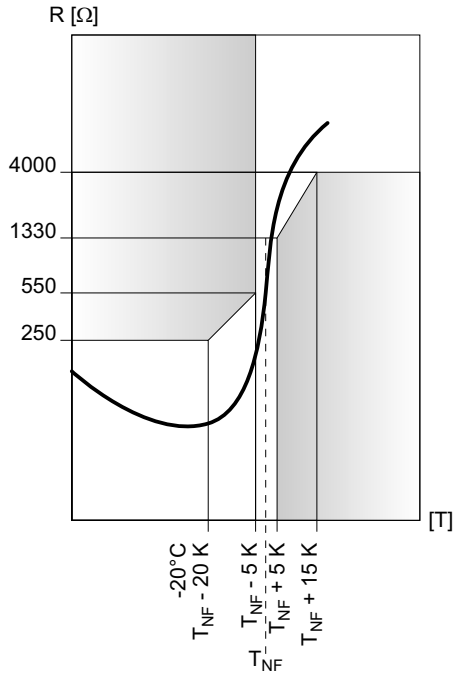
The figure below shows the characteristic curve of /TF with reference to the nominal response temperature (referred to as T_{NF}).



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5.15.2 /TH winding thermostats

The thermostats are connected in series as standard and open when the permitted winding temperature is exceeded. They can be connected in the drive monitoring loop.

	AC V	DC V	
Voltage U in V	250	60	24
Current (cos ϕ = 1.0) in A	2.5	1.0	1.6
Current (cos ϕ = 0.6) in A	1.6		
Contact resistance max. 1 Ω at DC 5 V/1 mA			

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5.15.3 Temperature detection /KY (KTY84 – 130)

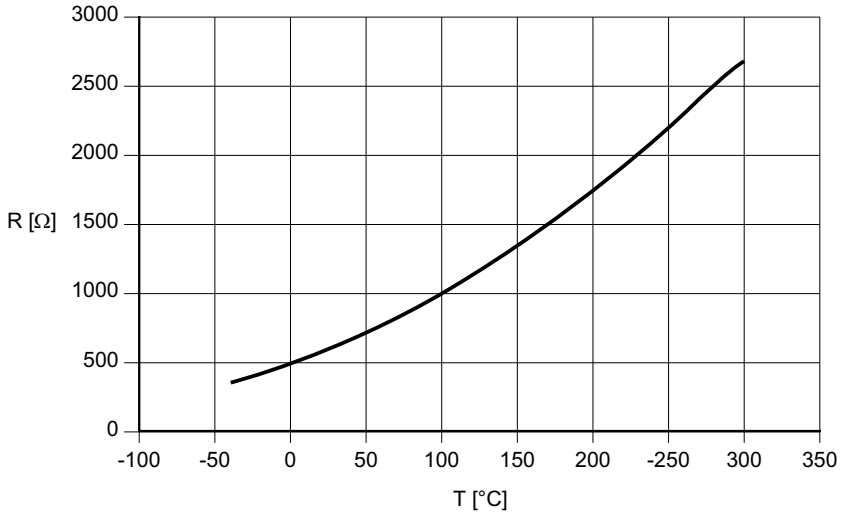
NOTICE

Excessive self-heating of the temperature sensor can damage the insulation of the temperature detection as well as the motor winding.

The drive system might be damaged.

- Use currents > 3 mA in the KTY circuit.
- Observe the correct connection of the KTY to ensure correct evaluation of the temperature detection.
- Observe the polarity during connection.

The characteristic curve in the following figure shows the resistance curve subject to the motor temperature with a measuring current of 2 mA and correct pole connection:



1140975115

Technical data	KTY84 – 130
Connection	Red (+) Blue (−)
Total resistance at 20 – 25 °C	540 Ω < R < 640 Ω
Test current	< 3 mA

5.15.4 Temperature sensor /PT (PT100)

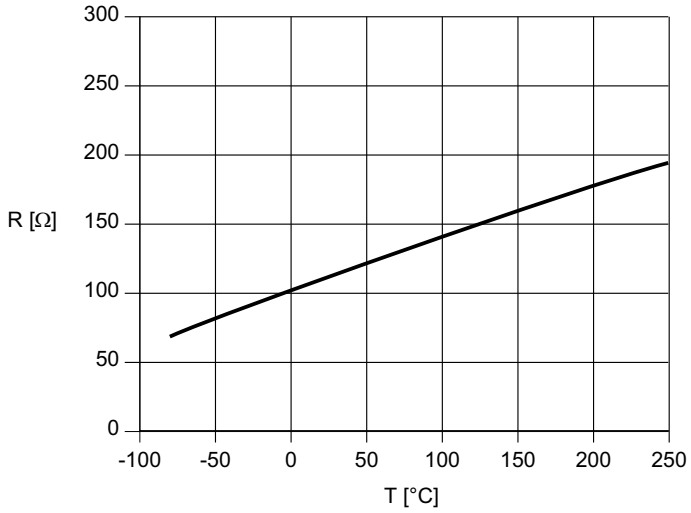
NOTICE

Excessive self-heating of the temperature detection can damage the insulation of the temperature detection as well as the motor winding.

The drive system might be damaged.

- Avoid currents > 3 mA in the circuit of the PT100.
- Observe the correct connection of the PT100 to ensure correct evaluation of the temperature detection.

The characteristic curve in the following figure shows the resistance curve subject to the motor temperature.



1145838347

Technical data	PT100
Connection	Red/white
Resistance at 20 – 25 °C per PT100	107.8 Ω < R < 109.7 Ω
Test current	< 3 mA

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5.15.5 Temperature detection /PK (PT1000)

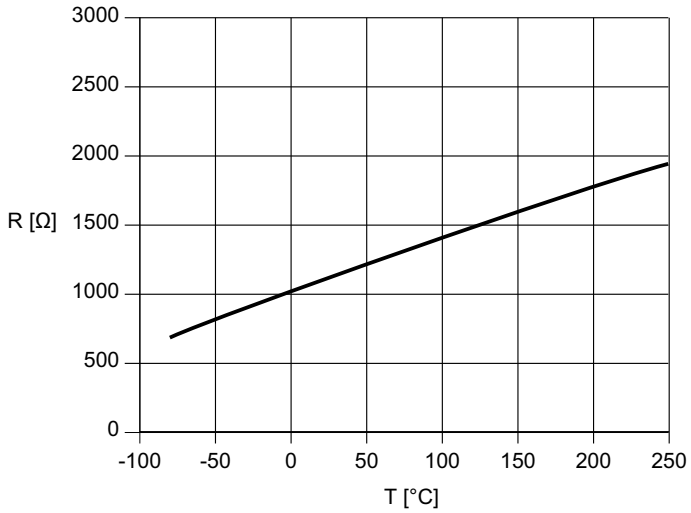
NOTICE

Excessive self-heating of the temperature sensor can damage the insulation of the temperature detection as well as the motor winding.

The drive system might be damaged.

- Avoid currents > 3 mA in the circuit of the PT1000.
- Observe the correct connection of the PT1000 to ensure correct evaluation of the temperature detection.

The characteristic curve in the following figure shows the resistance curve subject to the motor temperature.



17535480203

Technical data	PT1000
Connection	Black/red
Resistance at 20 – 25 °C per PT1000	1077 Ω < R < 1098 Ω
Test current	< 3 mA

5.15.6 Forced cooling fan /V

- Connection in separate terminal box
- Max. connection cross section 3 × 1.5 mm² (3 × AWG 15)
- Cable gland M16 × 1.5

Motors	Operating mode/connection	Frequency Hz	Voltage V
DR..71 – 132, DRN71 – 132, DR2..71 – 80	1 ~ AC[1] (△)	50	100 – 127
DR..71 – 132, DRN71 – 132, DR2..71 – 80	3 ~ AC ⅄	50	175 – 220
DR..71 – 132, DRN71 – 132, DR2..71 – 80	3 ~ AC △	50	100 – 127
DR..71 – 180, DRN71 – 180, DR2..71 – 80	1 ~ AC[1] (△)	50	230 – 277
DR..71 – 315, DRN71 – 315, DR2..71 – 80	3 ~ AC ⅄	50	346 – 500
DR..71 – 315, DRN71 – 315, DR2..71 – 80	3 ~ AC △	50	200 – 290

1) Steinmetz circuit

Motors	Operating mode/connection	Frequency Hz	Voltage V
DR..71 – 132, DRN71 – 132, DR2..71 – 80	1 ~ AC[1] (△)	60	100 – 135
DR..71 – 132, DRN71 – 132, DR2..71 – 80	3 ~ AC ⅄	60	175 – 230
DR..71 – 132, DRN71 – 132, DR2..71 – 80	3 ~ AC △	60	100 – 135
DR..71 – 180, DRN71 – 180, DR2..71 – 80	1 ~ AC[1] (△)	60	230 – 277
DR..71 – 315, DRN71 – 315, DR2..71 – 80	3 ~ AC ⅄	60	380 – 575
DR..71 – 315, DRN71 – 315, DR2..71 – 80	3 ~ AC △	60	220 – 330

1) Steinmetz circuit

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Motors	Operating mode/connection	Voltage V
DR..71 – 132, DRN80 – 132, DR2..71 – 80	DC 24 V	24

INFORMATION

For information on how to connect the /V forced cooling fan, refer to chapter "Forced cooling fan /V" (→ 🗎 282).

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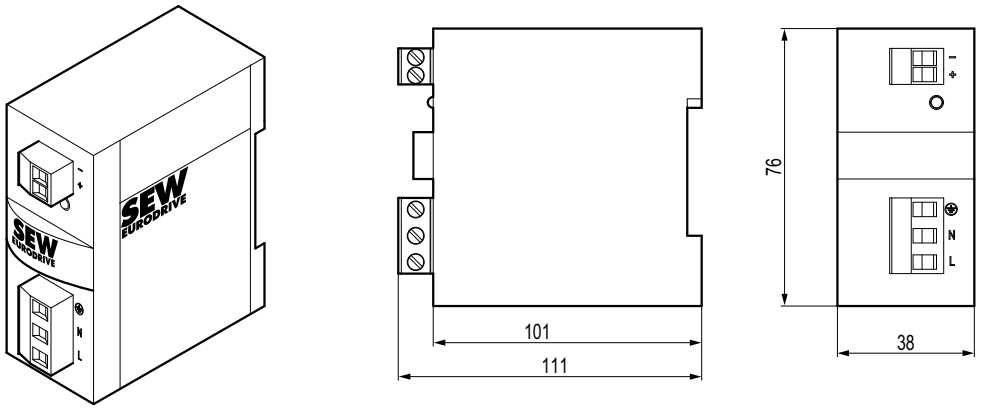
5.15.7 UWU52A switched-mode power supply

The forced cooling fan design V for DC 24 V furthermore includes the UWU52A switched-mode power supply, if you have ordered it. It can be ordered using the part number from SEW-EURODRIVE, even after the order has been placed.

The following figure depicts the UWU52A switched-mode power supply:



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Input	AC 110 – 240 V 1.04 – 0.61 A 50/60 Hz
	DC 110 – 300 V 0.65 – 0.23 A
Output	DC 24 V 2.5 A (40 °C)
	DC 24 V 2.0 A (55 °C)
Connection	Screw terminals 1.5 – 2.5 mm^2, separable
Degree of protection	IP20 Mounting on EN 60715 TH35 mounting rail in the control cabinet
Part number	01881817

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5.15.8 Overview of add-on encoders

Refer to the wiring diagrams for information on how to connect add-on encoders:

Encoder	Motors	Encoder type	Mounting type	Supply DC V	Signal	Wiring diagram
ES7S	DR..71 – 132 DRN80 – 132S	Incremental	Shaft-centered	7 – 30	1 V_{PP} sin/cos	68180xx08
ES7R	DR..71 – 132 DRN80 – 132S	Incremental	Shaft-centered	7 – 30	TTL (RS422)	68179xx08
ES7C	DR..71 – 132 DRN80 – 132S	Incremental	Shaft-centered	4.5 – 30	HTL/TTL (RS422)	68179xx08
AS7W	DR..71 – 132 DRN80 – 132S	Absolute value	Shaft-centered	7 – 30	1 V_{pp} sin/cos+ RS485	68181xx08
AS7Y	DR..71 – 132 DRN80 – 132S	Absolute value	Shaft-centered	7 – 30	1 V_{pp} sin/cos + SSI	68182xx08
EG7S	DR..160 – 280 DRN132M – 280	Incremental	Shaft-centered	7 – 30	1 V_{PP} sin/cos	68180xx08
EG7R	DR..160 – 280 DRN132M – 280	Incremental	Shaft-centered	7 – 30	TTL (RS422)	68179xx08
EG7C	DR..160 – 280 DRN132M – 280	Incremental	Shaft-centered	4.5 – 30	HTL/TTL (RS422)	68179 xx08
AG7W	DR..160 – 280 DRN132M – 280	Absolute value	Shaft-centered	7 – 30	1 V_{pp} sin/cos+ RS485	68181xx08
AG7Y	DR..160 – 280, DRN132M – 280	Absolute value	Shaft-centered	7 – 30	1 V_{pp} sin/cos + SSI	68182xx08
EH7S	DR../DRN315	Incremental	Shaft-centered	10 – 30	1 V_{PP} sin/cos	08511xx08
EH7C	DR../DRN315	Incremental	Shaft-centered	10 – 30	HTL	08511xx08
EH7R	DR../DRN315	Incremental	Shaft-centered	10 – 30	TTL (RS422)	08511xx08
EH7T	DR../DRN315	Incremental	Shaft-centered	5	TTL (RS422)	08511xx08
AH7Y	DR../DRN315	Absolute value	Shaft-centered	9 – 30	TTL (RS422) +SSI	08259xx07
EV7S	DR..71 – 280 DRN80 – 280	Incremental	Flange centered	7 – 30	1 V_{PP} sin/cos	68180xx08
EV7R	DR..71 – 280 DRN80 – 280	Incremental	Flange centered	7 – 30	TTL (RS422)	68179xx08
EV7C	DR..71 – 280 DRN80 – 280	Incremental	Flange centered	4.5 – 30	HTL/TTL (RS422)	68179xx08
AV7W	DR..71 – 280 DRN80 – 280	Absolute value	Flange centered	7 – 30	1 V_{pp} sin/cos+ RS485	68181xx08
AV7Y	DR..71 – 280 DRN80 – 280	Absolute value	Flange centered	7 – 30	1 V_{pp} sin/cos + SSI	68182xx08
EK8S	DRN71 – 315 DR2..71 – 80	Incremental	Shaft-centered	7 – 30	1 V_{PP} sin/cos	63278995
EK8C	DRN71 – 315 DR2..71 – 80	Incremental	Shaft-centered	4.5 – 30	HTL/TTL (RS-422)	63279010

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En-coder	Motors	Encoder type	Mounting type	Supply DC V	Signal	Wiring dia-gram
EK8R	DRN71 – 315 DR2..71 – 80	Incremental	Shaft-centered	7 – 30	TTL (RS-422)	63279029
AK8W	DRN71 – 315 DR2..71 – 80	Absolute value	Shaft-centered	7 – 30	1 V_{PP} sin/cos + RS485	63279037
AK8Y	DRN71 – 315 DR2..71 – 80	Absolute value	Shaft-centered	7 – 30	1 V_{PP} sin/cos + SSI	63279045
AK8H	DRN71 – 315 DR2..71 – 80	Absolute value	Shaft-centered	7 – 12	sin/cos + RS485 HIPERFACE®	63279053
EV8S	DRN71 – 280 DR2..71 – 80	Incremental	Flange centered	7 – 30	1 V_{PP} sin/cos	63278995
EV8C	DRN71 – 280 DR2..71 – 80	Incremental	Flange centered	4.5 – 30	HTL / TTL (RS-422)	63279010
EV8R	DRN71 – 280 DR2..71 – 80	Incremental	Flange centered	7 – 30	TTL (RS-422)	63279029
AV8W	DRN71 – 280 DR2..71 – 80	Absolute value	Flange centered	7 – 30	1 V_{PP} sin/cos + RS485	63279037
AV8Y	DRN71 – 280 DR2..71 – 80	Absolute value	Flange centered	7 – 30	1 V_{PP} sin/cos + SSI	63279045
AV8H	DRN71 – 280 DR2..71 – 80	Absolute value	Flange centered	7 – 12	sin/cos + RS485 HIPERFACE®	63279053

INFORMATION

- Maximum oscillation load for encoders ≤ 10 g ≈ 100 m/s² (10 Hz to 2 kHz)
- Shock resistance = 100 g ≈ 1000 m/s² for DR..71 – 132, DRN80 – 132S motors
- Shock resistance = 200 g ≈ 2000 m/s² for DR..160 – 315, DRN132M – 315 motors

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5.15.9 Overview of optical status messages for built-in encoders

INFORMATION

Refer to the wiring diagram for information on how to connect the built-in encoder.

- Observe the information in chapter "Wiring diagrams" (→ 🗎 269) for connection via terminal strip.
- Refer to the enclosed wiring diagram when connecting the EI7. built-in encoder via the M12 connector.
- Refer to the enclosed wiring diagram when connecting the EI8. built-in encoder via the M23 connector.

Encoder	Motors	Supply in DC V	Signals
EI71	DR..71 – 132 DRN71 – 132S DR2..71 – 80 DRN63 (only EI7C)	9 – 30	HTL 1 period/revolution
EI72		9 – 30	HTL 2 periods/revolution
EI76		9 – 30	HTL 6 periods/revolution
EI7C		9 – 30	HTL 24 periods/revolution
EI8R	DRN71 – 132S DR2..71 – 80	7 – 30	TTL (RS-422) 1024 periods/revolution
EI8C	DRN71 – 132S DR2..71 – 80	7 – 30	HTL 1024 periods/revolution

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EI7. B – visual feedback

The EI7. encoders use 2 bi-colored LEDs (red + green each) for visual feedback on the operating state.

LED H1 (at cable output of the encoder) – status and errors

The green LED indicates the status or the configuration of the encoder. It flashes. The flashing frequency indicates the set number of periods.

LED H1 green	
Frequency	**Status/configuration**
LED off	Encoder without voltage or faulty
0.6 Hz	EI71 (1 period per revolution)
1.2 Hz	EI71 (2 periods per revolution)
3 Hz	EI76 (6 periods per revolution)
15 Hz	EI7C (24 periods per revolution)
LED lit continuously	Encoder defective

The red LED is lit when the encoder detects an error.

LED H1 red	
Flash code	**Meaning**
10 s with 1 Hz and 2 s continuous	No valid number of periods can be set
other	Output driver signals a fault (e.g. short circuit or overtemperature)

The H2 LED gives visual feedback on the signal track status.

LED color	Track A	Track B	Track A	Track B
Orange (green and red)	0	0	1	1
Red	0	1	1	0
Green	1	0	0	1
Off	1	1	0	0

EI8. – visual feedback

The EI8. built-in encoders report their operating state visually via a duo LED.

LED light pattern	Meaning
Off	Encoder not supplied or defective
Permanent green light	Encoder operational, no errors
Red/orange, permanent or flashing light	Encoder reports self-diagnostic information or an error. The content depends on the color pattern and frequency.

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Diagnostics LED color orange/red	Meaning and measures
Red	Encoder diagnostics has detected an error. Permanently lit: Error regarding the internal encoder sensors (incremental sensors) Flashes 5 Hz: Error regarding the internal encoder sensors (index sensors): • Check the encoder and pole ring for damage or magnetizable contamination and replace or clean if necessary. • Check the fan to ensure it is seated correctly and check the distance between the pole ring and encoder. If necessary, readjust and resecure the fan and pole ring (see chapter "Removing and mounting built-in encoder EI8." (→ 🗎 167)). Flashes 1 Hz: Error regarding the encoder module electrical interface: • Short circuit/overcurrent of the signal tracks: Eliminate the short circuit or limit the output current of the encoder module. • Interference on the signal tracks: Eliminate the external interference. Observe the information regarding connection technology.
Orange	Encoder diagnostics signals a warning (function of the encoder is given, maintenance may be required) Permanently lit: Warning regarding the internal encoder sensors (incremental sensors). • Implement any necessary measures (see "Diagnostics red") as maintenance measures. Flashes 1 Hz: Warning regarding the internal memory (encoder signal correction). • The encoder signal correction is reinitialized every time the encoder is started.

If none of the measures are successful, please contact the SEW-EURODRIVE Service department in the event of an error. In this case, decommission the built-in encoder.

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5.15.10 Installation notes for encoders

When connecting the encoder to the inverter, observe the provided wiring diagrams and the information in these operating instructions as well as the operating instructions/wiring diagrams of the inverter and the operating instructions/wiring diagrams provided with the third-party encoder.

Proceed as described in chapter "Motor and brake maintenance – preliminary work" (→ 🗎 127) to mount the encoders. Observe the following information:

- Maximum line length (inverter to encoder):
  - 100 m with a capacitance per unit length core – shield ≤ 110 nF/km
  - 100 m with a capacitance per unit length core – core ≤ 85 nF/km
- Core cross-section: 0.20 – 0.5 mm^2; recommendation ≥ 0.25 mm^2
- Use shielded cable with twisted pair cores and apply shield over large area on both ends:
  - In the cable gland of the encoder connection cover or in the encoder connector
  - To the inverter on the electronics shield clamp and to the housing of the D-sub connector
- Install the encoder cables separately from the power cables, maintaining a distance of at least 200 mm.
- Compare the operating voltage with the permitted operating voltage range on the encoder nameplate. Deviations in the operating voltage may overheat and damage the encoder.
- SEW-EURODRIVE recommends the use of stabilized voltage sources and separate supply systems for encoder or other sensor components and active components such as switches and light barriers.
- Supplies with voltage transients and interferences higher than the supply voltage U_B are not permitted.
- Observe the clamping area of 5 to 10 mm of the cable gland of the connection cover. If you use cables with a different cross section, you have to replace the provided cable gland with another suitable EMC-compliant cable gland.
- The cable glands for the cable entry must meet the following conditions:
  - Cramping area is suitable for the used cable(s)
  - The IP degree of protection of the encoder connection is at least as high as the IP degree of protection of the actual encoder
  - The operating temperature range matches the designated ambient temperature range.
- Check the flawless state and the proper seat of the connection cover gasket.
- Tighten the screws of the connection cover with a tightening torque of 2.25 Nm.

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Minimum requirements for encoder cables

Make sure that self-assembled cables fulfill the following requirements:

- Cross section of voltage supply cable:
  - At least 0.25 mm^2 for cable lengths up to 50 m.
  - At least 0.5 mm^2 for cable lengths up to 100 m.
- Cross section of the signal wire:
  - At least 0.25 mm^2.
- Capacitance per unit length:
  - Maximum 70 pF/m – core/core.
  - Maximum 120 pF/m – core/shield.
- The cable must be shielded.
- Differential signals must be routed via twisted wires e.g. Data+ and Data-.

5.15.11 Anti-condensation heating

To protect a shutdown motor from freezing up (rotor blockage) or condensation inside the motor, it can be equipped with an optional anti-condensation heating. The anti-condensation heating consists of strip heaters that are integrated in the winding overhang and supplied with voltage when the motor is switched off. The motor is heated by the current flowing through the strip heaters.

The strip heaters are controlled according to the following principle:

- Motor switched off → anti-condensation heating activated
- Motor switched on → anti-condensation heating deactivated

Observe the permitted voltage according to the nameplate and the enclosed terminal assignment diagram.

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6 Startup

INFORMATION

- It is essential to comply with the safety notes in chapter 2 during installation.
- In case of problems, refer to chapter "Malfunctions" (→ 🗎 263).

If components with functional safety are installed in the motor, observe the following safety note:

⚠ WARNING

Disabling functional safety devices.

Severe or fatal injuries.

- Only qualified personnel is allowed to carry out work on functional safety components.
- Any work on functional safety components must be carried out by strictly observing the specifications in the operating instructions at hand and the respective addendum to the operating instructions. Otherwise, the warranty will become void.

⚠ WARNING

Electric shock due to incorrect installation.

Severe or fatal injuries.

- Use switch contacts in utilization category AC-3 according to EN 60947-4-1 for switching the motor.
- When motors are powered by inverters, you must adhere to the wiring instructions in the frequency inverter operating instructions.

⚠ CAUTION

The surfaces on the drive can be very hot during operation.

Risk of burns.

- Let the motor cool down sufficiently before you start working on it.

NOTICE

The maximum limit torque (M_{pk}) and the maximum current (I_{max}) may not be exceeded, not even for acceleration.

The drive system might be damaged.

- Limit the maximum current at the inverter.

INFORMATION

Limit the maximum speed at the inverter. For information on the procedure, refer to the documentation of the inverter.

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INFORMATION

When using DR..250 – 280, DRN250 – 280 motors with BE brake and encoder, observe the following information:

- Only operate the brake as holding brake.
- The brake may only be applied when the speed is ≤ 20 min^{-1}. For higher speeds, please contact SEW-EURODRIVE.
- Emergency stops from higher motor speeds are permitted.

6.1 Before startup

Prior to startup make sure that:

- The drive is undamaged and not blocked.
- Any transport locks have been removed.
- The measures stipulated in chapter "Preliminary work after longer periods of storage" (→ 🗎 33) are performed after storage periods longer than 9 months.
- All connections have been made correctly.
- The direction of rotation of the motor/gearmotor is correct.
  - Motor rotating clockwise: U, V, W (T1, T2, T3) to L1, L2, L3
- All protective covers are installed correctly.
- All motor protection equipment is active and set for the rated motor current.
- There are no other sources of danger.
- Loose elements like keys are appropriately secured.
- The brake is not manually released.
  - The set screw of /HF option is loosened correctly.
  - The hand lever of the /HR option has been removed and correctly attached to the stator using the designated clamps.

6.2 Motors with reinforced bearing

NOTICE

Damage to bearings due to impermissible heating of bearing and motor.

Bearing damage.

- Do not operate cylindrical roller bearings without overhung load.

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6.3 Motors with backstop /RS

An /RS backstop is used to block/prevent a direction of rotation of the motor. The direction of rotation is indicated by an arrow on the fan guard of the motor or on the device housing.

Observe the direction of rotation of the end shaft and the number of stages when you mount the motor to the gear unit. Do not start up the motor in blocking direction (note the correct phase angle when connecting the motor). For inspection purposes, you can operate the backstop once with half the motor voltage in blocking direction.

If a conversion is required to change the blocking direction, follow the instructions in chapter "Altering the blocking direction on motors with a backstop" (→ 🗎 219).

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7 Inspection/maintenance

⚠ WARNING

Risk of injury if the drive starts up unintentionally.

Severe or fatal injuries.

- Before you start working on the unit, disconnect the motor and all connected options from the power supply.
- Secure the motor against unintended power-up.

⚠ CAUTION

Inhaling, swallowing brake abrasion when releasing the brake.

Irritation of the respiratory tract and respiratory organs.

- ✓ Wear a respirator of class FFP2 during the maintenance of brakemotors.
- Avoid swirling of the brake abrasion.
- Remove the brake abrasion with suitable extraction systems or damp cloths that bind dust.
- Make sure that there is adequate ventilation in the work environment.

⚠ CAUTION

The surfaces on the drive can be very hot during operation.

Risk of burns.

- Let the motor cool down sufficiently before you start working on it.

NOTICE

Damage to the oil seals if the temperature is too low during installation.

Possible damage to the oil seals.

- Before assembly, make sure that ambient temperature and the temperature of the oil seal are not below 0 °C.

INFORMATION

Apply grease with a grease depot to the lip of the oil seal before assembly. For further information on lubricants, refer to chapter "Order information for lubricants, anti-corrosion agents and sealants" (→ 🗎 245).

INFORMATION

Friction disks at brakemotors may only be replaced by the SEW-EURODRIVE service.

Repairs

Only SEW-EURODRIVE repair workshops or plants that provide the necessary expertise may repair or modify the motor/brakemotor.

Before you take the motor back into operation, check to see if the regulations have been adhered to. Confirm the compliance with a corresponding identification on the motor or by issuing a test report.

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Always perform safety and functional checks following all maintenance and repair work (thermal protection).

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7.1 Inspection and maintenance intervals

The following table lists the inspection and maintenance intervals:

Device/part of device	Time interval	What to do?
Brake BE02	• **If used as a working brake:** At least every 3000 operating hours[1)] • **If used as a holding brake:** Every 0.5 to 4 years, depending on the operating conditions[1)]	Inspect the brake • Measure the brake lining carrier thickness • Inspect the switch contacts and replace them, if necessary (e.g. in case of burnout)
Brake BE03	• **If used as a working brake:** At least every 3000 operating hours[1)] • **If used as a holding brake:** Every 0.5 to 4 years, depending on the operating conditions[1)]	Inspect the brake • Measure the working air gap • Inspect the switch contacts and replace them, if necessary (e.g. in case of burnout)
Brakes BE05 – BE122	• **If used as a working brake:** At least every 3000 operating hours[1)] • **If used as a holding brake:** Every 0.5 to 4 years, depending on the operating conditions[1)]	Inspect the brake: • Measure the brake disk thickness • Brake disk, lining • Measure and set the working air gap • Pressure plate • Driver/gearing • Pressure rings • Suck off any abrasion • Inspect the switch contacts and replace them, if necessary (e.g. in case of burnout)
Motor	• **Every 10000 operating hours**[2)3)]	Motor inspection: • Check rolling bearing and change if necessary • Replace the oil seal • Clean the cooling air ducts
Drive	• Differing[3)]	• Touch up or renew the surface/anti-corrosion coating • Check and clean the air filter. • If applicable, clean condensation drain hole at the bottom of the fan guard • Clean clogged bores
Connection cables	• Regularly	Inspect cables • Check for damages and replace the connection cable if necessary.

1) Wear times are subject to many factors and can be quite short. The system manufacturer must calculate the required inspection/ maintenance intervals individually in accordance with the project planning documents.

2) For the DR../DRN225 – 315 motors with relubrication device, note the shortened relubrication periods in chapter "Bearing lubrication".

3) The interval depends on outer influences and can be very short, e.g. in the event of high dust concentration in the environment.

If you open the motor during inspection/maintenance, you have to clean it before you close it.

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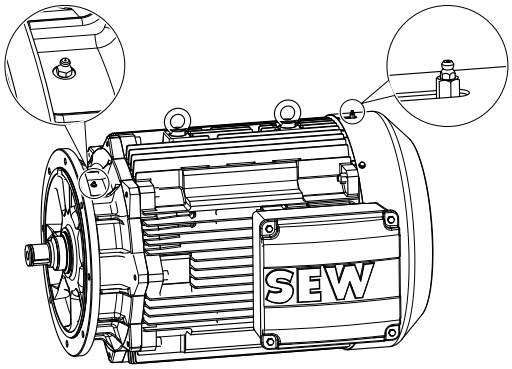
7.2 Bearing lubrication

7.2.1 Bearing lubrication for DR..71 – 280, DRN63 – 280, DR2..56 – 80 motors

In standard design, the bearings are lubricated for life.

7.2.2 Bearing lubrication for DR..250 – 315, DRN225 – 315 motors with relubrication device /NS

Motors of nominal sizes 225, 250, 280, and 315 can be equipped with a relubrication device. The following figure shows the positions of the lubrication devices.



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Under normal operating conditions and at an ambient temperature between -20 °C to +40 °C, SEW-EURODRIVE uses Mobil Polyrex EM (K2P-20 DIN 51825), a polyurea-based mineral high-performance, high-temperature grease for initial lubrication.

For motors in the low temperature range up to -40 °C, SEW-EURODRIVE uses SKF GXN or LGHP2, which are also a polyurea-based mineral greases.

Relubrication

The grease can be purchased from SEW-EURODRIVE in 400 g cartridges. For the relevant order information, refer to chapter "Order information for lubricants, anti-corrosion agents and sealants" (→ 🗎 245).

INFORMATION

Only mix lubricants of the same thickness type, the same base oil and the same consistency (NLGI class).

Grease the motor bearings in accordance with the information on the lubricant plate. The used grease collects inside the motor and should be removed every 6 to 8 relubrication cycles during an inspection. Each time you relubricate the bearings, ensure that the bearing is two-thirds full.

Start up the motors slowly after lubrication so that the grease is distributed evenly.

The relubrication channels leading the grease from the grease nipples to the bearings must always be filled with grease. This is usually ensured be adhering to the relubrication intervals. During maintenance work, the grease may remain in the channels and does not need to be removed.

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Re-lubrication period

For the relubrication intervals of the bearings, adhere to the requirements stated in the table:

- Ambient temperature: -20 °C to +40 °C
- Rated speed that corresponds to that of a 4-pole AC motor
- Normal load

In case of higher ambient temperatures, higher speeds, or larger loads, the relubrication intervals are shorter. Use 1.5 times of the stated quantity for the initial filling.

The relubrication channels leading the grease from the grease nipples to the bearings must always be filled with grease. This is usually ensured be adhering to the relubrication intervals. During maintenance work, the grease may remain in the channels and does not need to be removed.

Motors with option	Horizontal mounting position		Vertical mounting position	
	Duration	Quantity	Duration	Quantity
DR../DRN225 – 315 /NS	5000 h	50 g	3000 h	70 g
DR../DRN225 – 315 /ERF /NS	3000 h	50 g	2000 h	70 g

7.3 Reinforced bearings

NOTICE

Damage to bearings due to impermissible heating of bearing and motor.

Bearing damage.

- Do not operate cylindrical roller bearings without overhung load.

In the /ERF (reinforced bearing) option, cylindrical rolling bearings are installed on the A-side. The reinforced bearings must have overhung load applied to them and must never be operated without overhung load.

The reinforced bearings are only offered with the /NS (relubrication) option so as to facilitate optimal lubrication of the bearing.

Observe the notes on bearing lubrication in chapter "Bearing lubrication for DR..250 – 315, DRN225 – 315 motors with relubrication device /NS" (→ 🗎 125).

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7.4 Motor and brake maintenance – preliminary work

⚠ WARNING

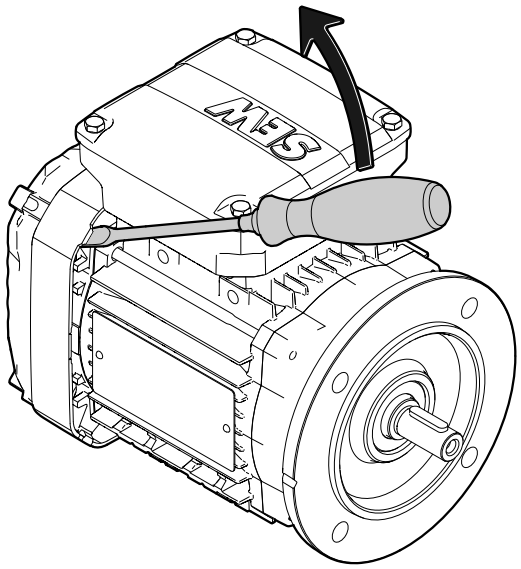
Risk of injury if the drive starts up unintentionally.

Severe or fatal injuries.

- Before you start working on the unit, disconnect the motor and all connected options from the power supply.
- Secure the motor against unintended power-up.

7.4.1 Removing/installing the fan guard for DRN63 – 71, DR2..63 – 71 motors

The fan guard for DRN63 – 71, DR2..63 – 71 motors is attached using clips.



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Removing the fan guard

Proceed as follows to remove the fan guard:

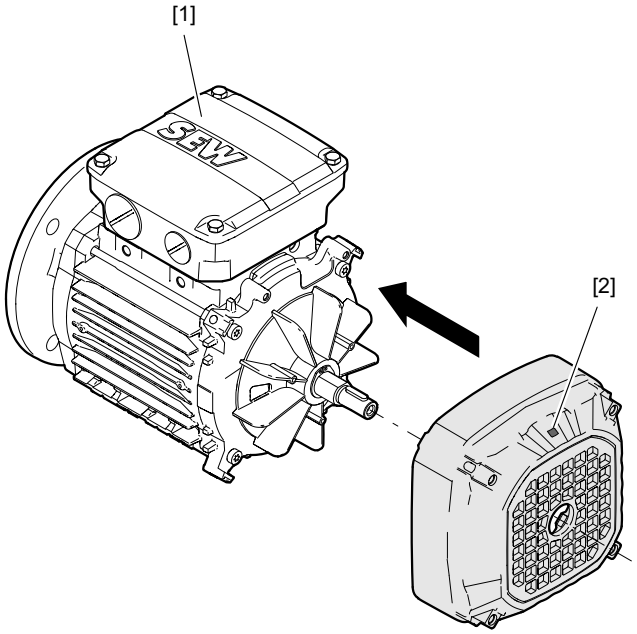
1. Using a suitable tool, lever out at least 2 adjacent detents.
   - ⇨ **With EI.. encoder option**: Lever out the detent pair opposite of the terminal box.
2. Pull the detents over the latching cams of the endshield.
   - ⇨ In case of DRN63, DR2..63, loosening all 4 fan guard connections may be required to remove the fan guard, depending on the option.

To request for a replacement in case the fan guard is damaged, contact SEW-EURODRIVE.

Reassembly

- ✓ The rectangular marking on the fan guard [2] must point in direction of the terminal box [1].

1. Evenly push the detents of the fan guard onto the latching cams until they snap in.



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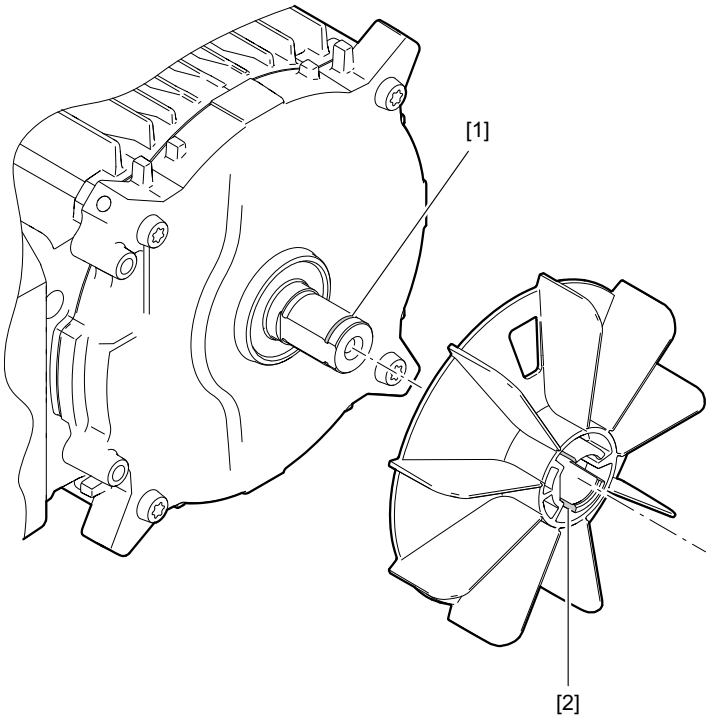
7.4.2 Removing/installing the plastic fan for DR..71, DRN63 – 71, DR2..56 – 71 motors

The plastic fan [2] for DR..71, DRN63 – 71, DR2..56 – 71 motors is attached using clips.



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Removing the fan

Proceed as follows to remove the plastic fan:

✓ Required tools: 1 puller.

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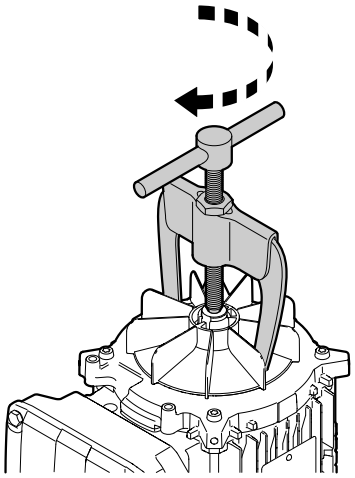
1. Pull off the fan [2] from the shaft [1] using the puller.
   ⇨ The detent is pulled out of the latching groove.
2. Check that the detent of the fan is not damaged.

To request a replacement in case the fan is damaged, please contact SEW-EURODRIVE.



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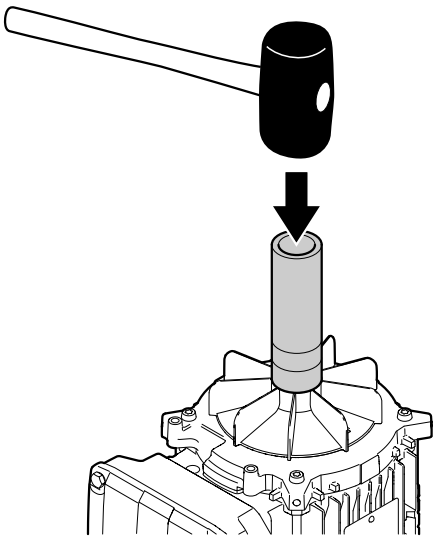
Reassembly

✓ Required tools: 1 hammer, 1 hammer insertion tool.

1. Position the fan centrally on the shaft using the precentering.
2. Mount the fan to the shaft using the plain hammer insertion tool and the hammer. The hammer insertion tool must not be placed on the detent but must have a larger diameter.
   ⇨ When the detent snaps into the latching groove, a click can be clearly heard.
3. Check if the detent is snapped into the latching groove.



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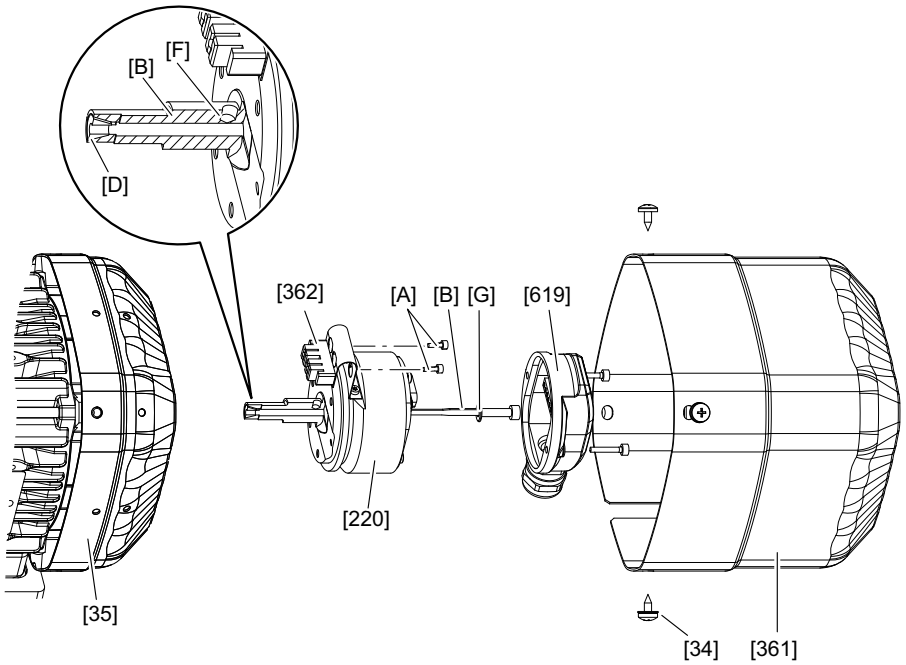
7.4.3 Removing rotary encoders from DR..71 – 132, DRN80 – 132S motors

The following figure illustrates the disassembly procedure using the ES7. rotary encoder as an example:



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[34] Tapping screw
[35] Fan guard
[220] Encoder
[361] Safety cover
[362] Expansion anchor
[619] Connection cover
[A] Retaining screws for the torque bracket
[B] Central retaining screw
[D] Cone
[F] Bore
[G] Tooth lock washer

Disassembling ES7./AS7.encoders

1. Remove the safety cover [361], or the forced cooling fan if required.
2. Loosen the screws of the connection cover [619] and remove it. Do not disconnect the encoder cable.
3. Make sure the cone [D] doesn't fall out while the central retaining screw [B] is loosened. Loosen the central retaining screw [B] by 2 – 3 turns. Loosen the cone [D] by tapping lightly onto the screw head.
4. To loosen the expansion anchor [362], remove the retaining screw of the torque bracket [A]. Carefully pull the encoder [220] from the rotor bore.

Reassembly

1. Apply a contact corrosion prevention compound, e.g. NOCO® fluid to the encoder pin.
2. Place the expansion anchor [362] at the torque bracket of the encoder.
3. Push the encoder into the bore in the shaft end to the stop.
4. Tighten the central retaining screw [B] with the inserted tooth lock washer [G].
   ⇨ Tightening torque 2.75 Nm.
5. Press the expansion anchor [362] into the fan guard [35] and check if it is seated correctly.
6. Screw the retaining screws of the torque bracket [A] into the expansion anchor [362] until the stop. Tighten the retaining screws of the torque bracket [A].
   ⇨ Tightening torque 2.25 Nm.
7. Screw on the connection cover [619].
   ⇨ Tightening torque 2.25 Nm.
8. Mount the safety cover [361] onto the forced cooling fan.

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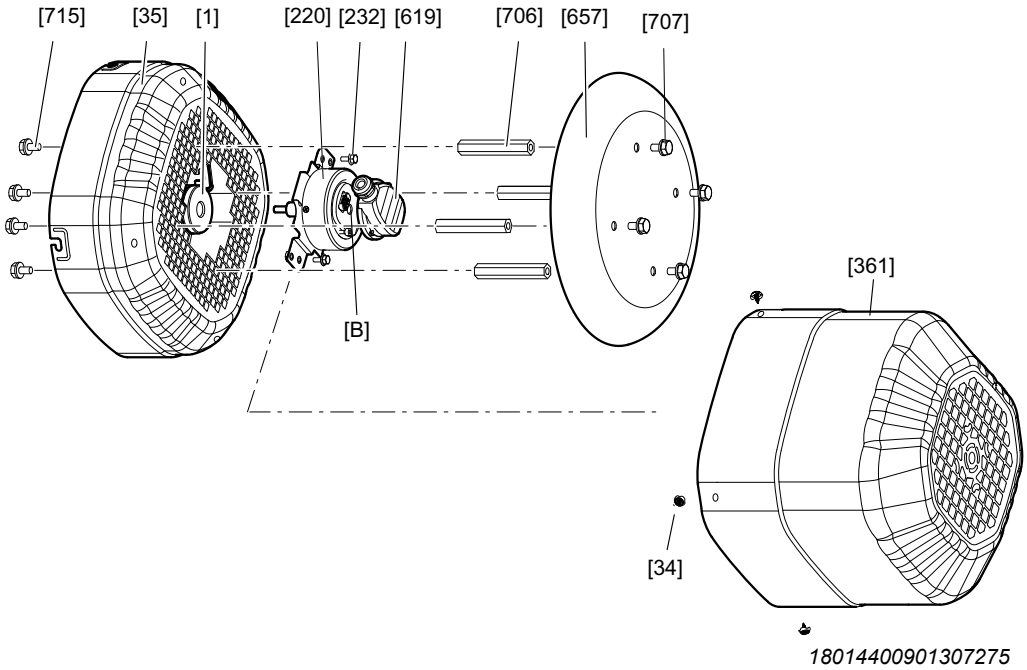
7.4.4 Removing rotary encoders from DR..160 – 280, DRN132M – 280 motors

The following figure illustrates the disassembly procedure using the EG7. rotary encoder as an example:



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[1]	Rotor	[B]	Central retaining screw
[34]	Tapping screw	[619]	Connection cover
[35]	Fan guard	[657]	Canopy
[220]	Encoder	[706]	Spacer bolt
[232]	Screws	[707] [715]	Screws
[361]	Safety cover	[A]	Screws

Removing EG7., AG7. encoders

1. Proceed as follows, depending on the design:
   - ⇨ **With canopy:** Remove the screws [707] to disassemble the canopy [657]. If required, counter using a hexagon wrench SW13 on the spacer bolt [706].
   - ⇨ **Without canopy:** Remove the screws [34] to disassemble the safety cover [361].
2. Remove the forced cooling fan if required.
3. Loosen the screws of the connection cover [619] and remove it. Do not disconnect the encoder cable.
4. Remove the retaining screws of the torque bracket [232].
5. Loosen the central retaining screw [B] by 2 – 3 turns to pull off the encoder [220].

Reassembly

1. Apply a contact corrosion prevention compound, e.g. NOCO® fluid to the encoder pin.
2. Push the encoder into the bore in the shaft end to the stop.
3. Tighten the central retaining screw [B] with the inserted tooth lock washer [G].
   ⇨ Tightening torque 8 Nm.
4. Tighten the retaining screws of the torque bracket [232].
   ⇨ Tightening torque 6 Nm.
5. Screw on the connection cover [619].
   ⇨ Tightening torque 2.25 Nm.
6. Mount the safety cover [361] onto the forced cooling fan.
7. Mount the canopy [657] if necessary.

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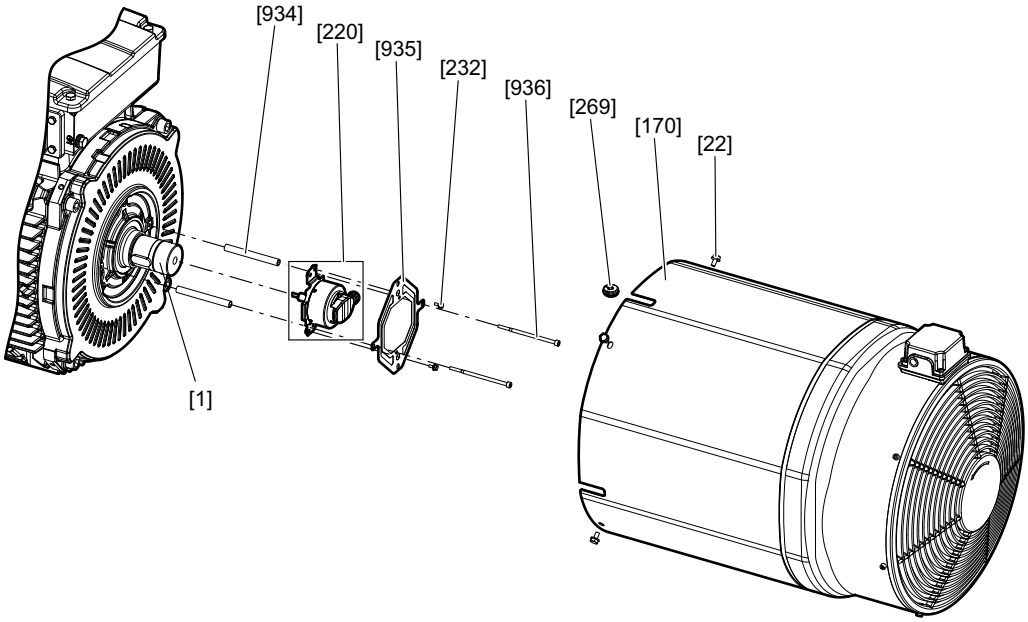
7.4.5 Removing the rotary encoder from DR..160 – 225, DRN132M – 315 motors with /V forced cooling fan option

The following figure illustrates the disassembly procedure using the EG7. rotary encoder as an example:



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[22]	Screw	[935]	Torque bracket
[170]	Forced cooling fan guard	[936]	Screw
[232]	Screws	[934]	Spacer bushing
[269]	Cable grommet	[220]	Encoder

Removing EG7., AG7. encoders

1. Remove the screws [22] to disassemble the forced cooling fan [170].
2. Remove the cable grommet [269] with the encoder cable from the forced cooling fan [170].
3. Remove the screws [232] and [936] to disassemble the torque bracket [935].
4. Loosen the screws of the connection cover [619] and remove it. Do not disconnect the encoder cable.
5. Loosen the central retaining screw [B] by 2 – 3 turns to pull off the encoder [220].

Reassembly

1. Apply a contact corrosion prevention compound, e.g. NOCO® fluid to the encoder pin.
2. Push the encoder into the bore in the shaft end to the stop.
3. Tighten the central retaining screw [B] with the inserted tooth lock washer [G].
   ⇨ Tightening torque 8 Nm.
4. Place the torque bracket [935] onto the spacer bushing [934] and tighten the screws [936].
   ⇨ Tightening torque 11 Nm.
5. Tighten the retaining screws of the torque bracket [232].
   ⇨ Tightening torque 6 Nm.
6. Insert the cable grommet [269] into the forced cooling fan [170].
7. Mount the forced cooling fan [170] and tighten the screws [22].
   ⇨ Tightening torque 28 Nm.

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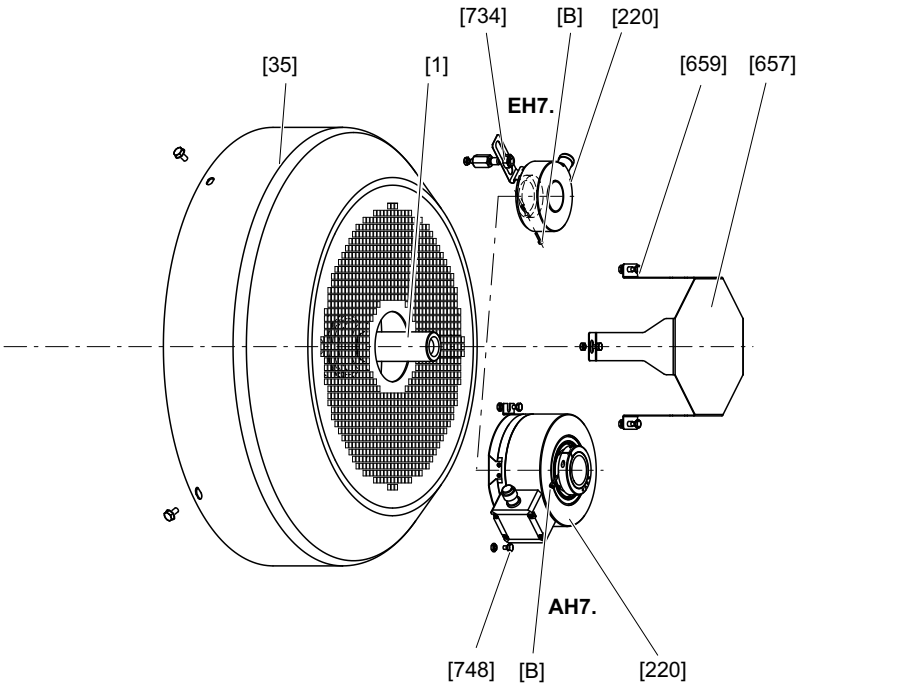
7.4.6 Removing rotary encoders from DR..315, DRN315 motors

The following figure illustrates the disassembly procedure using the EH7. and AH7. rotary encoders as an example:



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[35]	Fan guard	[659]	Screw
[220]	Encoder	[734]	Nut
[B]	Central retaining screw	[748]	Screw
[657]	Cover plate		

Removing EH7., AH7. encoders

1. Remove the screws [659] to disassemble the cover plate [657].
2. Depending on the design, remove the encoder [220] from the fan guard [35] as follows:
   - ⇨ **EH7.:** Remove the nut [734].
   - ⇨ **AH7.:** Remove screw [748].
3. Loosen the central retaining screw [B] by 2 – 3 turns to pull off the encoder [220].

Reassembly

1. Push the encoder into the bore in the shaft end to the stop.
2. Tighten the central retaining screw [B].
   - ⇨ **EH7.:** Tightening torque 3 Nm.
   - ⇨ **AH7.:** Tightening torque 2 Nm.
3. Proceed as follows, depending on encoder:
   - ⇨ **EH7.:** Install the nut [734].
   - ⇨ **AH7.:** Insert and tighten screw [748].
4. Mount the cover plate [657] using the screws [659].

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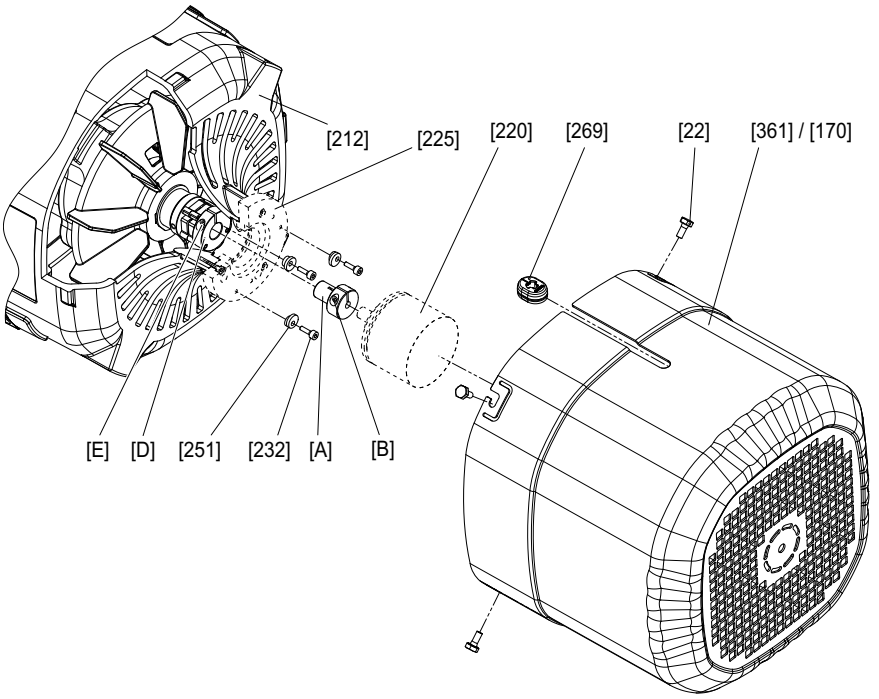
7.4.7 Mounting/removing rotary encoders with XV../EV../AV.. encoder mounting adapter for DR..71 – 225, DRN71 – 225, DR2..71 – 80 motors

The following figure illustrates the disassembly procedure using a third-party encoder as an example:



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[22]	Screw	[361]	Safety cover (normal/long)
[170]	Forced cooling fan guard	[269]	Cable grommet
[212]	Fan guard with encoder mount	[A]	Adapter
[220]	Encoder	[B]	Clamping screw
[225]	Intermediate flange (not with XV1A)	[D]	Coupling (spread- or solid shaft coupling)
[232]	Retaining screws (enclosed with XV1A and XV2A)	[E]	Clamping screw
[251]	Conical spring washers (enclosed with XV1A and XV2A)		

Removing the XV.., EV.., AV.. encoders

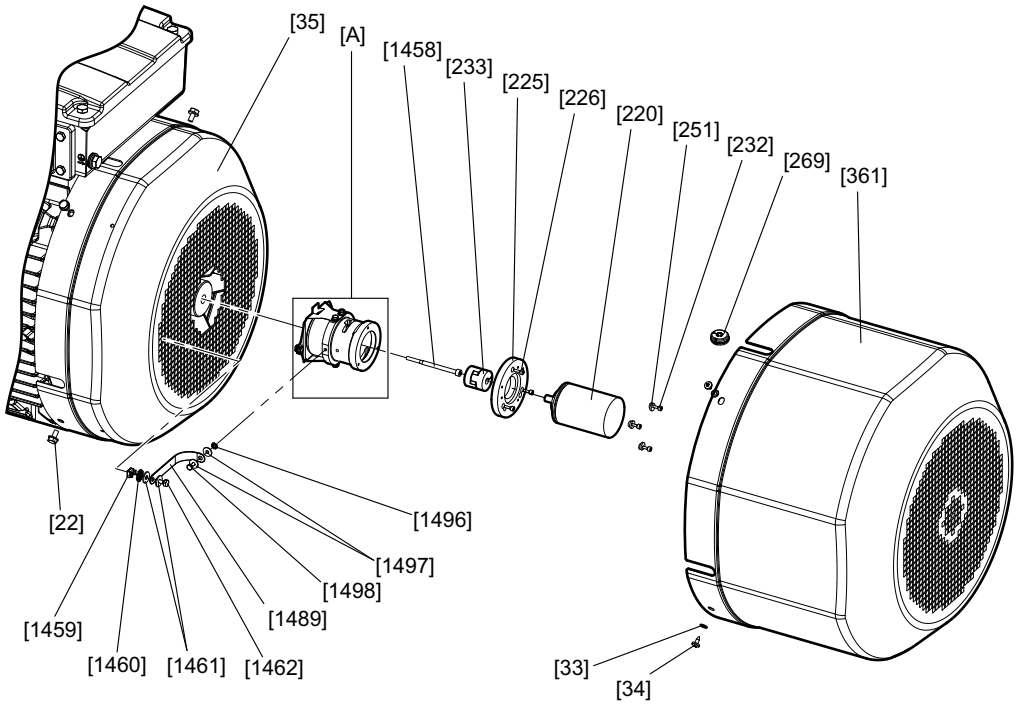
1. Remove the safety cover [361], or the forced cooling fan if required.
2. Loosen the retaining screws [232] and turn the conical spring washers [251] outwards.
3. Loosen the clamping screw [E] of the coupling.
4. Remove adapter [A] and encoder [220].

Reassembly

1. Proceed as described in chapter "Encoder mounting adapter" (→ 🗎 40) to mount the encoder.

7.4.8 Mounting/removing rotary encoders with XV../EV../AV.. encoder mounting adapter for DR..250 – 280, DRN250 – 280 motors

The following figure illustrates the disassembly procedure using a third-party encoder as an example:



18014406225445899

[22]	Screw	[361]	Safety cover (normal/long)
[33]	Washer	[1458]	Screw
[34]	Screw	[1459]	Cage nut
[35]	Fan guard	[1460]	Serrated lock washer
[220]	Encoder	[1461]	Washer
[225]	Intermediate flange (optional)	[1462]	Screw
[226]	Screw	[1489]	Ground strap
[232]	Screws (enclosed with .V1A and .V2A)	[1496]	Serrated lock washer
[233]	Coupling	[1497]	Washer
[251]	Conical spring washers (enclosed with .V1A and .V2A)	[1498]	Screw
[269]	Cable grommet	[A]	Encoder mounting adapter

Removing the encoder mounting adapter

1. Remove the screws [34] to disassemble the safety cover [361].
2. Remove the encoder [220], see chapter "Removing EV.., AV.. encoders" (→ 🗎 141).
3. In order to remove the ground strap [1489] from the encoder mounting adapter [A], loosen the serrated lock washer [1496], washer [1497], and screw [1498].
4. Remove the screws [22] to disassemble the fan guard [35].
5. Loosen the screw [1458] to remove the encoder mounting adapter [A].
   - ⇨ **If the encoder mounting adapter cannot easily be removed:** Screw an M6 set screw (length 20 – 35 mm) hand tight in the rotor bore. Screw an M8 set screw (length > 10 mm) into the same bore and push the encoder mounting adapter [A] off the rotor [1]. Remove the M6 set screw from the rotor bore.

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Removing EV.., AV.. encoders

1. Remove the screws [34] to disassemble the safety cover [361].
2. Pull out the cable grommet [269] together with the encoder cable from the safety cover [361].
3. Loosen the retaining screws [232] and turn the conical spring washers [251] outwards.
4. Loosen the screw at the coupling clamping hub [233] at the encoder end, the screw can be accessed through the slots of the encoder mounting adapter [A].
5. Remove the encoder [220] from the encoder mounting adapter [A] or the intermediate flange [225].

Reassembly

1. Proceed as described in chapter "Encoder mounting adapter" (→ 🗎 40) to mount the encoder.

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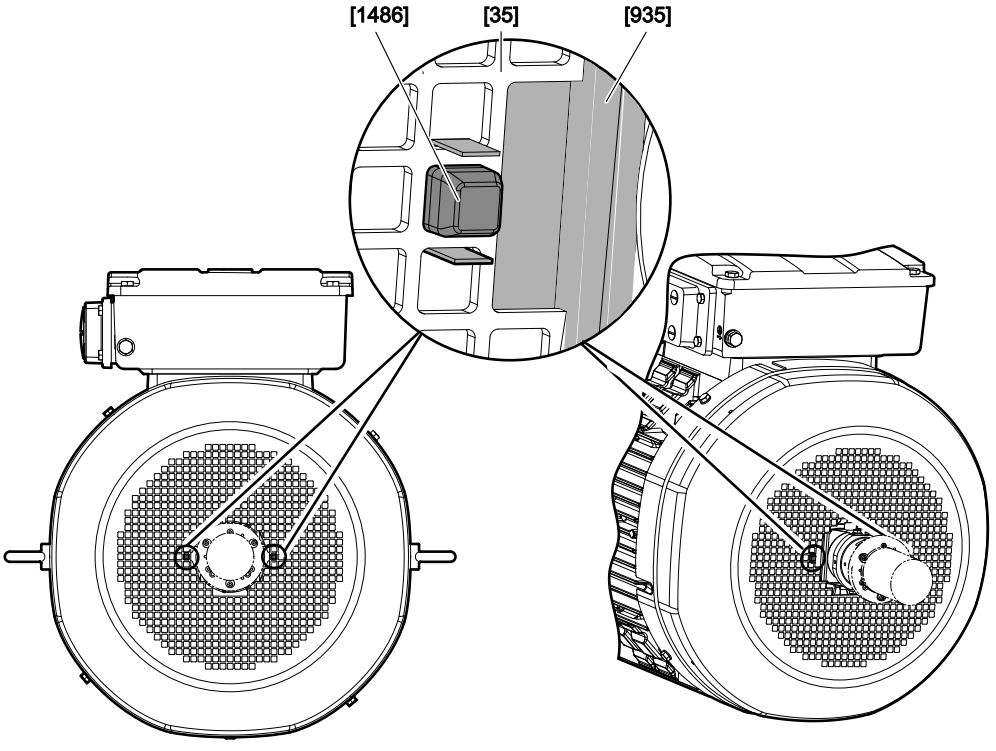
When re-installing the fan guard [35], make sure that the torque is supported:

The damping elements [1486] on both sides of the encoder mounting adapter [A] must engage with the ventilation grid (see figure below). The torque plate [935] must protrude from the grid to the left and to the right of the damping element.



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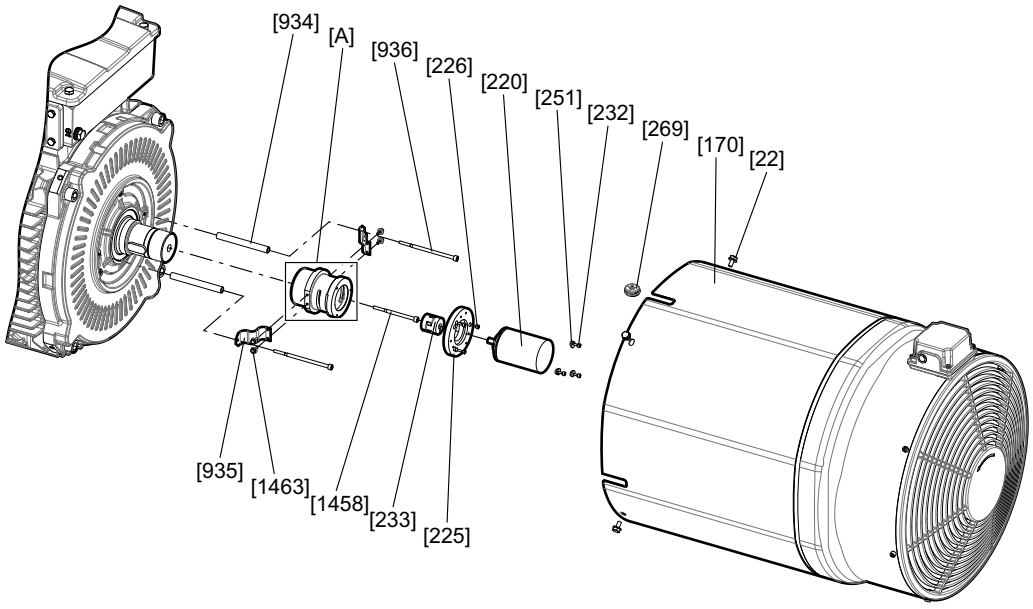
7.4.9 Mounting/removing the rotary encoder with EV../AV../XV.. encoder mounting adapter for DR..250 – 280, DRN250 – 280 motors with /V forced cooling fan option

The following figure illustrates the disassembly procedure using a third-party encoder as an example:



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[22]	Screw	[269]	Cable grommet
[170]	Forced cooling fan guard	[934]	Spacer bushing
[220]	Encoder	[935]	Torque bracket
[225]	Intermediate flange (optional)	[936]	Screw
[226]	Screw	[1458]	Screw
[232]	Screws (enclosed with .V1A and .V2A)	[1463]	Screw
[233]	Coupling	[A]	Encoder mounting adapter
[251]	Conical spring washers (enclosed with .V1A and .V2A)		

Removing the encoder mounting adapter

1. Remove the screws [22] to disassemble the forced cooling fan [170].
2. Remove the cable grommet [269] with the encoder cable from the forced cooling fan [170].
3. Loosen the retaining screws [232] and turn the conical spring washers [251] outwards.
4. Loosen the screw at the coupling clamping hub [233] at the encoder end, the screw can be accessed through the slots of the encoder mounting adapter [A].
5. Remove the encoder [220] from the encoder mounting adapter [A] or the intermediate flange [225].
6. Loosen the screws [1458] and [936] to remove the encoder mounting adapter [A]. The torque brackets [935] and screws [1463] can remain at the encoder mounting adapter [A].
   - ⇨ **If the encoder mounting adapter cannot easily be removed:** Screw an M6 set screw (length 20 – 35 mm) hand tight in the rotor bore. Screw an M8 set screw (length > 10 mm) into the same bore and push the encoder mounting adapter [A] off the rotor [1]. Remove the M6 set screw from the rotor bore.

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Removing EV.., AV.., and XV. encoders

1. Remove the screws [22] to disassemble the forced cooling fan [170].
2. Remove the cable grommet [269] with the encoder cable from the forced cooling fan [170].
3. Loosen the retaining screws [232] and turn the conical spring washers [251] outwards.
4. Loosen the screw at the coupling clamping hub [233] at the encoder end, the screw can be accessed through the slots of the encoder mounting adapter [A].
5. Remove the encoder [220] from the encoder mounting adapter [A] or the intermediate flange [225].

Reassembly

1. Proceed as described in chapter "Encoder mounting adapter" (→ 🗎 40) to mount the encoder.

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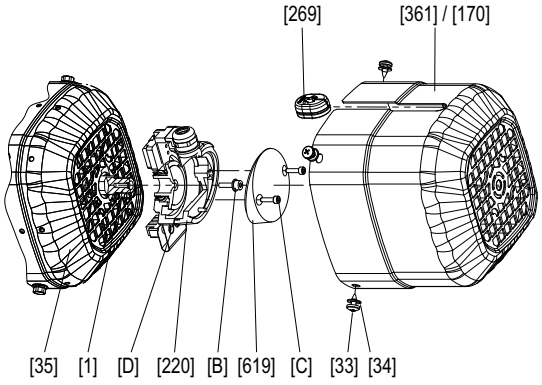
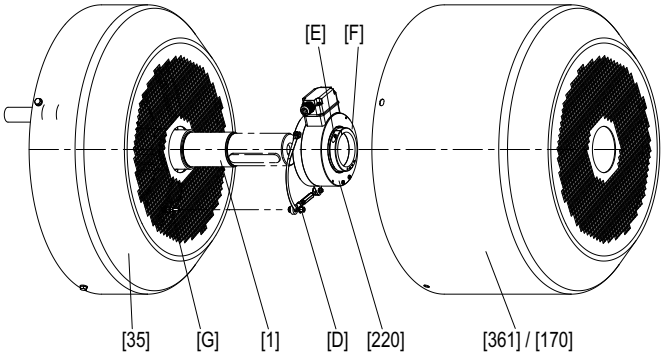
7.4.10 Mounting/removing hollow shaft encoders with XH.A encoder mounting adapter for DR..71 – 225, DRN71 – 225, DR2..71 – 80 motors

The following figure illustrates the disassembly procedure using a third-party encoder as an example:

Encoder mounting with XH1A encoder mounting adapter



Encoder mounting with XH7A and XH8A encoder mounting adapter



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[1]	Rotor	[B]	Central retaining screw
[33]	Tapping screw	[619]	Connection cover
[34]	Washer	[C]	Screw connection cover
[35]	Fan guard	[D]	Torque bracket screws
[170]	Forced cooling fan guard	[E]	Screw
[220]	Encoder	[F]	Clamping ring
[269]	Cable grommet	[G]	Nut of the torque bracket
[361]	Safety cover		

Removing hollow shaft encoders form XH1A encoder mounting adapter

1. Remove the safety cover [361], or the forced cooling fan if required.
2. Loosen the screws of the connection cover [619] and remove it. Do not disconnect the encoder cable.
3. Screw out the central retaining screw [B].
4. Remove the torque bracket screws [D].
5. Pull the torque bracket off.
6. Remove the encoder [220] from the shaft end.

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Removing hollow shaft encoders from XH7A and XH8A encoder mounting adapter

1. Remove the safety cover [361], or the forced cooling fan if required.
2. Loosen the screw [E] from clamping ring [F].
3. Remove the torque bracket screws [D].
4. Remove the encoder [220] from the shaft end.

Reassembly of hollow shaft encoders to XH1A encoder mounting adapter

1. Push the encoder [220] on the shaft end.
2. Screw in the screw [D] to mount the torque bracket.
3. Tighten the central retaining screw [B].
   ⇨ Tightening torque 2.9 Nm
4. Screw on the connection cover [619].
   ⇨ Tightening torque 3 Nm.
5. Mount the safety cover [361] onto the forced cooling fan.

Reassembly of hollow shaft encoders to XH7A and XH8A encoder mounting adapter

1. Push the encoder [220] on the shaft end.
2. Screw in the screw [D] to mount the torque bracket.
3. Remove the screw [E] from clamping ring [F].
   ⇨ Tightening torque 5 Nm.
4. Mount the safety cover [361] onto the forced cooling fan.

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7.4.11 Encoder mounting adapter EK8A

The encoder mounting adapter EK8A...

Content of the accessory bag [1634]

- Screws [232] for fastening the torque arm of the encoder [220]
- from size DRN180: Insulation coupling [1891]

Mounting the encoder mounting adapter EK8A

1. Unscrew the screws [22].
2. Remove the fan guard [35] from the motor.
3. Remove the protection cap [1143] from the recess of the fan guard [35].
   ⇨ Dispose of the protection cap [1143].
4. Remove the closing plug [950] from the rotor [1].
   ⇨ Dispose of the closing plug [950].

Then proceed with the installation process as described in chapter "Mounting cone shaft encoders EK8./AK8.".

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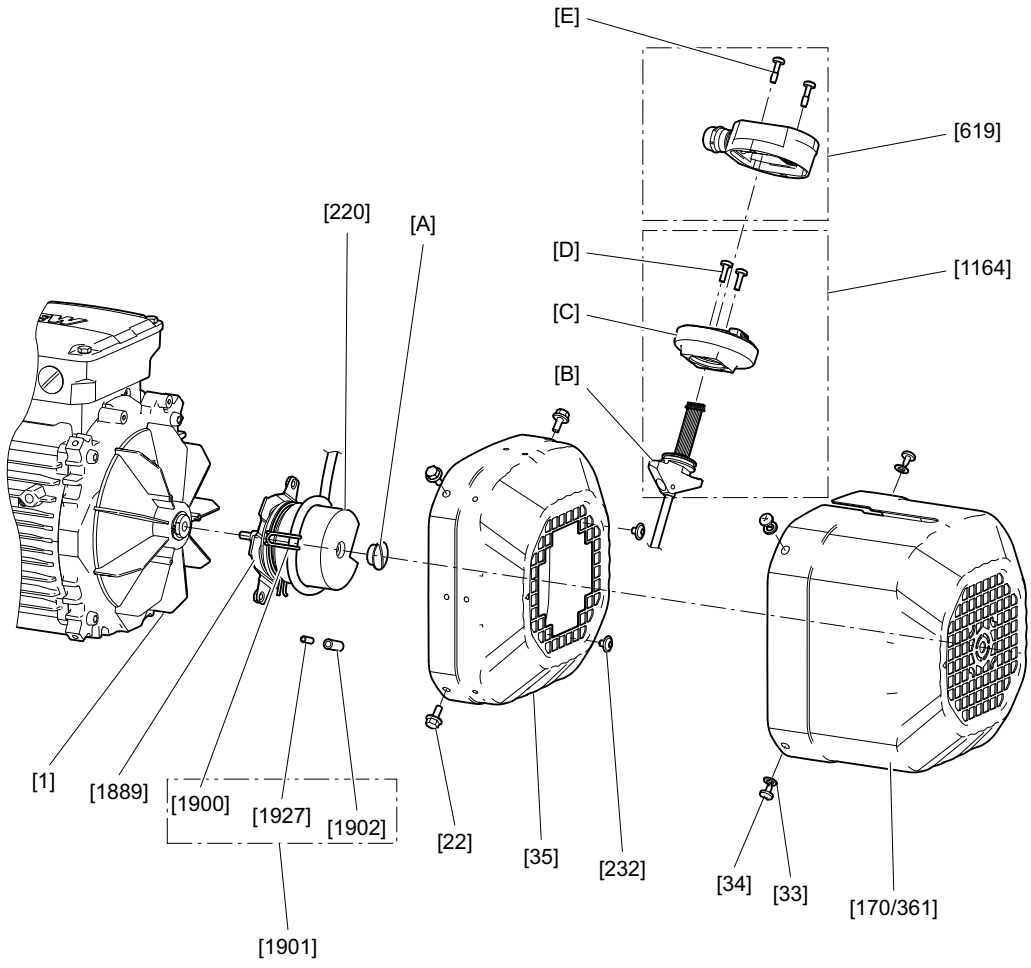
7.4.12 Removing and mounting cone shaft encoders of motors DRN71 – 132S, DR2..17 – 80



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[1]	Rotor	[1889]	Torque arm
[22]	Screw (hexagonal)	[1900]	Cable retainer
[33]	Washer	[1901]	Accessory bag
[34]	Screw (cross recess)	[1902]	Threaded sleeve
[35]	Fan guard	[1927]	Set screw
[170]	Forced cooling fan	[A]	Screw plug
[220]	Encoder	[B]	T-slot nut
[232]	Screw (hexalobular)	[C]	Lower part
[361]	Safety cover	[D]	Screw
[619]	Connection cover	[E]	Screw
[1164]	Connection adapter		

Removing encoder EK8./AK8.

1. Unscrew the screws [E].
2. Remove the connection cover [619] from the connection adapter [1164].
3. Loosen the screws [D] in the lower part [C].
   ⇨ Only unscrew the screws [D] to such an extent that the connection adapter [1164] can be moved in the recess of the safety cover [361].
4. Unscrew the screws [34].
5. Remove the safety cover [361] from the motor. When doing this, slide the connection adapter [1164] out of the recess.

6. Unscrew the screws [232].
7. Unscrew the screws [22].
8. Remove the fan guard [35] over the encoder [220]. Guide the connection adapter [1164] with the signal cable through the cutout of the fan guard [35].
9. Unscrew the central screw plug [A] of the encoder [220].
10. Loosen the central retaining screw of the encoder [220].
    ⇨ If the central retaining screw of the encoder [220] cannot be loosened, counter-tighten the spanner flat SW10 of the encoder shaft.
11. Loosen the cone connection.
    ⇨ Encoder EK8., AK8W, AK8Y: To loosen the cone connection, continue turning the central retaining screw of the encoder [220] counterclockwise.
    ⇨ Encoder AK8H: Continue turning the central retaining screw of the encoder [220] counterclockwise. To loosen the cones, screw an M6 screw (≥ 70 mm long) into the bore.
12. Remove the encoder [220] from the rotor [1].

Mounting encoder EK8./AK8.

1. Clean the cone of the encoder [220] and the rotor [1].
2. Remove the central screw plug [A].
3. Insert the encoder [220] into the conical bore of the rotor [1].
4. To secure the encoder [220] in place, tighten the central retaining screw.
    ⇨ Counter-tighten the spanner flat SW 30 of the insulation coupling.
    ⇨ Tightening torque 3.3 Nm.
5. To seal the encoder [220], screw in the central screw plug [A].
    ⇨ Tightening torque 1.8 Nm.
6. Mount the fan guard [35] over the encoder [220]. When doing this, guide the connection adapter [1164] with the signal line through the central grille cutout of the fan guard [35].
7. Use the screws [22] to secure the fan guard [35] to the rear endshield or brake endshield [42] of the motor.
    ⇨ For metal hoods: Tightening torque 3.3 Nm.
    ⇨ For plastic hoods: Tightening torque 2 Nm.
8. Screw the screws [232] through the grille of the fan guard [35] and into the nuts of the torque arm [1889].
    ⇨ If you need to turn the encoder [220] in order for the screws to reach the nuts of the torque arm, turn the encoder [220] clockwise.
    ⇨ Make sure the signal cable is of a sufficient length so that the connection adapter [1164] can be inserted into the recess of the safety cover [361].
    ⇨ Tightening torque 3.3 Nm.
9. Push the connection adapter [1164] up to the end of the recess facing away from the motor.

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10. Place the safety cover [361] onto the fan guard [35].
    ⇨ The arrow that is cast in the lower part [C] of the connection adapter [1164] indicates the direction of the subsequent cable outlet for the connection cover [619].
    ⇨ If you wish to change the direction of the cable outlet: Unscrew the screws [D]. Twist the lower part [C] against the T-slot nut [B]. Screw in the screws [D]. When doing so, only tighten the screws [D] lightly.
11. Secure the safety cover [361] in place by using the screws [34].
    ⇨ Tightening torque 2 Nm.
12. Turn the connection adapter [1164] clockwise up to the stop.
13. Secure the connection adapter [1164] in place by tightening the screws [D].
    ⇨ Tightening torque 2 Nm.
14. Place the connection cover [619] onto the connection adapter [1164].
15. Screw the screws [E] through the bore in the connection cover [619] and into the bore in the connection adapter [1164].
    ⇨ Tightening torque 2.5 Nm

Removing encoder EK8./AK8. with optional forced cooling fan

1. Unscrew the screws [E].
2. Remove the connection cover [619] from the connection adapter [1164].
3. Loosen the screws [D] in the lower part [C].
    ⇨ Only unscrew the screws [D] to such an extent that the connection adapter [1164] can be moved in the recess of the forced cooling fan [170].
4. Loosen the screws [22].
5. Unscrew the screws [34].
6. Remove the forced cooling fan [170] from the motor. When doing this, slide the connection adapter [1164] out of the recess.
7. Unscrew the screws [232].
8. Remove the signal cable from the slot of the cable retainer [1900].
9. Unscrew the screws [22].
10. Remove the fan guard [35] over the encoder [220]. Guide the connection adapter [1164] with the signal cable through the cutout of the fan guard [35].
11. Unscrew the central screw plug [A] of the encoder [220].
12. Loosen the central retaining screw of the encoder [220].
    ⇨ If the central retaining screw of the encoder [220] cannot be loosened, counter-tighten the spanner flat SW10 of the encoder shaft.
13. Loosen the cone connection.
    ⇨ Encoder EK8., AK8W, AK8Y: To loosen the cone connection, continue turning the central retaining screw of the encoder [220] counterclockwise.
    ⇨ Encoder AK8H: Continue turning the central retaining screw of the encoder [220] counterclockwise. To loosen the cones, screw an M6 screw (≥ 70 mm long) into the bore.
14. Remove the encoder [220] from the rotor [1].

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Mounting encoder EK8./AK8. with optional forced cooling fan

1. Clean the cone of the encoder [220] and the rotor [1].
2. Remove the central screw plug [A].
3. Insert the encoder [220] into the conical bore of the rotor [1].
4. To secure the encoder [220] in place, tighten the central retaining screw.
   - ⇨ Counter-tighten the spanner flat SW10 of the encoder shaft.
   - ⇨ Tightening torque 3.3 Nm.
5. To seal the encoder [220], screw in the central screw plug [A].
   - ⇨ Tightening torque 1.8 Nm.
6. Mount the fan guard [35] over the encoder [220]. When doing this, guide the connection adapter [1164] with the signal line through the central grille cutout of the fan guard [35].
7. Attach the screws [22] of the fan guard [35] to the rear endshield or brake endshield [42] of the motor.
8. Screw the screws [232] through the grille of the fan guard [35] and into the nuts of the torque arm [1889].
   - ⇨ If you need to turn the encoder [220] in order for the screws to reach the nuts of the torque arm, turn the encoder [220] clockwise.
   - ⇨ Make sure the signal cable is of a sufficient length so that the connection adapter [1164] can be inserted into the recess of the forced cooling fan [170].
   - ⇨ Tightening torque 3.3 Nm.
9. ⚠ **CAUTION!**
   Improper installation can cause damage to the equipment. Risk of damage to the signal cable. Insert the signal cable into the slot of the cable retainer [1900] in such a way that the signal cable does not come into contact with the rotating forced cooling fan.
10. To turn the cable retainer [1900], loosen the set screw [1927].
11. To secure the cable retainer [1900] in place, tighten the set screw [1927].
    - ⇨ Tightening torque 1.8 Nm.
12. Place the forced cooling fan [170] onto the fan guard [35].
13. Insert the connection adapter [1164] into the recess of the forced cooling fan [170]. The standard alignment of the recess points towards the terminal box.
    - ⇨ The arrow that is cast in the lower part [C] of the connection adapter [1164] indicates the direction of the subsequent cable outlet for the connection cover [619].
    - ⇨ If you wish to change the direction of the cable outlet: Unscrew the screws [D]. Twist the lower part [C] against the T-slot nut [B]. Screw in the screws [D]. When doing so, only tighten the screws [D] lightly.
14. Use the screws [22] to secure the fan guard [35] to the rear endshield or brake endshield [42] of the motor.
    - ⇨ For metal hoods: Tightening torque 3.3 Nm.
    - ⇨ For plastic hoods: Tightening torque 2 Nm.
15. Secure the forced cooling fan with the screws [34].
    - ⇨ Tightening torque 2 Nm.

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16. Push the connection adapter [1164] up to the end of the recess facing away from the motor.
17. Turn the connection adapter [1164] clockwise up to the stop.
18. Secure the connection adapter [1164] in place by tightening the screws [D].
    ⇨ Tightening torque 2 Nm.
19. Place the connection cover [619] onto the connection adapter [1164].
20. Screw the screws [E] through the bore in the connection cover [619] and into the bore in the connection adapter [1164].
    ⇨ Tightening torque 2.5 Nm

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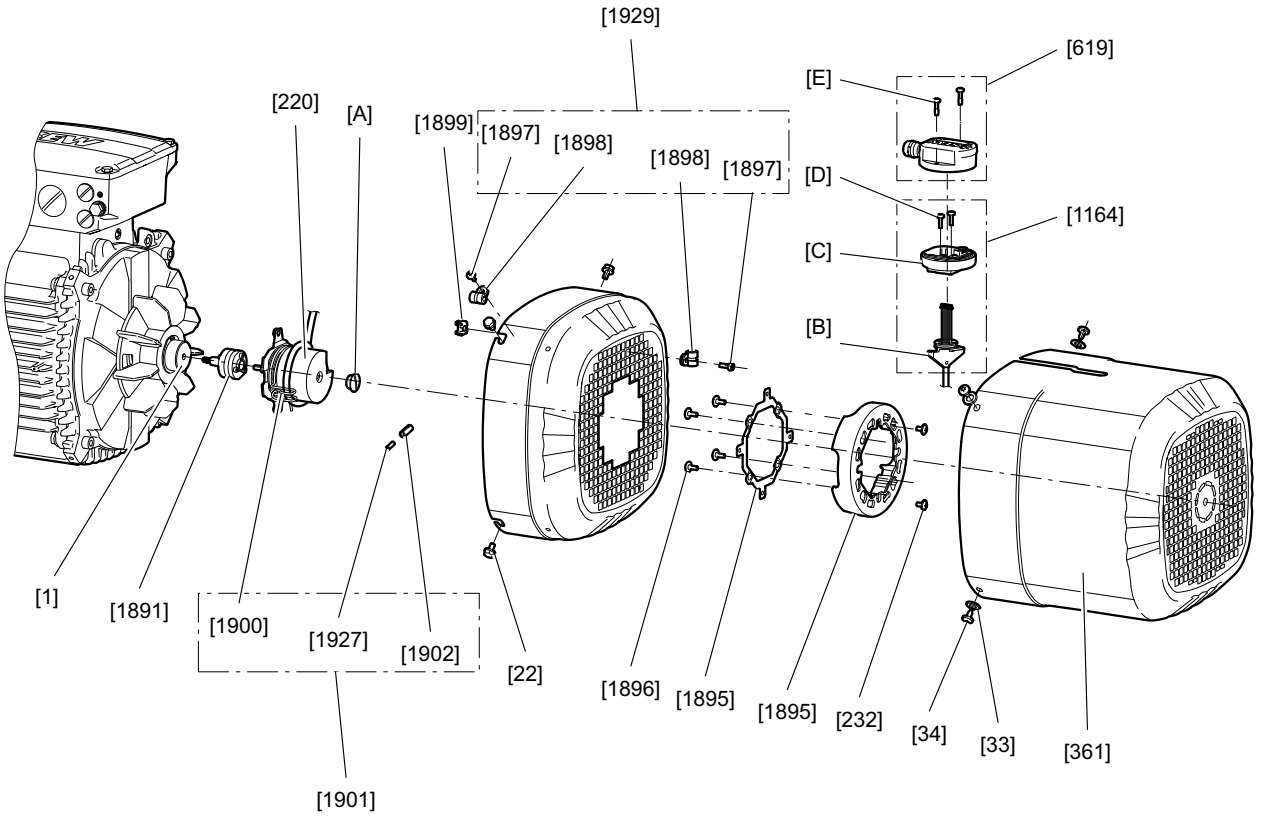
7.4.13 Removing and mounting cone shaft encoders of motors DRN132M – 315



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[1]	Rotor	[1898]	Clamp
[22]	Screw (hexagonal)	[1899]	Cage nut
[33]	Washer	[1900]	Cable retainer
[34]	Screw (cross recess)	[1901]	Accessory bag
[220]	Encoder	[1902]	Threaded sleeve
[232]	Screw (hexalobular)	[1927]	Set screw
[361]	Safety cover	[1929]	Accessory bag
[619]	Connection cover	[A]	Screw plug
[1164]	Connection adapter	[B]	T-slot nut
[1891]	Insulation coupling	[C]	Lower part
[1895]	Support ring/spacer ring	[D]	Screw
[1896]	Screw (hexalobular)	[E]	Screw
[1897]	Screw (hexagon socket)		

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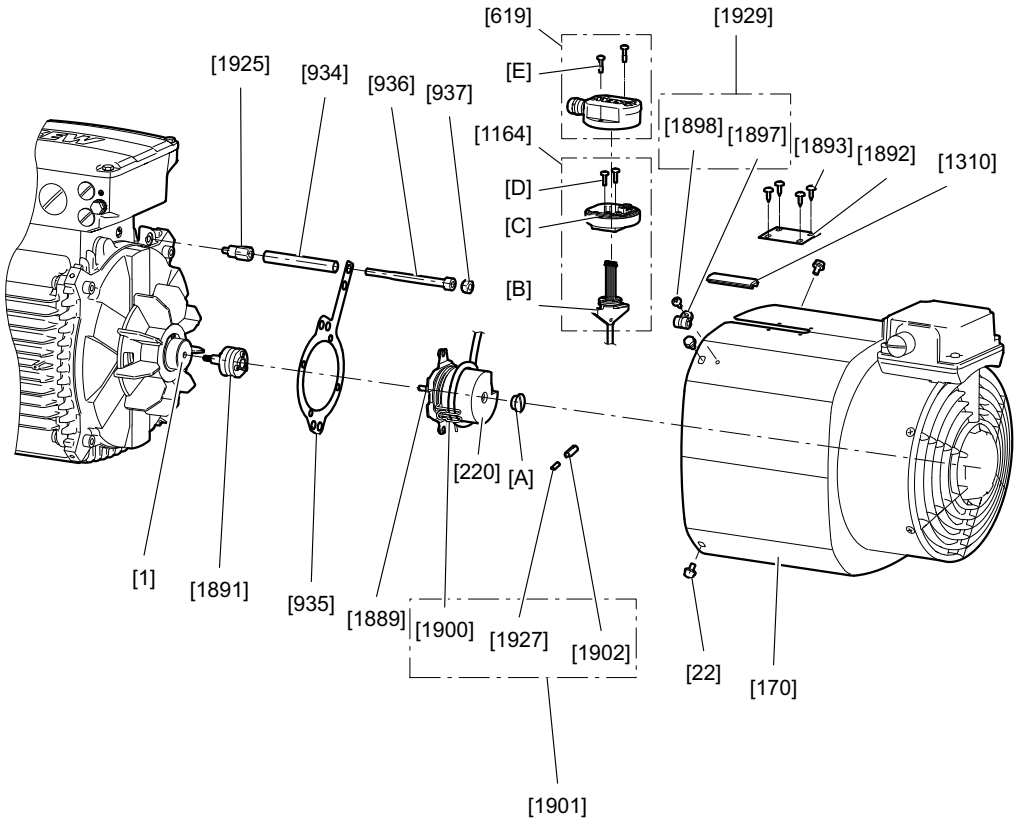

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[1]	Rotor	[1892]	Support plate
[22]	Screw (hexagonal)	[1893]	Screw (cross recess)
[33]	Washer	[1897]	Screw (hexagon socket)
[34]	Screw (cross recess)	[1900]	Cable retainer
[220]	Encoder	[1901]	Accessory bag
[232]	Screw (hexalobular)	[1902]	Threaded sleeve
[361]	Safety cover	[1925]	Spacer bolt
[619]	Connection cover	[1927]	Set screw
[934]	Spacer bushing	[1929]	Accessory bag
[935]	Torque arm	[A]	Screw plug
[936]	Cap screw	[B]	T-slot nut
[937]	Hex nut	[C]	Lower part
[1310]	Sealing strip	[D]	Screw
[1889]	Torque arm	[E]	Screw

Removing encoder EK8./AK8.

1. Unscrew the screws [E].
2. Remove the connection cover [619] from the connection adapter [1164].
3. Loosen the screws [D] in the lower part [C].
   ⇨ Only unscrew the screws [D] to such an extent that the connection adapter [1164] can be moved in the recess of the safety cover [361].
4. Unscrew the screws [34].
5. Remove the safety cover [361] from the motor. When doing this, slide the connection adapter [1164] out of the recess.
6. Unscrew the screws [232].
7. Unscrew the screws [22].

8. Remove the fan guard [35] over the encoder [220]. Guide the connection adapter [1164] with the signal cable through the cutout of the fan guard [35].
9. Unscrew the central screw plug [A] of the encoder [220].
10. Loosen the central retaining screw of the encoder [220].
    ⇨ If the central retaining screw of the encoder [220] cannot be loosened, counter-tighten the spanner flat SW10 of the encoder shaft.
11. Loosen the cone connection.
    ⇨ Encoder EK8., AK8W, AK8Y: To loosen the cone connection, continue turning the central retaining screw of the encoder [220] counterclockwise.
    ⇨ Encoder AK8H: Continue turning the central retaining screw of the encoder [220] counterclockwise. To loosen the cones, screw an M6 screw (≥ 70 mm long) into the bore.
12. Remove the encoder [220] from the rotor [1].
13. For optional insulation coupling: Remove the encoder [220] from the insulation coupling [1891].

Mounting encoder EK8./AK8.

1. Clean the cone of the encoder [220] and the rotor [1].
2. For optional insulation coupling: Clean the cones of the insulation coupling [1891].
3. Remove the central screw plug [A].
4. For optional insulation coupling: The insulation coupling [1891] must be mounted before the encoder is mounted. Insert the insulation coupling [1891] into the conical bore of the rotor [1]. To secure the insulation coupling in place, tighten the central retaining screw.
    ⇨ Counter-tighten the spanner flat SW 30 of the insulation coupling.
    ⇨ Tightening torque 3.3 Nm.
5. Insert the encoder [220] into the conical bore of the rotor [1].
6. For optional insulation coupling: Insert the encoder [220] into the conical opening of the insulation coupling [1891].
7. To secure the encoder [220] in place, tighten the central retaining screw.
    ⇨ Counter-tighten the spanner flat SW10 of the encoder shaft.
    ⇨ Tightening torque 3.3 Nm.
8. To seal the encoder [220], screw in the central screw plug [A].
    ⇨ Tightening torque 1.8 Nm.
9. Mount the fan guard [35] over the encoder [220]. When doing this, guide the connection adapter [1164] with the signal line through the central grille cutout of the fan guard [35].
10. Use the screws [22] to secure the fan guard [35] to the rear endshield or brake endshield [42] of the motor.
    ⇨ DRN132M – L: Tightening torque 11.3 Nm.
    ⇨ DRN160 – 280: Tightening torque 27.3 Nm.
    ⇨ DRN315: Secure the screws [22] in place with medium-strength thread locker. Tightening torque 5 Nm.

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11. Screw the screws [232] through the support ring/spacer ring [1895] and the grille of the fan guard [35] and into the nuts of the torque arm [1889].
    - ⇨ Make sure the signal cable is of a sufficient length so that the connection adapter [1164] can be inserted into the recess of the safety cover [361].
    - ⇨ Tightening torque 3.3 Nm.
12. Place the safety cover [361] onto the fan guard [35].
    - ⇨ The standard alignment of the recess points towards the terminal box.
    - ⇨ The arrow that is cast in the lower part [C] of the connection adapter [1164] indicates the direction of the subsequent cable outlet for the connection cover [619].
    - ⇨ If you wish to change the direction of the cable outlet: Unscrew the screws [D]. Twist the lower part [C] against the T-slot nut [B]. Screw in the screws [D]. When doing so, only tighten the screws [D] lightly.
13. Secure the safety cover [361] in place by using the screws [34].
    - ⇨ Tightening torque 4.5 Nm
14. Push the connection adapter [1164] up to the end of the recess facing away from the motor.
15. Turn the connection adapter [1164] clockwise up to the stop.
16. Secure the connection adapter [1164] in place by tightening the screws [D].
    - ⇨ Tightening torque 2 Nm.
17. Place the connection cover [619] onto the connection adapter [1164].
18. Screw the screws [E] through the bore in the connection cover [619] and into the bore in the connection adapter [1164].
    - ⇨ Tightening torque 2.5 Nm

Removing encoder EK8./AK8. with optional forced cooling fan

1. For motors EDRN250 – 315: If the screws [1893] are present, unscrew the screws. Remove the support plate [1892]. Slide the sealing strip [1310]**/[1965]** out of the recess.
2. Unscrew the screws [E].
3. Remove the connection cover [619] from the connection adapter [1164].
4. Loosen the screws [D] in the lower part [C].
    - ⇨ Only unscrew the screws [D] to such an extent that the connection adapter [1164] can be moved in the recess of the forced cooling fan [170].
5. Unscrew the screws [22].
6. Remove the forced cooling fan [170] from the motor. When doing this, slide the connection adapter [1164] out of the recess.
7. Unscrew the screws [232].
8. Remove the signal cable from the slot of the cable retainer [1900].
9. To remove the torque arm [935], loosen the screw [936]/hex nut [937]. Guide the connection adapter [1164] with the signal cable through the cutout of the torque arm [935].
10. Loosen the central retaining screw of the encoder [220].
    - ⇨ If the central retaining screw of the encoder [220] cannot be loosened, counter-tighten the spanner flat SW10 of the encoder shaft.

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11. Loosen the cone connection.
    - ⇨ Encoder EK8., AK8W, AK8Y: To loosen the cone connection, continue turning the central retaining screw of the encoder [220] counterclockwise.
    - ⇨ Encoder AK8H: Continue turning the central retaining screw of the encoder [220] counterclockwise. To loosen the cones, screw an M6 screw (≥ 70 mm long) into the bore.
12. Remove the encoder [220] from the rotor [1].
13. For optional insulation coupling: Remove the encoder [220] from the insulation coupling [1891].

Mounting encoder EK8./AK8. with optional forced cooling fan

1. Clean the cone of the encoder [220] and the rotor [1].
2. For optional insulation coupling: Clean the cones of the insulation coupling [1891].
3. Remove the central screw plug [A].
4. For optional insulation coupling: The insulation coupling [1891] must be mounted before the encoder is mounted. Insert the insulation coupling [1891] into the conical bore of the rotor [1]. To secure the insulation coupling in place, tighten the central retaining screw.
    - ⇨ Counter-tighten the spanner flat SW10 of the encoder shaft.
    - ⇨ Tightening torque 3.3 Nm.
5. Insert the encoder [220] into the conical bore of the rotor [1].
6. For optional insulation coupling: Insert the encoder [220] into the conical opening of the insulation coupling [1891].
7. To secure the encoder [220] in place, tighten the central retaining screw.
    - ⇨ Counter-tighten the spanner flat SW10 of the encoder shaft.
    - ⇨ Tightening torque 3.3 Nm.
8. To seal the encoder [220], screw in the central screw plug [A].
    - ⇨ Tightening torque 1.8 Nm.
9. Guide the torque arm [935] over the connection adapter [1164] and the encoder [220].
10. For optional insulation coupling: Mount the spacer bolt [1625].
    - ⇨ M6 screw: Tightening torque 11.3 Nm.
    - ⇨ M8 screw: Tightening torque 27.3 Nm.
11. When mounting the torque arm [935], make sure it is aligned centrally to the encoder [220]. Screw in the screw [936]/hex nut [937] with the spacer bushings [934].
    - ⇨ M6 screw: Tightening torque 11.3 Nm.
    - ⇨ M8 screw: Tightening torque 27.3 Nm.
12. ⚠ **CAUTION!**
    Improper installation can cause damage to the equipment. Risk of damage to the signal cable. Insert the signal cable into the slot of the cable retainer [1900] in such a way that the signal cable does not come into contact with the rotating forced cooling fan.
13. To turn the cable retainer [1900], loosen the set screw [1927].

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14. To secure the cable retainer [1900] in place, tighten the set screw [1927].
    ⇨ Tightening torque 1.8 Nm.
15. To secure the torque arm [1889] of the encoder in place, screw the screws [232] into the bores of the torque arm [935].
    ⇨ Make sure the signal cable is of a sufficient length so that the connection adapter [1164] can be inserted into the recess of the forced cooling fan [170].
16. Place the forced cooling fan [170] onto the rear endshield or brake endshield [42].
17. Insert the connection adapter [1164] into the recess of the forced cooling fan [170]. The standard alignment of the recess points towards the terminal box.
    ⇨ The arrow that is cast in the lower part [C] of the connection adapter [1164] indicates the direction of the subsequent cable outlet for the connection cover [619].
    ⇨ If you wish to change the direction of the cable outlet: Unscrew the screws [D]. Twist the lower part [C] against the T-slot nut [B]. Screw in the screws [D]. When doing so, only tighten the screws [D] lightly.
18. Use the screws [22] to secure the forced cooling fan [170] to the rear endshield or brake endshield [42] of the motor.
    ⇨ DRN132M – L: Tightening torque 11.3 Nm.
    ⇨ DRN160 – 280: Tightening torque 27.3 Nm.
    ⇨ DRN315: Secure the screws [22] in place with medium-strength thread locker. Tightening torque 5 Nm.
19. Push the connection adapter [1164] up to the end of the recess facing away from the motor.
20. For motors EDRN250 – 315: To secure the support plate [1892] in place, screw in the screws [1893]. Slide the sealing strip [1310]/[1965] into the recess.
21. Secure the connection adapter [1164] in place by tightening the screws [D].
    ⇨ Tightening torque 2 Nm.
22. Place the connection cover [619] onto the connection adapter [1164].
23. Screw the screws [E] through the bore in the connection cover [619] and into the bore in the connection adapter [1164].
    ⇨ Tightening torque 2.5 Nm

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7.4.14 Removing and mounting encoder EV8./AV8. with coupling from motors DRN71 – 225

Removing encoder EV8./AV8. with coupling

1. Unscrew the screws [E].
2. Remove the connection cover [619] from the connection adapter [1164].
3. Loosen the screws [D] in the lower part [C].
   ⇨ Only unscrew the screws [D] to such an extent that the connection adapter [1164] can be moved in the recess of the safety cover [361].
4. Unscrew the screws [22].
5. Remove the safety cover [361] from the motor. When doing this, slide the connection adapter [1164] out of the recess.
6. Unscrew the screws [232].
7. Remove the eccentric disks [251] from the circumferential groove of the encoder [220].
8. Unscrew the central screw plug [A] of the encoder [220].
9. Loosen the central retaining screw of the encoder [220].
   ⇨ If the central retaining screw of the encoder [220] cannot be loosened, exert counter-pressure at the Ø 4.1 mm bore of the rear coupling half.
10. Remove the encoder [220] from the coupling [233].

Mounting encoder EV8./AV8. with coupling

1. Remove the central screw plug [A].
2. If the closing plate [646] is present: Unscrew the screws [232] and remove the closing plate [646].
3. Clean the cone of the rotor [1], the encoder [220] and the coupling [233].
4. Insert the coupling [233] into the conical bore of the rotor.
5. To secure the coupling [233] in place, screw in the central retaining screw [F].
   ⇨ Tightening torque 4 Nm
   ⇨ Exert counter-pressure at the Ø 4.1 mm bore of the rear coupling half.
6. To remove the torque arm [1889] from the encoder, unscrew the screws [1888].
7. Remove the central screw plug [A].
   ⇨ For size DRN132M/L: Place the spacer ring [225] between the encoder [220] and the fan guard with encoder mount [212].
8. Insert the encoder [220] into the coupling half with conical bore [233].
9. To secure the encoder [220] in place, tighten the central retaining screw.
   ⇨ Tightening torque 3.3 Nm.
   ⇨ Exert counter-pressure at the Ø 4.1 mm bore of the rear coupling half.
10. To seal the encoder [220], screw in the central screw plug [A].
    ⇨ Tightening torque 1.8 Nm.
11. To secure the eccentric disks [251], insert the screws [232].
12. Tighten the screws [232] while turning the eccentric disks [251] in clockwise direction into the groove of the encoder [220].
    ⇨ Tightening torque 2.25 Nm.

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⇨ Make sure the signal cable is of a sufficient length so that the connection adapter [1164] can be inserted into the recess of the safety cover [361].

13. Insert the connection adapter [1164] into the recess of the safety cover [361]. The standard alignment of the recess points towards the terminal box.
14. Place the safety cover [361] onto the fan guard [35].
    ⇨ The arrow that is cast in the lower part [C] of the connection adapter [1164] indicates the direction of the subsequent cable outlet for the connection cover [619].
    ⇨ If you wish to change the direction of the cable outlet: Unscrew the screws [D]. Twist the lower part [C] against the T-slot nut [B]. Screw in the screws [D]. When doing so, only tighten the screws [D] lightly.
15. Secure the safety cover [361] in place by using the screws [22].
    ⇨ DRN71 – 132S: Tightening torque 3.3 Nm
    ⇨ DRN132M – L: Tightening torque 11.3 Nm
    ⇨ DRN160 – 225: Tightening torque 27.3 Nm
16. Push the connection adapter [1164] up to the end of the recess facing away from the motor.
17. Turn the connection adapter [1164] clockwise up to the stop.
18. Secure the connection adapter [1164] in place by tightening the screws [D].
    ⇨ Tightening torque 2 Nm.
19. Place the connection cover [619] onto the connection adapter [1164].
20. Screw the screws [E] through the bore in the connection cover [619] and into the bore in the connection adapter [1164].
    ⇨ Tightening torque 2.5 Nm

Removing encoder EV8./AV8. with coupling and optional forced cooling fan

1. Unscrew the screws [E].
2. Remove the connection cover [619] from the connection adapter [1164].
3. Loosen the screws [D] in the lower part [C].
   ⇨ Only unscrew the screws [D] to such an extent that the connection adapter [1164] can be moved in the recess of the safety cover [361].
4. Loosen the screws [22].
5. Unscrew the screws [34].
6. Remove the forced cooling fan [170] from the motor. When doing this, slide the connection adapter [1164] out of the recess.
7. Remove the signal cable from the slot of the cable retainer [1900].
8. Unscrew the screws [232].
9. Remove the eccentric disks [251] from the circumferential groove of the encoder [220].
10. Unscrew the central screw plug [A] of the encoder [220].
11. Loosen the central retaining screw of the encoder [220].
    ⇨ If the central retaining screw of the encoder [220] cannot be loosened, exert counter-pressure at the Ø 4.1 mm bore of the rear coupling half.
12. Remove the encoder [220] from the coupling [233].

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Mounting encoder EV8./AV8. with coupling and optional forced cooling fan

1. Remove the central screw plug [A].
2. If the closing plate [646] is present: Unscrew the screws [232] and remove the closing plate [646].
3. Clean the cone of the rotor [1], the encoder [220] and the coupling [233].
4. Insert the coupling [233] into the conical bore of the rotor.
5. To secure the coupling [233] in place, screw in the central retaining screw [F].
   - ⇨ Tightening torque 3.3 Nm.
   - ⇨ Exert counter-pressure at the Ø 4.1 mm bore of the rear coupling half.
6. To remove the torque arm [1889] from the encoder, unscrew the screws [1888].
7. Remove the central screw plug [A].
   - ⇨ For size DRN132M/L: Place the spacer ring [225] between the encoder [220] and the fan guard with encoder mount [212].
8. Insert the encoder [220] into the coupling half with conical bore [233].
9. To secure the encoder [220] in place, tighten the central retaining screw.
   - ⇨ Tightening torque 3.3 Nm.
   - ⇨ Exert counter-pressure at the Ø 4.1 mm bore of the rear coupling half.
10. To seal the encoder [220], screw in the central screw plug [A].
    - ⇨ Tightening torque 1.8 Nm.
11. To secure the eccentric disks [251], insert the screws [232].
12. Tighten the screws [232] while turning the eccentric disks [251] in clockwise direction into the groove of the encoder [220].
    - ⇨ Tightening torque 2.25 Nm.
    - ⇨ Make sure the signal cable is of a sufficient length so that the connection adapter [1164] can be inserted into the recess of the forced cooling fan [170].
13. ⚠ **CAUTION!**
    Improper installation can cause damage to the equipment. Risk of damage to the signal cable. Insert the signal cable into the slot of the cable retainer [1900] in such a way that the signal cable does not come into contact with the rotating forced cooling fan.
14. To turn the cable retainer [1900], loosen the set screw [1927].
15. To secure the cable retainer [1900] in place, tighten the set screw [1927].
    - ⇨ Tightening torque 1.8 Nm.
16. Place the forced cooling fan [170] onto the fan guard with encoder mount [212].
17. Insert the connection adapter [1164] into the recess of the forced cooling fan [170]. The standard alignment of the recess points towards the terminal box.
    - ⇨ The arrow that is cast in the lower part [C] of the connection adapter [1164] indicates the direction of the subsequent cable outlet for the connection cover [619].
    - ⇨ If you wish to change the direction of the cable outlet: Unscrew the screws [D]. Twist the lower part [C] against the T-slot nut [B]. Screw in the screws [D]. When doing so, only tighten the screws [D] lightly.

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18. Use the screws [22] to secure the forced cooling fan [170] to the fan guard with encoder mount [212] of the motor.
    - ⇨ DRN71 – 132S: Tightening torque 3.3 Nm
    - ⇨ DRN132M – L: Tightening torque 11.3 Nm
    - ⇨ DRN160 – 225: Tightening torque 27.3 Nm
19. Push the connection adapter [1164] up to the end of the recess facing away from the motor.
20. Turn the connection adapter [1164] clockwise up to the stop.
21. Secure the connection adapter [1164] in place by tightening the screws [D].
    - ⇨ Tightening torque 2 Nm.
22. Place the connection cover [619] onto the connection adapter [1164].
23. Screw the screws [E] through the bore in the connection cover [619] and into the bore in the connection adapter [1164].
    - ⇨ Tightening torque 2.5 Nm

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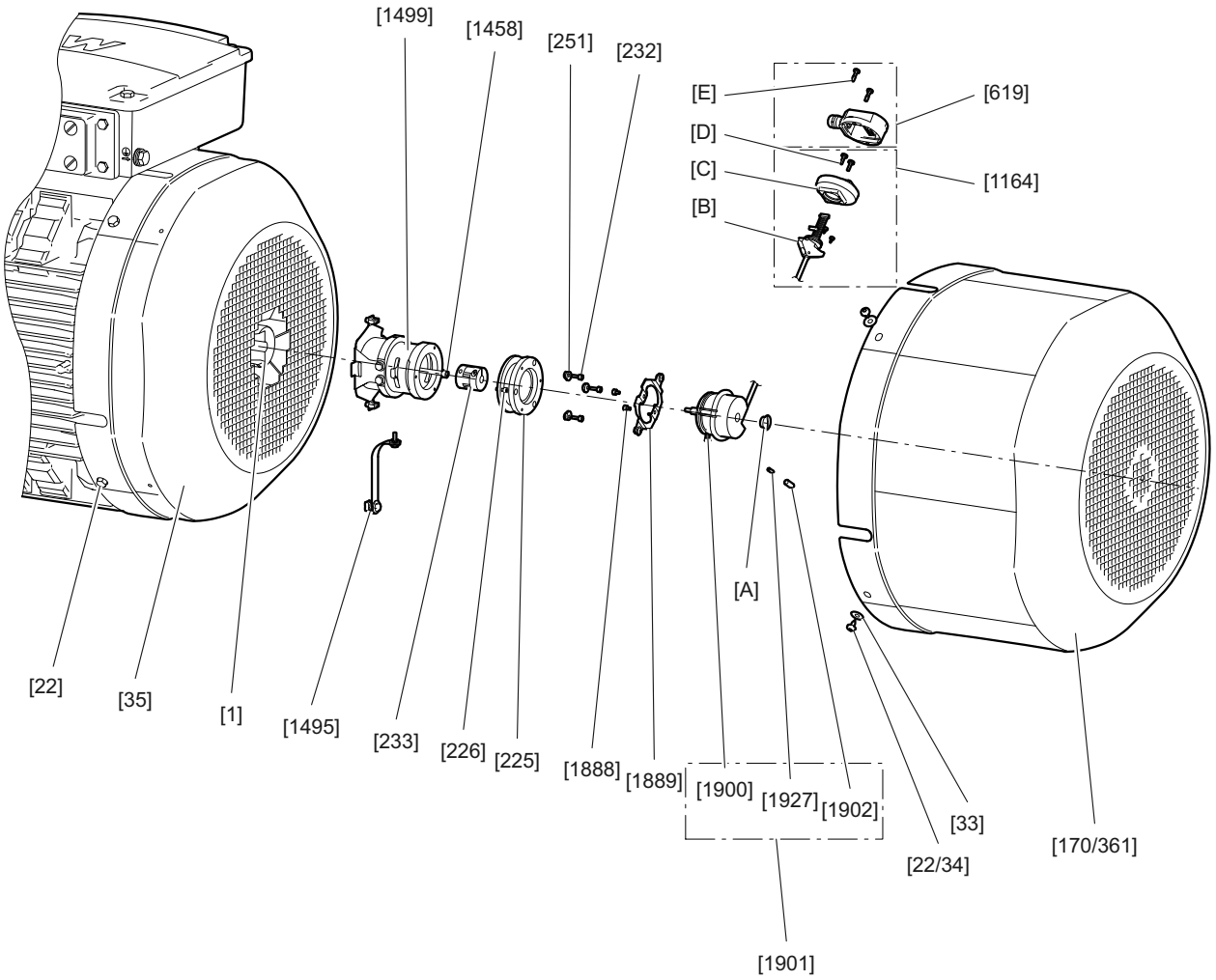
7.4.15 Removing and mounting encoder EV8./AV8. with coupling from motors DRN250 – 280



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[1]	Rotor	[1499]	Encoder mounting adapter
[22]	Screw (hexagonal)	[1495]	Ground strap SET
[33]	Washer	[1888]	
[34]	Screw (cross recess)	[1898]	Clamp
[35]	Fan guard	[1899]	Cage nut
[170]	Forced cooling fan	[1900]	Cable retainer
[225]	Intermediate flange	[1901]	Accessory bag
[226]	Cap screw	[1902]	Threaded sleeve
[232]	Screw (hexalobular)	[1927]	Set screw
[233]	Coupling	[A]	Screw plug
[251]	Conical spring washer	[B]	T-slot nut
[361]	Safety cover	[C]	Lower part
[619]	Connection cover	[D]	Screw
[1164]	Connection adapter	[E]	Screw
[1458]	Cap screw		

Removing encoder EV8./AV8. with coupling

1. Unscrew the screws [E].
2. Remove the connection cover [619] from the connection adapter [1164].

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3. Loosen the screws [D] in the lower part [C].
   ⇨ Only unscrew the screws [D] to such an extent that the connection adapter [1164] can be moved in the recess of the safety cover [361].
4. Unscrew the screws [34].
5. Remove the safety cover [361] from the motor. When doing this, slide the connection adapter [1164] out of the recess.
6. Unscrew the screws [232].
7. Remove the eccentric disks [251] from the circumferential groove of the encoder [220].
8. Remove the encoder [220] from the intermediate flange [225].
9. Unscrew the central screw plug [A] of the encoder [220].
10. Loosen the central retaining screw of the encoder [220].
11. Remove the encoder with the mounted rear coupling half [233] from the mounting adapter [1499].
    ⇨ If the central retaining screw of the encoder [220] cannot be loosened, counter-tighten the spanner flat SW10 of the encoder shaft.
12. Remove the encoder [220] from the coupling [233].

Mounting encoder EV8./AV8. with coupling

1. Clean the cone of the rotor [1], the encoder mounting adapter [1499] and the coupling [233].
2. Insert the encoder mounting adapter [1499] into the conical bore of the rotor [1].
3. To secure the encoder mounting adapter [1499] in place, screw in the central retaining screw [1458].
   ⇨ Tightening torque 3.3 Nm.
4. Use the screws [22] to secure the fan guard [35] to the rear endshield or brake endshield [42] of the motor.
   ⇨ While doing so, the plastic dampers [1486] of the torque arm for the encoder mounting adapter [1499] must engage into the grille of the fan guard [35].
   ⇨ Tightening torque 27.3 Nm.
5. To secure the ground strap [1495] to the encoder mounting adapter [1499], screw in the screw [1498].
   ⇨ Tightening torque 6.5 Nm
6. To secure the ground strap [1495] to the fan guard [35], screw the screw [1462] into the cage nut [1459].
   ⇨ Tightening torque 11.3 Nm.
7. Place the coupling half with cylindrical internal bore [233] onto the inner pin of the encoder mounting adapter [1499].
8. To secure the coupling half with cylindrical internal bore [233] in place, screw the screw into the conical spring washer of the coupling [233].
   ⇨ Tightening torque 3.3 Nm.
9. To secure the intermediate flange [225] to the encoder mounting adapter [1499], screw in the screw [226].
   ⇨ Tightening torque 3.3 Nm.

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10. To remove the torque arm [1889] from the encoder, unscrew the screws [1888].
11. Remove the central screw plug [A].
12. Insert the encoder [220] into the coupling half with conical bore [233].
13. To secure the encoder [220] in place, tighten the central retaining screw.
    - ⇨ Tightening torque 3.3 Nm.
    - ⇨ Counter-tighten the spanner flat SW10 of the encoder shaft.
14. To seal the encoder [220], screw in the central screw plug [A].
    - ⇨ Tightening torque 1.8 Nm.
15. Insert the encoder [220] with mounted coupling half into the centering of the intermediate flange [225]. The two coupling halves must interlock via the plastic coupling star.
16. To secure the eccentric disks [251], insert the screws [232].
17. Tighten the screws [232] while turning the eccentric disks [251] in clockwise direction into the groove of the encoder [220].
    - ⇨ Tightening torque 2.25 Nm.
    - ⇨ Make sure the signal cable is of a sufficient length so that the connection adapter [1164] can be inserted into the recess of the safety cover [361].
18. Insert the connection adapter [1164] into the recess of the safety cover [361]. The standard alignment of the recess points towards the terminal box.
19. Place the safety cover [361] onto the fan guard [35].
    - ⇨ The arrow that is cast in the lower part [C] of the connection adapter [1164] indicates the direction of the subsequent cable outlet for the connection cover [619].
    - ⇨ If you wish to change the direction of the cable outlet: Unscrew the screws [D]. Twist the lower part [C] against the T-slot nut [B]. Screw in the screws [D]. When doing so, only tighten the screws [D] lightly.
20. Secure the safety cover [361] in place by using the screws [34].
    - ⇨ Tightening torque 4.5 Nm
21. Push the connection adapter [1164] up to the end of the recess facing away from the motor.
22. Turn the connection adapter [1164] clockwise up to the stop.
23. Secure the connection adapter [1164] in place by tightening the screws [D].
    - ⇨ Tightening torque 2 Nm.
24. Place the connection cover [619] onto the connection adapter [1164].
25. Screw the screws [E] through the bore in the connection cover [619] and into the bore in the connection adapter [1164].
    - ⇨ Tightening torque 2.5 Nm

Removing encoder EV8./AV8. with coupling and optional forced cooling fan

1. Unscrew the screws [E].
2. Remove the connection cover [619] from the connection adapter [1164].
3. Loosen the screws [D] in the lower part [C].
   - ⇨ Only unscrew the screws [D] to such an extent that the connection adapter [1164] can be moved in the recess of the forced cooling fan [170].

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4. Unscrew the screws [22].
5. Remove the forced cooling fan [170] from the motor. When doing this, slide the connection adapter [1164] out of the recess.
6. If necessary, loosen the set screw [1927].
7. Remove the signal cable from the slot of the cable retainer [1900].
8. Unscrew the screws [232].
9. Remove the eccentric disks [251] from the circumferential groove of the encoder [220].
10. Remove the encoder [220] from the intermediate flange [225].
11. Unscrew the central screw plug [A] of the encoder [220].
12. Loosen the central retaining screw of the encoder [220].
13. Remove the encoder with the mounted rear coupling half [233] from the mounting adapter [1499].
    ⇨ If the central retaining screw of the encoder [220] cannot be loosened, counter-tighten the spanner flat SW10 of the encoder shaft.
14. Remove the encoder [220] from the coupling [233].

Mounting encoder EV8./AV8. with coupling and optional forced cooling fan

1. Clean the cone of the rotor [1], the encoder mounting adapter [1499] and the coupling [233].
2. Insert the encoder mounting adapter [1499] into the conical bore of the rotor [1].
3. To secure the encoder mounting adapter [1499] in place, screw in the central retaining screw [1458].
    ⇨ Tightening torque 3.3 Nm.
4. Use the screws [1485] to secure the torque arm [935] to the mounting adapter [1499].
    ⇨ Tightening torque 6 Nm.
5. Use the sleeves [934], screws [936] and washers [1666] to secure the torque arm [935] to the rear endshield or brake endshield [42].
    ⇨ Tightening torque 11.3 Nm.
6. Use the screws [22] to secure the fan guard [35] to the rear endshield or brake endshield [42] of the motor.
    ⇨ While doing so, the plastic dampers [1486] of the torque arm for the encoder mounting adapter [1499] must engage into the grille of the fan guard [35].
    ⇨ Tightening torque 27.3 Nm.
7. Place the coupling half with cylindrical internal bore [233] onto the inner pin of the encoder mounting adapter [1499].
8. To secure the coupling half with cylindrical internal bore [233] in place, screw the screw into the conical spring washer of the coupling [233].
    ⇨ Tightening torque 3.3 Nm.
9. To secure the intermediate flange [225] to the encoder mounting adapter [1499], screw in the screw [226].
    ⇨ Tightening torque 3.3 Nm.
10. To remove the torque arm [1889] from the encoder, unscrew the screws [1888].

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11. Remove the central screw plug [A].
12. Insert the encoder [220] into the coupling half with conical bore [233].
13. To secure the encoder [220] in place, tighten the central retaining screw.
    - ⇨ Tightening torque 3.3 Nm.
    - ⇨ Counter-tighten the spanner flat SW10 of the encoder shaft.
14. To seal the encoder [220], screw in the central screw plug [A].
    - ⇨ Tightening torque 1.8 Nm.
15. Insert the encoder [220] with mounted coupling half into the centering of the intermediate flange [225]. The two coupling halves must interlock via the plastic coupling star.
16. To secure the eccentric disks [251], insert the screws [232].
17. Tighten the screws [232] while turning the eccentric disks [251] in clockwise direction into the groove of the encoder [220].
    - ⇨ Tightening torque 2.25 Nm.
    - ⇨ Make sure the signal cable is of a sufficient length so that the connection adapter [1164] can be inserted into the recess of the safety cover [361].
18. ⚠ **CAUTION!**
    Improper installation can cause damage to the equipment. Risk of damage to the signal cable. Insert the signal cable into the slot of the cable retainer [1900] in such a way that the signal cable does not come into contact with the rotating forced cooling fan.
19. To turn the cable retainer [1900], loosen the set screw [1927].
20. To secure the cable retainer [1900] in place, tighten the set screw [1927].
    - ⇨ Tightening torque 1.8 Nm.
21. Insert the connection adapter [1164] into the recess of the forced cooling fan [170]. The standard alignment of the recess points towards the terminal box.
    - ⇨ The arrow that is cast in the lower part [C] of the connection adapter [1164] indicates the direction of the subsequent cable outlet for the connection cover [619].
    - ⇨ If you wish to change the direction of the cable outlet: Unscrew the screws [D]. Twist the lower part [C] against the T-slot nut [B]. Screw in the screws [D]. When doing so, only tighten the screws [D] lightly.
22. Use the screws [22] to secure the forced cooling fan [170] to the rear endshield or brake endshield [42] of the motor.
    - ⇨ Tightening torque 27.3 Nm.
23. Push the connection adapter [1164] up to the end of the recess facing away from the motor.
24. For motors EDRN250 – 315: To secure the support plate [1892] in place, screw in the screws [1893]. Slide the sealing strip [1310]/[1965] into the recess.
25. Secure the connection adapter [1164] in place by tightening the screws [D].
    - ⇨ Tightening torque 2 Nm.
26. Place the connection cover [619] onto the connection adapter [1164].
27. Screw the screws [E] through the bore in the connection cover [619] and into the bore in the connection adapter [1164].
    - ⇨ Tightening torque 2.5 Nm

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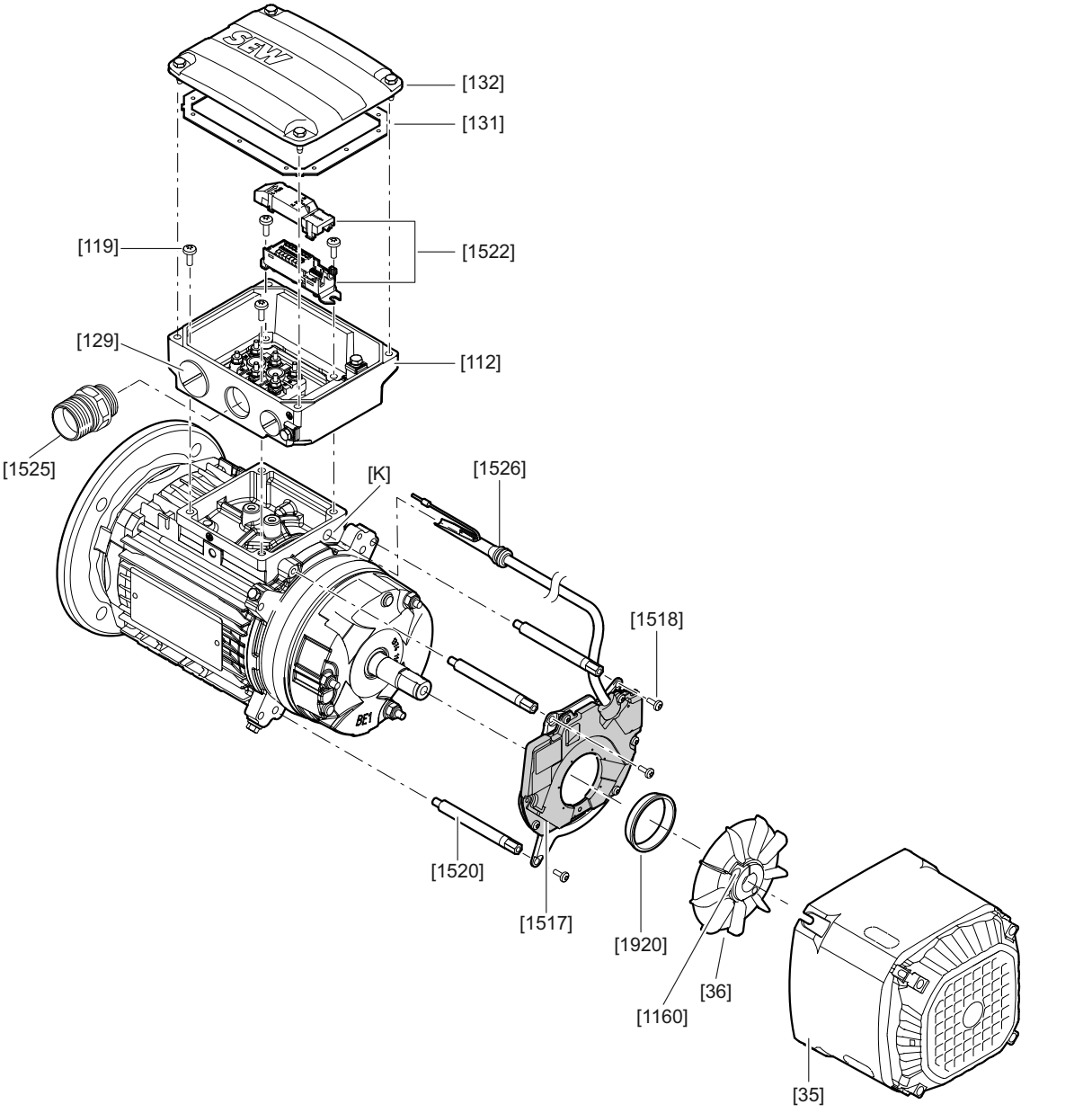
7.4.16 Removing and mounting built-in encoder EI8.

A centering ring is required when mounting the built-in encoder EI8. You can order the centering ring via the following part number:

Motor	Built-in encoder	Part number
DRN71 – 132S DR2..71 – 80	Centering ring EI8.	22659129



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[35]	Fan guard	[132]	Terminal box cover	[1525]	M23 plug connector
[36]	Fan, complete	[1160]	Cap screw	[1526]	Grommet
[112]	Terminal box lower part	[1517]	Encoder module	[1920]	Centering ring (aid)
[119]	Screw	[1518]	Flat head screw	[K]	Knock-out
[129]	Screw plug	[1520]	Spacer		
[131]	Gasket for cover	[1522]	Connection unit		

Removing EI8. with connection unit

✓ Required resources: Screwdriver

1. Remove the forced cooling fan if required.
2. Remove the screws [22] to disassemble the fan guard [35].
3. Loosen the radial clamping screw [1160]:
   - ⇨ DRN71 – 100: M3 with cylinder head
   - ⇨ DRN112/132S: M4 with cylinder head
4. Remove the fan [36] with bushing and pole ring from the shaft end.
5. Remove the 3 x M4 pan head screws [1518] of the encoder module [1517].
6. If present, remove the hexagonal spacers [1520] (SW8).
7. Unscrew the screws [123] to remove the terminal box cover [132].
8. Remove the cover of the connection unit [1522] by pressing the cover on both sides behind the cable entry.
9. Disconnect the 10-pin board connector.
10. Pull the jack of the encoder cable from the connector.
11. Unscrew the grounding element of the encoder cable.
12. **NOTICE!** Possible defect of the encoder module. Physical damage can occur. Do not pull directly on the encoder module.
    To remove the encoder module [1517] from the motor, pull the encoder cable out of the grommet [1526] and the opening of the knock-out [K].

Mounting EI8. with connection unit

- ✓ Required resources: Feeler gauge, screwdriver, centering ring [1920]

1. Unscrew the screws [123] to remove the terminal box cover [132].
2. **NOTICE!** Damage to the terminal box or fragments inside the motor. Possible physical damage. Exercise caution when breaking open the knock-outs.
   Break open the knock-out [K] by using a chisel or screwdriver.
3. **NOTICE!** Damage to the connector. Possible physical damage. Do not subject the connector to excessive tension.
   Pull the grommet [1526] with encoder cable through the knock-out [K].
   - ⇨ The grommet must engage into the opening of the knock-out [K].
4. If necessary, screw the hexagonal spacers [1520] into the brake endshield.
   - ⇨ Tightening torque 5 Nm.
5. Place the centering ring [1920] onto the pole ring.
6. Push the encoder module [1517] onto the shaft end.
7. Push the fan [36] with bushing and pole ring onto the shaft end.
8. Center the encoder module [1517] with the centering ring [1920] radially to the shaft.
9. Use 3 pan head screws [1518] to secure the encoder module [1517] to the brake endshield or, if applicable, to the hexagonal spacers [1520].
   - ⇨ Tightening torque 2.5 Nm
10. Remove the fan [36] with bushing and pole ring from the shaft end and remove the centering ring [1920].
11. Push the fan [36] with bushing and pole ring onto the shaft end.

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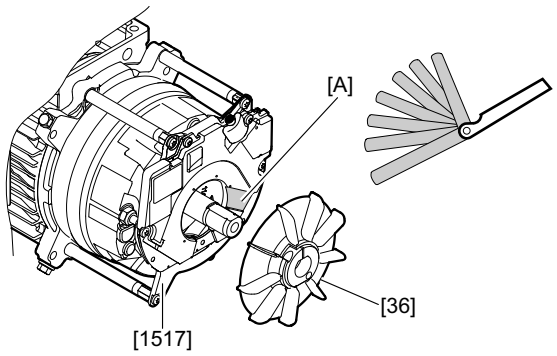
12. To set the distance of 1 mm between the encoder module [1517] and the pole ring, insert a feeler gauge into the designated notch [A].



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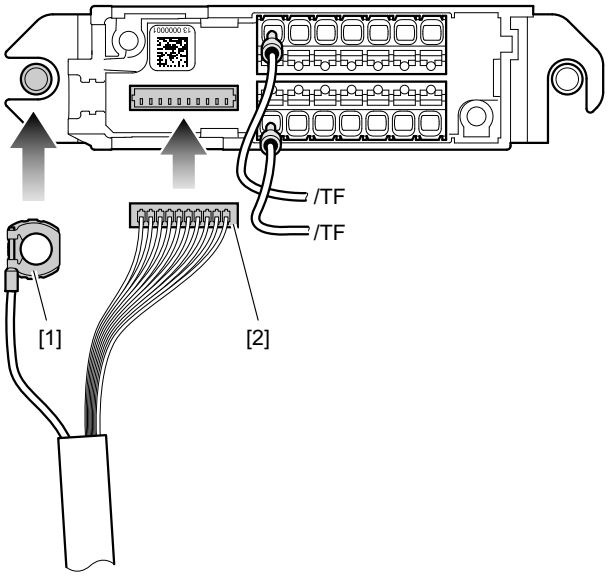
13. Tighten the clamping screw [1160].
    - ⇨ DRN71 – 100, DR2..71 – 80: Tightening torque 1.2 Nm
    - ⇨ DRN112 – 132S: Tightening torque 3.3 Nm
14. Route the encoder cable in the terminal box in such a way that it is not crushed or improperly subjected to stress.
15. Remove the cover of the connection unit [1522] by pressing the cover on both sides behind the cable entry.
16. Apply the shielding of the encoder cable onto the Stocko terminal.
17. Place the connection unit [1522] in the terminal box.
18. To secure the connection unit [1522] in place, screw the Stocko terminal [1] and the shield plate tightly in the terminal box.
    - ⇨ Tightening torque 5 Nm.



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19. Insert the jack of the encoder cable [2] into the connector on the board and insert the encoder cable into the hollow of the connection unit [1522], which serves as strain relief. If applicable, connect the temperature sensor /TF.
20. Connect the customer's evaluation unit for the encoder to the connection unit [1522] with a shield plate.
21. Connect the supply voltage to the encoder module [1517].

22. Attach the cover of the connection unit [1522].
23. Check the visual feedback of the status LED for the encoder module [1517].
    - ⇨ LED lights up green: The encoder module [1517] has been installed correctly and you can continue with the assembly process.
    - ⇨ LED lights up red: Switch off the supply voltage. Set the distance of 1 mm between the encoder module [1517] and the pole ring again. Switch the supply voltage back on. If the status LED still lights up red, please contact the SEW-EURODRIVE Service department.
24. Mount the terminal box cover [132] using the screws [123] (4xM5 SW8).
    - ⇨ Tightening torque 4 Nm
25. Mount the fan guard [35] with the screws [22].
    - ⇨ Tightening torque 2 Nm.
26. Mount the forced cooling fan if applicable.

Removing EI8. with M23 plug connector

- ✓ Required resources: Screwdriver

1. Remove the forced cooling fan if required.
2. Remove the screws [22] to disassemble the fan guard [35].
3. Loosen the radial clamping screw [1160]:
   - ⇨ DRN71 – 100: M3 with cylinder head
   - ⇨ DRN112/132S: M4 with cylinder head
4. Remove the fan [36] with bushing and pole ring from the shaft end.
5. Remove the 3 x M4 pan head screws [1518] of the encoder module [1517].
6. If present, remove the hexagonal spacers [1520] (SW8).
7. Unscrew the screws [123] to remove the terminal box cover [132].
8. Remove the protective cover of the M23 plug connector [1525] on the inside of the terminal box.
9. Pull the jack of the encoder cable from the connector.
10. Remove the grounding element of the encoder.
11. **NOTICE!** Possible defect of the encoder module. Physical damage can occur. Do not pull directly on the encoder module.
    To remove the encoder module [1517] from the motor, pull the encoder cable out of the grommet [1526] and the opening of the knock-out [K].

Mounting EI8. with M23 plug connector

- ✓ Required resources: Feeler gauge, screwdriver, centering ring [1920]

1. Unscrew the screws [123] to remove the terminal box cover [132].
2. **NOTICE!** Damage to the terminal box or fragments inside the motor. Possible physical damage. Exercise caution when breaking open the knock-outs.
   Break open the knock-out [K] by using a chisel or screwdriver.
3. **NOTICE!** Damage to the connector. Possible physical damage. Do not subject the connector to excessive tension.
   Pull the grommet [1526] with encoder cable through the knock-out [K].
   - ⇨ The grommet must engage into the opening of the knock-out [K].

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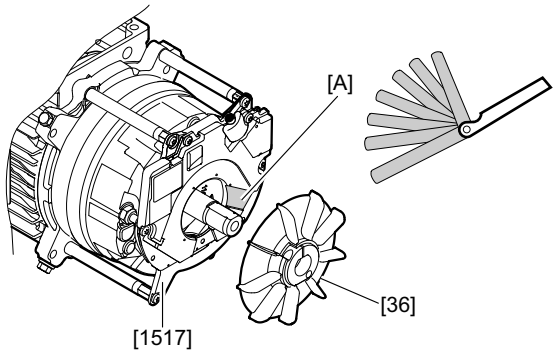
4. If necessary, screw the hexagonal spacers [1520] into the brake endshield.
   ⇨ Tightening torque 5 Nm.
5. Place the centering ring [1920] onto the pole ring.
6. Push the encoder module [1517] onto the shaft end.
7. Push the fan [36] with bushing and pole ring onto the shaft end.
8. Center the encoder module [1517] with the centering ring [1920] radially to the shaft.
9. Use 3 pan head screws [1518] to secure the encoder module [1517] to the brake endshield or, if applicable, to the hexagonal spacers [1520].
   ⇨ Tightening torque 2.5 Nm
10. Remove the fan [36] with bushing and pole ring from the shaft end and remove the centering ring [1920].
11. Push the fan [36] with bushing and pole ring onto the shaft end.
12. To set the distance of 1 mm between the encoder module [1517] and the pole ring, insert a feeler gauge into the designated notch [A].



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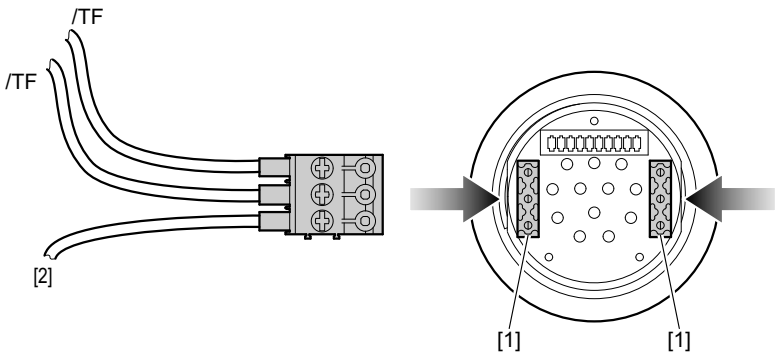
13. Tighten the clamping screw [1160].
    ⇨ DRN71 – 100, DR2..71 – 80: Tightening torque 1.2 Nm
    ⇨ DRN112 – 132S: Tightening torque 3.3 Nm
14. Route the encoder cable in the terminal box in such a way that it is not crushed or improperly subjected to stress.
15. Remove the protective cover of the M23 plug connector [1525] on the inside of the terminal box.
16. Insert the jack of the encoder cable into the connector on the board.
17. Connect the shielding of the encoder cable [2] and, if applicable, the temperature sensor /TF to the screw terminal.



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18. Insert the screw terminal (with the connection side facing outwards) into one of the two plug connectors [1] on the printed circuit board.
19. Attach the protective cover of the M23 plug connector [1525] to the inside of the terminal box.
20. Connect the evaluation unit for the encoder via the M23 plug connector [1525].
21. Connect the supply voltage to the encoder module [1517].
22. Check the visual feedback of the status LED for the encoder module [1517].
    - ⇨ LED lights up green: The encoder module [1517] has been installed correctly and you can continue with the assembly process.
    - ⇨ LED lights up red: Switch off the supply voltage. Set the distance of 1 mm between the encoder module [1517] and the pole ring again. Switch the supply voltage back on. If the status LED still lights up red, please contact the SEW-EURODRIVE Service department.
23. Mount the terminal box cover [132] using the screws [123] (4xM5 SW8).
    - ⇨ Tightening torque 4 Nm
24. Mount the fan guard [35] with the screws [22].
    - ⇨ Tightening torque 2 Nm.
25. Mount the forced cooling fan if applicable.

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7.5 Inspection/maintenance work for DR..71 – 315, DRN63 – 315, DR2..56 – 80 motors

For the position numbers used in the following descriptions, refer to chapter "Motor structure" (→ 🗎 15).

7.5.1 Working steps for inspecting DR..71 – 315, DRN63 – 315, DR2..56 – 80 motors

1. Before starting to perform any work on the motor, disconnect the motor and all mounted options from the power supply before and secure the motor against unintentional power-up.
2. With gearmotors: Remove the motor from the gear unit.

   Remove pinion and oil flinger [107].
3. Remove the forced cooling fan and rotary encoder, if installed (see chapter "Preliminary work for motor and brake maintenance" (→ 🗎 127)).
4. Remove fan guard [35] and fan [36].
5. Remove stator:
   - **DRN63, DR2..63 motors**: Removing the cap screw [19].
   - **DR..71 – 132, DRN71 – 132S, DR2..56, 71 – 80 motors:** Remove cap screws [13] from flanged endshield [7] and rear endshield [42]. Remove stator [16] from flanged endshield [7].
   - **DR..160 – 180, DRN132M – 180 motors:** Loosen cap screw [19] and remove rear endshield [42]. Loosen hex head screw [15] and remove stator from flanged endshield.
   - **DR..200 – 225, DRN200 – 225 motors**
     - Loosen hex head screw [15] and remove flanged endshield [7] from stator.
     - Loosen cap screws [19] and remove the complete rotor [1] together with the rear endshield [42].
     - Loosen cap screws [25] and remove the complete rotor [1] from the rear endshield [42].
   - **DR..250 – 280, DRN250 – 280 motors** without option /ERF or /NS
     - Loosen cap screws [15] and remove the flange [7].
     - Loosen cap screws [19] and remove the rear endshield [42] together with the rotor [1].
     - Loosen cap screws [25] and remove the rear endshield [42] from the rotor [1].
   - **DR..250 – 280, DRN250 – 280 motors with** option /ERF or /NS, or **DR../ DRN315**
     - Loosen cap screws [19] and [25] and remove the rear endshield [42].
     - Loosen cap screws [15] and remove the flange [7] together with the rotor [1].

       Apply tension or pressure mainly via the rotor [1], carry the flange [7] evenly.
     - Loosen hex head screws [609] and remove the flange [7] from the rotor [1].
     - Before disassembly, preferably protect the oil seal seat from damage using adhesive tape or a protective sleeve.
6. Visual inspection: Is there any moisture or gear unit oil inside the stator?
   - If not, proceed with step 9.
   - If there is moisture, proceed with step 7.

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- If there is gear oil, have the motor repaired by a specialist workshop

7. If there is moisture inside the stator:
   - With gearmotors: Remove the motor from the gear unit.
   - With motors without a gear unit: Remove the A-flange.
   - Remove the rotor [1].
8. Clean the winding, dry it and check it electrically, see chapter "Drying the motor" (→ 🗎 35).
9. Replace the rolling bearing [11], [44] with permitted rolling bearing types, see chapter "Permitted rolling bearings" (→ 🗎 242).

   Apply tension or pressure to the inner ring of the bearings.
10. **DR..250 – 280, DRN225 – 280 motors with** option /ERF or /NS, or for **DR../ DRN315**
    - Fill the rolling bearing with grease until it is two-thirds full, see chapter "Bearing lubrication" (→ 🗎 125)
    - Notice: Place the oil seal flange [608] and [21] onto the rotor shaft before installing the bearings.
    - Mount the motor vertically starting on the A-side.
    - Place the springs [105] and lubrication ring [604] into the bearing bore of the flange [7].
    - Hang the rotor [1] onto the B-side thread, and guide it into the flange [7].
    - Fasten the oil seal flange [608] to the flange [7] using the hex head screws [609].
11. Reseal the shaft:
    - A-side: Replace the oil seal [106].
    - B-side: Replace the oil seal [30].

      Coat the sealing lip with grease (Klüber Petamo GHY 133).
12. Reseal the stator seat:
    - Seal the sealing surface with duroplastic sealing compound (operating temperature -40 °C to +180 °C), such as "SEW L Spezial".
    - **DR..71 – 132, DRN71 – 132S, DR2..71 – 80 motors**: Replace the seal [392].
    - **DR..71 – 132, DRN63 – 132S, DR2..56 – 80 motors**: Replace the O-ring [1480] if it is deformed or damaged. As an alternative, use e.g. "SEW L Spezial" instead of the O-ring.
    - **DRN63, DR2..56 – 63 motors**: Replace the O-ring [392] if it is deformed or damaged. As an alternative, use a duroplastic sealing compound, e.g. "SEW L Spezial" instead of the O-ring.
13. Install the motor and options.

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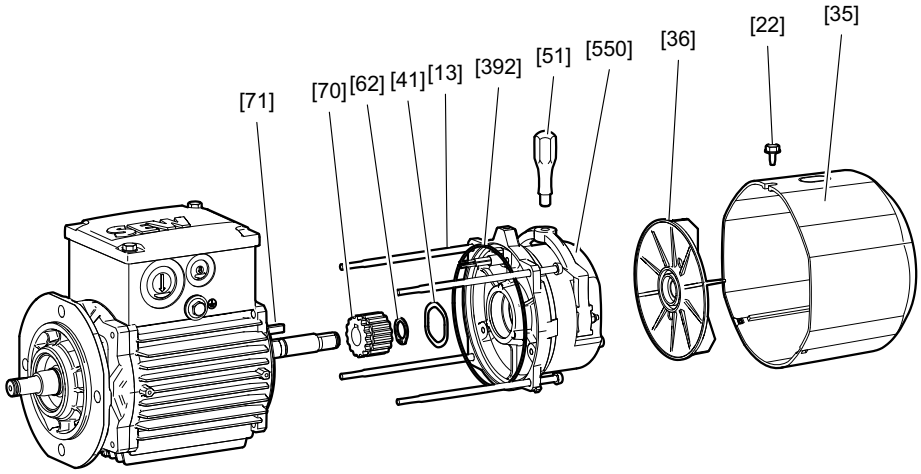
7.6 Inspection/maintenance work for DR..71 – 315, DRN63 – 315, DR2..56 – 80 brakemotors

7.6.1 Basic structure of DR2..56 brakemotors



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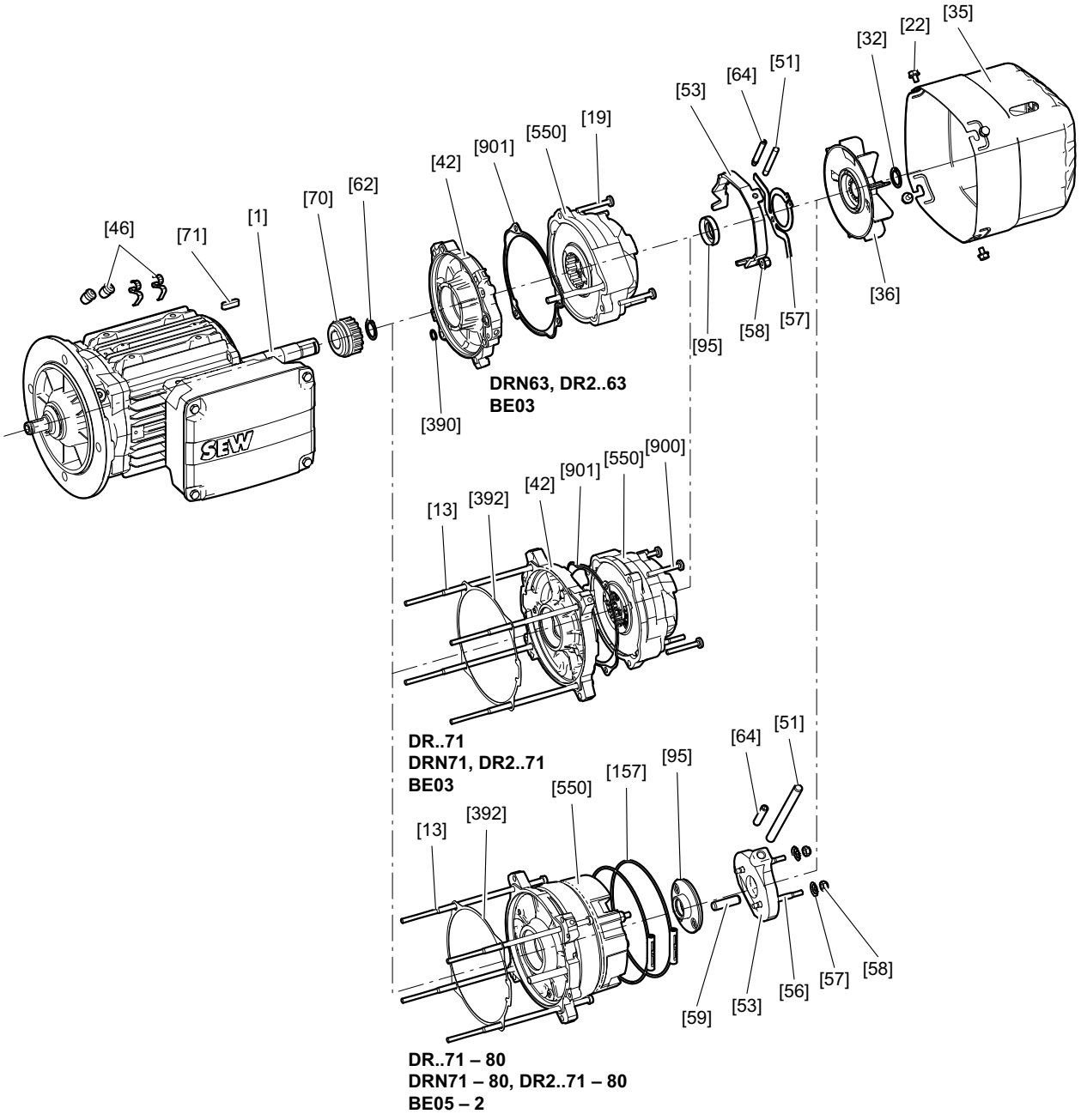
[13]	Cap screw	[41]	Equalizing ring	[71]	Key
[22]	Hex head screw	[51]	Hand lever (/HR)	[392]	Gasket
[35]	Fan guard	[62]	Retaining ring	[550]	Pre-assembled brake
[36]	Fan wheel	[70]	Driver		

7.6.2 General structure of DR..71 – 80, DRN63 – 80, DR2..63 – 80 brakemotors



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[1]	Motor	[51]	Hand lever (/HR)	[70]	Driver
[13]	Cap screw	[53]	Releasing lever	[71]	Key
[19]	Screw	[56]	Stud	[95]	Sealing ring
[22]	Hex head screw	[57]	Conical spring	[157]	Clamping strap (optional)
[32]	Retaining ring	[58]	Hex nut	[392]	Gasket
[35]	Fan guard	[59]	Parallel pin	[550]	Pre-assembled brake
[36]	Fan wheel	[62]	Retaining ring	[900]	Screw
[42]	Brake endshield	[64]	Set screw (/HF)	[901]	Flat gasket
[46]	Clip				

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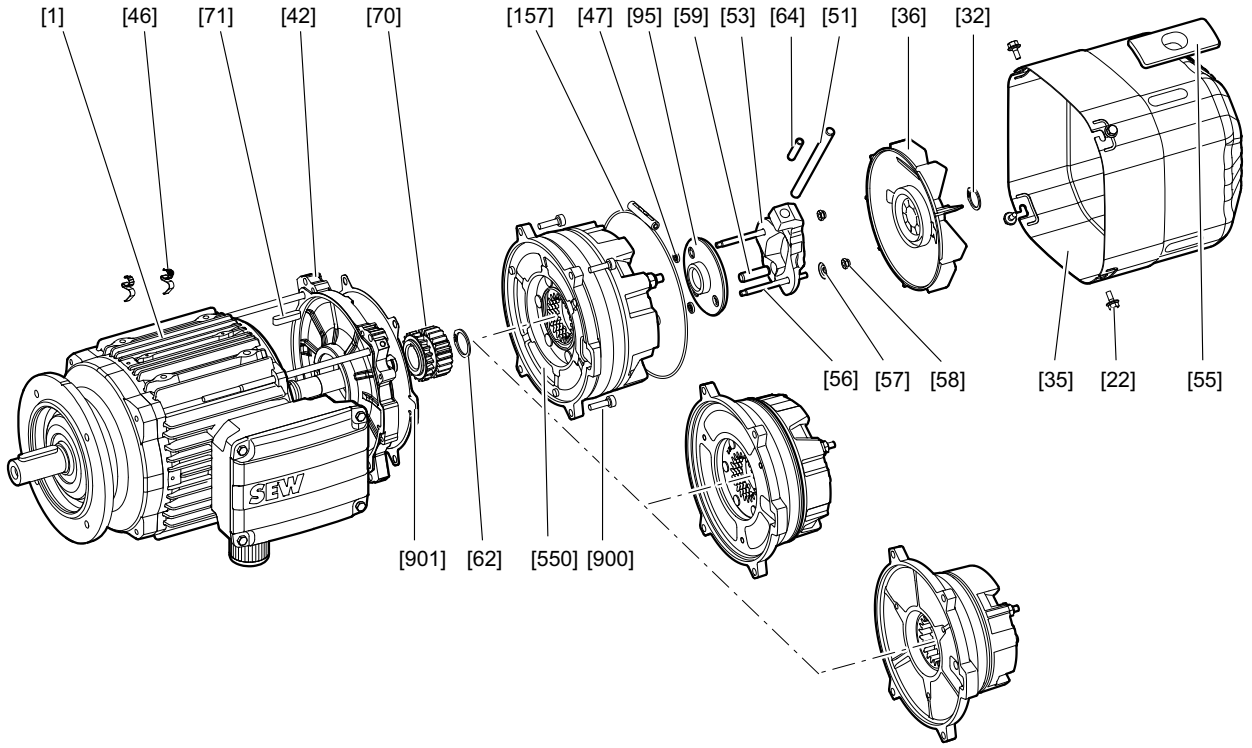
7.6.3 Basic structure of DR..90 – 132, DRN90 – 132S brakemotors



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[1]	Motor	[56]	Stud	[71]	Key
[22]	Hex head screw	[57]	Conical spring	[95]	Sealing ring
[32]	Retaining ring	[58]	Hex nut	[157]	Clamping strap (optional)
[35]	Fan guard	[59]	Parallel pin	[550]	Pre-assembled brake
[36]	Fan wheel	[62]	Retaining ring	[900]	Screw
[42]	Brake endshield	[64]	Set screw (/HF)	[901]	Gasket
[46]	Bracket	[70]	Driver		
[47]	O-ring				
[51]	Hand lever (/HR)				
[53]	Releasing lever				
[55]	Closing piece fan guard (DR..112 – 132, DRN112 – 132S)				

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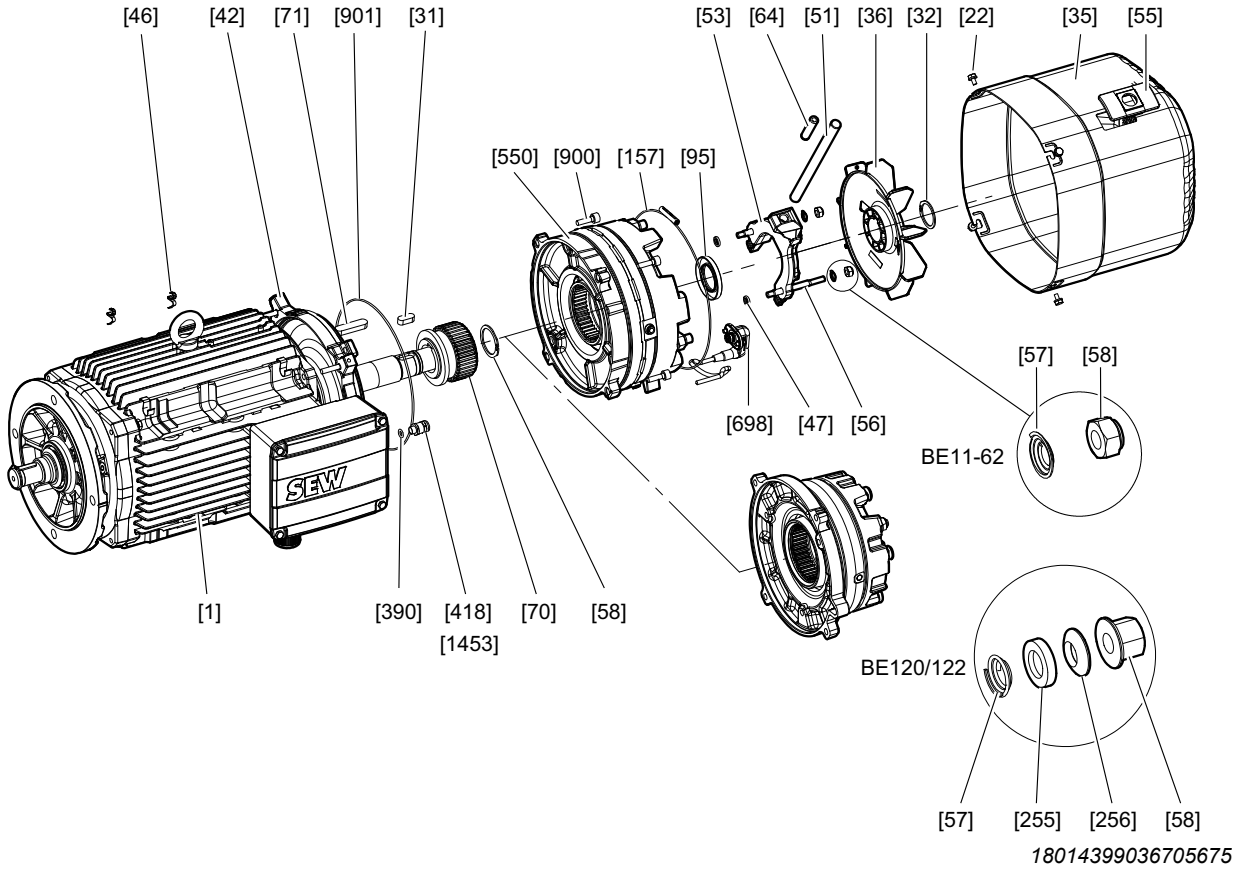
7.6.4 Basic structure of DR..160 – 315, DRN132M – 315 brakemotors



[1]	Motor with brake endshield	[53]	Releasing lever	[95]	Sealing ring
[22]	Hex head screw	[55]	Closing piece	[157]	Clamping strap (optional)
[31]	Key	[56]	Stud	[255]	Conical seat
[32]	Retaining ring	[57]	Conical spring	[256]	Spherical washer
[35]	Fan guard	[58]	Hex nut	[390]	O-ring (DR..160 – 225, DRN132M – 225)
[36]	Fan	[58]	Adjusting nut	[418]	Cable gland
[42]	Brake endshield	[62]	Retaining ring	[550]	Pre-assembled brake
[46]	Bracket	[64]	Set screw (/HF)	[698]	Connector complete (BE20-BE122)
[47]	O-ring	[70]	Driver	[900]	Screw
[51]	Hand lever	[71]	Key	[901]	O-ring/seal (DR..160 – 225, DRN132M – 225)
				[1453]	Grommet (for DRN180 instead of [418])
				[1607]	O-ring (DR..250 –280/DRN250 – 280)

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7.6.5 Working steps for inspecting DR..71 – 315, DRN63 – 315, DR2..63 – 80 brakemotors

1. Before starting to perform any work on the motor, disconnect the motor and all mounted options from the power supply before and secure the motor against unintentional power-up.
2. With gearmotors: Remove the motor from the gear unit. Remove pinion and oil flinger [107].
3. Remove forced cooling fan and rotary encoder, if installed. See chapter "Motor and brake maintenance – preliminary work" (→ 🗎 127).
4. Remove the fan guard with encoder mount or fan guard [35] and the fan wheel [36].
5. If applicable, disassemble the sensors of the /DUE option, see chapter "Removing the /DUE diagnostic unit" (→ 🗎 209).
6. **DR..90 – 315, DRN63– 315, DR2..56 – 80 motors**: Remove the brake cpl. [550] (if applicable) with mounted /HR, /HF option manual brake release.
   - **BE02 – 11**: Remove terminal box cover, loosen brake cable and microswitch supply cable of the /DUB option from the terminals.
   - **BE20 – 122**: Loosen locking screws of the brake plug connector [698] and remove plug connector.
   - Loosen screws [13]/[19]/[900], press brake [550] off the endshield [42], and carefully lift off the brake.
7. Remove stator:
   - **DR..71 – 132, DRN63 – 132S, DR2..63 – 80 motors:** Remove cap screws [13] from flanged endshield [7] and rear endshield [42]. Remove stator [16] from flanged endshield [7].
   - **DR..160 – 180, DRN132M – 180 motors:** Loosen cap screw [19] and remove rear endshield [42]. Loosen hex head screw [15] and remove stator from flanged endshield.
   - **DR..200 – 225, DRN200 – 225 motors**
     – Loosen hex head screw [15] and remove flanged endshield [7] from stator.
     – Loosen cap screws [19] and remove the complete rotor [1] together with the rear endshield [42].
     – Loosen cap screws [25] and remove the complete rotor [1] from the rear endshield [42].
   - **DR..250 – 280, DRN250 – 280 motors** without option /ERF or /NS
     – Loosen cap screws [15] and remove the flange [7].
     Apply tension or pressure to the rotor [1], carry the flange [7] evenly.
     – Loosen cap screws [19] and remove the rear endshield [42] together with the rotor [1].
     – Loosen cap screws [25] and remove the rear endshield [42] from the rotor [1].
   - **DR..250 – 280, DRN250 – 280 motors** with option /ERF or /NS, or **DR../ DRN315 motors**
     – Loosen cap screws [19] and [25] and remove the rear endshield [42].
     – Loosen cap screws [15] and remove the flange [7] together with the rotor [1].
     – Loosen hex head screws [609] and remove the flange [7] from the rotor [1].

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– Before disassembly, preferably protect the oil seal seat from damage using adhesive tape or a protective sleeve.

8. Pull the stator back by approx. 3 to 4 cm.
9. Visual inspection: Is there any moisture or gear unit oil inside the stator?
   - If not, proceed with step 11.
   - If there is moisture, proceed with step 10.
   - If there is gear oil, have the motor repaired by a specialist workshop.
10. If there is moisture inside the stator:
    - With gearmotors: Remove the motor from the gear unit
    - With motors without a gear unit: Remove the A-flange
    - Remove the rotor [1]
    - Clean the winding, dry it and check it electrically, see chapter "Drying the motor" (→ 🗎 35).
11. Remove the driver from the shaft.
12. Replace the rolling bearing [11], [44] with permitted rolling bearing types, see chapter "Permitted rolling bearings" (→ 🗎 242).

    Apply tension or pressure to the inner ring of the bearings.
13. Install key [71] and driver [70]:
    - Preheat the driver to allow for easier installation (joining temperature +85 °C to +115 °C).
    - **DR..71, DRN63 – 71, DR2..63 – 71 motors**: Clean the driver seat at the rotor [1] before installation. Glue in the driver using Loctite 649. Join the retaining ring [62] flush to the driver. Protect the sealing surface for the oil seal against scratches.
    - **DR..80 – 315, DRN80 – 315, DR2..56, 80 motors**: Clean the driver at the rotor [1] and coat with anti-corrosion agent NOCO® fluid before fitting. Next, mount the retaining ring [62].
14. Seal the stator again and install it:
    - **DR..71 – 132, DRN63 – 132S, DR2..56 – 80 motors**: Replace the seal [392].
    - **DRN63, DR2..63, DRN132M – 225 and DR..160-225 motors:** Replace O-ring [390].
    - **DR..160 – 315, DRN132M – 315 motors**: Seal the sealing surfaces with duroplastic sealing compound (operating temperature -40 °C to +180 °C), such as "SEW-L-Spezial".
15. **DR..250 – 280, DRN225 – 280 motors with** option /ERF or /NS, or with **DR../ DRN315 motors**
    - Fill the rolling bearing with grease until it is two-thirds full, see chapter "Bearing lubrication" (→ 🗎 125).
    - Notice: Place the oil seal flange [608], [21] onto the rotor shaft before installing the bearings.
    - Mount the motor vertically starting on the A-side.
    - Place the springs [105] and lubrication ring [604] into the bearing bore of the flange [7].
    - Hang the rotor [1] onto the B-side thread, and guide it into the flange [7].

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- Fasten the oil seal flange [608] to the flange [7] using the hex head screws [609].
- Screw in the stator [16] and flange [7] with screws [15].

  Notice: Protect the winding overhang from damage.
- Before mounting the rear endshield, screw in the M8 set screw (approximately 200 mm) into the oil seal flange [21].
- Before mounting the rear endshield [42], insert the set screw in through a bore for the screw [25]. Screw rear endshield to stator [16] using cap screws [19] and hex nuts [17]. Lift the oil seal flange [21] with the set screw, and fasten using 2 screws [25]. Remove the set screw and screw in the remaining screws [25].

16. Reseal the shaft:
    - Replace the oil seal [106] on the A-side.
    - **DR..315, DRN315 motors with /FG option:** Replace the oil seal [250] on the A-side.
    - **DR..250 – 315, DRN250 – 315, DRN225 motors with /NS option:** Replace the oil seal [30] on B-side
    - Apply suitable grease to the sealing lip, see chapter "Order information for lubricants, anti-corrosion agents and sealants" (→ 🖹 245).
17. Seal the friction disk of the brake [550] again at the brake endshield [42]:
    - **DRN63 – 71, DR2..63– 71 motors with BE03 brake:** Replace flat gasket [901].
    - **DR..90 – 132, DRN90 – 132S motors:** Replace gasket [901]
    - **DR..160 – 280, DRN132M – 280 motors**: Replace O-ring [901] or [1607].
    - **DR..315, DRN315 motors**: Seal the sealing surface with duroplastic sealing compound (operating temperature -40 °C to +180 °C), such as "SEW L Spezial".
18. Reinstall the brake [550]: Insert the brake cable into the terminal box when installing the brake. Install the brake. Observe the alignment of the brake. (Cams at the endshield, manual brake release position).
    - **BE03 brake**: The self-tapping screws must be distributed and tightened around the brake evenly to prevent the mounted brake from being tilted.
    - **DRN63, DR2..63/BE03 motors**: Tighten screw [19] M5x35 (self-tapping) with a tightening torque of 5 Nm. The screws can be reused.
    - **DRN71, DR2..71/BE03 motors**: Tighten screw [900] M5x20 (self-tapping) with a tightening torque of 5 Nm. New screws must be used each time the brake is mounted again.
    - **DR..71 – 80, DRN71 – 80, DR2..56, 71– 80 motors**: Install cap screws [13]. Tightening torque: 5 Nm
    - **DR..90 – 315, DRN90 – 315 motors**: Install cap screws [900].

Motors	DR..90 – 100, DRN90 – 100	DR..112 – 160, DRN112 – 132	DR..180, DRN160 – 180	DR..200 – 225, DRN200 – 225	DR..250 – 315, DRN250 – 315
Tightening torque	10.3 Nm	25.5 Nm	50 Nm	87.3 Nm	230 Nm

19. Connect the brake connection cable.
    - **BE02 – 11**: Reconnect the brake cable according to the wiring diagram.

- **BE20 – 122**: Plug in the brake plug connector [698] again. Tighten the retaining screws again (tightening torque: 3 Nm)

20. **DR..71 – 315, DRN63 – 315, DR2..63 – 80 motors:** Apply suitable grease to the sealing ring [95], see chapter "Order information for lubricants, anti-corrosion agents and sealants" (→ 🗎 245).
21. If applicable: Install sensors of the /DUE option and recalibrate the zero value. See chapter "Retrofitting the /DUE diagnostic unit for function and wear monitoring" (→ 🗎 209).
22. Install the fan wheel [36] and the fan guard [35]. Install available optional equipment.
23. With gearmotors: Replace oil flinger [107] and install the pinion.

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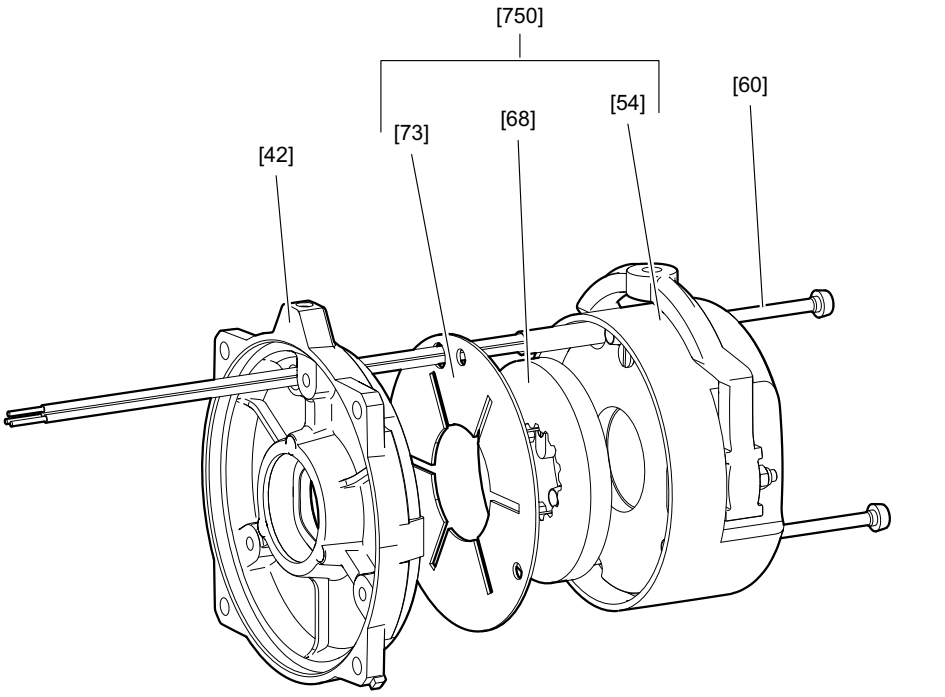
7.6.6 Basic structure of BE02 brakes



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[42]	Brake endshield	[68]	Brake lining
[54]	Magnet body, complete	[73]	Friction plate
[60]	Cap screw	[750]	Pre-assembled brake

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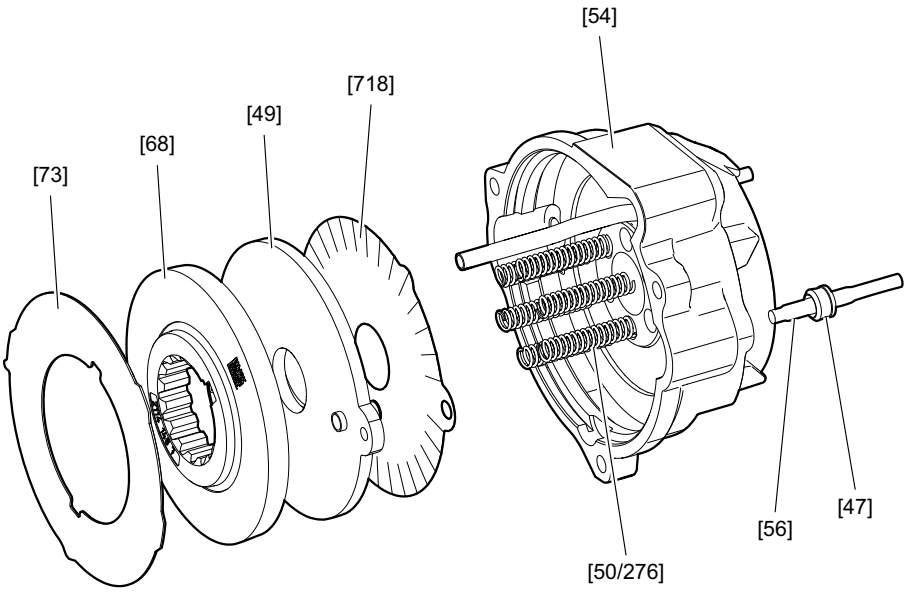
7.6.7 Basic structure of BE03 brakes



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[47]	Sealing element	[54]	Magnet body, complete	[73]	Friction plate
[49]	Pressure plate	[56]	Stud	[276]	Brake spring
[50]	Brake spring	[68]	Brake disk (complete)	[718]	Damping plate

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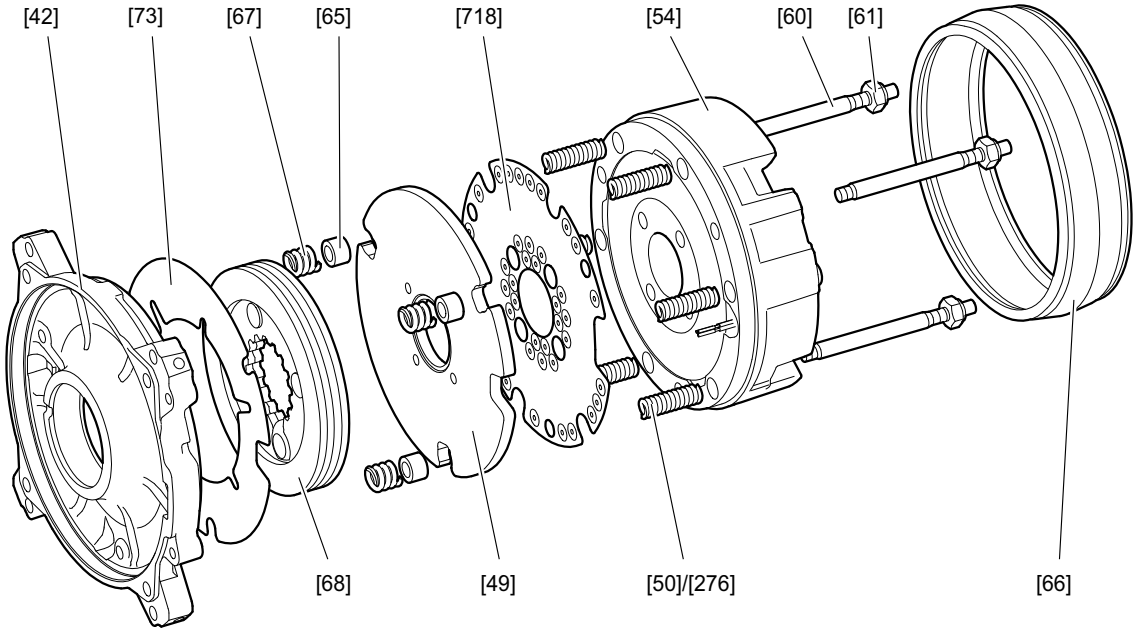
7.6.8 Basic structure of BE05 – 2 brakes



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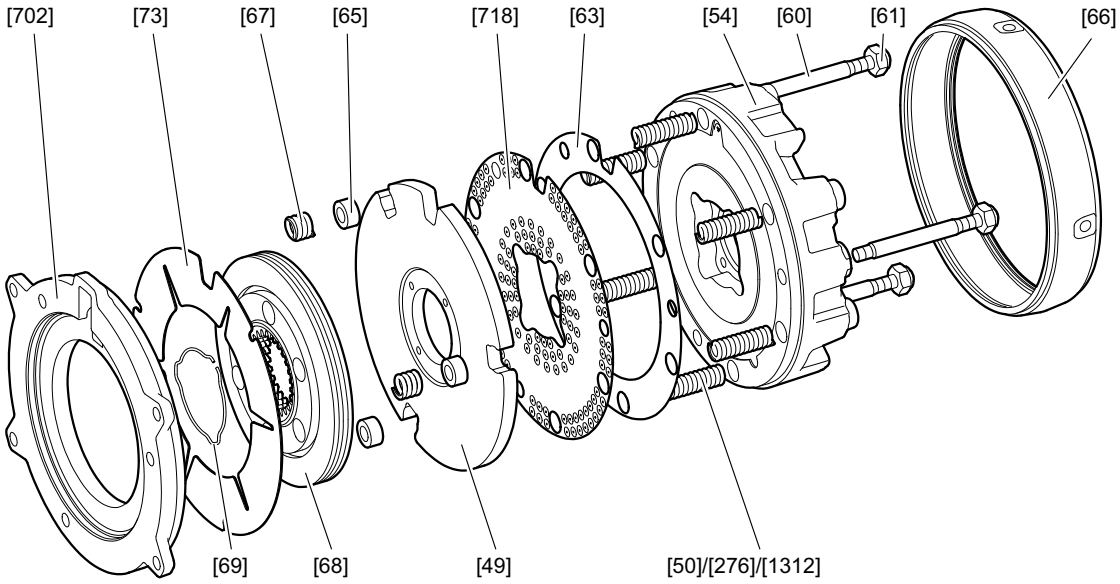
[42]	Brake endshield	[61]	Hex nut	[73]	Niro sheet metal
[49]	Pressure plate	[65]	Pressure ring	[276]	Brake spring (blue)
[50]	Brake spring (normal)	[66]	Sealing strip	[718]	Damping plate
[54]	Magnet body, complete	[67]	Counter spring		
[60]	Stud	[68]	Brake lining carrier		

7.6.9 Basic structure of BE05 – 20 brakes



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[49]	Pressure plate	[65]	Pressure ring	[276]	Brake spring (blue)
[50]	Brake spring (normal)	[66]	Sealing strip	[702]	Friction disk
[54]	Magnet body, complete	[67]	Counter spring	[718]	Damping plate (BE05 – 11)
[60]	Stud	[68]	Brake lining carrier	[1312]	Brake spring (white)
[61]	Hex nut	[69]	Circular spring/clasp (BE5 – 20)		
[63]	Pole sheet	[73]	Niro sheet metal		

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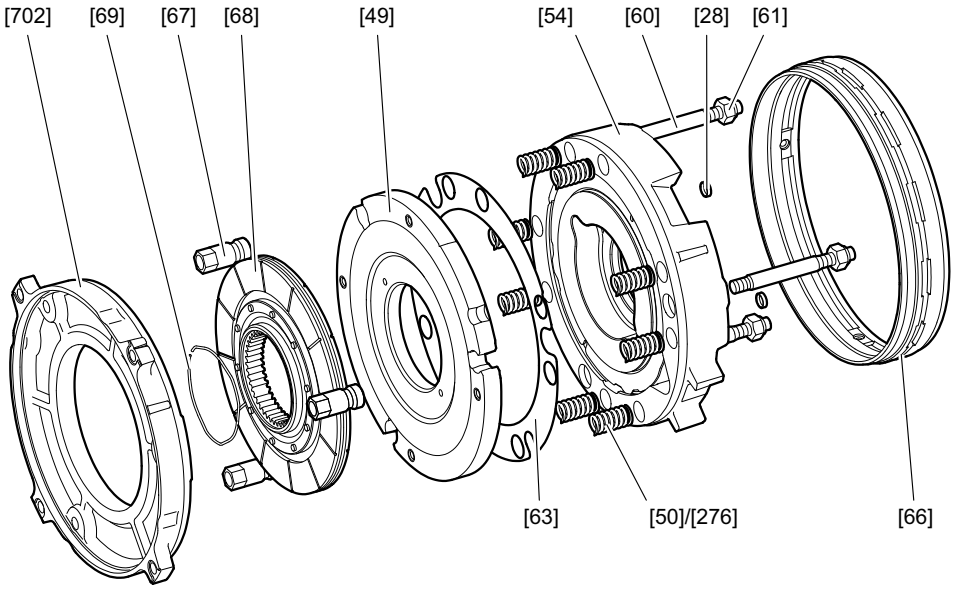
7.6.10 Basic structure of BE30, 60, 120 brakes



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[28]	Closing cap	[61]	Hex nut	[69]	Circular spring
[49]	Pressure plate	[63]	Pole sheet	[276]	Brake spring (blue)
[50]	Brake spring (normal)	[66]	Sealing strip	[702]	Friction disk
[54]	Magnet body, complete	[67]	Setting sleeve		
[60]	Stud	[68]	Complete brake disk		

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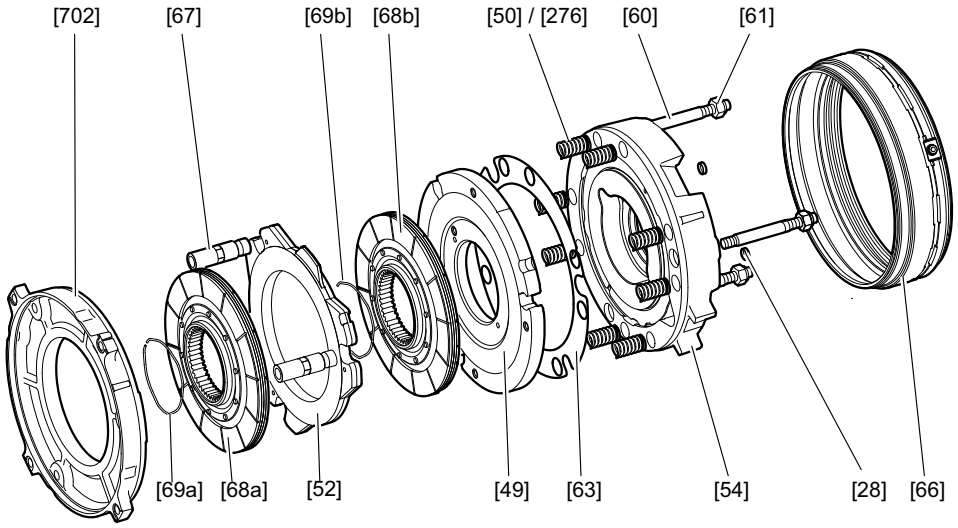
7.6.11 Basic structure of BE32, 62, 122 brakes



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[28]	Closing cap	[61]	Hex nut	[69a]	Circular spring
[49]	Pressure plate	[63]	Pole sheet	[69b]	Circular spring
[50]	Brake spring (normal)	[66]	Sealing strip	[276]	Brake spring (blue)
[52]	Brake plate complete	[67]	Setting sleeve	[702]	Friction disk
[54]	Magnet body, complete	[68a]	Complete brake disk		
[60]	Stud	[68b]	Complete brake disk		

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7.6.12 Measuring the wear of the BE02 brake

The working air gap of BE02 brakes cannot be adjusted. Check the brake lining carrier thickness during maintenance.

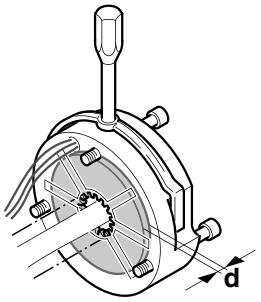
Replacing individual parts of the brake is not permitted.

✓ The motor and all connected options are disconnected from the power supply.

✓ The motor is protected against unintended restart.

1. Loosen the screws [60].
2. Remove the complete magnet body [54] with pressure plate and, if applicable, installed manual brake release from the brake endshield [42].
3. Make sure the brake springs [50]/[276] and friction plates [73] do not fall out.
4. Remove the brake lining carrier [68] and measure its thickness "d".

⇨ Replace the brake if the lining thickness is below the minimum permitted value. For the values, refer to chapter "Braking work, working air gap, and brake lining carrier thickness" (→ 🗎 225).



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7.6.13 Measuring the wear of BE03 brakes

The working air gap of BE03 brakes cannot be adjusted. Check the stroke of the pressure plate during maintenance.

Replacing individual parts of the brake is not permitted.

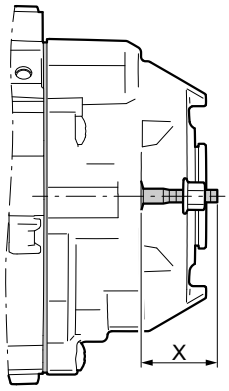
✓ The motor and all connected options are disconnected from the power supply.

✓ The motor is protected against unintended restart.

1. Measure the dimension "X" at the stroke of the studs when the brake is released or applied using a depth gauge or slide gauge.

   ⇨ The difference between both values is the working air gap.

⇨ The maximum permitted working air gap is 0.65 mm. Replace the brake in case this value is exceeded.



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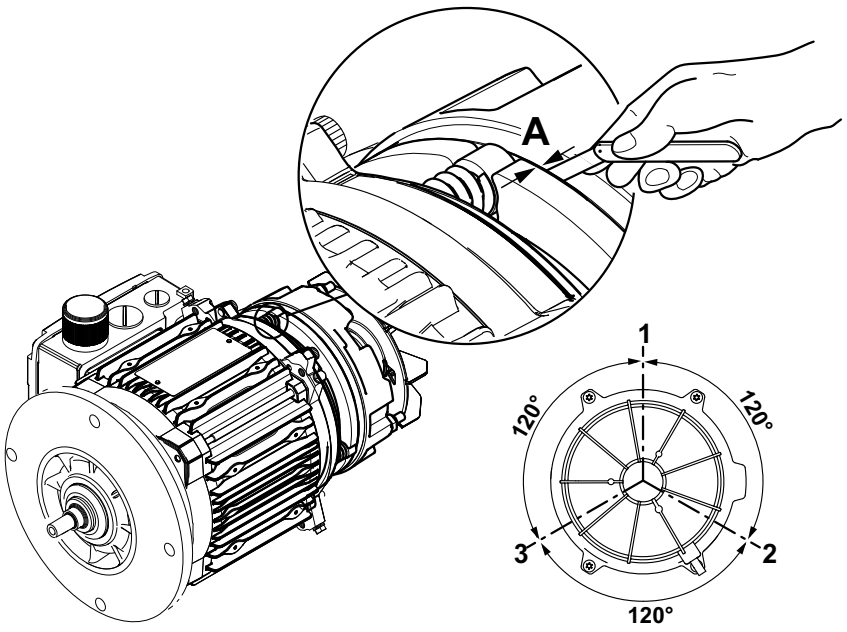
7.6.14 Setting the working air gap of BE05 – BE122 brakes

1. Before starting to perform any work on the motor, disconnect the motor and all mounted options from the power supply before and secure the motor against unintentional power-up.
2. Remove the following:
   - Forced cooling fan and rotary encoder, if installed, see chapter "Motor and brake maintenance – preliminary work" (→ 🗎 127).
   - Fan guard with encoder mount or fan guard [35]
3. Push the sealing strip [66] aside,
   - Loosen the clamping strap [157] to do this, if necessary
   - Vacuum any abrasion
4. Measure the brake lining carrier [68]:
   - For the minimum thickness of the brake lining carrier, see chapter "Technical data" (→ 🗎 222).
   - If necessary, replace the brake lining carrier according to chapter "Replacing the brake lining carrier of BE05 – BE122 brakes" (→ 🗎 193).
5. **BE30 – 122:** Loosen the setting sleeve [67] by turning it towards the rear end-shield.
6. Measure the working air gap A (see the following figure)

   (use a feeler gauge and measure at three points offset by 120°):
   - **BE05 – 11**: between pressure plate [49] and damping plate [718]
   - **BE20 – 122**: between pressure plate [49] and magnet body [54]



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   - **BE05 – 20:** Tighten the hex nuts [61] until the working air gap is set correctly, see chapter "Braking work, working air gap, and brake lining carrier thickness" (→ 🗎 225).

- **BE30 – 122:** Tighten the hex nuts [61] until the working air gap is initially 0.05 – 0.1 mm larger than the desired setting value (for default values, see chapter "Braking work, working air gap, and brake lining carrier thickness" (→ 🗎 225)). For example, with a desired air gap of 0.4 mm, the preset value must be 0.45 – 0.5 mm.

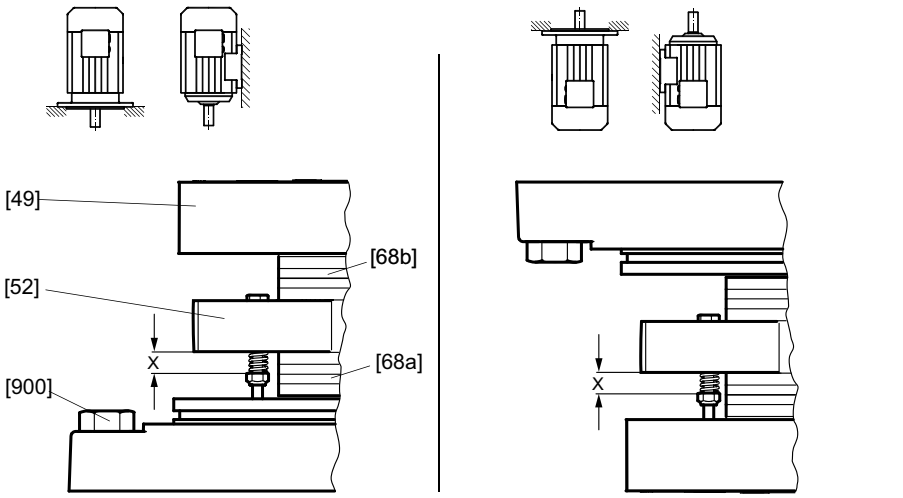
7. **BE30 – 122:** Evenly apply the setting sleeves [67] to the friction disk [900] by screwing them out of the magnet body.

   Tighten the hex nut [61] with the following tightening torque. Lastly, check the settings of the working air gap and adjust it if necessary.

Brake	Tightening torque
BE30 – BE32	93 Nm
BE60 – BE62	40 Nm
BE120 – BE122	230 Nm

8. If you are mounting the **BE32, BE62, BE122** to a motor with vertical motor axis, set the 3 springs of the brake plate [52] to the following dimension:

Brake	Dimension X in mm
BE32	7.3
BE62	10.0
BE122	10.0



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9. Refit the sealing strip [66] and reinstall the dismantled parts.

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7.6.15 Replacing the brake lining carrier of BE05 – BE122 brakes

In addition to the brake elements listed in column "BE brake", see chapter "Inspection and maintenance intervals" (→ 🗎 123), check the hex nuts [61] for wear when you replace the brake lining carrier. You must always replace the hex nuts [61] when you replace the brake lining carrier.

INFORMATION

- With DR..71 – 80, DRN71 – 80 motors with BE05 – 2 brake, the brake cannot be removed from the motor because the BE brake is directly installed on the brake endshield of the motor.

1. Disconnect the motor and all mounted options from the power supply before starting to work, and secure the motor against unintentional power-up.
2. Remove the following:
   - Forced cooling fan and rotary encoder, if installed, see chapter "Motor and brake maintenance – preliminary work" (→ 🗎 127).
   - Fan guard with encoder mount or fan guard [35], retaining ring [32]/[62] and fan [36]
3. Remove the brake cable
   - **BE05 – 11:** Loosen the terminal box cover and unfasten the brake cable from the rectifier.
   - **BE20 – 122:** Loosen locking screws of the brake plug connector [698] and remove plug connector.
4. Remove the rubber sealing collar [66]
5. Remove manual brake release if necessary.
   - Adjusting nuts [58], conical springs [57], studs [56], releasing lever [53], conical seat [255], spherical washer [256]
6. Loosen the hex nuts [61], carefully pull off the magnet body [54] (brake cable!) and take out the brake springs [50]/[276]/[1312].
7. **BE05 – 11:** Remove the damping plate [718], pressure plate [49] and brake lining carrier [68]

   BE20, BE30, BE60, BE120: Remove the pressure plate [49], pole sheet [63] and brake lining carrier [68]

   BE32, BE62, BE122: Remove the pressure plate [49], brake lining carrier [68a] and [68b], and the brake plate [52].
8. Clean the brake components.
9. Install new brake lining carrier(s).
10. Brake parts are installed as described in chapter "Working steps for inspecting DR..71 – 315, DRN63 – 315, DR2..63 – 80 brakemotors" (→ 🗎 179).
    - Except for the fan and the fan guard, because the working air gap has to be set first, see chapter "Setting the working air gap of BE05 – BE122 brakes" (→ 🗎 191).
11. In case of manual brake release: Use the adjusting nuts to adjust the floating clearance "s" between the conical springs (pressed flat) and the adjusting nuts (see chapter "Retrofitting the /HR, /HF manual brake release" (→ 🗎 203).

⚠ WARNING

No braking due to incorrectly set floating clearance "s".

Severe or fatal injuries.

- Make sure the floating clearance "s" is correctly set, so that the pressure plate can move up as the brake lining wears.

12. Put the sealing strip [66] in place and re-install the dismantled parts.

INFORMATION

After replacing the brake disk, the maximum braking torque is reached only after several cycles.

7.6.16 Changing the braking torque of BE05 – BE122 brakes

You can alter the braking torque in stages. This can be done in various ways:

- By changing the type and number of brake springs
- By changing the complete magnet (only possible for BE05 and BE1)
- By changing the brake (from motor size 90)
- By changing to a double disk brake (only possible for BE30, BE60, BE120)

For possible braking torque steps, refer to chapter "Technical data" (→ 🗎 222).

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7.6.17 Changing the brake spring of BE05 – BE122 brakes

1. Disconnect the motor and all mounted options from the power supply before starting to work, and secure the motor against unintentional power-up.
2. Remove the following:
   - Forced cooling fan and rotary encoder, if installed, see chapter "Motor and brake maintenance – preliminary work" (→ 🗎 127).
   - Fan guard with encoder mount or fan guard [35], retaining ring [32]/[62] and fan [36]
3. Remove the brake cable.
   - **BE05 – 11:** Remove the terminal box cover. Remove the brake cable from the rectifier.
   - **BE20 – 122:** Loosen the locking screws of the brake plug connector [698]. Remove the plug connector.
4. Remove the sealing strip [66] and (if necessary) the manual brake release:
   - Setting nuts [58], conical springs [57], studs [56], releasing lever [53], conical seat [255], spherical washer [256]
5. Unfasten the hex nuts [61] and pull off the magnet body [54]
   - By approx. 50 mm (watch the brake cable!)
6. Replace or add brake springs [50/276/1312]
   - Arrange brake springs symmetrically
7. Brake parts are installed as described in chapter "Working steps for inspecting DR..71 – 315, DRN63 – 315, DR2..63 – 80 brakemotors" (→ 🗎 179).
   - Except for the fan and the fan guard, because the working air gap has to be set first, see chapter "Setting the working air gap of BE05 – BE122 brakes" (→ 🗎 191).
8. In case of manual brake release: Use the adjusting nuts to adjust the floating clearance "s" between the conical springs (pressed flat) and the adjusting nuts (see chapter "Retrofitting the /HR, /HF manual brake release" (→ 🗎 203).

⚠ WARNING

No braking due to incorrectly set floating clearance "s".

Severe or fatal injuries.

- Make sure the floating clearance "s" is correctly set, so that the pressure plate can move up as the brake lining wears.

9. Put the sealing strip [66] in place and re-install the dismantled parts.

INFORMATION

Replace the setting sleeves [58] if the removal procedure is repeated.

7.6.18 Changing the magnet body of BE05 – BE122 brakes

1. Disconnect the motor and all mounted options from the power supply before starting to work, and secure the motor against unintentional power-up.
2. Remove the following:
   - Forced cooling fan and rotary encoder, if installed, see chapter "Motor and brake maintenance – preliminary work" (→ 🗎 127).
   - Fan guard with encoder mount or fan guard [35], retaining ring [32]/[62] and fan [36]
3. Remove the rubber sealing collar [66] and the manual brake release:
   - Setting nuts [58], conical coil springs [57], studs [56], releasing lever [53], parallel pin [59].
4. Remove the brake cable
   - **BE05 – 11:** Loosen the terminal box cover and unfasten the brake cable from the rectifier.
   - **BE20 – 122:** Loosen locking screws of the brake plug connector [698] and remove plug connector.
5. Loosen hex nuts [61], remove complete magnet body [54], remove brake springs [50]/[276]/[1312].
6. Install new magnet body with brake springs. For the possible braking torque steps, refer to chapter "Technical data" (→ 🗎 222).
7. Brake parts are installed as described in chapter "Working steps for inspecting DR..71 – 315, DRN63 – 315, DR2..63 – 80 brakemotors" (→ 🗎 179).
   - Except for the fan and the fan guard, because the working air gap has to be set first, see chapter "Setting the working air gap of BE05 – BE122 brakes" (→ 🗎 191).
8. In case of manual brake release: Use the adjusting nuts to adjust the floating clearance "s" between the conical springs (pressed flat) and the adjusting nuts (see chapter "Retrofitting the /HR, /HF manual brake release" (→ 🗎 203).

⚠ WARNING

No braking due to incorrectly set floating clearance "s".

Severe or fatal injuries.

- Make sure the floating clearance "s" is correctly set, so that the pressure plate can move up as the brake lining wears.

9. Put the sealing strip [66] in place and re-install the dismantled parts.
10. Replace the brake control in the event of an interturn short circuit or a short circuit to frame.

INFORMATION

Replace the setting sleeves [58] if the removal procedure is repeated.

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7.6.19 Replacing BE02 brakes with DR2..56 motors

✓ The motor and all connected options are disconnected from the power supply.

✓ The motor is protected against unintended restart.

1. Disassemble the following parts:
   - ⇨ Forced cooling fan and rotary encoder, if installed, see chapter "Motor and brake maintenance – preliminary work" (→ 🗎 127).
   - ⇨ Fan guard with encoder mount [212] or fan guard [35], retaining ring [32]/[62] and fan [36]
2. Remove the terminal box cover and loosen the brake cable from the brake control/ terminals. Attach trailing wire to brake cables, if necessary.
3. Remove the screws and brake (with brake endshield if necessary) from the stator.
   - ⇨ DR2..56: Screws [13]
4. Replace gasket [392]. Observe the alignment of the gasket.
5. If necessary, replace driver [70], key [71], and retaining ring [62], see chapter "Working steps for inspecting DR..71 – 315, DRN63 – 315, DR2..63 – 80 brakemotors" (→ 🗎 179).
6. Insert the brake cable of the new brake into the terminal box.
7. Position the new brake. Make sure the cable outlet and brake lining carrier gearing are correctly aligned.
8. Refasten the brake using the screws.
   - ⇨ Cap screws [13]
   - ⇨ Tightening torque 3.3 Nm.
   - ⇨ Tolerance ±10%.
9. Install the disassembled parts of the motor.

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7.6.20 Replacing BE03 brakes for DRN63 – 71 and DR2..63 – 71 motors

✓ The motor and all connected options are disconnected from the power supply.

✓ The motor is protected against unintended restart.

1. Disassemble the following parts:
   - ⇨ Forced cooling fan and rotary encoder, if installed, see chapter "Motor and brake maintenance – preliminary work" (→ 🗎 127).
   - ⇨ Fan guard with encoder mount [212] or fan guard [35], retaining ring [32]/[62] and fan [36]
2. Remove the terminal box cover and loosen the brake cable from the brake control/ terminals. Attach trailing wire to brake cables, if necessary.
3. Remove the screws and brake (with brake endshield if necessary) from the stator.
   - ⇨ DRN63, DR2..63 motors: Screws [19]
   - ⇨ DRN71, DR2..71 motors: Screws [900]
4. Replace the gasket [901]. Observe the alignment of the gasket, if necessary.
5. If necessary, replace driver [70], key [71], and retaining ring [62], see chapter "Working steps for inspecting DR..71 – 315, DRN63 – 315, DR2..63 – 80 brakemotors" (→ 🗎 179).
6. Insert the brake cable of the new brake into the terminal box.
7. Position the new brake. Make sure the cable outlet and brake lining carrier gearing are correctly aligned.
8. Fasten the brake using screws [19] or [900]. Distribute the screws around the brake and tighten them one after the other.
   - ⇨ DRN63, DR2..63 motors: The screws [19] can be reused. Tightening torque 5 Nm, tolerance ±10%
   - ⇨ DRN71, DR2..71 motors: Use new screws [900]. Tightening torque 5 Nm, tolerance ±10%
9. Seal the shaft.
10. Replace the sealing ring [95].
11. Apply grease to the sealing lip, see chapter "Order information for lubricants, anti-corrosion agents and sealants" (→ 🗎 245).
12. ⚠ **DANGER!** No braking due to incorrectly set floating clearance "s". Severe or fatal injuries. Make sure the floating clearance "s" is set correctly so that the pressure plate can move up as the brake lining wears.
    Manual brake release option: Set the floating clearance "s" using the adjusting nuts, see chapter "Retrofitting the /HR, /HF manual brake release" (→ 🗎 203).
13. Install the disassembled parts of the motor.

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7.6.21 Replacing BE05 – 2 brakes for DR..71 – 80, DRN80, DR2..80 motors

✓ The motor and all connected options are disconnected from the power supply.

✓ The motor is protected against unintended restart.

1. Disassemble the following parts:
   - ⇨ Forced cooling fan and rotary encoder, if installed, see chapter "Motor and brake maintenance – preliminary work" (→ 🗎 127).
   - ⇨ Fan guard with encoder mount [212] or fan guard [35], retaining ring [32]/[62] and fan [36]
2. Remove the terminal box cover and loosen the brake cable from the brake control/ terminals. Attach trailing wire to brake cables, if necessary.
3. Remove the screws and brake (with brake endshield if necessary) from the stator.
   - ⇨ DR..71 – 80, DRN80, DR2..80: Screws [13]
4. Replace gasket [392]. Observe the alignment of the gasket.
5. If necessary, replace driver [70], key [71], and retaining ring [62], see chapter "Working steps for inspecting DR..71 – 315, DRN63 – 315, DR2..63 – 80 brakemotors" (→ 🗎 179).
6. Insert the brake cable of the new brake into the terminal box.
7. Position the new brake. Make sure the cable outlet and brake lining carrier gearing are correctly aligned.
8. Refasten the brake using the screws.
   - ⇨ Cap screws [13]
   - ⇨ Tightening torque 5 Nm.
   - ⇨ Tolerance ±10%.
9. Seal the shaft.
10. Replace the sealing ring [95].
11. Apply grease to the sealing lip, see chapter "Order information for lubricants, anti-corrosion agents and sealants" (→ 🗎 245).
12. For designs with corrosion protection /KS and/or IP56/66, the clamping straps of the disassembled brake have to be mounted to the new brake [550]. Seal studs with SEW-L-Spezial, see chapter "Order information for lubricants, anti-corrosion agents and sealants" (→ 🗎 245).
13. ⚠ **DANGER!** No braking due to incorrectly set floating clearance "s". Severe or fatal injuries. Make sure the floating clearance "s" is set correctly so that the pressure plate can move up as the brake lining wears.
    Manual brake release option: Set the floating clearance "s" using the adjusting nuts, see chapter "Retrofitting the /HR, /HF manual brake release" (→ 🗎 203).
14. Diagnostic unit option /DUE: Insert the sensor [1151] into the magnet body [54] of the new brake using the screw fitting. Fasten the cable with the terminal [1152/1153] at the magnet body in a way that the sensor cable cannot touch the fan wheel [36]. Then calibrate the zero value, see chapter "Zero value calibration" (→ 🗎 217).
15. Install the disassembled parts of the motor.

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7.6.22 Replacing BE05 – 62 brakes for DR..90 – 225, DRN90 – 225 motors

✓ The motor and all connected options are disconnected from the power supply.

✓ The motor is protected against unintended restart.

1. Disassemble the following parts:
   - ⇨ Forced cooling fan and rotary encoder, if installed, see chapter "Motor and brake maintenance – preliminary work" (→ 🗎 127).
   - ⇨ Fan guard with encoder mount [212] or fan guard [35], retaining ring [32]/[62] and fan [36]
2. Loosen the brake cable.
   - ⇨ BE05 – 11: Remove the terminal box cover and loosen the brake cable from the brake control/terminals.
   - ⇨ BE20 – 62: Loosen locking screws of the brake plug connector [698] and remove plug connector.
3. Remove the screws and brake (with brake endshield if necessary) from the stator.
4. Replace the gasket [901]. Observe the alignment of the gasket, if necessary.
5. If necessary, replace driver [70], key [71], and retaining ring [62], see chapter "Working steps for inspecting DR..71 – 315, DRN63 – 315, DR2..63 – 80 brakemotors" (→ 🗎 179).
6. BE05 – 11: Insert the brake cable of the new brake into the terminal box.
7. Position the new brake. Make sure the cable outlet and brake lining carrier gearing are correctly aligned.
   - ⇨ BE20 – 62 with manual brake release option: It is important that the manual brake release is positioned properly.
8. Refasten the brake using the screws.
   - ⇨ Cap screws [900]
   - ⇨ Tightening torque for DR..90 – 100, DRN90 – 100: 10.3 Nm
   - ⇨ Tightening torque for DR..112 – 160, DRN112 – 132: 25.5 Nm
   - ⇨ Tightening torque for DR..180, DRN160 – 180: 50 Nm
   - ⇨ Tightening torque for DR..200 – 225, DRN200 – 225: 87.3 Nm
   - ⇨ Tolerance ±10%.
9. Seal the shaft.
10. Replace the sealing ring [95].
11. Apply grease to the sealing lip, see chapter "Order information for lubricants, anti-corrosion agents and sealants" (→ 🗎 245).
12. BE20 – 62: Insert the plug connector [698] into the brake and fasten using screws.
    - ⇨ Tightening torque 3 Nm.
13. For designs with corrosion protection /KS and/or IP56/66, the clamping straps of the disassembled brake have to be mounted to the new brake [550]. Seal studs with SEW-L-Spezial, see chapter "Order information for lubricants, anti-corrosion agents and sealants" (→ 🗎 245).
14. ⚠ **DANGER!** No braking due to incorrectly set floating clearance "s". Severe or fatal injuries. Make sure the floating clearance "s" is set correctly so that the pressure plate can move up as the brake lining wears.
    Manual brake release option: Set the floating clearance "s" using the adjusting nuts, see chapter "Retrofitting the /HR, /HF manual brake release" (→ 🗎 203).

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15. Diagnostic unit option /DUE: Insert the sensor [1151] into the magnet body [54] of the new brake using the screw fitting. Fasten the cable with the terminal [1152/1153] at the magnet body in a way that the sensor cable cannot touch the fan wheel [36]. Then calibrate the zero value, see chapter "Zero value calibration" (→ 🗎 217).
16. Install the disassembled parts of the motor.

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7.6.23 Replacing BE60 – 122 brakes for DR..250 – 315, DRN250 – 315 motors

✓ The motor and all connected options are disconnected from the power supply.

✓ The motor is protected against unintended restart.

1. Disassemble the following parts:
   ⇨ Forced cooling fan and rotary encoder, if installed, see chapter "Motor and brake maintenance – preliminary work" (→ 🗎 127).
   ⇨ Fan guard with encoder mount [212] or fan guard [35], retaining ring [32]/[62] and fan [36]
2. Unscrew the locking screws of the brake plug connector [698] and remove the plug connector.
3. Remove the screws and brake (with brake endshield if necessary) from the stator.
   ⇨ DR..250 – 280, DRN250 – 280 motors: Replace the O-ring [1607].
4. If necessary, replace driver [70], key [71], and retaining ring [62], see chapter "Working steps for inspecting DR..71 – 315, DRN63 – 315, DR2..63 – 80 brakemotors" (→ 🗎 179).
5. Seal the shaft.
6. Replace the sealing ring [95].
7. Apply grease to the sealing lip, see chapter "Order information for lubricants, anti-corrosion agents and sealants" (→ 🗎 245).
8. Position the new brake. Make sure the cable outlet and brake lining carrier gearing are correctly aligned.
   ⇨ Manual brake release option: It is important that the manual brake release is positioned properly.
9. Refasten the brake using the screws.
   ⇨ Cap screws [900]
   ⇨ Tolerance ±10%.
10. For designs with corrosion protection /KS and/or IP56/66, the clamping straps of the disassembled brake have to be mounted to the new brake [550]. Seal studs with SEW-L-Spezial, see chapter "Order information for lubricants, anti-corrosion agents and sealants" (→ 🗎 245).
11. Insert plug connector [698] in the brake and fasten using screws.
    ⇨ Tightening torque 3 Nm.
12. ⚠ **DANGER!** No braking due to incorrectly set floating clearance "s". Severe or fatal injuries. Make sure the floating clearance "s" is set correctly so that the pressure plate can move up as the brake lining wears.
    Manual brake release option: Set the floating clearance "s" using the adjusting nuts, see chapter "Retrofitting the /HR, /HF manual brake release" (→ 🗎 203).
13. Diagnostic unit option /DUE: Insert the sensor [1151] into the magnet body [54] of the new brake using the screw fitting. Fasten the cable with the terminal [1152/1153] at the magnet body in a way that the sensor cable cannot touch the fan wheel [36]. Then calibrate the zero value, see chapter "Zero value calibration" (→ 🗎 217).
14. Install the disassembled parts of the motor.

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7.6.24 Retrofitting the /HR, /HF manual brake release

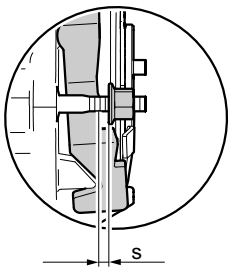
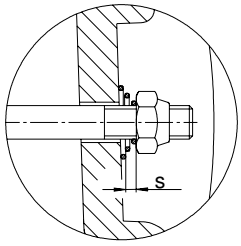
INFORMATION

With BE02 brakes, the manual brake release can only be retrofitted if the brake is completely replaced.

✓ The motor and all connected options are disconnected from the power supply.

✓ The motor is protected against unintended restart.

1. Disassemble the following parts:
   - ⇨ Forced cooling fan and rotary encoder, if installed, see chapter "Motor and brake maintenance – preliminary work" (→ 🗎 127).
   - ⇨ Fan guard with encoder mount [212] or fan guard [35], retaining ring [32]/[62] and fan [36]
2. Mount the manual brake release.
   - ⇨ BE03: Position the releasing lever [53] and the spring plate [53] correctly. Mount the flange nut [58]. Attach the hand lever [51]/set screw [64] to the stator using the grommets.
   - ⇨ BE05 – BE11: Remove the old sealing ring [95]. Screw in the studs [56] and glue them. Insert the sealing rings for the manual brake release [95]. Hammer in the parallel pin [59]. Install the releasing lever [53], the conical springs [57] and the adjusting nuts [58].
   - ⇨ BE20 – BE62: Insert O-rings [47] into the magnet body. Screw in the studs [56] and glue them. Install the releasing lever [53], the conical springs [57] and the adjusting nuts [58].
   - ⇨ BE120 – BE122: Insert O-rings [47] in the magnet body. Screw in the studs [56] and glue them.
3. ⚠ **DANGER!** No braking due to incorrectly set floating clearance "s". Severe or fatal injuries. Make sure the floating clearance "s" is set correctly so that the pressure plate can move up as the brake lining wears.
   Set the floating clearance "s" using the adjusting nuts or flange nuts.
   - ⇨ BE03: Between releasing lever and flange nut (see following illustration).
   - ⇨ BE05 – 122: Between conical springs (pressed flat) and adjusting nuts (see following illustration).

BE03	BE05 – 122
	

Brake	Floating clearance s mm
BE03	2.2
BE05, BE1, BE2	1.5

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Brake	Floating clearance s mm
BE5	1.7
BE11, BE20, BE30, BE32, BE60, BE62, BE120, BE122	2

4. Install the disassembled parts of the motor.

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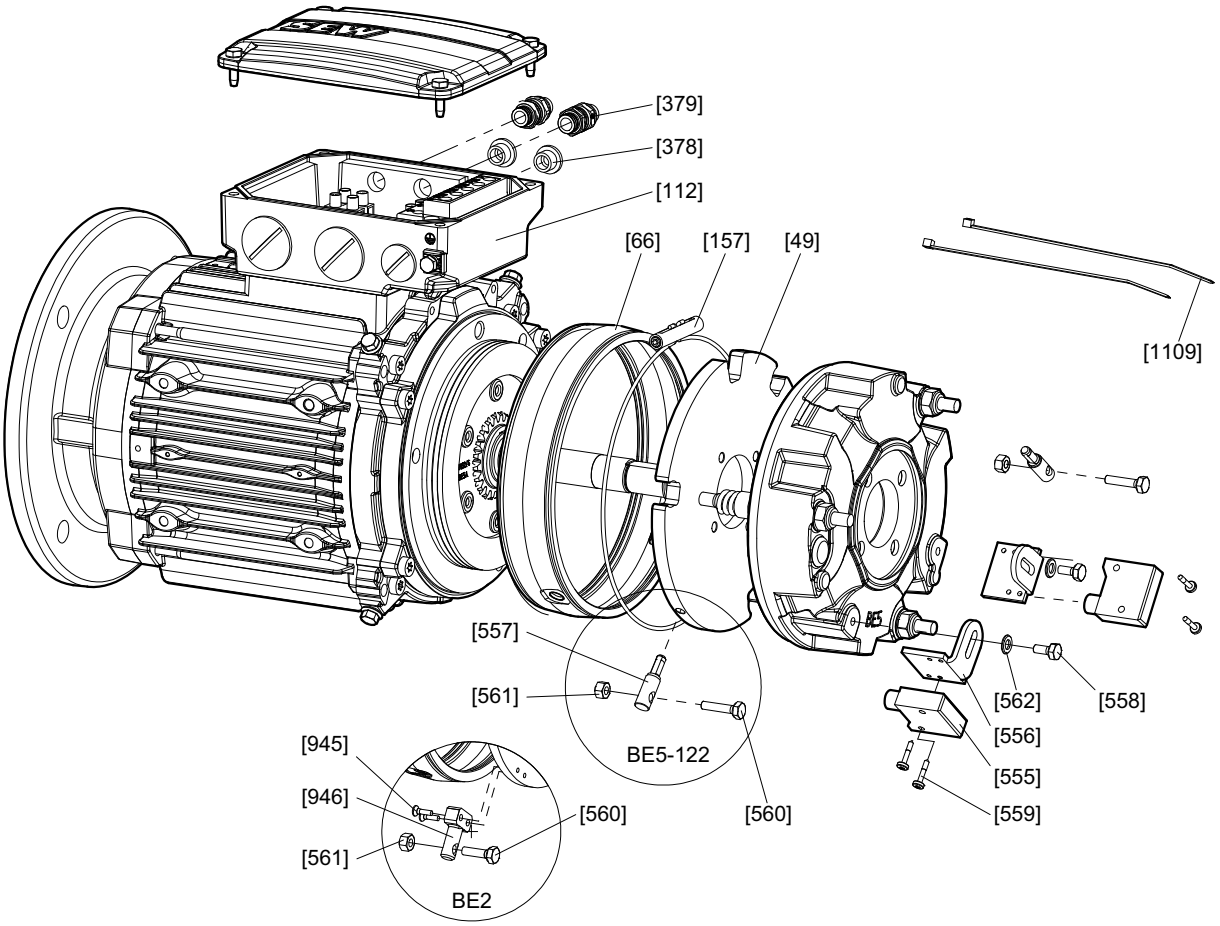
7.7 Inspection/maintenance work diagnostic unit /DUB

7.7.1 Basic structure of diagnostic unit /DUB on DR..90 – 315 motors with BE..



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[49]	Pressure plate for DUB	[555]	Microswitch	[561]	Hex nut
[66]	Sealing strip for DUB	[556]	Angle bracket	[562]	Shim
[112]	Terminal box lower part	[557]	Bolt (BE5 and larger)	[945]	Hex head screw (BE2)
[157]	Clamping strap (BE2 – 11)	[558]	Hex head screw	[946]	Mounting plate (BE2)
[378]	Screw plug	[559]	Pan head screw	[1109]	Cable ties
[379]	Screw fitting	[560]	Hex head screw		

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7.7.2 Inspection/maintenance work diagnostic unit /DUB

⚠ WARNING

Risk of injury if the drive starts up unintentionally.

Severe or fatal injuries.

- Before you start working on the unit, disconnect the motor and all connected options from the power supply.
- Secure the motor against unintended power-up.

INFORMATION

Brakes equipped with the /DUB option have at least one microswitch. These can be used for function monitoring or setting a wear monitoring. If 2 microswitches are mounted to one brake, both monitoring statuses can be realized. In this case, first set the switch for wear monitoring, then the switch for function monitoring.

INFORMATION

The specifications provided in the tables on setting the wear monitoring refer to the maximum permitted working air gap for brakemotors without safety options at brake and encoder, see chapter "Braking work, working air gap, and brake lining carrier thickness" (→ 🗎 225). Deviating values apply to brakemotors with the specified safety options. Observe the information in the addendum to the operating instructions "Safety Encoders and Safety Brakes – AC Motors DR.., DRN.., DR2.., EDR.., EDRN.. – Functional Safety".

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7.7.3 Inspection/maintenance work at the /DUB diagnostic unit with microswitch for function monitoring

1. Check the working air gap according to chapter "Setting the working air gap of BE05 – BE122 brakes" (→ 🗎 191) and adjust it if necessary.
2. Screw the hex head screw [560] against the actuator of the microswitch [555] until it trips (brown, blue contacts closed).

   While screwing, install hex nut [561] to eliminate the longitudinal play from the thread.
3. Turn the hex head screw [560] back until the microswitch [555] switches back (contacts brown-blue open). Depending on the brake size, screw out the hex head screw [560] by the specified angle to set the switching hysteresis.

Brake	Angle
BE2, BE5, BE11, BE20, BE30, BE60	60°
BE32, BE62	90°
BE120, BE122	105°

- After reaching the respective end position, tighten the hex nut [561] against the bolts [557]/[945] while holding the hex head screw [560] to keep it in the correct position.
- Switch the brake on and off several times. Check whether the microswitch opens and closes reliably in any motor shaft position. Therefore, change the position of the motor shaft manually several times. In case of incorrect switching, the setting procedure may require to be repeated.
- Check if the cables are routed firmly and if they require additional fastening in form of cable ties [1109]. Make sure the cables are routed in a sufficient distance to the fan wheel of the motor.
- Install the previously removed motor parts again.

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7.7.4 Inspection/maintenance of the diagnostic unit /DUB with microswitch for wear monitoring

1. Check the working air gap according to chapter "Setting the working air gap of BE05 – BE122 brakes" (→ 🗎 191) and adjust it if necessary.
2. Screw the hex head screw [560] against the actuator of the microswitch [555] until it trips (brown, blue contacts closed).

   While screwing, install hex nut [561] to eliminate the longitudinal play from the thread.
3. Screw the hex head screw [560] further in from the actuated switching point, so that the microswitch [555] remains activated (contact brown-blue closed). Depending on the brake size, screw the hex head screw [560] further in by the specified angle to set the wear point:

Brake	Standard brake without safety encoder	With safety brake or safety encoder
BE2	135°	135°
BE5	270°	180°
BE11, BE20, BE30, BE32, BE60, BE62	360°	
BE120	270°	135°
BE122	180°	90°

- After reaching the respective end position, tighten the hex nut [561] against the bolts [557]/[945] while holding the hex head screw [560] to keep it in the correct position.
- Check if the cables are routed firmly and if they require additional fastening in form of cable ties [1109]. Make sure the cables are routed in a sufficient distance to the fan wheel of the motor.
- Install the previously removed motor parts again.

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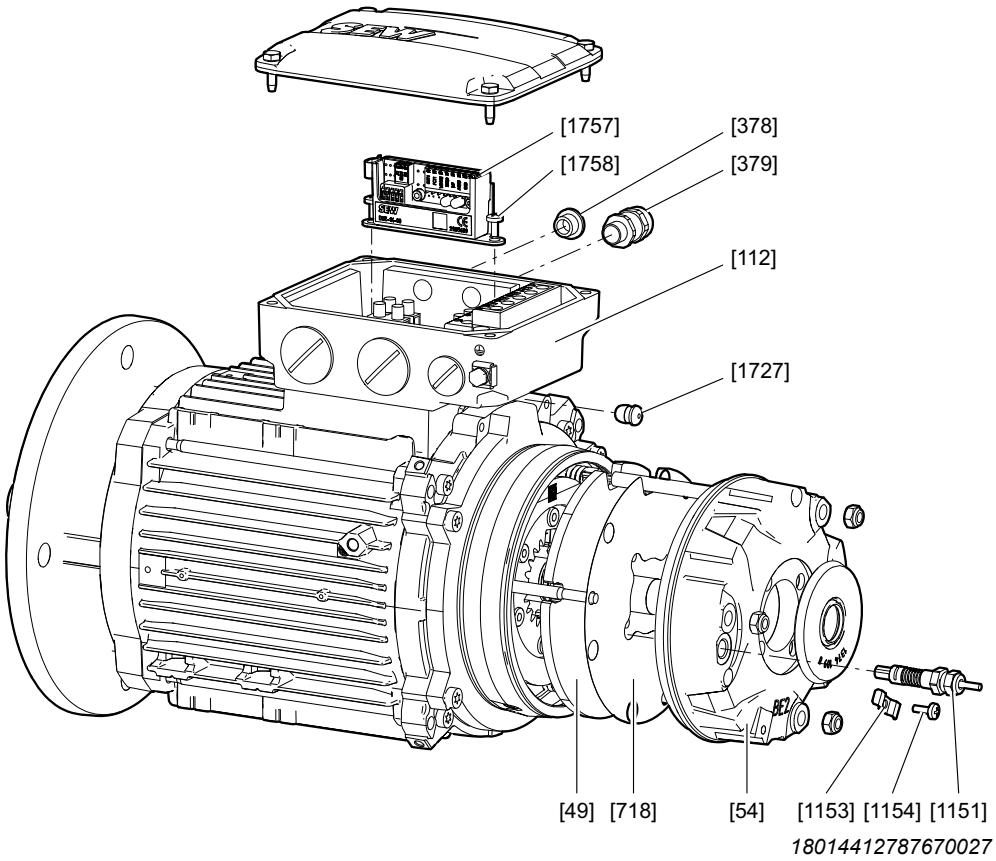
7.8 Inspection/maintenance work diagnostic unit /DUE

7.8.1 Basic structure of diagnostic unit /DUE



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[49]	Pressure plate for /DUE (BE20 and higher)	[1151]	Distance sensor
[54]	Magnet body complete for /DUE	[1153]	Spring (BE20 – 122)
[112]	Terminal box lower part	[1154]	Mushroom head screw (BE20 – 122)
[378]	Screw plug (DRN200 – 315)	[1757]	Evaluation unit
[379]	Screw fitting (DRN200 – 315)	[1758]	Screw
[718]	Dampening plate (BE1 – 11)	[1727]	Grommet (DRN80 – 180)

7.8.2 Removing the /DUE diagnostic unit

1. Remove forced cooling fan and rotary encoder, if installed, see chapter "Motor and brake maintenance – preliminary work" (→ 🗎 127).
2. Remove the fan guard [35] / fan guard with encoder mount [212], or the forced cooling fan [170] by loosening the retaining screws [22].
3. If applicable: Remove the retaining ring [32] and the fan wheel [36] using a suitable tool.
4. Loosen the screw [1154] for the cable fixture clamp [1153].
5. Loosen the union nut of the sensor screw fitting. The sensor cable is free.
6. Loosen the sensor [1151] on the mounting flange. Remove the sensor.

7.8.3 Retrofitting the /DUE diagnostic unit for function and wear monitoring

Designation

For the component designation of the evaluation unit, refer to chapter "Designation of the components" (→ 🗎 101).

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Conditions

The /DUE diagnostic unit can only be retrofitted for motor sizes 80 – 315 with brakes BE1 – 122 under the following conditions:

- Exchange of the existing brake without /DUE preparation for a new brake with /DUE preparation.
- Conversion of the terminal box to create room for the evaluation unit of the /DUE diagnostic unit.
- Retrofitting of the evaluation and sensor unit, see chapter "Evaluation unit" (→ 🗎 210).

Whether and to what extent the first two measures in the list are to be carried out depends greatly on the respective motor design. To identify the components that need to be replaced, please contact SEW-EURODRIVE.

Evaluation unit

The evaluation unit has a 5-pin DIP switch that is labeled with the numbers 1 to 5. Use it to set the measuring range and the maximum permitted wear limit (maximum working air gap).

If the brake is used in combination with a safety encoder, or if the brake is designed as safety brake, the setting values for the wear limit are reduced. For the new values, refer to the addendum to the operating instructions for safety brakes and safety encoders.

To activate the DIP switch ≙1, push the switch upwards. To deactivate the DIP switch ≙ 0, push the switch downwards.

The following table shows the DIP switch settings of the evaluation unit for the maximum working air gap.

S1	S2	S3	S4	S5	Wear limit	BE1 – 2 brake	BE5 brake
Sensor Ø 6 mm							
0	**0**	**0**	**0**	**0**	1.2 mm		
0	**0**	**0**	**0**	**1**	1.1 mm		
0	**0**	**0**	**1**	**0**	1.0 mm		
0	**0**	**0**	**1**	**1**	0.9 mm		X
0	**0**	**1**	**0**	**0**	0.8 mm		
0	**0**	**1**	**0**	**1**	0.7 mm		
0	**0**	**1**	**1**	**0**	0.6 mm	X	
0	**0**	**1**	**1**	**1**	0.5 mm		
S1	**S2**	**S3**	**S4**	**S5**	**Wear limit**	**BE11 – 122 brake**	
Sensor Ø 8 mm							
1	**0**	**0**	**0**	**0**	1.2 mm	X	
1	**0**	**0**	**0**	**1**	1.1 mm		
1	**0**	**0**	**1**	**0**	1.0 mm		
1	**0**	**0**	**1**	**1**	0.9 mm		
1	**0**	**1**	**0**	**0**	0.8 mm		
1	**0**	**1**	**0**	**1**	0.7 mm		
1	**0**	**1**	**1**	**0**	0.6 mm		
1	**0**	**1**	**1**	**1**	0.5 mm		

X Factory setting
Setting possible in addition

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Setting and mounting the evaluation unit

✓ The motor and all connected options are disconnected from the power supply.

✓ The motor is protected against unintended restart.

1. Set the wear limit using the DIP switches.
2. Screw the evaluation unit into the terminal box after consultation with SEW-EURODRIVE.
3. Connect the sensor, see chapter "Connecting the sensor" (→ 🗎 213).
4. Calibrate the infinite value, see chapter "Calibrating the infinite value" (→ 🗎 215).
5. Install the sensor in the brake, see chapter "Installing the sensor" (→ 🗎 216).
6. Route the cable, see chapter "Cable routing" (→ 🗎 217).
7. Calibrate the zero value, see chapter "Zero value calibration" (→ 🗎 217).
8. To check the function, measure the voltage via terminal 5k to 10k. Switch the brake and check if 24 V are applied.
9. To check if the working air gap is within the permitted range, measure the current between terminals 4k and 10k. Compare the value to the range in the diagram in chapter "Output signals for function and wear monitoring" (→ 🗎 214).

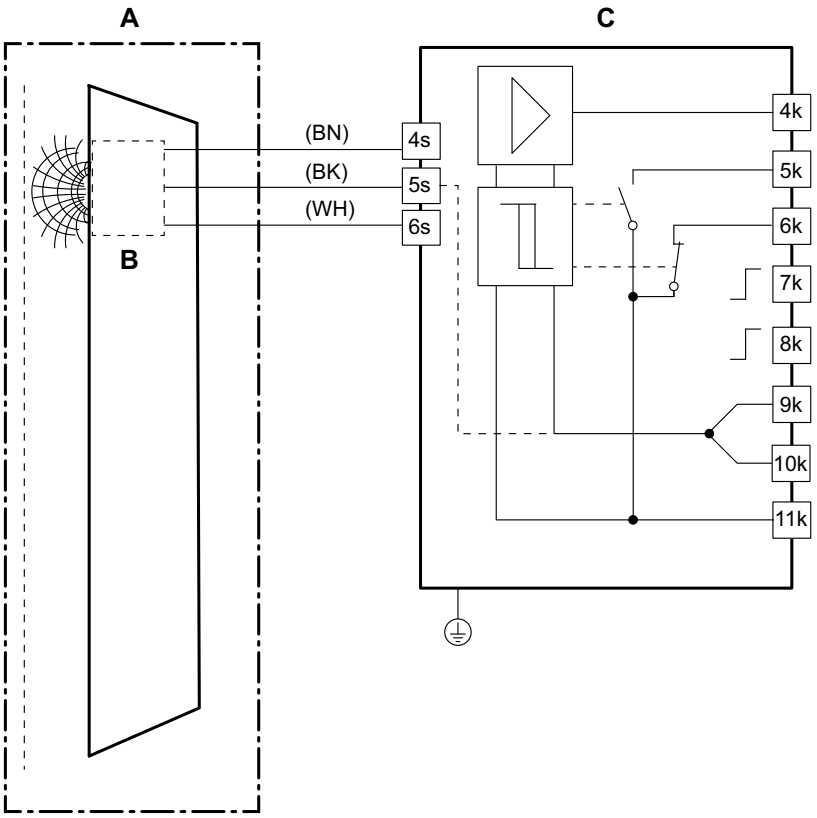
Connecting electronics

The function and wear monitoring is connected according to the following wiring diagram. The maximum permitted cable cross section at terminals "k" is 1.5 mm² with conductor end sleeve without plastic collar, 0.75 mm² with plastic collar. The recommended cable cross section at terminal "k" is 0.5 mm² with conductor end sleeve with plastic collar.

INFORMATION

Use shielded cables to wire the evaluation unit. Connect the shield to the GND potential, or use the shield plate at the user's signal evaluation.

- Unless they are shielded, sensor cables must always be routed separately from other power cables with phased currents.
- Provide for a suitable equipotential bonding between drive and control cabinet.



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[A]	Brake	[4k]	Analog output wear 1 (air gap)
[B]	Eddy current sensor	[5k]	Digital output function 1 (NO contact)
[C]	Evaluation unit	[6k]	Digital output wear 1 (NC contact)
		[7k]	Input calibration zero value
[4s]	Connection sensor A1 (brown cable)	[8k]	Input calibration infinite value
[5s]	Connection sensor GND 1 (black cable)	[9k]	Signal ground AGND
[6s]	Connection sensor B1 (white cable)	[10k]	Ground potential GND
		[11k]	DC 24 V supply

The evaluation unit is supplied with DC 24 V via the terminals GND [10k] and DC 24 V [11k].

Brake monitoring provides digital signals for:

- Function FCT1 [5k] and wear WEAR1 [6k] of the brake.

The working air gap can be monitored continuously via the analog signal (4 – 20 mA) regarding the signal ground [9k]:

- Terminal OUT1 [4k]

Use terminals ZERO [7k] and INF [8k] for calibration.

INFORMATION

If values deviate from the factory setting, the wear point setting must be adjusted. See chapter "Evaluation unit" (→ 🗎 210).

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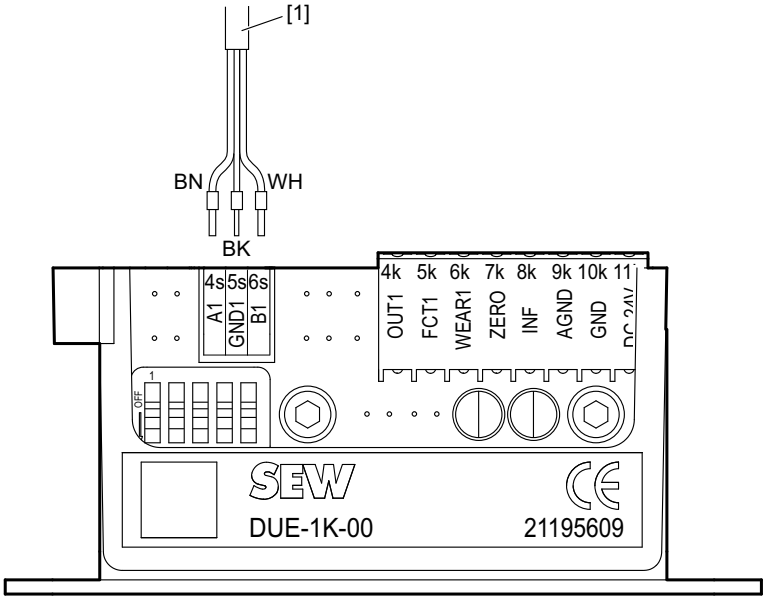
Connecting the sensor



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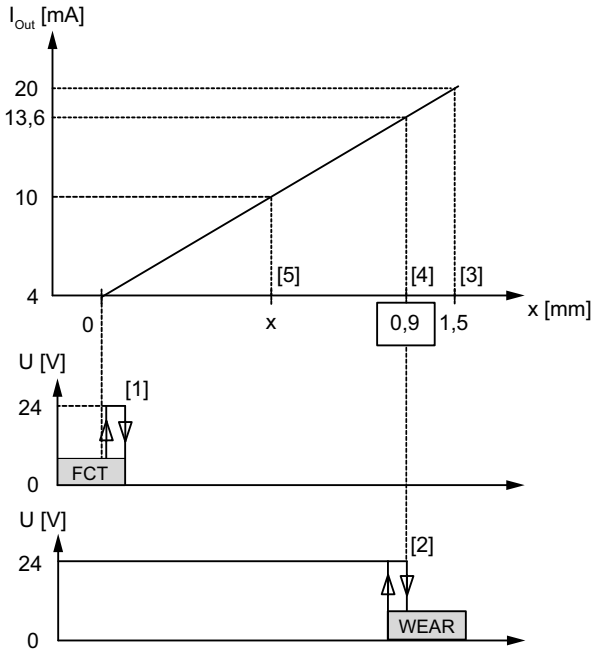
[1] Brake sensor

The connection cross section of the sensor is 0.14 mm^2. The litz wires of the sensor cables must be equipped with conductor end sleeves. The cable shield must be isolated against other potentials using a heat shrink tubing. The litz wires can be pushed into the terminals without using tools. Put the sensor cables in the provided line clip, see figure in chapter "Calibrating the infinite value" (→ 🗎 215). To remove the sensor cables, use an electronic screwdriver to disengage the clips.

Output signals for function and wear monitoring

The diagnostic unit /DUE provides an analog signal (4 – 20 mA, DIN IEC 60381-1) for the current working air gap of the brake.

D6



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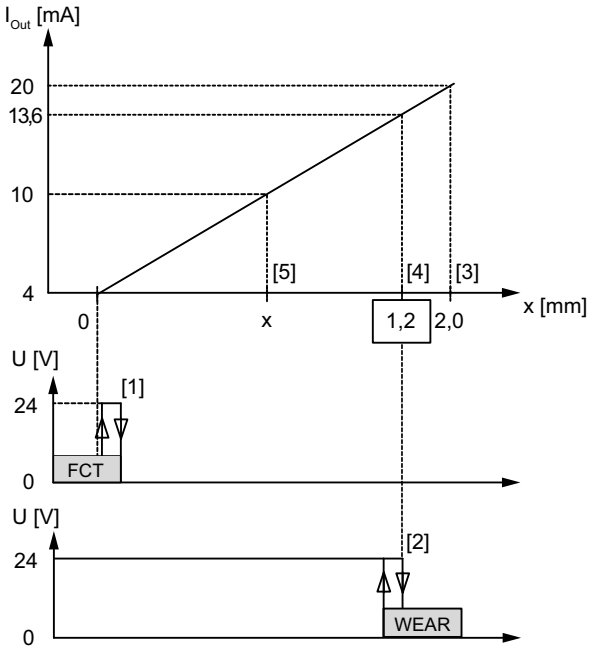
D8



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[1] FCT: Digital output function (DC 24 V, DIN EN 61131-2)
[2] WEAR: Digital output wear (DC 24 V, DIN EN 61131-2)
[3] Measuring range of the sensor
[4] Max. working air gap of the brake (exemplary)
[5] Currently measured working air gap (exemplary)

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Calibrating the infinite value

Before you can install the sensor in the brake, the electronics must be calibrated to the actual cable length. During calibration of the infinite value, electronics is adjusted to the sensor cable length. Electronics is reset and previous settings are overwritten.

The sensor must be removed from the brake for the following steps.

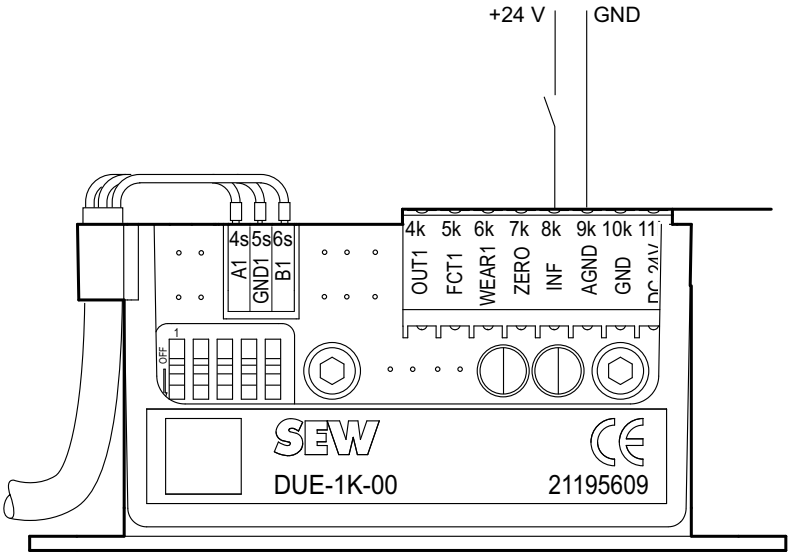
Procedure to calibrate the infinite value for the sensor:

1. Make sure that no metallic objects are within a 10 cm radius from the sensor head. The mounting springs may be in contact with the back of the sensor head during calibration.
2. Connect the supply voltage to INF (8k) and AGND (9k) for approx. 5 s. You can use GND (10k) as reference potential instead of AGND (9k). The evaluation unit is supplied via the calibration input during calibration.

The analog output OUT1 signals 0 mA during the calibration procedure.

The infinite value was successfully calibrated when OUT1 (4k) displays 20 mA. The red LED briefly flashes once per second as visual signal.

The corresponding wiring diagram for the calibration process.



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During calibration, the digital outputs WEAR1 (6k), FCT1 (5k) send a 0 signal which may lead to error messages (wear limit reached).

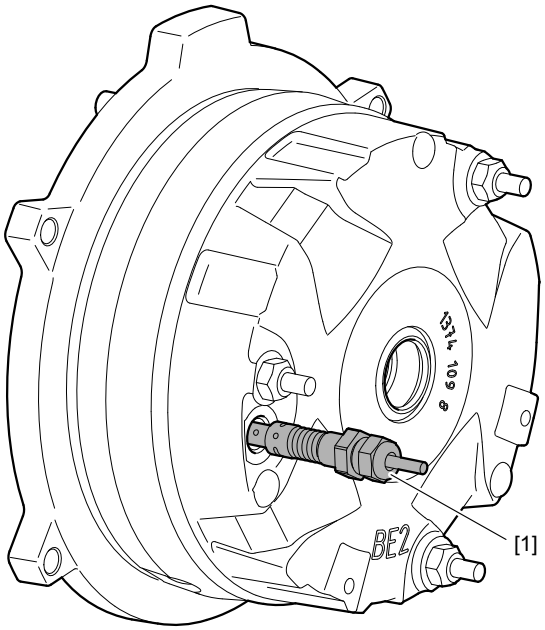
Installing the sensor

After calibration, the eddy current sensor can be installed in the magnet body of the brake. When installing the sensor, make sure that the sensor head can be inserted in the stepped bore without pressure being applied.

First install the lower part of the cable gland. Then mount the upper part of the cable gland.

INFORMATION

To ensure that the sensor is correctly inserted in the stepped bore, twist the sensor carefully with the cable before screwing in the cable gland. Protect the sensor cable against damage.



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[1] Brake sensor

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Cable routing

Prevent the cable from colliding with the fan cable. If necessary, attach the cable to the included clamping strap [157] on the brake using cable ties.

Zero value calibration

During calibration of the zero value, the current working air gap with released (open) brake is written to the evaluation unit. The electronics are reset and previous settings are overwritten. You can save the zero value again at any time without changing the infinite value.

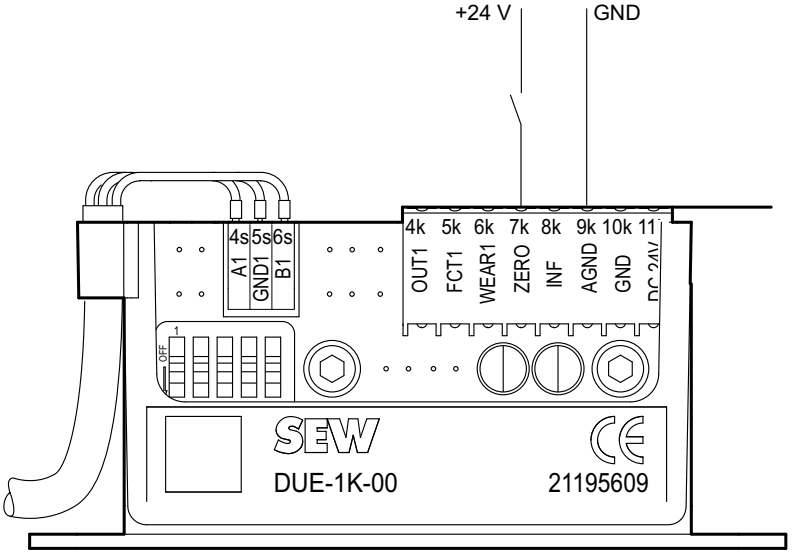
Procedure for calibrating the zero value:

1. Open the brake.
2. Apply the supply voltage to ZERO (7k) and AGND (9k) for approx. 3 seconds. Electronics is in calibration mode. You can use GND (10k) as reference potential instead of AGND (9k). The evaluation unit is supplied via the calibration input during calibration.

The evaluation unit saves the smallest working air gap of the brake. Each write process is indicated by a brief flashing of the red LED.

The activated calibration mode is indicated by the following LED state:

LED	State
Green [6]	Off
Red [6]	Flashing (2 Hz)



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During calibration, the digital outputs WEAR1 (6k), FCT1 (5k) send a 0 signal which may lead to error messages (wear limit reached).

The analog output OUT1 (4k) signals 0 mA during the calibration procedure. After successful calibration, the value is saved. The output has 4 mA with released brake. If a smaller value is available within 3 seconds, the last value is deleted and the new value is saved. The 4 mA at the output remain unchanged.

Status messages of the evaluation unit

Brake	Sensor	Calibration		LEDs and outputs					State
		ZERO	INF	Green	Red	FCT	WEAR	OUT	
Open	Installed	–	–	To	Off	HI	HI	3.6 – 5.6 mA	Brake open, no wear
Go to	Installed	–	–	Off	Off	LO	HI	6 – 20 mA	Brake closed, no wear
Go to	Installed	–	–	Off	To	LO	LO	6 – 20 mA	Brake closed, set wear limit of brake reached
–	–	–	–	Off	To	LO	LO	>20 mA	Measuring range exceeded or sensor not connected correctly
–	Not installed	–	HI	Off	Blinking 1 Hz	LO	LO	0 mA	Infinite value calibration active
–	Not installed	–	HI	Off	Flashing 1 Hz	LO	LO	20 mA	Infinite calibration successful
–	–	–	–	Blinking 1 Hz	Blinking 1 Hz	Clock 1 Hz	Clock 1 Hz	0 mA	Not completely calibrated: • ZERO calibration missing • Delivery state (both calibrations missing)
Open	Installed	HI	–	Off	Blinking 2 Hz	LO	LO	0 mA	Zero value calibration active
Open	Installed	HI	–	Off	Blinking 2 Hz	LO	LO	4 mA	First zero value calibration successful
Open	Installed	HI	–	Off	Flickering	LO	LO	4 mA	Smaller zero value detected and saved

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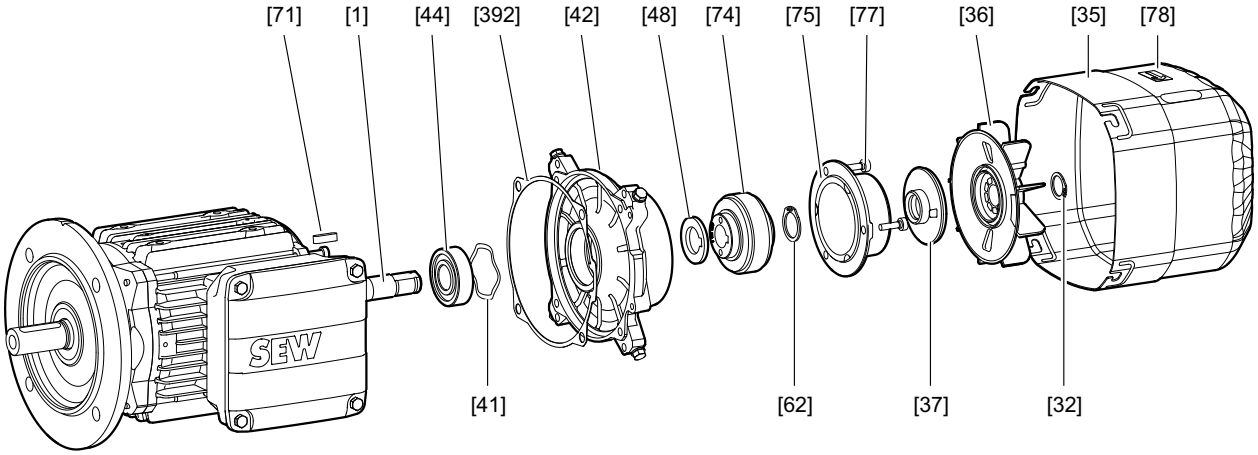
7.9 Altering the blocking direction on motors with a backstop

7.9.1 Basic structure of DR..71 – 80, DRN71 – 80, DR2..71 – 80 motors with backstop



18014399652340235

[1]	Motor with brakemotor	[48]	Spacing ring (only DR../DRN/DR2..80)
[32]	Retaining ring	[62]	Retaining ring (only DR../DRN/ DR2..80)
[35]	Fan guard	[71]	Key
[36]	Fan wheel	[74]	Backstop
[37]	Sealing ring	[75]	Sealing flange
[41]	Equalizing ring	[77]	Cap screw
[42]	Backstop endshield, complete	[78]	Direction of rotation information sign
[44]	Deep groove ball bearing	[392]	Gasket

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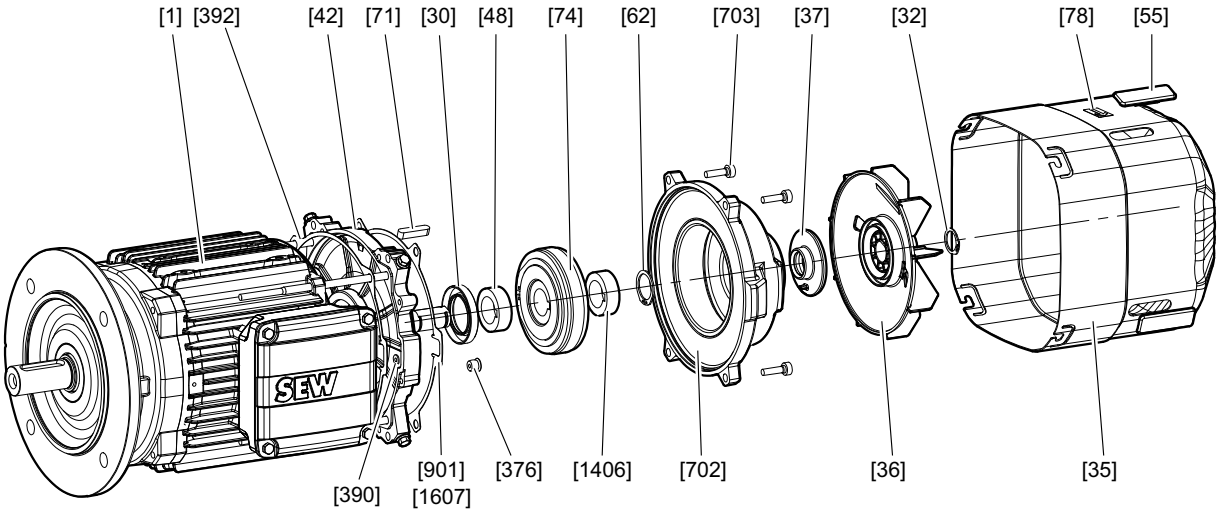
7.9.2 Basic structure of DR..90 – 315, DRN63, 90 – 315, DR2..63 motors with backstop



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[1]	Motor	[74]	Backstop
[30]	Sealing ring (DR../DRN250-315)	[78]	Information sign for direction of rotation
[32]	Retaining ring		
[35]	Fan guard	[702]	Backstop housing
[36]	Fan wheel	[703]	Cap screw
[37]	Sealing ring	[376]	Screw plug (DR..160 – 315, DRN132M – 315)
[42]	Brake endshield	[392]	O-ring (with DRN63, DR..63) Seal (DR..90 – 132, DRN90 – 132S)
[48]	Spacing ring	[901]	Seal (DR..90 – 225, DRN90 – 225)
[55]	Closing piece (from DR../ DRN112)	[1406]	Spacing ring (DR..250 – 315, DRN250 – 315)
[62]	Retaining ring (from DR../DRN90)	[1607]	O-ring (DR..250 – 280, DRN250 – 280)
[71]	Key		

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7.9.3 Changing the blocking direction

Proceed as follows to change the blocking direction:

✓ The motor and all connected options are disconnected from the power supply.

✓ The motor is protected against unintended restart.

1. Disassemble the following parts:
   - ⇨ Forced cooling fan and rotary encoder, if installed, see chapter "Motor and brake maintenance – preliminary work" (→ 🗎 127).
   - ⇨ Fan guard with encoder mount [212] or fan guard [35], retaining ring [32]/[62] and fan [36]
   - ⇨ **DR..71 – 80, DRN71 – 80, DR2..71 – 80 motors:** Sealing flange [75].
   - ⇨ **DR..90 – 315, DRN63, 90 – 315, DR2..63 motors:** Backstop housing, complete [702].
2. Remove the retaining ring [62] and, if necessary, the spacing ring [1406].
3. Dismount the backstop [74] using a puller.
4. To alter the blocking direction, turn around the backstop [74].
5. Check the old grease. If necessary, replace the grease as specified below.
   - ⇨ **DRN63 – 71, DR2..63 – 71 motors**: Glue in the backstop [74] with Loctite 648/649.
   - ⇨ **DR..71 – 315, DRN80 – 315, DR2..80 motors:** Press on the backstop [74].
6. Mount the retaining ring [62].
7. Mount the following parts:
   - ⇨ **DR..71 –80, DRN71 – 80, DR2..71 – 80 motors:** Apply SEW-L-Spezial sealant to the sealing flange [75]. Mount the sealing flange [75].
   - ⇨ **DR..90 – 315, DRN63, 90 – 315, DR2..63 motors:** Replace the gasket [901], O-ring [1607], and if necessary sealing ring [37]. Mount the complete backstop housing [702].
8. Install the disassembled parts of the motor.
9. Replace the label [78] indicating the direction of rotation.

Lubricating the backstop

The backstop is greased at the factory with the corrosion protection low-viscosity grease LBZ 1. If you want to use another grease, make sure it complies with NLGI class 00/000 with a base oil viscosity of 42 mm^2/s at 40 °C on a lithium saponified and mineral oil base. The application temperature range is from -50 °C to +90 °C. See the following table for the amount of grease required:

DR.. motors	**71**	**80**	**90/100**	**112/132**	**160**	**180**	**200/225**	**250/280**	**315**
DRN.. motors	**63/71**	**80**	**90/100**	**112/132S**	**132M/L**	**160/180**	**200/225**	**250/280**	**315**
DR2.. motors	**63/71**	**80**	**–**	**–**	**–**	**–**	**–**	**–**	**–**
Amount of grease in g	9	11	15	20	30	45	80	80	120

The tolerance regarding the grease level is ± 30%.

8 Technical data

8.1 Braking torques

The following table shows the possible braking torque combinations for various sizes of the BE05 – 122 brake. For BE02 and BE03 brakes, the braking torques of each brake are preset at the factory and cannot be adjusted.

⚠ WARNING

Insufficient or excessive braking torque due to impermissible spring pack.

Severe or fatal injuries.

- Maintenance work may only be performed by a trained specialist.
- In case of a conversion, make sure the selected spring set generates nominal braking torques that are permitted for your drive combination and are suitable for the application.
- Observe the project planning note in the manual "Project Planning for BE.. Brakes – DR.., DRN.., DR2.., EDR.., EDRN.. AC Motors – Standard Brake/Safety Brake", or contact SEW-EURODRIVE.

Brake	Part number Damping plate [718] Pole sheet [63]	Braking torque settings					
		Braking torque	Type and number of brake springs			Purchase order numbers for brake springs	
		Nm	Normal [50]	Blue [276]	White [1312]	Normal	Blue/white
BE05	13740563	5.0	3	–	–	0135017X	13741373
		3.5	–	6	–		
		2.5	–	4	–		
		1.8	–	3	–		
BE1	13740563 13749862[1)]	10	6	–	–	0135017X	13741373
		7.0	4	2	–		
		5.0	3	–	–		
BE2	13740199 13749870[1)]	20	6	–	–	13740245	13740520
		14	2	4	–		
		10	2	2	–		
		7.0	–	4	–		
		5.0	–	3	–		
BE5	13740695 13749889[1)]	55	6	–	–	13740709	13740717
		40	2	4	–		
		28	2	2	–		
		20	–	–	6		13747738
		14	–	–	4		
BE11	13741713 13749854[1)]	110	6	–	–	13741837	13741845
		80	2	4	–		
		55	2	2	–		
		40	–	4	–		
	13741713 + 13746995 13749854[1)] + 13746995	28	–	3	–		
	13741713 + 13746995 13749854[1)] + 13746995	20	–	–	4		13747789

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Brake	Part number Damping plate [718] Pole sheet [63]	Braking torque settings					
		Braking torque	Type and number of brake springs			Purchase order numbers for brake springs	
		Nm	Normal [50]	Blue [276]	White [1312]	Normal	Blue/white
BE20	–	200	6	–	–	13743228	13742485
	–	150	4	2	–		
	–	110	3	3	–		
	–	80	3	–	–		
	13749307	55	–	4	–		
	13746758	40	–	3	–		
BE30	–	300	8	–	–	01874551	13744356
	–	200	4	4	–		
	–	150	4	–	–		
	–	100	–	8	–		
	13749455	75	–	6	–		
BE32	–	600	8	–	–	01874551	13744356
	–	500	6	2	–		
	–	400	4	4	–		
	–	300	4	–	–		
	–	200	–	8	–		
	13749455	150	–	6	–		
	13749455	100	–	4	–		
BE60	–	600	8	–	–	01868381	13745204
	–	500	6	2	–		
	–	400	4	4	–		
	–	300	4	–	–		
	–	200	–	8	–		
BE62	–	1200	8	–	–	01868381	13745204
	–	1000	6	2	–		
	–	800	4	4	–		
	–	600	4	–	–		
	–	400	–	8	–		
BE120	–	1000	8	–	–	13608770	13608312
	–	800	6	2	–		
	–	600	4	4	–		
	–	400	4	–	–		
BE122	–	2000	8	–	–	13608770	13608312
	–	1600	6	2	–		
	–	1200	4	4	–		
	–	800	4	–	–		

1) For option /DUE

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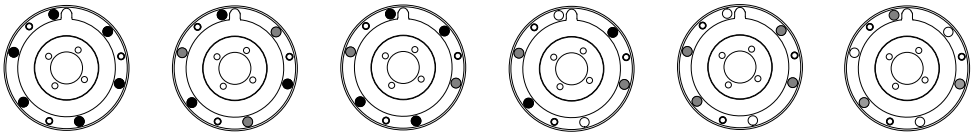
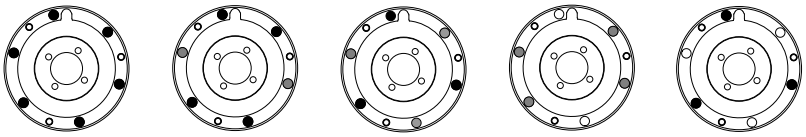
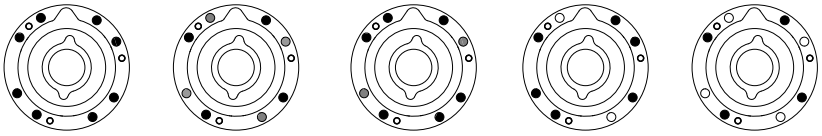
8.1.1 Brake spring layout

The following table shows the brake spring layout:

BE05 – 11:					
6 springs	3 + 3 springs	4 + 2 springs	2 + 2 springs	4 springs	3 springs
					
BE20:					
6 springs	4 + 2 springs	3 + 3 springs	4 springs	3 springs	
					
BE30 – 122:					
8 springs	4 + 4 springs	6 + 2 springs	6 springs	4 springs	
					

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8.2 Braking work, working air gap, and brake lining carrier thickness

If the brake is used in combination with a safety encoder, or if the brake is designed as safety brake, the maximum values for the working air gap and for the braking work until maintenance are reduced. For the new values, refer to the addendum to the operating instructions for safety brakes and safety encoders.

Brake	Braking work until maintenance[1]	Working air gap		Brake lining carrier
		min.[2]	maximum	minimum
	10^6 J	mm	mm	mm
BE02	15	–[3]	–[3]	min. 5.4 for 0.8 Nm min. 5.6 for 1.2 Nm
BE03	200	0.25	0.65	–[3]
BE05	120	0.25	0.6	11.0
BE1	120	0.25	0.6	11.0
BE2	180	0.25	0.6	11.0
BE5	390	0.25	0.9	11.0
BE11	640	0.3	1.2	12.5
BE20	1000	0.3	1.2	12.5
BE30	1500	0.3	1.2	12.5
BE32	1500	0.4	1.2	12.5
BE60	2500	0.3	1.2	14.0
BE62	2500	0.4	1.2	14.0
BE120	390	0.6	1.2	14.0
BE122	390	0.8	1.2	14.0

1) The specified values are nominal values that were determined during rating operation. The actual braking work that can be reached before maintenance may vary depending on the actual load during operation.
2) When checking the working air gap, note: After a test run, parallelism tolerances on the brake lining carrier may give rise to deviations of ±0.15 mm.
3) The brake lining carrier cannot be replaced. When the minimum brake lining carrier thickness/maximum working air gap is reached, the brake must be replaced.

INFORMATION

In case of drives with BE32, BE62, or BE122 brake in pivoted mounting position, the specified value may be reduced by up to 50%, depending on the pivoting angle.

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8.3 Operating currents

8.3.1 General information on determining operating currents

The tables in this chapter list the operating currents of BE.. brakes at different voltages.

The acceleration current I_B (= inrush current) flows only for a short time (approx. 160 ms for BE02 – BE62, 400 ms for BE60 – BE122 with BMP3.1 brake control) when the brake is released. No increased inrush current occurs when using BG.., BS24 or BMS.. brake control and direct DC voltage supply without control unit (only possible with brake size BE02 – BE2).

The values for the holding currents I_H are rms values. Only use current measurement units that are designed to measure rms values.

INFORMATION

The following operating currents and power consumption values are nominal values. They refer to a coil temperature of +20 °C.

Operating currents and power consumption usually decrease during normal operation due to heating of the brake coil.

Note that the actual operating currents can be higher by up to 25% depending on the ambient temperature and with coil temperatures below +20 °C.

8.3.2 Legend

The following tables list the operating currents of the brakes at different voltages.

The following values are specified:

P_B	Nominal value of the electric power consumption in the brake coil in watt.
U_N	Nominal voltage (rated voltage range) of the brake in V (AC or DC).
I_H	Nominal holding current in A (AC). rms value of the braking current in the supply cable to the SEW-EURODRIVE brake control.
I_{DC}	Nominal holding current in A (DC) in the brake cable with direct DC voltage supply or Nominal holding current in A (DC) in the brake cable with DC 24 V supply via BS24, BSG, or BMV.
I_B	Acceleration current in ampere (AC or DC) when operated with SEW brake control for high-speed excitation.
I_B/I_H	Inrush current ratio ESV.
I_B/I_{DC}	Inrush current ratio ESV for DC 24 V supply with BSG or BMV.

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8.3.3 BE02, BE03, BE05, BE1, BE2 brakes

	BE02	BE03	BE05, BE1	BE2
Nominal power brake coil in W	25	25	30	41
Inrush current ratio ESV	4	4	4	4

Nominal voltage (rated voltage range) V_N		BE02		BE03		BE05, BE1		BE2	
		I_H	I_{DC}	I_H	I_{DC}	I_H	I_{DC}	I_H	I_{DC}
AC V	DC V	AC A	DC A	AC A	DC A	AC A	DC A	AC A	DC A
24 (23 – 26)	10	–	–	2.18	2.83	2.25	2.90	2.95	3.80
60 (57 – 63)	24	–	0.72	0.8	1.08	0.90	1.17	1.18	1.53
120 (111 – 123)	48	–	–	0.41	0.54	0.45	0.59	0.59	0.77
184 (174 – 193)	80	–	–	0.27	0.35	0.29	0.37	0.38	0.49
208 (194 – 217)	90	–	–	0.24	0.31	0.26	0.33	0.34	0.43
230 (218 – 243)	96	0.14	0.18	0.22	0.28	0.23	0.30	0.30	0.39
254 (244 – 273)	110	–	–	0.20	0.26	0.20	0.27	0.27	0.35
290 (274 – 306)	125	–	–	0.18	0.23	0.18	0.24	0.24	0.31
330 (307 – 343)	140	–	–	0.16	0.20	0.16	0.21	0.21	0.28
360 (344 – 379)	160	–	–	0.13	0.18	0.14	0.19	0.19	0.25
400 (380 – 431)	180	0.08	0.10	0.11	0.15	0.13	0.17	0.17	0.22
460 (432 – 484)	200	0.07	0.09	0.10	0.13	0.11	0.15	0.15	0.19
500 (485 – 542)	220	–	–	0.09	0.12	0.10	0.13	0.14	0.18
575 (543 – 600)	250	–	–	0.08	0.11	0.09	0.12	0.12	0.16

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8.3.4 Brakes BE5, BE11, BE20, BE30, BE32, BE60, BE62

	BE5	BE11	BE20	BE30, BE32	BE60, BE62
Nominal power brake coil in W	50	70	95	120	195
Inrush current ratio ESV	5.9	6.6	7.5	8.5	9.2

Nominal voltage (rated voltage range) V_N		BE5	BE11	BE20	BE30, BE32	BE60, BE62
		I_H	I_H	I_H	I_H	I_H
AC V	DC V	AC A	AC A	AC A	AC A	AC A
60 (57 – 63)	24	1.28	2.05	2.55	–	–
120 (111 – 123)	–	0.64	1.04	1.28	1.66	–
184 (174 – 193)	–	0.41	0.66	0.81	1.05	–
208 (194 – 217)	–	0.37	0.59	0.72	0.94	1.50
230 (218 – 243)	–	0.33	0.52	0.65	0.84	1.35
254 (244 – 273)	–	0.29	0.47	0.58	0.75	1.20
290 (274 – 306)	–	0.26	0.42	0.51	0.67	1.12
330 (307 – 343)	–	0.23	0.37	0.46	0.59	0.97
360 (344 – 379)	–	0.21	0.33	0.41	0.53	0.86
400 (380 – 431)	–	0.18	0.30	0.37	0.47	0.77
460 (432 – 484)	–	0.16	0.27	0.33	0.42	0.68
500 (485 – 542)	–	0.15	0.24	0.29	0.38	0.60
575 (543 – 600)	–	0.13	0.22	0.26	0.34	0.54

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8.3.5 Brake BE120, BE122

	BE120, BE122
Nominal power brake coil in W	220
Inrush current ratio ESV	6

Nominal voltage (rated voltage range) V_N	BE120, BE122
	I_H
AC V	AC A
230 (218 – 243)	1.45
254 (244 – 273)	1.30
290 (274 – 306)	1.16
360 (344 – 379)	0.92
400 (380 – 431)	0.82
460 (432 – 484)	0.73
500 (485 – 542)	0.65
575 (543 – 600)	0.58

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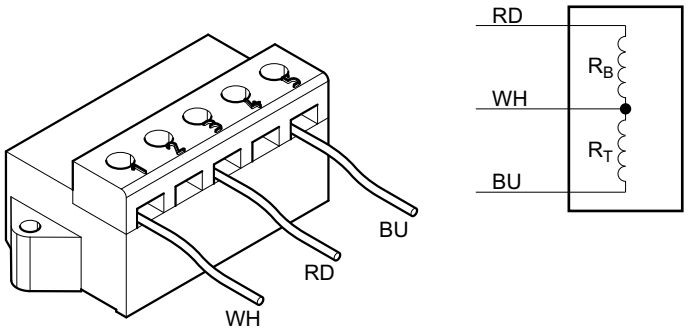
8.4 Resistors

The depicted values apply to the standard temperature range of -20 to +40 °C. Deviating resistances may occur in other temperature ranges, especially in case of drives with permitted temperature above +60 °C, or in case of non-ventilated drives, due to modified winding configurations. The values are available from SEW-EURODRIVE on request.

8.4.1 Resistance measurement BE02, BE03, BE05, BE1, BE2, BE5, BE30, BE32, BE60, BE62

Cut-off in the AC circuit

The following illustration shows how to measure resistance with cut-off in the AC circuit.



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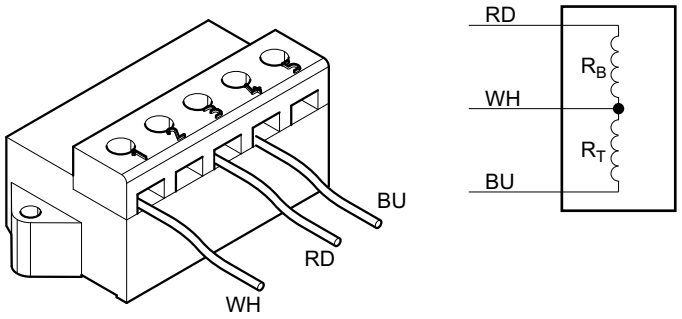
Cut-off in the DC and AC circuits

The following illustration shows how to measure resistance with cut-off in the DC and AC circuits.



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BS	Accelerator coil	RD	Red
TS	Coil section	WH	White
R_B	Accelerator coil resistance at 20 °C in Ω	BU	Blue
R_T	Coil section resistance at 20 °C in Ω		
U_N	Nominal voltage (rated voltage range)		

INFORMATION

When measuring the resistance of the coil section (R_{Sec}) or the acceleration coil (R_{Acc}), remove the white conductor from the brake rectifier; if it remains connected, the internal resistance of the brake rectifier will cause erroneous results.

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8.4.2 Brakes BE02, BE03, BE05, BE1, BE2

	BE02	BE03	BE05, BE1	BE2
Nominal power brake coil in W	25	25	32	43
Inrush current ratio ESV	4	4	4	4

Nominal voltage (rated voltage range) V_N		BE02		BE03		BE05, BE1		BE2	
AC V	DC V	R_B	R_T	R_B	R_T	R_B	R_T	R_B	R_T
60 (57 – 63)	24	8.5	24	6	20	4.85	14.8	3.60	11.0
120 (111 – 123)	48	–	–	25	78	19.4	59.0	14.4	44.0
184 (174 – 193)	80	–	–	62	191	48.5	148	36.0	110
208 (194 – 217)	90	–	–	78	241	61.0	187	45.5	139
230 (218 – 243)	96	121	345	96	296	77.0	235	58.0	174
254 (244 – 273)	110	–	–	119	367	97.0	296	72.0	220
290 (274 – 306)	125	–	–	150	462	122	372	91	275
330 (307 – 343)	140	–	–	191	589	154	469	115	350
360 (344 – 379)	160	–	–	247	762	194	590	144	440
400 (380 – 431)	180	375	1070	326	1004	244	743	182	550
460 (432 – 484)	200	580	1650	412	1270	308	935	230	690
500 (485 – 542)	220	–	–	512	1580	387	1178	290	870
575 (543 – 600)	250	–	–	645	1989	488	1483	365	1100

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8.4.3 Brakes BE5, BE11, BE20, BE30, BE32, BE60, BE62

	BE5	BE11	BE20	BE30, BE32	BE60, BE62
Nominal power brake coil in W	49	77	95	120	195
Inrush current ratio ESV	5.9	6.6	7.5	8.5	9.2

Nominal voltage (rated voltage range) V_N	**BE5**		**BE11**		**BE20**		**BE30, BE32**		**BE60, BE62**	
AC V	**R_B**	**R_T**	**R_B**	**R_T**	**R_B**	**R_T**	**R_B**	**R_T**	**R_B**	**R_T**
60 (57 – 63)	2.20	10.5	1.22	7.0	0.9	5.7	–	–	–	–
120 (111 – 123)	8.70	42.0	4.90	28.0	3.4	22.8	2.3	17.2	–	–
184 (174 – 193)	22.0	105	12.3	70	8.5	57.2	5.8	43.2	–	–
208 (194 – 217)	27.5	132	15.5	88	10.7	72.0	7.3	54.4	4.0	32.6
230 (218 – 243)	34.5	166	19.5	111	13.5	90.6	9.2	68.5	5.0	41.0
254 (244 – 273)	43.5	210	24.5	139	17.0	114.1	11.6	86.2	6.3	51.6
290 (274 – 306)	55.0	265	31.0	175	21.4	143.6	14.6	108.6	7.9	65.0
330 (307 – 343)	69.0	330	39.0	220	26.9	180.8	18.4	136.7	10.0	81.8
360 (344 – 379)	87.0	420	49	280	33.2	223	23.1	172.1	12.6	103
400 (380 – 431)	110	530	62	350	42.7	287	29.1	216.6	15.8	130
460 (432 – 484)	138	660	78	440	53.2	357	35.1	261.8	19.9	163
500 (485 – 542)	174	830	98	550	67.7	454	45.2	336.4	25.1	205
575 (543 – 600)	220	1050	123	700	83.5	559	56.3	419.2	31.6	259

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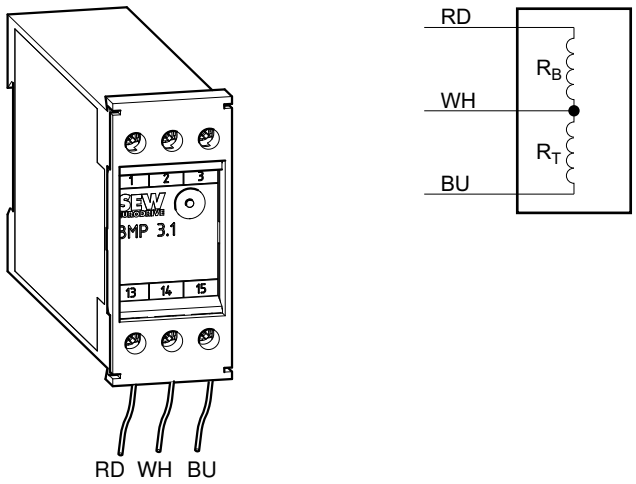
8.4.4 Resistance measurement BE120, BE122

The following illustration shows how to measure resistance with BMP 3.1.



BS	Accelerator coil	RD	Red
TS	Coil section	WH	White
R_B	Accelerator coil resistance at 20 °C in Ω	BU	Blue
R_T	Coil section resistance at 20 °C in Ω		
V_N	Nominal voltage (rated voltage range)		

INFORMATION

When measuring the resistance of the coil section (R_{Sec}) or the acceleration coil (R_{Acc}), remove the white conductor from the brake rectifier; if it remains connected, the internal resistance of the brake rectifier will cause erroneous results.

8.4.5 Brake BE120, BE122

	BE120, BE122
Nominal power brake coil in W	220
Inrush current ratio ESV	6

Nominal voltage (rated voltage range) V_N	BE120, BE122	
AC V	**R_B**	**R_T**
230 (218 – 243)	7.6	37.9
254 (244 – 273)	9.6	47.7
290 (274 – 306)	12.1	60.1
360 (344 – 379)	19.2	95.2
400 (380 – 431)	24.2	119.9
460 (432 – 484)	30.4	150.9
500 (485 – 542)	38.3	189.9
575 (543 – 600)	48.2	239.1

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8.5 Brake control

The depicted combinations apply to drives in insulation class B or F, and to the standard temperature range of -20 °C to +40 °C.

For the brake control assigned to your drive, refer to the specifications on the motor nameplate.

INFORMATION

The depicted combinations may be limited depending in the present drive configuration (e.g. insulation class H, deviating temperature ranges, etc.). In case of a conversion, check if brake control is permitted for your drive combination. Contact SEW-EURODRIVE if necessary.

8.5.1 Permitted combinations

The table below shows the standard and optional combinations of brakes and brake rectifiers.

		BE02	BE03 with DRN63	BE03	BE05	BE1	BE2
BG..	BG 1.2	X	X	–	–	–	–
	BG 1.4	–	–	X[3]	X[3]	X[3]	X[3]
	Size 1.5	–	–	X[1]	X[1]	X[1]	X[1]
	BG 2.4	X	X	–	–	–	–
	BG 3	–	–	X[2]	X[2]	X[2]	X[2]
BGE..	BGE 1.4	–	–	o	o	o	o
	BGE 1.5	–	–	•	•	•	•
	BGE 3	–	–	•	•	•	•
BS..	BS 24	–	–	X	X	X	X
BMS..	BMS 1.4	o	o	o	o	o	o
	BMS 1.5	•	•	•	•	•	•
	BMS 3	•	•	•	•	•	•
BME..	BME 1.4	o	o	o	o	o	o
	BME 1.5	•	•	•	•	•	•
	BME 3	•	•	•	•	•	•
BMH..	BMH 1.4	o	o	o	o	o	o
	BMH 1.5	•	•	•	•	•	•
	BMH 3	•	•	•	•	•	•
BMK..	BMK 1.4	o	o	o	o	o	o
	BMK 1.5	•	•	•	•	•	•
	BMK 3	•	•	•	•	•	•
BMKB..	BMKB 1.5	•	•	•	•	•	•
BMP..	BMP 1.4	o	o	o	o	o	o
	BMP 1.5	•	•	•	•	•	•
	BMP 3	•	•	•	•	•	•
	BMP 3.1	–	–	–	–	–	–
BMV..	BMV 5	•	•	•	•	•	•
BSG..	BSG	–	–	•	•	•	•

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		BE02	BE03 with DRN63	BE03	BE05	BE1	BE2
BSR..	BG 1.2 + SR10	•	•	–	–	–	–
	BG 2.4 + SR10	•	•	–	–	–	–
	BGE1.5 + SR10	–	–	•	•	•	–
	BGE 1.4 + SR 15	–	–	o	o	o	o
	BGE 3 + SR 11	–	–	•	•	•	•
	BGE 3 + SR 15	–	–	•	•	•	•
	BGE3 + SR10	–	–	•	•	•	–
	BGE 1.5 + SR 11	–	–	•	•	•	•
	BGE 1.5 + SR 15	–	–	•	•	•	•
BUR..	BG 1.2 + UR10	•	•	–	–	–	–
	BG 2.4 + UR10	•	•	–	–	–	–
	BGE 3 + UR 11	–	–	•	•	•	•
	BGE 1.5 + UR 15	–	–	•	•	•	•
BST..	BST 0.6S	•	•	•	•	•	•
	BST 0.7S	•	•	•	•	•	•
	BST 1.2S	•	•	•	•	•	•
		BE5	**BE11**	**BE20**	**BE30, BE32**	**BE60, BE62**	**BE120, BE122**
BG..	BG 1.2	–	–	–	–	–	–
	BG 1.4	–	–	–	–	–	–
	Size 1.5	–	–	–	–	–	–
	BG 2.4	–	–	–	–	–	–
	BG 3	–	–	–	–	–	–
BGE..	BGE 1.4	X[3]	X[3]	X[3]	X[3]	X[3]	–
	BGE 1.5	X[1]	X[1]	X[1]	X[1]	X	–
	BGE 3	X[2]	X[2]	X[2]	X[2]	X	–
BS..	BS 24	–	–	–	–	–	–
BMS..	BMS 1.4	–	–	–	–	–	–
	BMS 1.5	–	–	–	–	–	–
	BMS 3	–	–	–	–	–	–
BME..	BME 1.4	o	o	o	o	o	–
	BME 1.5	•	•	•	•	X	–
	BME 3	•	•	•	•	X	–
BMH..	BMH 1.4	o	o	o	o	–	–
	BMH 1.5	•	•	•	•	–	–
	BMH 3	•	•	•	•	–	–
BMK..	BMK 1.4	o	o	o	o	–	–
	BMK 1.5	•	•	•	•	–	–
	BMK 3	•	•	•	•	–	–
BMKB..	BMKB 1.5	•	•	•	•	–	–
BMP..	BMP 1.4	o	o	o	o	–	–
	BMP 1.5	•	•	•	•	–	–
	BMP 3	•	•	•	•	–	–
	BMP 3.1	–	–	–	–	•	X
BMV..	BMV 5	•	•	•	–	–	–
BSG..	BSG	X	X	X	–	–	–

		BE5	BE11	BE20	BE30, BE32	BE60, BE62	BE120, BE122
BSR..	BG 1.2 + SR10	–	–	–	–	–	–
	BG 2.4 + SR10	–	–	–	–	–	–
	BGE1.5 + SR10	–	–	–	–	–	–
	BGE 1.4 + SR 15	o	o	o	o	–	–
	BGE 3 + SR 11	•	•	–	–	–	–
	BGE 3 + SR 15	•	•	•	•	–	–
	BGE3 + SR10	–	–	–	–	–	–
	BGE 1.5 + SR 11	•	•	–	–	–	–
	BGE 1.5 + SR 15	•	•	•	•	–	–
BUR..	BG 1.2 + UR10	–	–	–	–	–	–
	BG 2.4 + UR10	–	–	–	–	–	–
	BGE 3 + UR 11	•	–	–	–	–	–
	BGE 1.5 + UR 15	•	•	•	•	–	–
BST..	BST 0.6S	•	•	•	•	–	–
	BST 0.7S	•	•	•	•	–	–
	BST 1.2S	•	•	•	•	–	–

X Standard version

X^1 Standard design with nominal brake voltage of 150 – 500 V_{AC}

X^2 Standard design with nominal brake voltage of 24/42 – 150 V_{AC}

X^3 Standard design with nominal brake voltage of 575 V_{AC}

• Can be selected

o Optional with AC 575 V nominal brake voltage

– Not permitted

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8.5.2 Motor terminal box

The following table shows the technical data of the brake controls for installation in the terminal box. The different housings have different colors (= color code) to make them easier to distinguish.

BG..

Half-wave rectifier without electronic switching.

Type	Nominal voltage	Nominal output current I_L	Part number	Color code
BG1.4	AC 230 – 575 V	DC 1.0 A	08278814	Jet black
BG1.2	AC 90 – 500 V	DC 1.2 A	08269920	Jet black
BG1.5	AC 150 – 500 V	DC 1.5 A	08253846	Jet black
BG2.4	AC 24 – 90 V	DC 2.4 A	08270198	Mahogany brown
BG3	AC 24 – 500 V	DC 2.8 A	08253862	Mahogany brown

BGE..

Half-wave rectifier with electronic switching.

Type	Nominal voltage	Nominal output current I_L	Part number	Color code
BGE1.4	AC 230 – 575 V	DC 1.0 A	08278822	Vermilion
BGE1.5	AC 150 – 500 V	DC 1.5 A	08253854	Vermilion
BGE3	AC 42 – 150 V	DC 2.8 A	08253870	Light blue

BSR..

Half-wave rectifier + current relay for switch-off in the DC circuit.

Type	Nominal voltage	Nominal output current I_L	Part number	Color code
BGE1.5 + SR10	AC 150 – 500 V	DC 1.0 A	08253854 0826760X	Jet black Gray
BGE1.5 + SR11	AC 150 – 500 V	DC 1.0 A	08253854 08267618	Jet black Gray
BGE1.5 + SR15	AC 150 – 500 V	DC 1.0 A	08253854 08267626	Jet black Gray
BG1.2 + SR10	AC 90 – 500 V	DC 1.0 A	08269920 0826760X	Jet black Gray
BG1.2 + SR11	AC 90 – 500 V	DC 1.0 A	08269920 08267618	Jet black Gray

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Type	Nominal voltage	Nominal output current I_L	Part number	Color code
BG2.4 + SR10	AC 42 – 90 V	DC 1.0 A	08270198 0826760X	Mahogany brown Gray
BGE3 + SR11	AC 42 – 150 V	DC 1.0 A	20253870 08267618	Mahogany brown Gray
BGE3 + SR15	AC 42 – 150 V	DC 1.0 A	08253870 08267626	Mahogany brown Gray

BUR..

Half-wave rectifier with voltage relay for switch-off in the DC circuit.

Type	Nominal voltage	Nominal output current I_L	Part number	Color code
BG1.2 + UR15	AC 150 – 500 V	DC 1.0 A	08269920 0826760X	Jet black Gray
BGE1.5 + UR15	AC 150 – 500 V	DC 1.0 A	08253854 08267596	Vermilion Gray
BG2.4 + UR11	AC 42 – 150 V	DC 1.0 A	08270198 08267588	Mahogany brown Gray
BGE3 + UR11	AC 42 – 150 V	DC 1.0 A	08253870 08267588	Light blue Gray

BS24

Varistor overvoltage protection.

Type	Nominal voltage	Nominal output current I_L	Part number	Color code
BS24	DC 24 V	DC 5.0 A	08267634	Water blue

BSG..

Electronic switching.

Type	Nominal voltage	Nominal output current I_L	Part number	Color code
BSG	DC 24 V	DC 5.0 A	08254591	Pure white

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BMP..

Half-wave rectifier with electronic switching and integrated voltage relay for cut-off in the DC circuit.

Type	Nominal voltage	Nominal output current I_L	Part number	Color code
BMP3.1[1)]	AC 230 – 575 V	DC 2.8 A	08295077	–

1) Only sizes 250 – 315

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8.5.3 Control cabinet

The following tables list the technical data of brake control systems for installation in the control cabinet. The different housings have different colors (= color code) to make them easier to distinguish.

BMS..

Half-wave rectifier without electronic switching.

Type	Nominal voltage	Nominal output current I_L	Part number	Color code
BMS1.4	AC 230 – 575 V	DC 1.0 A	08298300	Tar black
BMS1.5	AC 150 – 500 V	DC 1.5 A	08258023	Tar black
BMS3	AC 42 – 150 V	DC 3.0 A	08258031	Mahogany brown

BME..

Half-wave rectifier with electronic switching.

Type	Nominal voltage	Nominal output current I_L	Part number	Color code
BME1.4	AC 230 – 575 V	DC 1.0 A	08298319	Vermilion
BME1.5	AC 150 – 500 V	DC 1.5 A	08257221	Vermilion
BME3	AC 42 – 150 V	DC 3.0 A	0825723X	Light blue

BMH..

Half-wave rectifier with electronic switching and heating function

Type	Nominal voltage	Nominal output current I_L	Part number	Color code
BMH1.4	AC 230 – 575 V	DC 1.0 A	08298343	Signal green
BMH1.5	AC 150 – 500 V	DC 1.5 A	0825818X	Signal green
BMH3	AC 42 – 150 V	DC 3.0 A	08258198	Zinc yellow

BMP..

Half-wave rectifier with electronic switching and integrated voltage relay for cut-off in the DC circuit.

Type	Nominal voltage	Nominal output current I_L	Part number	Color code
BMP1.4	AC 230 – 575 V	DC 1.0 A	08298327	Light gray
BMP1.5	AC 150 – 500 V	DC 1.5 A	08256853	Light gray
BMP3	AC 42 – 150 V	DC 3.0 A	08265666	Light green

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Type	Nominal voltage	Nominal output current I_L	Part number	Color code
BMP3.1	AC 230 – 575 V	DC 2.8 A	08295077	–

BMK..

Half-wave rectifier with electronic switching, DC 24 V control input, and cut-off in the DC circuit.

Type	Nominal voltage	Nominal output current I_L	Part number	Color code
BMK1.4	AC 230 – 575 V	DC 1.0 A	08298335	Water blue
BMK1.5	AC 150 – 500 V	DC 1.5 A	08264635	Water blue
BMK3	AC 42 – 150 V	DC 3.0 A	08265674	Light pink

BMKB..

Half-wave rectifier with electronic switching, DC 24 V control input, rapid cut-off and LED status display.

Type	Nominal voltage	Nominal output current I_L	Part number	Color code
BMKB1.5	AC 150 – 500 V	DC 1.5 A	08281602	Water blue

BMV..

Brake control unit with electronic switching, DC 24 V control input and fast cut-off.

Type	Nominal voltage	Nominal output current I_L	Part number	Color code
BMV5	DC 24 V	DC 5.0 A	13000063	Pure white

BST..

Safe brake control with electronic switching, DC 24 V control input and safe DC 24 V control input. Supply via the DC link of the inverter.

Type	Nominal voltage	Nominal output current I_L	Part number	Color code
BST0.6S	AC 460 V	DC 0.6 A	08299714	–
BST0.7S	AC 400 V	DC 0.7 A	13000772	–
BST1.2S	AC 230 V	DC 1.2 A	13001337	–

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8.6 Permitted rolling bearings

8.6.1 Rolling bearing for DR..71 – 280 motors

Motors	A-side bearing		B-side bearing	
	AC motor	Gearmotor	AC motor	Brakemotor
DR..71	6204-2Z-C3	6303-2Z-C3	6203-2Z-C3	6203-2RS-C3
DR..80	6205-2Z-C3	6304-2Z-C3	6304-2Z-C3	6304-2RS-C3
DR..90 – 100	6306-2Z-C3		6205-2Z-C3	6205-2RS-C3
DR..112 – 132	6308-2Z-C3		6207-2Z-C3	6207-2RS-C3
DR..160	6309-2Z-C3		6209-2Z-C3	6209-2RS-C3
DR..180	6312-2Z-C3		6213-2Z-C3	6213-2RS-C3
DR..200 – 225	6314-2Z-C3		6314-2Z-C3	6314-2RS-C3
DR..250 – 280	6317-2Z-C4		6315-2Z-C3	6315-2RS-C3

8.6.2 Rolling bearings for DRN63 – 280, DR2..56 – 80 motors

Motors	A-side bearing		B-side bearing	
	AC motor	Gearmotor	AC motor	Brakemotor
DR2..56	–	6302-2Z-C3	6002-2Z-C3	6002-2RS-C3
DRN63 **DR2..63**	6202-2Z-C3	6303-2Z-C3	6203-2Z-C3	6203-2Z-C3
DRN71 **DR2..71**	6204-2Z-C3		6203-2Z-C3	
DRN80 **DR2..80**	6205-2Z-C3	6304-2Z-C3	6304-2Z-C3	6304-2RS-C3
DRN90	6305-2Z-C3		6205-2Z-C3	6205-2RS-C3
DRN100	6306-2Z-C3		6205-2Z-C3	6205-2RS-C3
DRN112	6308-2Z-C3		6207-2Z-C3	6207-2RS-C3
DRN132S	6308-2Z-C3	6308-2Z-C3	6207-2Z-C3	6207-2RS-C3
DRN132M/L	6308-2Z-C3	6309-2Z-C3	6209-2Z-C3	6209-2RS-C3
DRN160	6310-2Z-C3	6312-2Z-C3	6212-2Z-C3	6212-2RS-C3
DRN180	6311-2Z-C3	6312-2Z-C3	6212-2Z-C3	6212-2RS-C3
DRN200	6312-2Z-C3	6314-2Z-C3	6314-2Z-C3	6314-2RS-C3
DRN225	6314-2Z-C3		6314-2Z-C3	6314-2RS-C3
DRN250 – 280	6317-2Z-C4		6315-2Z-C3	

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8.6.3 Rolling bearing for DR..315, DRN315 motors

Motors	A-side bearing		B-side bearing	
	AC motor	Gearmotor	AC motor	Gearmotor
DR..315K, DRN315S	6319-C3	6319-C3	6319-C3	6319-C3
DR..315S, DRN315M				
DR..315M, DRN315L	6319-C3	6322-C3	6319-C3	6322-C3
DR..315L, DRN315H				

8.6.4 Rolling bearing for DR..250 – 315, DRN250 – 315 motors, with reinforced bearings /ERF

Motors	A-side bearing	B-side bearing	
		AC motor	Gearmotor
DR..250 – 280, DRN250 – 280	NU317E-C3	6315-C3	
DR..315K, DRN315S	NU319E	6319-C3	6319-C3
DR..315S, DRN315M			
DR..315M, DRN315L			6322-C3
DR..315L, DRN315H			

8.6.5 Rolling bearing for DR..200 – 315, DRN200 – 315 motors, with current-insulated rolling bearings /NIB

Motors	B-side bearing	
	AC motor	Gearmotor
DR..200 – 225, DRN200 – 225	6314-C3-EI	6314-C3-EI
DR..250 – 280, DRN250 – 280	6315-Z-C3-EI	6315-Z-C3-EI
DR..315K, DRN315S	6319-C3-EI	6319-C3-EI
DR..315S, DRN315M		
DR..315M, DRN315L		6322-C3-EI
DR..315L, DRN315H		

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8.7 Lubricant tables

8.7.1 Lubricant table for rolling bearings

INFORMATION

Use of wrong bearing grease can damage the bearings.

Motors with sealed bearings

The bearings are 2Z or 2RS closed bearings and cannot be relubricated. They are used for DR..71 – 280, DRN63 – 280, DR256 – 80 motors.

	Ambient temperature	Manufacturer	Type	DIN designation
Motor rolling bearings	-20 °C to +80 °C	Mobil	Polyrex EM[1)]	K2P-20
	+20 °C to +100 °C	Klüber	Barrierta L55/2[2)]	KX2U
	-40 °C to +60 °C	Kyodo Yushi	Multemp SRL[2)]	KE2N-40
	-20 °C to +60 °C	SKF	LHT23[2)]	KE2N-40

1) Mineral lubricant (= mineral-based bearing grease)

2) Synthetic lubricant (= synthetic-based bearing grease)

Motors with open bearings

Motors in the sizes DR..315 and DRN315 always have open bearings. If DR..250 – 280 and DRN225 – 280 motors have the relubrication option /NS, these sizes also have open bearings.

	Ambient temperature	Manufacturer	Type	DIN designation
Rolling bearing	-20 °C to +80 °C	Mobil	Polyrex EM[1)]	K2P-20
	-40 °C to +60 °C	SKF	LGHP 2[1)]	K2N-40

1) Mineral lubricant (= mineral-based bearing grease)

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8.7.2 Order information for lubricants, anti-corrosion agents and sealants

Lubricants, anti-corrosion agents, and sealants may be obtained directly from SEW-EURODRIVE using the following order numbers.

Usage	Manufacturer	Type	Quantity	Order number
Lubricant for rolling bearings	Mobil	Polyrex EM	400 g	09101470
	SKF	LGHP2	400 g	09101276
Lubricant for sealing rings				
Material: NBR/FKM	Klüber	Petamo GHY 133N	10 g	04963458
	FUCHS LUBRITECH	Gleitmo 100 S	1 kg	03258092
Material: EPDM/EPP	Klüber	Klübersynth BLR 46-122	10 g	03252663
Corrosion protection and lubricant	SEW-EURODRIVE	NOCO® fluid	5.5 g	09107819
Sealant	Marston Domsel	SEW-L-Spezial	80 g	09112286

8.8 Encoders

8.8.1 Incremental encoder E.7S – sin/cos

Encoder		ES7S	EV7S	EG7S	EH7S
Supply voltage	U_B	DC 7 V – 30 V			
Max. current consumption	I_{in}	140 mA_{RMS}			
Max. pulse frequency	f_{max}	150 kHz			180 kHz
Incremental tracks, periods per revolution	A, B	1024 (10 bits)			
	C	1			
Position resolution, increments per revolution	A, B				
Output amplitude per track	U_{high}	1 V_{PP}			
	U_{low}				
Signal output		sin/cos			
Output current per track	I_{out}	10 mA_{RMS}			
Pulse duty factor according to IEC 60469-1, n = constant		–			
Phase offset A: B n = constant		90° ± 3°			90° ± 10°
Accuracy[1)]		0.0194°	–	0.0194°	–
Vibration resistance according to EN 60088-2-6		≤ 100 m/s^2			
Shock resistance according to EN 60088-2-27		≤ 1000 m/s^2		≤ 2000 m/s^2	
Maximum speed	n_{max}	6000 min^{-1}			
Duration until fault message (disabled outputs)[2)]		25 ms	–	25 ms	–
Activation time of rotary encoder internal diagnostics after switching on		–			
Degree of protection in accordance with EN 60529		IP66			IP65
Connection		Terminal box on incremental encoder			12-pin plug connector
Ambient temperature	°C	-30 to +60	-30 to +80	-30 to +60	-40 to +60

1) Due to the stiffness of the torque arm, you have to take into account an automatically resetting ±0.6° twist (depending of the direction of rotation) of the encoder housing compared to the encoder shaft.

2) Sin/cos encoders have a self-diagnostics function. If an error is detected, the sensor reports it by deactivating the output signals to the encoder evaluation unit.

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8.8.2 Incremental encoder E.7R – TTL (RS422), 9 V ≤ U_B ≤ 30 V

Encoder		ES7R	EV7R	EG7R	EH7R
Supply voltage	U_B	DC 7 V – 30 V			DC 10 V – 30 V
Max. current consumption	I_{in}	160 mA_{RMS}			140 mA_{RMS}
Max. pulse frequency	f_{max}	120 kHz			300 kHz
Incremental tracks, periods per revolution	A, B	1024 (10 bits)			
	C	1			
Position resolution, increments per revolution	A, B	4096 (12 bits)			
Output amplitude per track	U_{high}	≥ DC 2.5 V			
	U_{low}	≤ DC 0.5 V			
Signal output		TTL (RS422)			
Output current per track	I_{out}	25 mA_{RMS}			20 mA_{RMS}
Pulse duty factor according to IEC 60469-1, n = constant		50% ± 10%			
Phase offset A: B n = constant		90° ± 20°			
Vibration resistance according to EN 60088-2-6		≤ 100 m/s^2			
Shock resistance according to EN 60088-2-27		≤ 1000 m/s^2		≤ 2000 m/s^2	
Maximum speed	n_{max}	6000 min^{-1}			6000 min^{-1} 2500 min^{-1} at 60 °C
Degree of protection in accordance with EN 60529		IP66			IP65
Connection		Terminal box on incremental encoder			12-pin plug connector
Ambient temperature	°C	-30 to +60	-30 to +60		-40 to +60

8.8.3 Incremental encoder E.7C – HTL

Encoder		ES7C	EV7C	EG7C	EH7C
Supply voltage	U_B	DC 4.75 V – 30 V			DC 10 V – 30 V
Max. current consumption	I_{in}	240 mA_{RMS}			225 mA_{RMS}
Max. pulse frequency	f_{max}	120 kHz			300 kHz
Incremental tracks, periods per revolution	A, B	1024 (10 bits)			
	C	1			
Position resolution, increments per revolution	A, B	4096 (12 bits)			
Output amplitude per track	U_{high}	V_B -2.5 V		V_B -2.5 V	V_B -2 V
	U_{low}	≤ DC 1.1 V			≤ DC 2.5 V
Signal output		HTL/TTL (RS422)		HTL/TTL (RS422)	HTL
Output current per track	I_{out}	60 mA_{RMS}			30 mA_{RMS}
Pulse duty factor according to IEC 60469-1, n = constant		50% ± 10%			50% ± 20%
Phase offset A: B n = constant		90° ± 20°			
Vibration resistance according to EN 60088-2-6		≤ 100 m/s^2			
Shock resistance according to EN 60088-2-27		≤ 1000 m/s^2		≤ 2000 m/s^2	
Maximum speed	n_{max}	6000 min^{-1}			6000 min^{-1} 2500 min^{-1} at 60 °C
Degree of protection in accordance with EN 60529		IP66			IP65
Connection		Terminal box on incremental encoder			12-pin plug connector
Ambient temperature	°C	-30 to +60		-30 to +60	-40 to +60

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8.8.4 Incremental encoder E.7T – TTL (RS422) at U_B = 5 V

Encoder		EH7T
Supply voltage	U_B	DC 5 V
Max. current consumption	I_{in}	140 mA
Max. pulse frequency f_{max}	kHz	300
Incremental tracks, periods per revolution	A, B	1024 (10 bits)
	C	1
Position resolution, increments per revolution	A, B	4096 (12 bits)
Output amplitude	U_{high}	≥ DC 2.5 V
	U_{low}	≤ DC 0.5 V
Signal output		TTL (RS422)
Output current per track	I_{out}	20 mA
Pulse duty factor according to IEC 60469-1, n = constant		50% ± 20%
Phase offset A: B n = constant		90° ± 20°
Vibration resistance according to EN 60088-2-6 at 10 Hz – 2 kHz		≤ 100 m/s^2
Shock resistance according to EN 60088-2-27		≤ 2000 m/s^2
Maximum speed	n_{max}	6000 min^{-1} 2500 min^{-1} at 60 °C
Degree of protection according to EN 60529		IP65
Connection		12-pin plug connector
Ambient temperature	°C	-40 to +60

8.8.5 Incremental encoder E.8.

Encoder		EK8S EV8S 1)	EK8R EV8R 2)	EK8C EV8C
Supply voltage	U_B	DC 7 V – 30 V		DC 4.75 V – 30 V
Supply voltage for functional safety applications	U_{B_FS}	DC 7 V – 30 V	–	
Maximum current consumption, free of load	I_{in}	100 mA (at U_B = 7 V)		
Max. pulse frequency	f_{pulse_max}	150 kHz	120 kHz	
Direction of rotation		A before B when looking at the motor output shaft in clockwise rotation		
Incremental tracks, periods per revolution	A, B	1024 (10 bits)		
	C	1		
Position resolution, increments per revolution	A, B	4096 (12 bits)		
Voltage output signal differential (peak-to-peak) (A' = A - $\overline{A}$; B' = B - $\overline{B}$)	U_{t_diff}	1 V ± 10%	–	
Voltage output signal non-differential (peak-to-peak)	U_t	0.5 V ± 10%	U_{Low} ≤ 0.5 V U_{High} ≥ 2.5 V	U_B ≤ 6 V: U_{Low} ≤ 0.5 V U_{High} ≥ 2.5 V U_B > 6 V: U_{Low} ≤ 3 V U_{High} ≥ U_B - 2.5 V
Signal level output, offset nominal against 0 V (A, B, C, $\overline{A}$, $\overline{B}$, $\overline{C}$)V	U_{t_o}	2.5 V ± 0.3 V	–	
Signal output		sin/cos	TTL (RS422)	HTL
Load resistance/load current differential	R_L/I_L	120 Ω ± 10%		U_B 6 V: 120 Ω ± 10% UB > 6 V: 1 – 3 kΩ
Resistance between tracks and reference ground	R_{gnd}	≥ 1 kΩ	–	
Load capacitance, output	C_o	≤ 20 nF	–	–
Voltage output signal, differential (C' = C - $\overline{C}$) (peak-to-peak)	U_{t_diff} e	0.3 – 1.4 V	–	–
C track offset	g	192 mV ± 5 mV	–	–
Voltage output signal, non-differential (C,$\overline{C}$) (peak-to-peak)	U_{t_C}	–	U_{Low} ≤ 0.5 V U_{High} ≥ 2.5 V	U_B ≤ 6 V: U_{Low} ≤ 0.5 V U_{High} ≥ 2.5 V U_B > 6 V: U_{Low} ≤ 3 V U_{High} ≥ U_B - 2.5 V
Phase angle track C', n = constant	k, l	k = 180° ± 90° l = 180° ± 90°	–	–
Signal width track C	W_C	see figure	90° electrical	
Signal logic track C		see figure	C = log 1, when A = B = log 1	
Pulse duty factor according to IEC 60469-1, n = constant		–	50 % ± 10%	
Phase offset A: B; $\overline{A}$: $\overline{B}$ n = constant	d	90° ± 2°	90° ± 20°	
Accuracy of the incremental section[3)]		0.0194° (70 ")	0.033° (120 ")	
Vibration resistance according to EN 60068-2-6		≤ 10 g (f > 18.5 Hz)		
Shock resistance according to EN 60068-2-27		≤ 100 g (t = 6 ms, 18 pulses)		
Maximum speed	n_{max}	6000 min^{-1}		
Maximum line length		100 m	300 m	100 m

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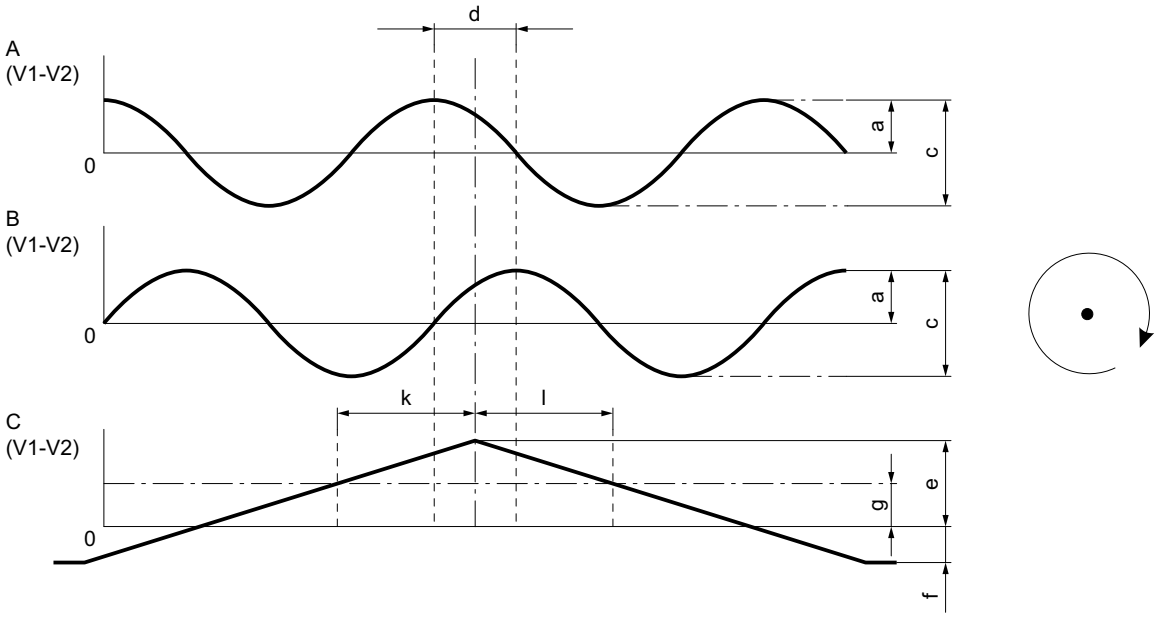
Encoder		EK8S EV8S 1)	EK8R EV8R 2)	EK8C EV8C
Duration until fault message (disabled outputs)[4]		≤ 25 ms	–	
Activation time of rotary encoder internal diagnostics after switching on		≤ 200 ms	–	
Degree of protection in accordance with EN 60529		IP66		
Installation altitude	h	≤ 4000 m above sea level		
Corrosion protection, surface protection		KS, OS1 – OS4, OSG		
Connection		Integrated encoder plug connector on the fan guard (can be pre-assembled and plugged in the field)		
Ambient temperature of motor	T_{amb}	-30 to +60 °C		
Electronic nameplate		RS485 (serial, asynchronous); 1920 bytes	–	–

1) see figure "Sin/cos signals and phase relationship"
2) see figure "HTL/TTL signals and phase relationship"
3) Due to the stiffness of the torque arm, you have to take into account an automatically resetting ±0.6° twist (depending of the direction of rotation) of the encoder housing compared to the encoder shaft.
4) Sin/cos encoders have a self-diagnostics function. If an error is detected, the sensor reports it by deactivating the output signals to the encoder evaluation unit.

Sin/cos signals and phase relationship



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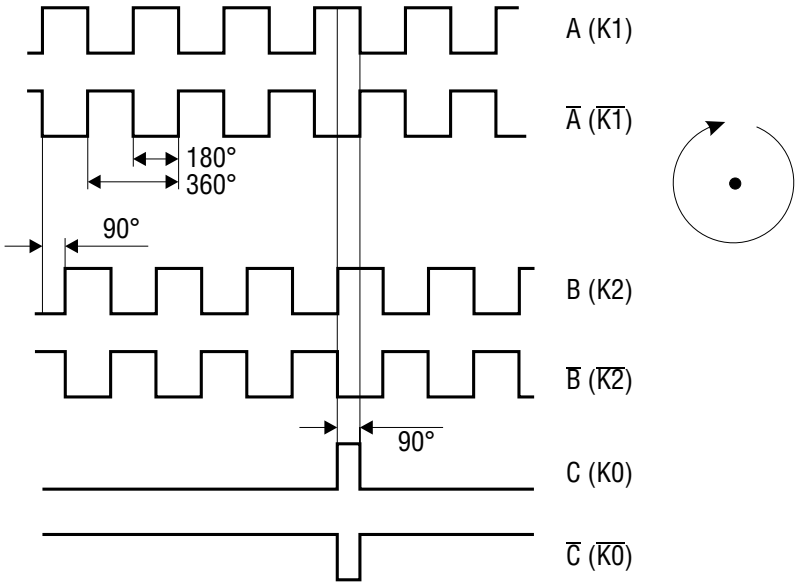
HTL/TTL signals and phase relationship



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8.8.6 Incremental encoder EI.7

Encoder		EI71 EI72 EI76 EI7C	EI8R	EI8C
Supply voltage	U_B	DC 9 V – 30 V	DC 7 V – 30 V	
Supply voltage for FS applications	U_{B_FS}	DC 19.2 V – 30 V	–	
Max. current consumption, free of load	I_{in}	120 mA	100 mA	
Max. pulse frequency	f_{pulse_max}	1.44 kHz	102.4 kHz	
Direction of rotation		A before B when looking at the motor output shaft in clockwise rotation		
Incremental tracks, periods per revolution	A, B	1, 2, 6, 24 (size 63: 24 only) (EI7C FS: 24 only)	1024 (10 bits)	
	C	–	1	
Position resolution, increments per revolution	A, B	4, 8, 24, 96 (size 63: 96 only) (EI7C FS: 96 only)	4096 (12 bits)	
Voltage output signal differential (peak-to-peak) (A' = A - $\overline{A}$; B' = B - $\overline{B}$)	U_{t_diff}	–	–	
Voltage output signal non-differential (peak-to-peak)	U_t	$U_{Low} \le 3$ V $U_{High} \ge U_B - 3.5$ V	$U_{Low} \le 0.5$ V $U_{High} \ge 2.5$ V	$U_{Low} \le 3$ V $U_{High} \ge U_B - 3.5$ V
Signal level output, offset nominal against 0 V (A, B, C, $\overline{A}$, $\overline{B}$, $\overline{C}$)V	U_{t_o}	–	–	
Signal output		HTL	TTL (RS422)	HTL
Load resistance/load current differential	R_L/I_L	60 mA	25 mA	60 mA
Resistance between tracks and reference ground	R_{gnd}	–	–	–
Load capacitance, output	C_o	–	–	–
Voltage output signal, differential (C' = C - $\overline{C}$) (peak-to-peak)	U_{t_diff} e[1)]	–	–	–
C track offset	g[1)]	–	–	–
Voltage output signal, non-differential (C,$\overline{C}$) (peak-to-peak)	U_{t_C}	–	$U_{Low} \le 0.5$ V $U_{High} \ge 2.5$ V	$U_{Low} \le 3$ V $U_{High} \ge U_B - 2.5$ V
Phase angle track C', n = constant	k, l[1)]	–	–	–
Signal width track C	W_C[1)]	–	90° electrical	
Signal logic track C		–	C = log 1 when A = B = log 1	
Pulse duty factor according to IEC 60469-1, n = constant		50 % ± 20%	50 % ± 10%	
Phase offset A: B; $\overline{A}$: $\overline{B}$ n = constant	d[1)]	90° ± 20°	90° ± 20°	
Accuracy of the incremental section		3.75° (225 ")	0.2° (720 ")	
Vibration resistance according to EN 60068-2-6		≤ 10 g (f > 18.5 Hz)		
Shock resistance according to EN 60068-2-27		≤ 100 g (t = 6 ms, 18 pulses)		
Maximum permissible external magnetic field (outer contour of motor)		25 mT/20 kA/m		
Maximum speed	n_{max}	3600 min^{-1}	6000 min^{-1}	
Maximum line length		100 m		
Duration until error message (disabled outputs)		–	–	

Encoder		EI71 EI72 EI76 EI7C	EI8R	EI8C
Activation time of rotary encoder internal diagnostics after switching on		–	–	
Degree of protection in accordance with EN 60529		IP66		
Installation altitude	h	≤ 4000 m above sea level		
Corrosion protection, surface protection		KS, OS1 – OS4, OSG		
Connection		Size 63: M12 (8-pin) Size 71 – 132S: M12 (8- or 4-pin) or connection unit (can be pre-assembled in the field) in a terminal box	M23 or connection unit (can be pre-assembled in the field) in a terminal box	
Ambient temperature of motor	T_{amb}	-30 to +60 °C		
Electronic nameplate		–	–	–
Other technical data		On request		

1) relating to measurements in figure "Sin/cos signals and phase relationship"

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8.8.7 Multi-turn absolute encoder A.7Y – SSI (multi-turn) + sin/cos or TTL (RS422)

Encoder		AS7Y	AV7Y	AG7Y	AH7Y
Supply voltage	U_B	DC 7 V – 30 V			DC 9 V – 30 V
Max. current consumption	I_{in}	140 mA			150 mA
Max. pulse frequency	f_{limit}	200 kHz			120 kHz
Incremental tracks, periods per revolution	A, B	2048 (11 bits)			
	C	–			–
Output amplitude per track	U_{high}	1 V_{PP}			≥ DC 2.5 V_{PP}
	U_{low}				≤ DC 0.5 V_{PP}
Signal output		sin/cos			TTL (RS422)
Output current per track	I_{out}	10 mA			20 mA
Pulse duty factor according to IEC 60469-1, n = constant		–			50 ± 20%
Phase offset A: B n = constant		90° ± 3°			90° ± 20°
Accuracy of the incremental section[1]		0.0194°			–
Accuracy of the absolute section		±1 LSB (Least Significant Bit)			–
Scanning code		Gray code			
Position resolution, increments per revolution	A, B	8192 (13 bits)			
Position resolution of the absolute section, increments per revolution		4096 (12 bits)			
Multi-turn resolution		4096 revolutions (12 bits)			
Data transmission		Synchronous, serial (SSI)			
Serial data output		Driver to EIA RS422			Driver to EIA RS485
Serial pulse input		Recommended receiver to EIA RS422			Optocoupler, recommended driver to EIA RS485
Clock frequency		Permitted range: 100 – 2000 kHz (max. 100 m cable length with 300 kHz)			
Clock-pulse space period		12 – 30 µs			
Vibration resistance according to EN 60088-2-6		≤ 100 m/s^2			
Shock resistance according to EN 60088-2-27		≤ 1000 m/s^2			≤ 2000 m/s^2
Maximum speed	n_{max}	6000 min^{-1}		6000 min^{-1} at T_U to 40 °C 4500 min^{-1} at T_U > 40 °C	3500 min^{-1}
Duration until fault message (disabled outputs)[2]		25 ms + 3/4 revolution			–
Activation time of rotary encoder internal diagnostics after switching on		–			
Degree of protection in accordance with EN 60529		IP66			IP56
Connection		Terminal strip in pluggable connection cover			Terminal strip on encoder
Ambient temperature	°C	-30 to +60			-20 to +40

1) Due to the stiffness of the torque arm, you have to take into account an automatically resetting ±0.6° twist (depending of the direction of rotation) of the encoder housing compared to the encoder shaft.

2) Absolute encoders AS7Y, AV7Y, and AG7Y have a self-diagnostics function. If an error is detected, the sensor reports it by deactivating the output signals to the encoder evaluation unit.

8.8.8 Multi-turn absolute encoder A.7W – RS485 (multi-turn) + sin/cos

Encoder		AS7W	AV7W	AG7W
Supply voltage	U_B	DC 7 V – 30 V		
Max. current consumption	I_{in}	150 mA		
Max. pulse frequency	f_{max}	200 kHz		
Incremental tracks, periods per revolution	A, B	2048 (11 bits)		
	C	–		
Output amplitude per track	U_{high} / U_{low}	1 V_{PP}		
Signal output		sin/cos		
Output current per track	I_{out}	10 mA		
Pulse duty factor according to IEC 60469-1, n = constant		–		
Phase offset A: B n = constant		90° ± 3°		
Accuracy of the incremental section[1)]		0.0194°		
Accuracy of the absolute section		±1 LSB (Least Significant Bit)		
Scanning code		Binary code		
Position resolution, increments per revolution	A, B	8192 (13 bits)		
Multi-turn resolution		65536 revolutions (16 bits)		
Data transmission		RS485		
Serial data output		Driver to EIA RS485		
Serial pulse input		Recommended driver to EIA RS485		
Clock frequency		9600 baud		
Clock-pulse space period		–		
Vibration resistance according to EN 60088-2-6		≤ 100 m/s^2		
Shock resistance according to EN 60088-2-27		≤ 1000 m/s^2		≤ 2000 m/s^2
Maximum speed	n_{max}	6000 min^{-1}	6000 min^{-1} at T_U to 40 °C 4500 min^{-1} at T_U > 40 °C	6000 min^{-1}
Duration until fault message (disabled outputs)[2)]		25 ms + 3/4 revolution		
Activation time of rotary encoder internal diagnostics after switching on		–		
Degree of protection in accordance with EN 60529		IP66		
Connection		Terminal strip in pluggable connection cover		
Ambient temperature	°C	-30 to +60		

1) Due to the stiffness of the torque arm, you have to take into account an automatically resetting ±0.6° twist (depending of the direction of rotation) of the encoder housing compared to the encoder shaft.

2) Absolute encoders AS7W, AV7W, and AG7W have a self-diagnostics function. If an error is detected, the sensor reports it by deactivating the output signals to the encoder evaluation unit.

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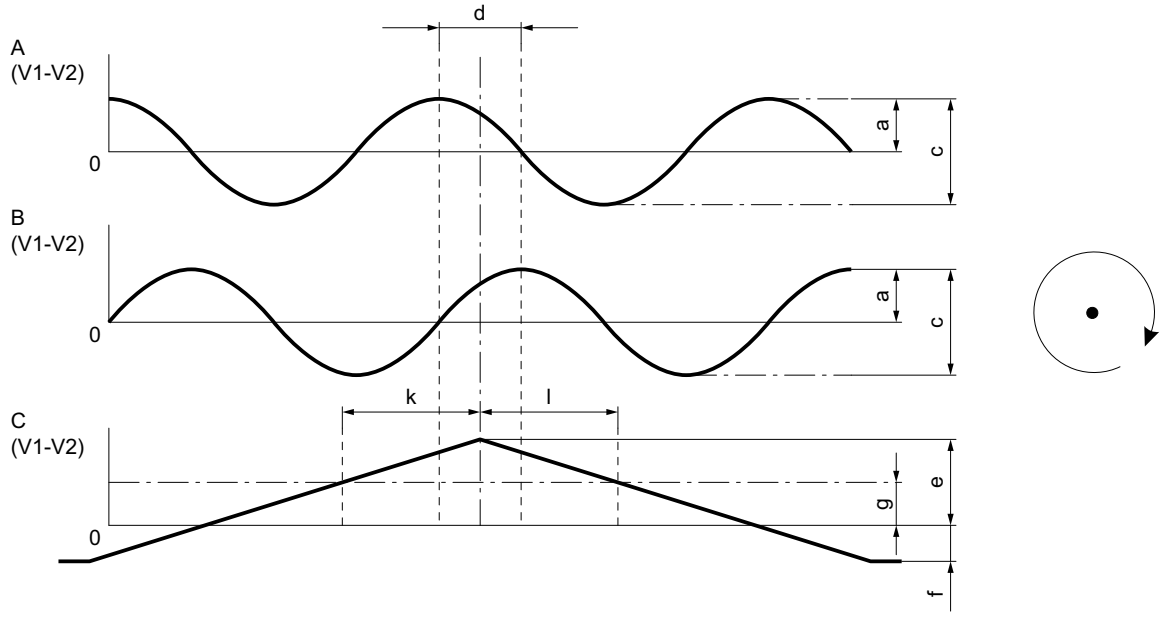
8.8.9 Multi-turn absolute encoder A.8.

Encoder		AK8Y AV8Y 1)	AK8W AV8W 1)	AK8H AV8H 1)2)
Supply voltage	U_B	DC 7 V – 30 V		DC 7 V – 12 V
Supply voltage for FS applications	U_{B_FS}	DC 7 V – 30 V		–
Max. current consumption, free of load	I_{in}	100 mA (at U_B = 7 V)		80 mA
Max. pulse frequency	f_{pulse_max}	200 kHz		
Direction of rotation		A before B when looking at the motor output shaft in clockwise rotation		
Incremental tracks, periods per revolution	A, B	2048 (11 bits)		1024 (10 bits)
	C	–		
Position resolution, increments per revolution	A, B	4096 (12 bits) (SSI, RS422)	65536 (16 bits) (RS485)	32768 (15 bits) HIPERFACE®
Voltage output signal differential (peak-to-peak) (A' = A - $\overline{A}$; B' = B - $\overline{B}$	U_{t_diff}	1 V ± 10%		HIPERFACE®
Voltage output signal non-differential (peak-to-peak)	U_t	0.5 V ± 10%		
Signal level output, offset nominal against 0 V (A, B, C, $\overline{A}$, $\overline{B}$, $\overline{C}$)V	U_{t_o}	2.5 V ± 0.3 V		
Signal output		sin/cos + SSI, RS422	sin/cos + RS485	
Load resistance/load current differential	R_L/I_L	120 Ω ± 10%		
Resistance between track and reference ground	R_{gnd}	≥ 1 kΩ		
Load capacitance, output		≤ 20 nF		
Voltage output signal, differential (C' = C - $\overline{C}$) (peak-to-peak)	U_{t_diff} e	–	–	
C track offset	g	–	–	
Voltage output signal, non-differential (C,$\overline{C}$) (peak-to-peak)	U_{t_C}	–	–	
Phase angle track C', n = constant	k, l	–	–	
Signal width track C	W_C	–	–	–
Signal logic track C		–	–	–
Pulse duty factor according to IEC 60469-1, n = constant		–		–
Phase offset A: B; $\overline{A}$: $\overline{B}$ n = constant		90° ± 2°		HIPERFACE®
Accuracy of the incremental section[3)]		0.0194° (70 ")		± 0.0144° (± 52 ")
Accuracy of the absolute section		±1 LSB (Least Significant Bit)		
Scanning code/counting direction		Gray code, ascending with the direction of rotation specified above	Binary code, ascending with the direction of rotation specified above	–
Multi-turn resolution		4096 revolutions (12 bits)	65536 revolutions (16 bits)	4096 revolutions (12 bits)
Communication, interface		SSI (synchronous, serial)	RS485 (asynchronous, serial)	HIPERFACE®
Communication, modules		Driver to EIA RS422	Driver to EIA RS485	
Clock frequency/bandwidth		100 – 800 kHz (100 m cable length with maximum 300 kHz)	9600 baud	HIPERFACE®
Clock-pulse space period		12 – 30 µs	–	
Vibration resistance according to EN 60068-2-6		≤ 10 g (f > 18.5 Hz)		

Encoder		AK8Y AV8Y 1)	AK8W AV8W 1)	AK8H AV8H 1)2)
Shock resistance according to EN 60068-2-27		≤ 100 g (t = 6 ms, 18 pulses)		
Maximum speed	n_{max}	6000 min^{-1}		
Maximum line length		100 m		
Duration until fault message (disabled outputs)[4]		≤ 25 ms + 3/4 revolution		HIPERFACE®
Activation time of rotary encoder internal diagnostics after switching on		200 ms		HIPERFACE®
Degree of protection in accordance with EN 60529		IP66		
Installation altitude	h	≤ 4000 m above sea level		≤ 2000 m above sea level
Corrosion protection, surface protection		KS, OS1 – OS4, OSG		
Connection		Integrated encoder plug connector on the fan guard (can be pre-assembled and plugged in the field)		
Ambient temperature of motor	T_{amb}	-30 to +60 °C		
Electronic nameplate		–	RS485 (serial, asynchronous); 1920 bytes	HIPERFACE®; 1792 bytes
Other technical data		On request		

1) see figure "Sin/cos signals and phase relationship"
2) Please observe the specification for the HIPERFACE® interface, Sick AG
3) Due to the stiffness of the torque arm, you have to take into account an automatically resetting ±0.6° twist (depending of the direction of rotation) of the encoder housing compared to the encoder shaft.
4) Absolute encoders A.8. and AG7Y have a self-diagnostics function. If an error is detected, the sensor reports it by deactivating the output signals to the encoder evaluation unit.

Sin/cos signals and phase relationship



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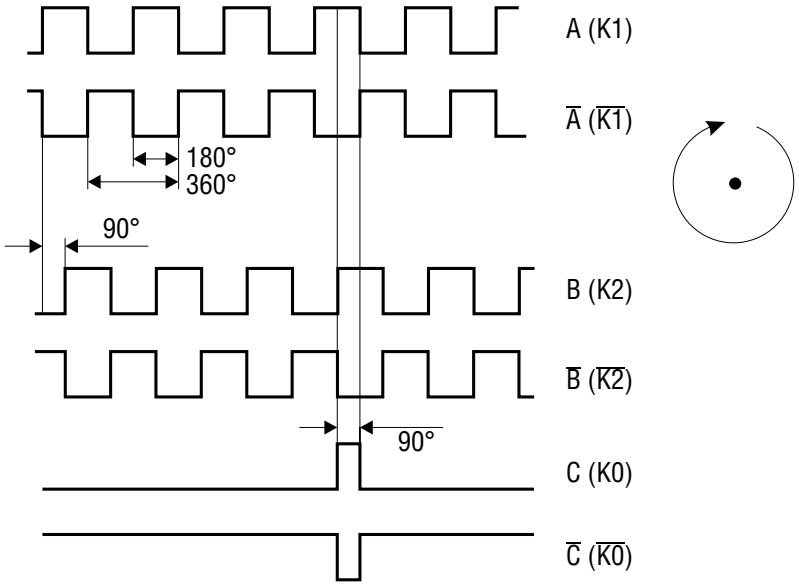
HTL/TTL signals and phase relationship



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8.9 Diagnostic unit /DUE

Sensors		Ø 6 mm	Ø 8 mm
		DUE-d6-00	DUE-d8-00
Measuring range (MB)	mm	1.5	2.0
Protection class		IP66	IP66
Operating temperature (sensor and cable)		-50 to +150 °C	-50 to +150 °C

Evaluation unit			DUE-1K-00
Part number			21195609
Signal outputs (1 channel)			OUT1: 4 – 20 mA FCT1: DC 24 V (150 mA) WEAR1: DC 24 V (150 mA)
Current consumption	Max.	mA	320
	Min.	mA	40
Supply voltage			DC 24 V (±15%)
Electromagnetic compatibility			DIN EN 61800-3
Operating temperature (evaluation unit)			-40 to +105 °C
Humidity			≤ 90% rF
Protection class			IP20 (in the closed terminal box up to IP66)

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8.10 Characteristic safety values

8.10.1 Characteristic safety values for BE.. brakes

The values specified in the following table apply to BE.. brakes in standard applications.

	Characteristic safety values according to EN ISO 13849-1	
Classification	Category B	
System structure	1-channel (Cat. B)	
$MTTF_D$ value	Calculation via B_{10D} value	
B_{10D} value	BE02	1.5×10^6
	BE03	20×10^6
	BE05	16×10^6
	BE1	12×10^6
	BE2	8×10^6
	BE5	6×10^6
	BE11	3×10^6
	BE20	2×10^6
	BE30	1.5×10^6
	BE32	1.5×10^6
	BE60	1×10^6
	BE62	1×10^6
	BE120	0.25×10^6
	BE122	0.25×10^6

SEW-EURODRIVE offers BE.. brakes also as safety brakes up to size BE32. For more information, consult the addendum to the operating instructions "Safety Encoders and Safety Brakes – AC Motors DR.., DRN.., DR2.., EDR.., EDRN.. – Functional Safety".

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8.11 S1 duty cycle DRK.. single-phase motor

The following section describes the data for DRK.. single-phase motor in S1 continuous duty.

The specified starting torques result from the connection of a running capacitor or a running capacitor with start-up capacitor connected in parallel, respectively.

S1 operation at 1500/1800 min^{-1} 230 V)									
							M_A/M_N with C_B	C_A for M_A/M_N	
Motors		P_N	n_N	I_N	cos φ	C_B		100%	150%
	Hz	kW	min^{-1}	A		µF	%	µF	µF
DRK71S4	50	0.18	1450	1.53	0.81	20	50	14	25
	60		1755	1.38	0.87	18	45	14	25
DRK71M4	50	0.25	1455	2.05	0.80	25	45	16	35
	60		1760	1.80	0.89	25	50	14	30
DRK80S4	50	0.37	1420	2.40	0.98	18	50	12	25
	60		1730	2.45	0.94	15	45	12	20
DRK80M4	50	0.55	1430	3.45	0.97	25	50	12	30
	60		1740	3.45	0.94	20	50	12	25
DRK90M4	50	0.75	1430	4.75	0.93	15+15	50	20	40
	60		1740	4.80	0.90	25	50	18	35
DRK90L4	50	1.1	1415	6.6	0.97	20+25	50	30	70
	60		1725	6.8	0.93	15+20	55	30	50

C_B Running capacitor

C_A Start-up capacitor

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9 Malfunctions

9.1 General information

⚠ WARNING

Risk of injury if the drive starts up unintentionally.

Severe or fatal injuries.

- Before you start working on the unit, disconnect the motor and all connected options from the power supply.
- Secure the motor against unintended power-up.

⚠ CAUTION

The surfaces on the drive can be very hot during operation.

Risk of burns.

- Let the motor cool down sufficiently before you start working on it.

NOTICE

Improper troubleshooting measures may damage the drive.

The drive system might be damaged.

- Use only genuine spare parts in accordance with the valid parts list.

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9.2 Motor malfunctions

Fault	Possible cause	Measure
Motor does not start up	Supply cable interrupted	Check the connections and (intermediate) terminal points, correct if necessary
	Brake does not release	See chapter "Brake malfunctions"
	Supply cable fuse has blown	Replace fuse
	Motor protection (switch) has triggered	Check that the motor protection (switch) is set correctly; current specification is on the nameplate
	Motor protection does not trip	Check motor protection control
	Error in control or in the control process	Observe the switching sequence; correct if necessary
Motor only starts with difficulty or does not start at all	Motor power designed for delta connection but connected in star	Correct the connection from star to delta; Observe wiring diagram
	Motor power designed for star-star connection but only connected in star	Correct the connection from star to star-star; Observe wiring diagram
	Voltage or frequency differs considerably from the setpoint, at least when switching on the motor	Provide better power supply system; reduce the power supply load; Check cross section of supply cable, replace with cable of larger cross section if necessary
Motor does not start in star connection, only in delta connection	Star connection does not provide sufficient torque	If the delta inrush current is not too high (observe the regulations of the power supplier), start up directly in delta; Check the project planning and use a larger motor or special design if necessary. Contact SEW-EURODRIVE.
	Contact fault on star/delta switch	Check the switch, replace if necessary; Check the connections
Incorrect direction of rotation	Motor connected incorrectly	Swap 2 phases of the motor supply cable
Motor hums and has high current consumption	Brake does not release	See chapter "Brake malfunctions"
	Winding defective	Send motor to specialist workshop for repair
	Rotor rubbing	Send motor to specialist workshop for repair
Fuses blow or motor protection trips immediately	Short circuit in the motor supply cable	Eliminate short circuit
	Supply cables connected incorrectly	Correct the connection; Observe wiring diagram
	Short circuit in the motor	Send motor to specialist workshop for repair
	Ground fault on motor	Send motor to specialist workshop for repair

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Fault	Possible cause	Measure
Severe speed loss under load	Motor overload	Measure power, check project planning and use larger motor or reduce load if necessary
	Voltage drops	Check cross section of supply cable, replace with cable of larger cross section if necessary
Motor heats up excessively (measure temperature)	Overload	Measure power, check project planning and use larger motor or reduce load if necessary
	Insufficient cooling	Provide a cooling air supply or clear cooling air passages, retrofit forced cooling fan if necessary. Check the air filter, clean or replace if necessary
	Ambient temperature too high	Observe the permitted temperature range, reduce the load if necessary
	Motor in delta connection instead of star connection as intended	Correct the wiring, observe the wiring diagram
	Loose contact in supply cable (one phase missing)	Tighten loose contact, check connections, observe wiring diagram
	Fuse defective	Look for and rectify cause; replace fuse
	Line voltage deviates from the rated motor voltage by more than 5% (range A) / 10% (range B)	Adjust motor to line voltage
	Operating mode (S1 to S10, DIN 57530) exceeded, e.g. caused by excessive switching frequency	Adjust the operating mode of the motor to the required operating conditions; consult a professional to determine the proper drive, if necessary
Loud noises	Ball bearing compressed, dirty or damaged	Realign motor and the driven machine, inspect rolling bearing and replace if necessary.
	Vibration of rotating parts	Look for the cause, possibly an imbalance; correct the cause, observe method for balancing
	Foreign bodies in cooling air ducts	Clean cooling air ducts
	For DR.. motors with rotor designation "J": Load too high	Reduce the load

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9.3 Brake malfunctions

Fault	Possible cause	Measure
Brake does not release	Incorrect voltage on brake control unit	Apply the correct voltage; brake voltage specified on the nameplate.
	Brake control unit failed	Renew brake control, check resistors and isolation of the brake coils. Check switchgear, replace if necessary.
	Maximum permitted working air gap exceeded because brake lining worn down.	Measure and set working air gap. If the brake disk is too thin, replace the brake disk.
	Voltage drop along supply cable > 10%	Provide correct connection voltage: brake voltage specifications on the nameplate. Check the cross section of the brake supply cable, increase cross section if necessary.
	Inadequate cooling, brake overheating	Provide for cooling air supply or clear cooling air passages, check air filter, clean or replace if necessary. Replace type BG brake rectifier with type BGE.
	Brake coil has interturn short circuit or a short circuit to frame	Check resistors and isolation of the brake coils; Replace complete brake and brake control (specialist workshop); Check switchgear, replace if necessary.
	Rectifier defective	Replace rectifier and brake coil; it may be more economical to replace the complete brake.
Brake does not brake	Working air gap not correct	Measure and set working air gap. If the brake disk is too thin, replace the brake disk.
	Brake lining worn	Replace entire brake lining carrier.
	Incorrect braking torque	Check the dimensioning and, if necessary, change braking torque by type and number of brake springs, or by selecting a different brake.
Brake does not brake	Working air gap so large that setting nuts for the manual release come into contact	Set the working air gap.
	Manual brake release device not set correctly	Set the setting nuts for the manual release correctly.
	Brake locked by manual brake release HF	Loosen the set screw, remove if needed.
Brake is applied with time lag	Brake is switched only on AC voltage side	Switch both the DC and AC circuits (e.g. by retrofitting a SR current relay to BSR or a UR voltage relay to BUR); Observe wiring diagram.

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Fault	Possible cause	Measure
Noises in vicinity of brake	Gearing wear on the brake disk or the driver caused by jerky start-up	Check the project planning, replace the brake disk if necessary. Have a specialist workshop replace the carrier.
	Alternating torques due to incorrectly set inverter	Check correct setting of inverter according to its operating instructions, correct if necessary.

9.4 Malfunctions when operated with a frequency inverter

The symptoms described in chapter "Motor malfunctions" (→ 🗎 264) can also occur when the motor is operated with a frequency inverter. Refer to the frequency inverter operating instructions for the meaning of the problems that occur and to find information about rectifying the problems.

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9.5 Disposal

Dispose of the motors in accordance with the material structure and the regulations in force:

- Iron
- Aluminum
- Copper
- Plastics
- Electronic parts
- Oil and grease (not mixed with solvents)

9.6 Customer service

Have the following information available if you require customer service assistance:

- Nameplate data (complete)
- Nature and extent of the problem
- Time the failure occurred and any accompanying circumstances
- Assumed cause
- Ambient conditions e.g.:
  - Ambient temperature
  - Humidity
  - Installation altitude
  - Dirt
  - etc.

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10 Appendix

10.1 Wiring diagrams

INFORMATION

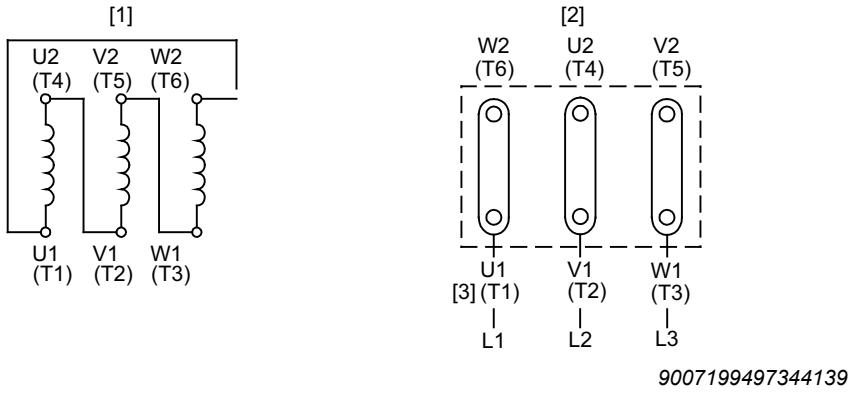
The motor should be connected as shown in the connection wiring diagram or the terminal assignment diagram, which are supplied with the motor. The following section only shows a selection of the common types of connections. You can obtain the relevant wiring diagrams free of charge from SEW-EURODRIVE.

10.1.1 Delta and star connection in wiring diagram R13 (68001 xx 06)

For all motors with one speed, direct on-line, or ⅄/△ start-up.

Delta connection

The following illustration shows the △ connection for lower voltage.

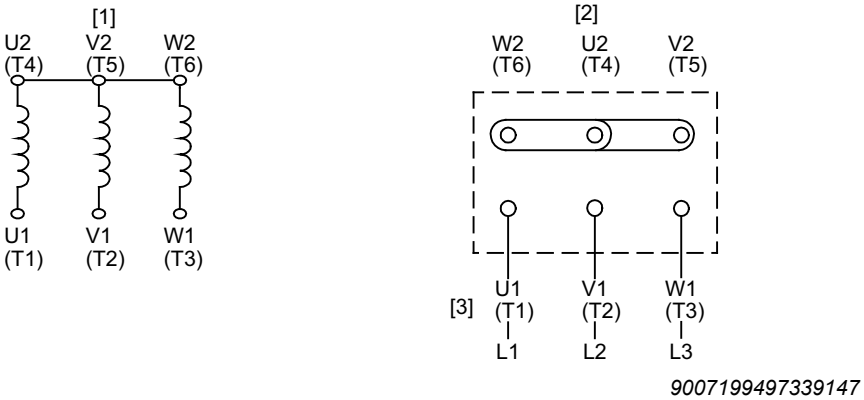


9007199497344139

[1] Motor winding
[2] Motor terminal board
[3] Supply cables

Star connection

The following illustration shows the ⅄ connection for high voltage.



9007199497339147

[1] Motor winding
[2] Motor terminal board
[3] Supply cables

Proceed as follows to reverse the direction of rotation:

1. Swap the supply cables L1 – L2.

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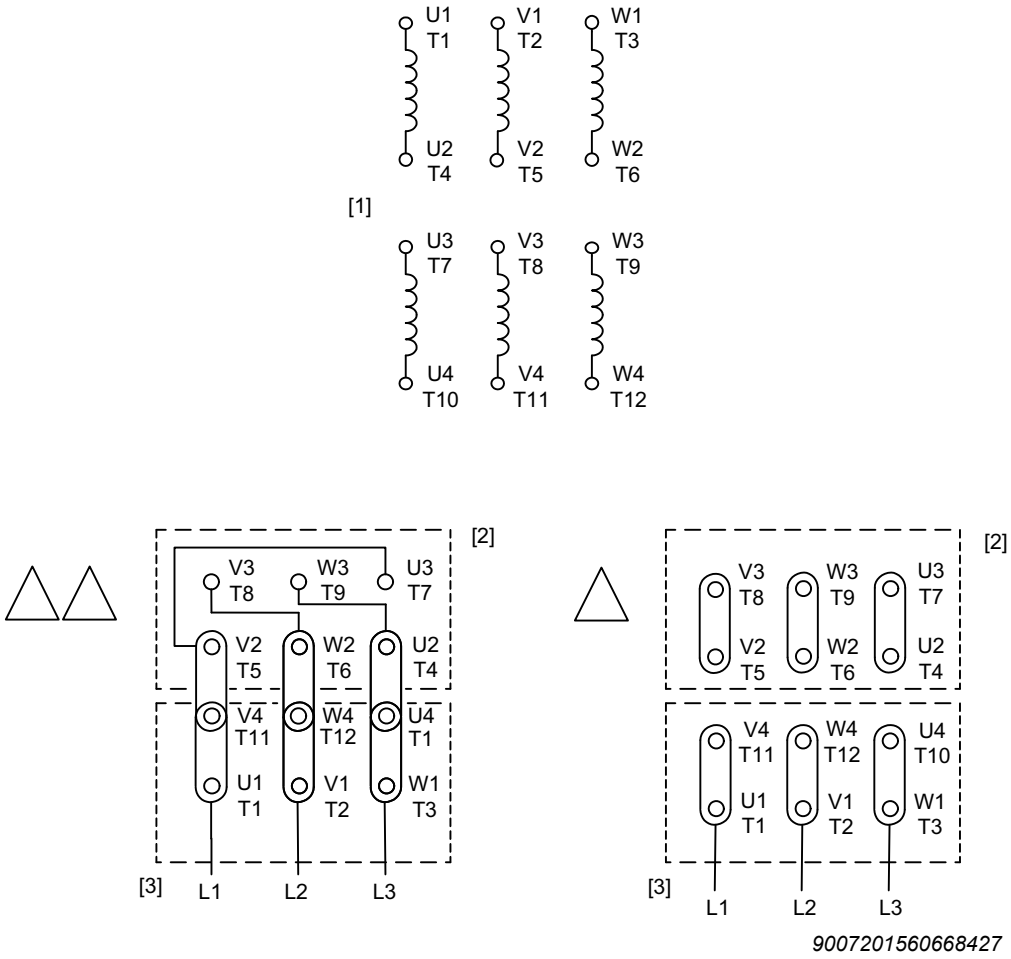
10.1.2 Delta connection with wiring diagram R72 (68192 xx 09)

For all motors with one speed and direct power-on.

Delta connection, Double-delta connection

The following figure shows the △ connection for high voltages and the △△ connection for lower voltages.



[1] Motor winding
[2] Motor terminal board
[3] Supply cables

Proceed as follows to reverse the direction of rotation:

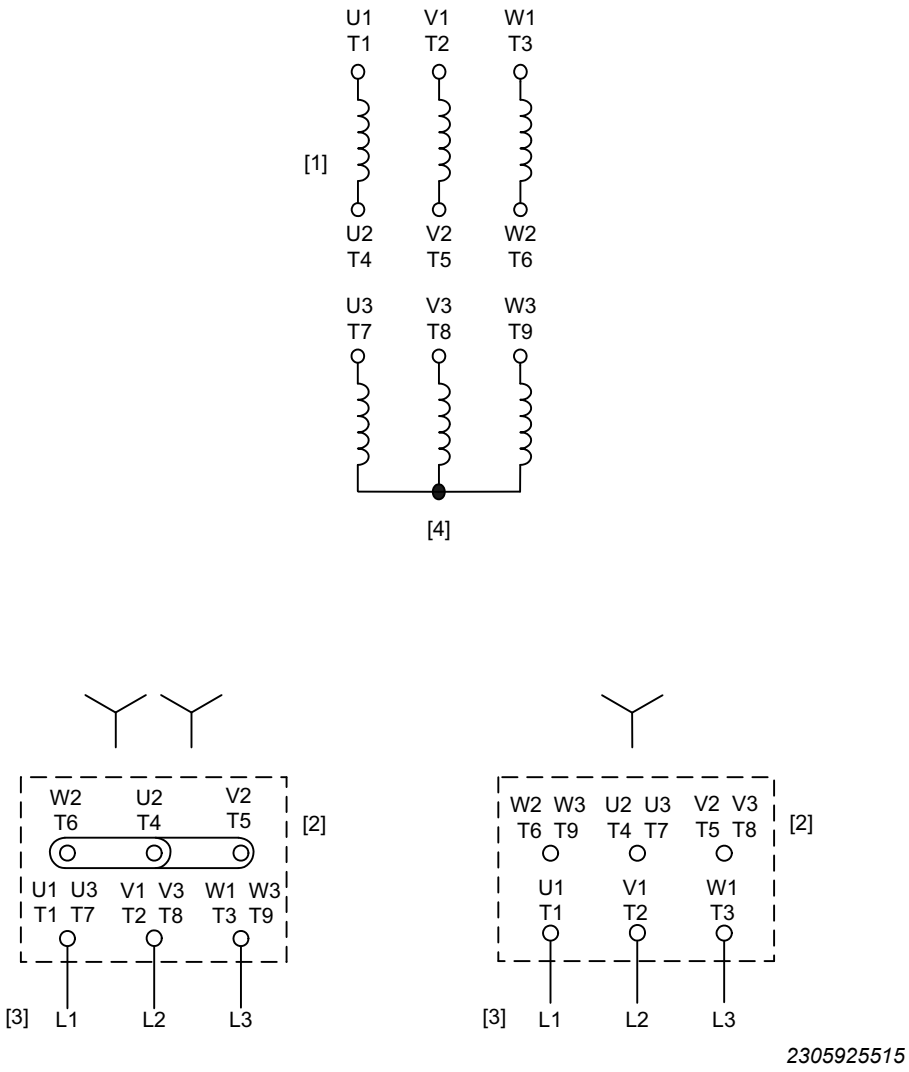
1. Swap the supply cables L1 – L2.

10.1.3 Star connection with wiring diagram R76 (68043 xx 06)

For all motors with one speed and direct power-on.

Star connection, double-star connection

The following figure shows the ⅄ connection for high voltages and the ⅄ ⅄ connection for lower voltages.



2305925515

[1] Motor winding
[2] Motor terminal board
[3] Supply cables
[4] Star point connected in motor

Proceed as follows to reverse the direction of rotation:

1. Swap the supply cables L1 – L2.

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10.1.4 Motor protection with /TF or /TH for DR..71 – 280, DRN63 – 280, DR2..63 – 80 motors

INFORMATION

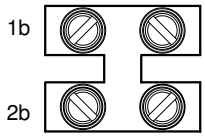
The following shows an example terminal assignment. The actual terminal assignment is included in the motor delivery as wiring diagram.

/TF, /TH

The following figures show examples for connection of motor protection with /TF PTC thermistor sensors or /TH bimetallic thermostats.

Either a two-pole connection terminal or a five-pole terminal strip is available for connecting to the trip switch.

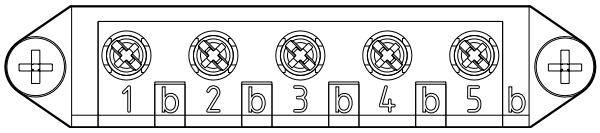
Example: /TF, /TH to 2-pin terminal strip



9007199728684427

1b	2b
TF/TH	TF/TH

Example: 2 × /TF, /TH to 5-pin terminal strip

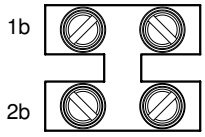


18014398983427083

1b	2b	3b	4b	5b
1.TF/TH	1.TF/TH	2.TF/TH	2.TF/TH	–

2 × /TF, /TH with anti-condensation heating

The following illustration shows the connection of the motor protection with 2 /TF PTC thermistor sensors or /TH bimetallic thermostats and Hx anti-condensation heating.



9007199728684427

1b	2b
Hx	Hx

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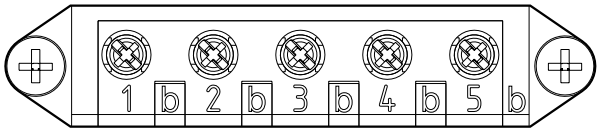


18014398983427083

1b	2b	3b	4b	5b
1.TF/TH	1.TF/TH	2.TF/TH	2.TF/TH	–

10.1.5 Motor protection with /TF or /TH for DR..315, DRN315 motors

INFORMATION

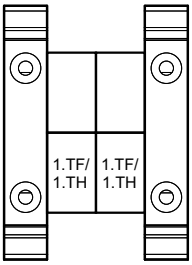
The following shows an example terminal assignment. The actual terminal assignment is included in the motor delivery as wiring diagram.

/TF, /TH

The following figures show examples for connection of motor protection with /TF PTC thermistor sensors or /TH bimetallic thermostats.

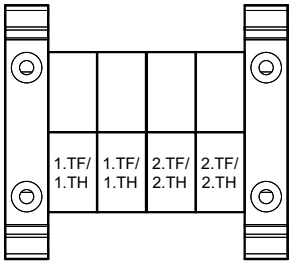
Depending on the version, an "x-pin" terminal strip is available for connection to the trip switch.

Example: /TF, /TH to terminal strip



473405707

Example: 2x /TF, /TH to terminal strip



473410187

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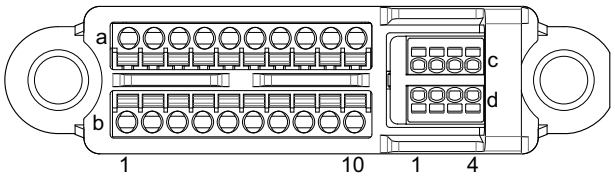
10.1.6 EI7.B built-in encoder

Connection via terminal strip

The encoder is equipped with a 10-pole terminal strip for connection:



9007207579353739

INFORMATION

The ranges 1a – 10a, 1c – 4c and 1d – 4d have been pre-configured by SEW-EURODRIVE. The must not be changed.

Range 1b – 10b is intended for customer adjustments.

Basic connection:

Connections 1a – 10a, 1c – 4c and 1d – 4d lead to the encoder or to the motor.

Connections 1b – 10b lead to the cable gland.

	1	2	3	4	5	6	7	8	9	10	1	2	3	4	
a	TF1[1]	TF1[1]	TF2[1] Opt.	TF2[1] Opt.	+UB[1] (GY)	GND[1] (PK)	A[1] (BN)	$\overline{A}$[1] (WH)	$\overline{B}$[1] (YE)	B[1] (GN)	see below				c
b	TF1	TF1	TF2 Opt.	TF2 Opt.	+UB	GND	A	$\overline{A}$	B	$\overline{B}$	see below				d

1) Pre-configured by SEW-EURODRIVE. Do not alter the setting!

Pin assignment EI7**C** B				
1	2	3	4	
GND_ Config (BU)[1]	n. c.[1]	n. c.[1]	n. c.[1]	c
EI7C[1] (RD)	n. c.[1]	n. c.[1]	n. c.[1]	d

Pin assignment EI7**6** B				
1	2	3	4	
GND_ Config (BU)[1]	n. c.[1]	n. c.[1]	n. c.[1]	c
n. c.[1]	EI76[1] (RD)	n. c.[1]	n. c.[1]	d

1) Pre-configured by SEW-EURODRIVE. Do not alter the setting!

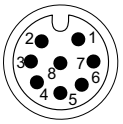
Pin assignment EI7**2** B				
1	2	3	4	
GND_ Config (BU)[1]	n. c.[1]	n. c.[1]	n. c.[1]	c
n. c.[1]	n. c.[1]	EI72[1] (RD)	n. c.[1]	d

Pin assignment EI7**1** B				
1	2	3	4	
GND_ Config (BU)[1]	n. c.[1]	n. c.[1]	n. c.[1]	c
n. c.[1]	n. c.[1]	n. c.[1]	EI71[1] (RD)	d

1) Pre-configured by SEW-EURODRIVE. Do not alter the setting!

Connection via M12 plug connector

A 8-pin or a 4-pin M12 plug connector is available for the connection.

4-pin M12 plug connector AVSE		8-pin M12 plug connector AVRE	
• A coded • Male 	Pin 1: $+U_B$ Pin 2: B Pin 3: GND Pin 4: A	• A coded • Male 	Pin 1: $+U_B$ Pin 2: GND Pin 3: A Pin 4: $\overline{A}$ Pin 5: B Pin 6: $\overline{B}$ Pin 7: TF1 Pin 8: TF1

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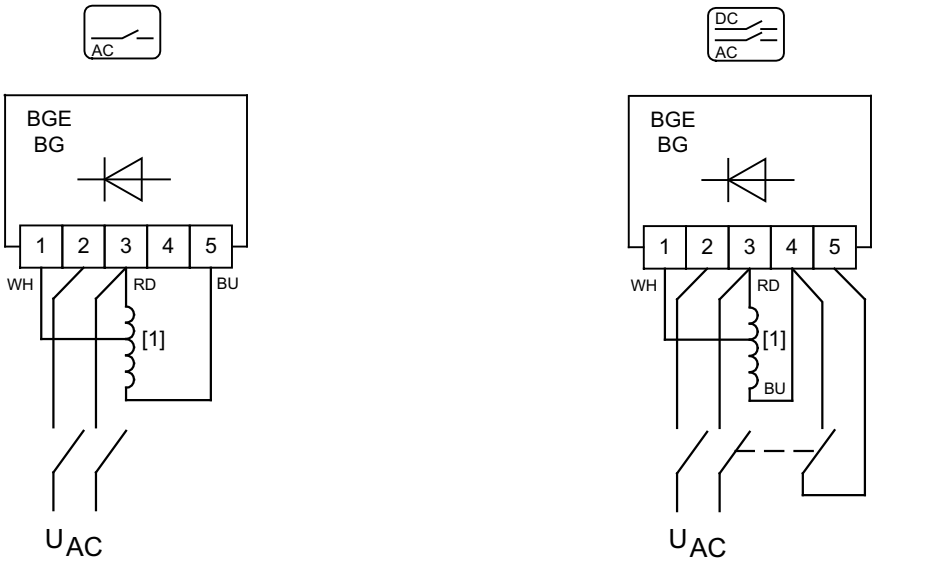
10.1.7 BGE..; BS..; BSG..; BUR.. brake control

BG../BGE..

Wiring diagram B100

The following illustration shows the wiring for BG.. and BGE.. brake rectifiers for the AC-side shut-off as well as the DC and AC-side shutoff.



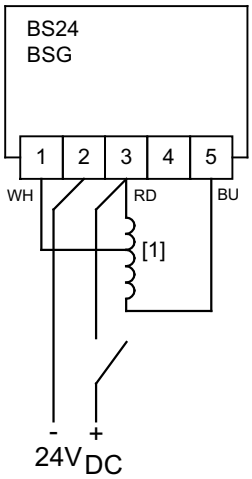
242604811

[1] Brake coil

BS24/BSG..

Wiring diagram B100

The following illustration shows the DC 24 V connection of the BS24 brake protection or BSG.. control unit.



9007199497347467

[1] Brake coil

BUR

NOTICE

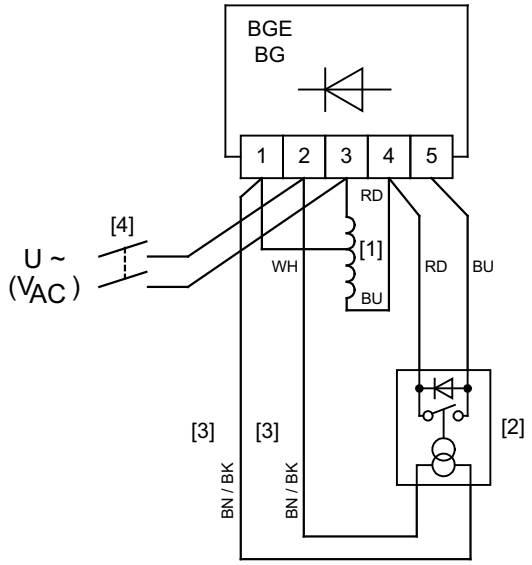
Malfunction caused by incorrect brake connection for frequency inverter operation.

The drive system might be damaged.

- Do not connect the brake to the terminal board of the motor.

Wiring diagram B100

The following figure shows the wiring for BUR.. brake control



242608139

[1] Brake coil
[2] UR11/UR15 voltage relay

BN = UR 11 (42 – 150 V)
BK = UR 15 (150 – 500 V)

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10.1.8 BSR.. brake control

Brake voltage = phase-to-neutral voltage

BSR.. brake control for single speed drives in line operation (basic wiring diagram R13)

Wiring diagram R13A/R13B

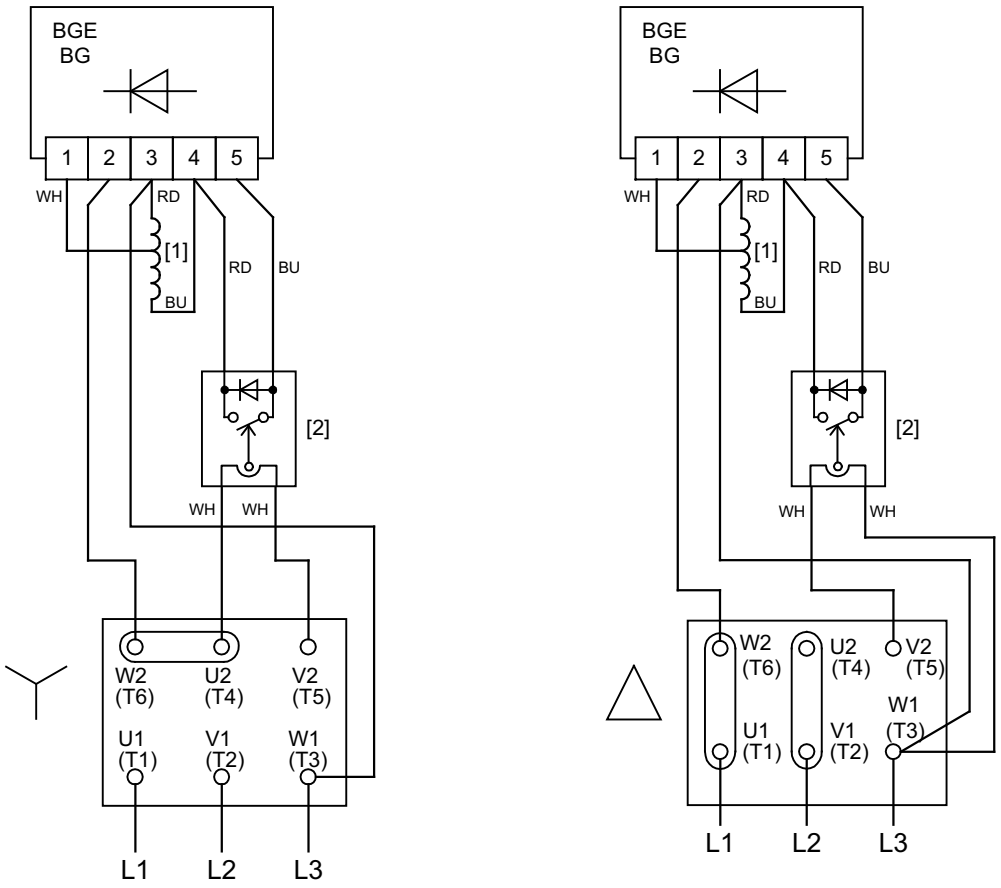
The white interconnecting wires are the ends of a converter loop and, depending on the motor connection, must be connected to the motor terminal block instead of the △ or ⅄ bridge.

The following figure shows the factory wiring for BSR.. brake control.

For example

Motor: AC 230 V/AC 400 V

Brake: AC 230 V



18014398752081803

[1] Brake coil
[2] SR10/11/15/19 current relay

Brake voltage = Line voltage

Wiring diagram R13C

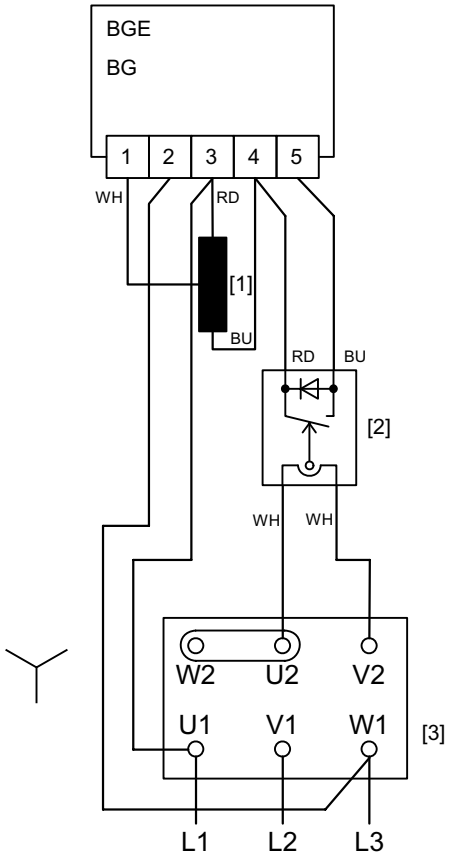
The white interconnecting wires are the ends of a converter loop and, depending on the motor connection, must be connected to the motor terminal block instead of one of the ⅄ bridges before startup.

The following figure shows the factory wiring for BSR.. brake control:

Example

Motor: AC 400 V

Brake: AC 400 V



17564599179

[1] Brake coil
[2] SR10/11/15/19 current relay
[3] Terminal board

Further wiring diagrams for BSR.. brake control

Wiring diagrams for BSR.. brake control in combination with the following drives are available from SEW-EURODRIVE upon request.

- Multi-voltage motors according to basic wiring diagram R76 or R72
- Single speed drive with cage clamp terminal /KCC (basic wiring diagram A13 or C13)

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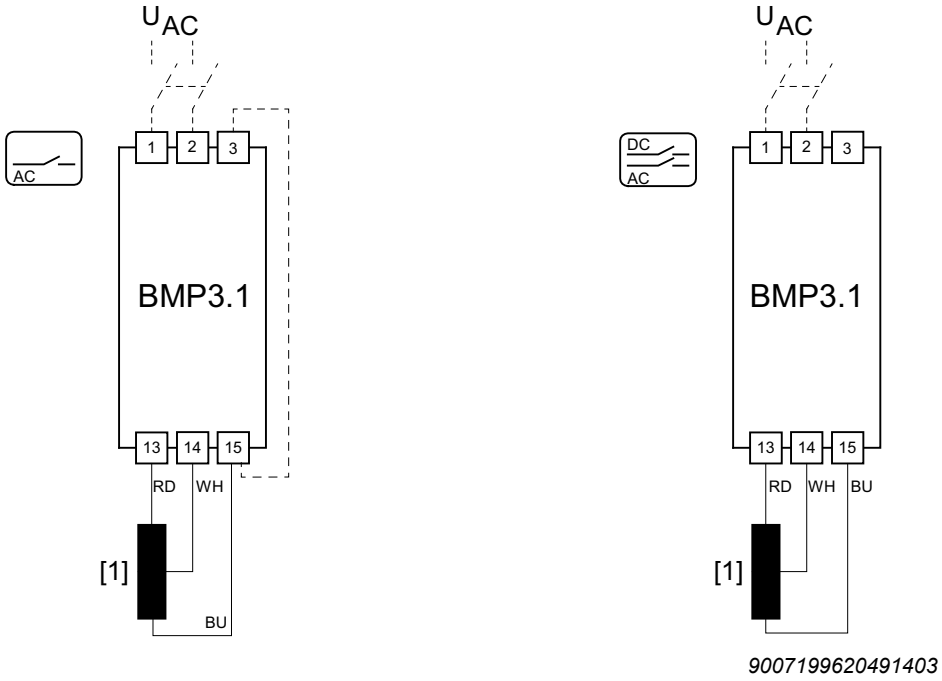
10.1.9 BMP3.1 brake control in the terminal box

INFORMATION

Separate supply cables are required for the voltage supply.

BMP3.1

The following illustration shows the wiring for the BMP3.1 brake rectifier for cut-off in the AC circuit and cut-off in the DC and AC circuit.



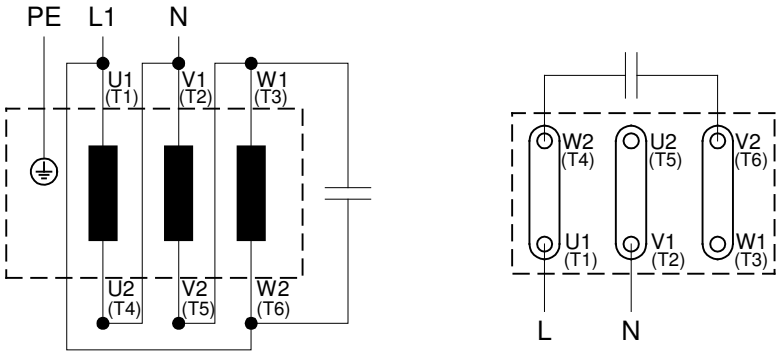
9007199620491403

[1] Brake coil

10.1.10 Forced cooling fan /V

Delta Steinmetz

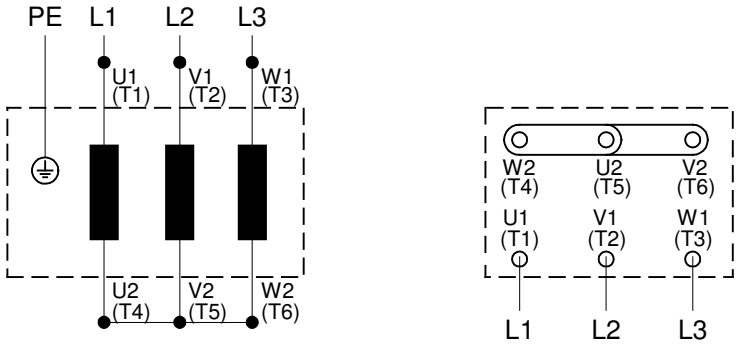
The following figure shows the wiring of the V forced cooling fan for delta-Steinmetz connection for 1-phase operation.



9007199778089483

Star connection

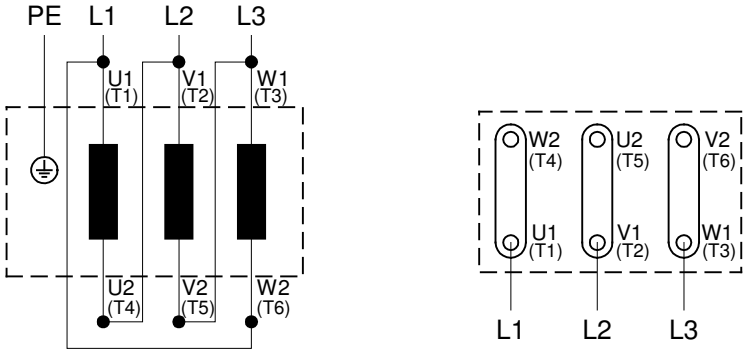
The following figure shows the wiring of the /V forced cooling fan for star connection.



9007199778091147

Delta connection

The following figure shows the wiring of the /V forced cooling fan for delta connection.



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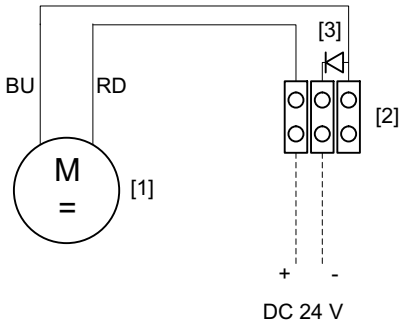
DC 24 V connection

The following figure shows the wiring of the /V forced cooling fan for DC 24 V.



9007201648125067

[1] Forced cooling fan
[2] Terminal strip
[3] Polarity reversal protection diode

NOTICE

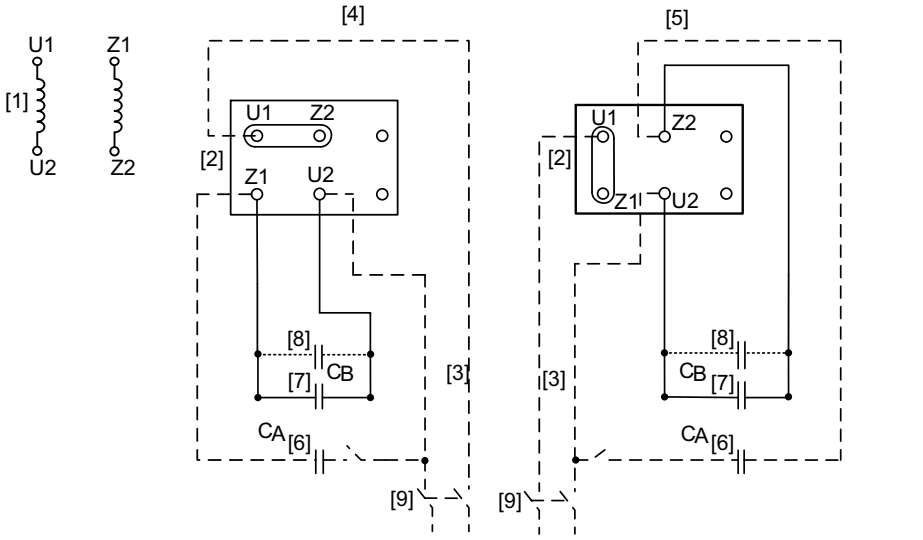
Damage to the forced cooling fan due to incorrect connection.

The drive system might be damaged.

- Observe the polarity when connecting the forced cooling fan.

10.1.11 DRK... single-phase motor

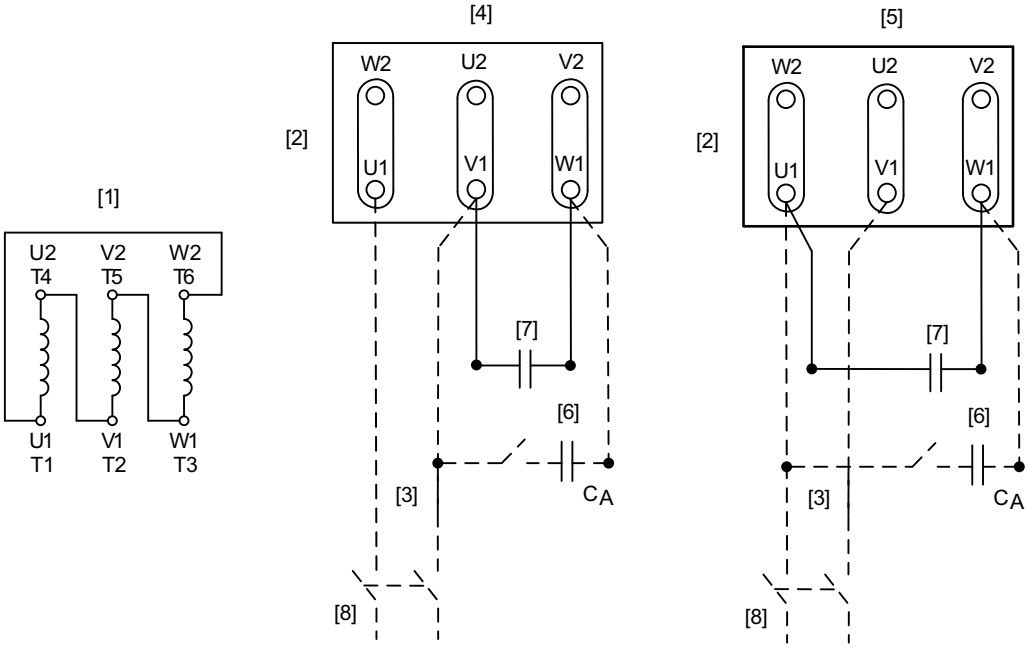
ER10 wiring diagram



11919510027

[1]	Motor winding	[6]	Starting capacitor, switchable
[2]	Motor terminal	[7]	Running capacitor
[3]	Incoming cables	[8]	Further running capacitors (if available)
[4]	Counterclockwise rotation		
[5]	CW rotation, connected at factory	[9]	All-pole power switch

ER11 wiring diagram



11919511947

[1]	Motor winding	[5]	CW rotation, connected at factory
[2]	Motor terminal board	[6]	Starting capacitor, switchable
[3]	Incoming cables	[7]	Running capacitor
[4]	Counterclockwise rotation	[8]	All-pole power switch

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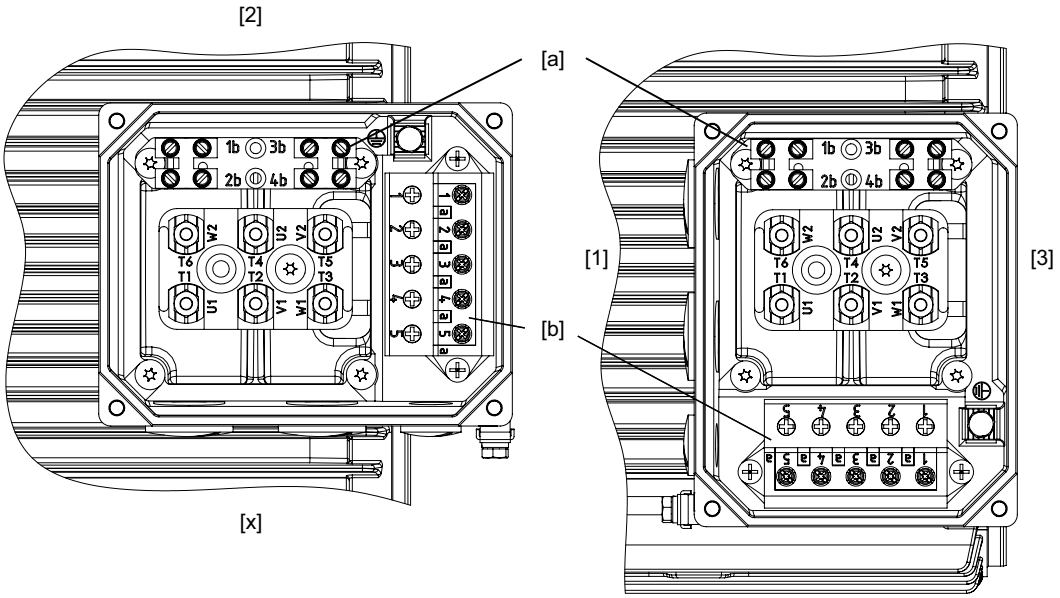
10.2 Auxiliary terminals

The following figure shows the arrangement of the auxiliary terminals for the different terminal box positions.

Terminal box position 2 and X, here X[1)]

Terminal box position 1 and 3, here 3



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1) If auxiliary terminal 2 is not provided, you can install auxiliary terminal 1 in the same position.

[1]	Terminal box position 1	[X]	Terminal box position X
[2]	Terminal box position 2	[a]	Auxiliary terminal 1
[3]	Terminal box position 3	[b]	Auxiliary terminal 2

Regardless of the terminal box position, auxiliary terminal 1 must always be mounted parallel to the terminal board.

The terminal structure can vary depending on the terminal box design.

11 Address list

Argentina			
Assembly Sales	Buenos Aires	SEW EURODRIVE ARGENTINA S.A. Ruta Panamericana Km 37.5, Lote 35 (B1619IEA) Centro Industrial Garín Prov. de Buenos Aires	Tel. +54 3327 4572-84 Fax +54 3327 4572-21 http://www.sew-eurodrive.com.ar sewar@sew-eurodrive.com.ar
Australia			
Assembly Sales Service	Melbourne	SEW-EURODRIVE PTY. LTD. 27 Beverage Drive Tullamarine, Victoria 3043	Tel. +61 3 9933-1000 Fax +61 3 9933-1003 http://www.sew-eurodrive.com.au enquires@sew-eurodrive.com.au
	Sydney	SEW-EURODRIVE PTY. LTD. 9, Sleigh Place, Wetherill Park New South Wales, 2164	Tel. +61 2 9725-9900 Fax +61 2 9725-9905 enquires@sew-eurodrive.com.au
Austria			
Assembly Sales Service	Vienna	SEW-EURODRIVE Ges.m.b.H. Richard-Strauss-Straße 24 1230 Wien	Tel. +43 1 617 55 00-0 Fax +43 1 617 55 00-30 http://www.sew-eurodrive.at sew@sew-eurodrive.at
Bangladesh			
Sales	Bangladesh	SEW-EURODRIVE INDIA PRIVATE LIMITED 345 DIT Road East Rampura Dhaka-1219, Bangladesh	Tel. +88 01729 097309 salesdhaka@seweurodrivebangladesh.com
Belarus			
Sales	Minsk	Foreign unitary production enterprise SEW-EURODRIVE RybalkoStr. 26 220033 Minsk	Tel. +375 17 298 47 56 / 298 47 58 Fax +375 17 298 47 54 http://www.sew.by sales@sew.by
Belgium			
Assembly Sales Service	Brussels	SEW-EURODRIVE n.v./s.a. Researchpark Haasrode 1060 Evenementenlaan 7 3001 Leuven	Tel. +32 16 386-311 Fax +32 16 386-336 http://www.sew-eurodrive.be info@sew-eurodrive.be
Service Competence Center	Industrial Gears	SEW-EURODRIVE n.v./s.a. Rue du Parc Industriel, 31 6900 Marche-en-Famenne	Tel. +32 84 219-878 Fax +32 84 219-879 http://www.sew-eurodrive.be service-IG@sew-eurodrive.be
Brazil			
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Assembly Sales Service	Rio Claro	SEW-EURODRIVE Brasil Ltda. Rodovia Washington Luiz, Km 172 Condomínio Industrial Conpark Caixa Postal: 327 13501-600 – Rio Claro / SP	Tel. +55 19 3522-3100 Fax +55 19 3524-6653 montadora.rc@sew.com.br
	Joinville	SEW-EURODRIVE Brasil Ltda. Jvl / Ind Rua Dona Francisca, 12.346 – Pirabeiraba 89239-270 – Joinville / SC	Tel. +55 47 3027-6886 Fax +55 47 3027-6888 filial.sc@sew.com.br
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Sales	Sofia	BEVER-DRIVE GmbH Bogdanovetz Str.1 1606 Sofia	Tel. +359 2 9151160 Fax +359 2 9151166 bever@bever.bg

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Cameroon			
Sales	Douala	SEW-EURODRIVE S.A.R.L. Ancienne Route Bonabéri P.O. Box B.P 8674 Douala-Cameroun	Tel. +237 233 39 02 10 Fax +237 233 39 02 10 sew@sew-eurodrive-cm
Canada			
Assembly Sales Service	Toronto	SEW-EURODRIVE CO. OF CANADA LTD. 210 Walker Drive Bramalea, ON L6T 3W1	Tel. +1 905 791-1553 Fax +1 905 791-2999 http://www.sew-eurodrive.ca l.watson@sew-eurodrive.ca
	Vancouver	SEW-EURODRIVE CO. OF CANADA LTD. Tilbury Industrial Park 7188 Honeyman Street Delta, BC V4G 1G1	Tel. +1 604 946-5535 Fax +1 604 946-2513 b.wake@sew-eurodrive.ca
	Montreal	SEW-EURODRIVE CO. OF CANADA LTD. 2001 Ch. de l'Aviation Dorval Quebec H9P 2X6	Tel. +1 514 367-1124 Fax +1 514 367-3677 n.paradis@sew-eurodrive.ca
Chile			
Assembly Sales Service	Santiago de Chile	SEW-EURODRIVE CHILE LTDA Las Encinas 1295 Parque Industrial Valle Grande LAMPA Santiago de Chile P.O. Box Casilla 23 Correo Quilicura - Santiago - Chile	Tel. +56 2 2757 7000 Fax +56 2 2757 7001 http://www.sew-eurodrive.cl ventas@sew-eurodrive.cl
China			
Production Assembly Sales Service	Tianjin	SEW-EURODRIVE (Tianjin) Co., Ltd. No. 78, 13th Avenue, TEDA Tianjin 300457	Tel. +86 22 25322612 Fax +86 22 25323273 http://www.sew-eurodrive.cn info@sew-eurodrive.cn
Assembly Sales Service	Suzhou	SEW-EURODRIVE (Suzhou) Co., Ltd. 333, Suhong Middle Road Suzhou Industrial Park Jiangsu Province, 215021	Tel. +86 512 62581781 Fax +86 512 62581783 suzhou@sew-eurodrive.cn
	Guangzhou	SEW-EURODRIVE (Guangzhou) Co., Ltd. No. 9, JunDa Road East Section of GETDD Guangzhou 510530	Tel. +86 20 82267890 Fax +86 20 82267922 guangzhou@sew-eurodrive.cn
	Shenyang	SEW-EURODRIVE (Shenyang) Co., Ltd. 10A-2, 6th Road Shenyang Economic Technological Development Area Shenyang, 110141	Tel. +86 24 25382538 Fax +86 24 25382580 shenyang@sew-eurodrive.cn
	Taiyuan	SEW-EURODRIVE (Taiyuan) Co,. Ltd. No.3, HuaZhang Street, TaiYuan Economic & Technical Development Zone ShanXi, 030032	Tel. +86-351-7117520 Fax +86-351-7117522 taiyuan@sew-eurodrive.cn
	Wuhan	SEW-EURODRIVE (Wuhan) Co., Ltd. 10A-2, 6th Road No. 59, the 4th Quanli Road, WEDA 430056 Wuhan	Tel. +86 27 84478388 Fax +86 27 84478389 wuhan@sew-eurodrive.cn
	Xi'An	SEW-EURODRIVE (Xi'An) Co., Ltd. No. 12 Jinye 2nd Road Xi'An High-Technology Industrial Development Zone Xi'An 710065	Tel. +86 29 68686262 Fax +86 29 68686311 xian@sew-eurodrive.cn
Sales Service	Hong Kong	SEW-EURODRIVE LTD. Unit No. 801-806, 8th Floor Hong Leong Industrial Complex No. 4, Wang Kwong Road Kowloon, Hong Kong	Tel. +852 36902200 Fax +852 36902211 contact@sew-eurodrive.hk

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Assembly Sales Service	Bogota	SEW-EURODRIVE COLOMBIA LTDA. Calle 17 No. 132-18 Interior 2 Bodega 6, Manzana B Santafé de Bogotá	Tel. +57 1 54750-50 Fax +57 1 54750-44 http://www.sew-eurodrive.com.co sew@sew-eurodrive.com.co
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	Drive Service Hotline / 24 Hour Service	+420 800 739 739 (800 SEW SEW)	Service Tel. +420 255 709 632 Fax +420 235 358 218 servis@sew-eurodrive.cz
Denmark			
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Egypt			
Sales Service	Cairo	Copam Egypt for Engineering & Agencies Building 10, Block 13005, First Industrial Zone, Obour City Cairo	Tel. +202 44812673 / 79 (7 lines) Fax +202 44812685 http://www.copam-egypt.com copam@copam-egypt.com
Estonia			
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Finland			
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	Tornio	SEW-EURODRIVE Oy Lossirannankatu 5 95420 Tornio	Tel. +358 201 589 300 Fax +358 3 780 6211 http://www.sew-eurodrive.fi sew@sew.fi
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	Paris	SEW-USOCOME Zone industrielle 2 rue Denis Papin 77390 Verneuil l'Étang	Tel. +33 1 64 42 40 80 Fax +33 1 64 42 40 88
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Production	Graben	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 1 76676 Graben-Neudorf	Tel. +49 7251 75-0 Fax +49 7251-2970
	Östringen	SEW-EURODRIVE GmbH & Co KG, Werk Östringen Franz-Gurk-Straße 2 76684 Östringen	Tel. +49 7253 9254-0 Fax +49 7253 9254-90 oestringen@sew-eurodrive.de
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	Electronics	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 42 76646 Bruchsal	Tel. +49 7251 75-1780 Fax +49 7251 75-1769 scc-elektronik@sew-eurodrive.de
Drive Technology Center	North	SEW-EURODRIVE GmbH & Co KG Alte Ricklinger Straße 40-42 30823 Garbsen (Hannover)	Tel. +49 5137 8798-30 Fax +49 5137 8798-55 dtc-nord@sew-eurodrive.de
	East	SEW-EURODRIVE GmbH & Co KG Dänkritzer Weg 1 08393 Meerane (Zwickau)	Tel. +49 3764 7606-0 Fax +49 3764 7606-30 dtc-ost@sew-eurodrive.de
	South	SEW-EURODRIVE GmbH & Co KG Domagkstraße 5 85551 Kirchheim (München)	Tel. +49 89 909552-10 Fax +49 89 909552-50 dtc-sued@sew-eurodrive.de
	West	SEW-EURODRIVE GmbH & Co KG Siemensstraße 1 40764 Langenfeld (Düsseldorf)	Tel. +49 2173 8507-30 Fax +49 2173 8507-55 dtc-west@sew-eurodrive.de
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	Hamburg	SEW-EURODRIVE GmbH & Co KG Hasselbinnen 11 22869 Schenefeld	Tel. +49 40 298109-60 Fax +49 40 298109-70 tb-hamburg@sew-eurodrive.de
	Ludwigshafen	SEW-EURODRIVE GmbH & Co KG c/o BASF SE Gebäude W130 Raum 101 67056 Ludwigshafen	Tel. +49 7251 75 3759 Fax +49 7251 75 503759 dc-ludwigshafen@sew-eurodrive.de

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	Ulm	SEW-EURODRIVE GmbH & Co KG Dieselstraße 18 89160 Dornstadt	Tel. +49 7348 9885-0 Fax +49 7348 9885-90 dc-ulm@sew-eurodrive.de
	Würzburg	SEW-EURODRIVE GmbH & Co KG Nürnbergerstraße 118 97076 Würzburg-Lengfeld	Tel. +49 931 27886-60 Fax +49 931 27886-66 dc-wuerzburg@sew-eurodrive.de
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Great Britain			
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	Drive Service Hotline / 24 Hour Service		Tel. 01924 896911
Greece			
Sales	Athens	Christ. Boznos & Son S.A. 12, K. Mavromichali Street P.O. Box 80136 18545 Piraeus	Tel. +30 2 1042 251-34 Fax +30 2 1042 251-59 http://www.boznos.gr info@boznos.gr
Hungary			
Sales Service	Budapest	SEW-EURODRIVE Kft. Csillaghegyí út 13. 1037 Budapest	Tel. +36 1 437 06-58 Fax +36 1 437 06-50 http://www.sew-eurodrive.hu office@sew-eurodrive.hu
Iceland			
Sales	Reykjavik	Varma & Vélaverk ehf. Knarrarvogi 4 104 Reykjavík	Tel. +354 585 1070 Fax +354 585)1071 http://www.varmaverk.is vov@vov.is
India			
Registered Office Assembly Sales Service	Vadodara	SEW-EURODRIVE India Private Limited Plot No. 4, GIDC POR Ramangamdi • Vadodara - 391 243 Gujarat	Tel. +91 265 3045200 Fax +91 265 3045300 http://www.seweurodriveindia.com salesvadodara@seweurodriveindia.com
Assembly Sales Service	Chennai	SEW-EURODRIVE India Private Limited Plot No. K3/1, Sipcot Industrial Park Phase II Mambakkam Village Sriperumbudur - 602105 Kancheepuram Dist, Tamil Nadu	Tel. +91 44 37188888 Fax +91 44 37188811 saleschennai@seweurodriveindia.com
	Pune	SEW-EURODRIVE India Private Limited Plant: Plot No. D236/1, Chakan Industrial Area Phase- II, Warale, Tal- Khed, Pune-410501, Maharashtra	Tel. +91 21 35 628700 Fax +91 21 35 628715 salespune@seweurodriveindia.com
Sales Service	Gurgaon	SEW-EURODRIVE India Private Limited Drive Center Gurugram Plot no 395, Phase-IV, UdyogVihar Gurugram , 122016 Haryana	Tel. +91 99588 78855 salesgurgaon@seweurodriveindia.com
Indonesia			
Sales	Medan	PT. Serumpun Indah Lestari Jl.Pulau Solor no. 8, Kawasan Industri Medan II Medan 20252	Tel. +62 61 687 1221 Fax +62 61 6871429 / +62 61 6871458 / +62 61 30008041 sil@serumpunindah.com serumpunindah@yahoo.com http://www.serumpunindah.com

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Indonesia			
	Jakarta	PT. Cahaya Sukses Abadi Komplek Rukan Puri Mutiara Blok A no 99, Sunter Jakarta 14350	Tel. +62 21 65310599 Fax +62 21 65310600 csajkt@cbn.net.id
	Jakarta	PT. Agrindo Putra Lestari JL.Pantai Indah Selatan, Komplek Sentra Industri Terpadu, Pantai indah Kapuk Tahap III, Blok E No. 27 Jakarta 14470	Tel. +62 21 2921-8899 Fax +62 21 2921-8988 aplindo@indosat.net.id http://www.aplindo.com
	Surabaya	PT. TRIAGRI JAYA ABADI Jl. Sukosemolo No. 63, Galaxi Bumi Permai G6 No. 11 Surabaya 60111	Tel. +62 31 5990128 Fax +62 31 5962666 sales@triagri.co.id http://www.triagri.co.id
	Surabaya	CV. Multi Mas Jl. Raden Saleh 43A Kav. 18 Surabaya 60174	Tel. +62 31 5458589 Fax +62 31 5317220 sianhwa@sby.centrin.net.id http://www.cvmultimas.com
Ireland			
Sales Service	Dublin	Alperton Engineering Ltd. 48 Moyle Road Dublin Industrial Estate Glasnevin, Dublin 11	Tel. +353 1 830-6277 Fax +353 1 830-6458 http://www.alperton.ie info@alperton.ie
Israel			
Sales	Tel Aviv	Liraz Handasa Ltd. Ahofer Str 34B / 228 58858 Holon	Tel. +972 3 5599511 Fax +972 3 5599512 http://www.liraz-handasa.co.il office@liraz-handasa.co.il
Italy			
Assembly Sales Service	Milan	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Via Bernini,14 20020 Solaro (Milano)	Tel. +39 02 96 980229 Fax +39 02 96 980 999 http://www.sew-eurodrive.it milano@sew-eurodrive.it
Ivory Coast			
Sales	Abidjan	SEW-EURODRIVE SARL Ivory Coast Rue des Pêcheurs, Zone 3 26 BP 916 Abidjan 26	Tel. +225 21 21 81 05 Fax +225 21 25 30 47 info@sew-eurodrive.ci http://www.sew-eurodrive.ci
Japan			
Assembly Sales Service	Iwata	SEW-EURODRIVE JAPAN CO., LTD 250-1, Shimoman-no, Iwata Shizuoka 438-0818	Tel. +81 538 373811 Fax +81 538 373814 http://www.sew-eurodrive.co.jp sewjapan@sew-eurodrive.co.jp hamamatsu@sew-eurodrive.co.jp
Kazakhstan			
Sales Service	Almaty	SEW-EURODRIVE LLP 291-291A, Tole bi street 050031, Almaty	Tel. +7 (727) 350 5156 Fax +7 (727) 350 5156 http://www.sew-eurodrive.kz sew@sew-eurodrive.kz
	Tashkent	SEW-EURODRIVE LLP Representative office in Uzbekistan 96A, Sharaf Rashidov street, Tashkent, 100084	Tel. +998 71 2359411 Fax +998 71 2359412 http://www.sew-eurodrive.uz sew@sew-eurodrive.uz
	Ulaanbaatar	IM Trading LLC Olympic street 28B/3 Sukhbaatar district, Ulaanbaatar 14230	Tel. +976-77109997 Fax +976-77109997 imt@imt.mn
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Lebanon			
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Sales (Jordan, Kuwait , Saudi Arabia, Syria)	Beirut	Middle East Drives S.A.L. (offshore) Sin El Fil. B. P. 55-378 Beirut	Tel. +961 1 494 786 Fax +961 1 494 971 http://www.medrives.com info@medrives.com
Lithuania			
Sales	Alytus	UAB Irseva Statybininku 106C 63431 Alytus	Tel. +370 315 79204 Fax +370 315 56175 http://www.irseva.lt irmantas@irseva.lt
Luxembourg			
Representation: Belgium			
Macedonia			
Sales	Skopje	Boznos DOOEL Dime Anicin 2A/7A 1000 Skopje	Tel. +389 23256553 Fax +389 23256554 http://www.boznos.mk
Malaysia			
Assembly Sales Service	Johor	SEW-EURODRIVE SDN BHD No. 95, Jalan Seroja 39, Taman Johor Jaya 81000 Johor Bahru, Johor West Malaysia	Tel. +60 7 3549409 Fax +60 7 3541404 sales@sew-eurodrive.com.my
Mexico			
Assembly Sales Service	Quéretaro	SEW-EURODRIVE MEXICO S.A. de C.V. SEM-981118-M93 Tequisquiapan No. 102 Parque Industrial Quéretaro C.P. 76220 Querétaro, México	Tel. +52 442 1030-300 Fax +52 442 1030-301 http://www.sew-eurodrive.com.mx scmexico@seweurodrive.com.mx
Sales Service	Puebla	SEW-EURODRIVE MEXICO S.A. de C.V. Calzada Zavaleta No. 3922 Piso 2 Local 6 Col. Santa Cruz Buenavista C.P. 72154 Puebla, México	Tel. +52 (222) 221 248 http://www.sew-eurodrive.com.mx scmexico@seweurodrive.com.mx
Mongolia			
Technical Office	Ulaanbaatar	IM Trading LLC Olympic street 28B/3 Sukhbaatar district, Ulaanbaatar 14230	Tel. +976-77109997 Tel. +976-99070395 Fax +976-77109997 http://imt.mn/ imt@imt.mn
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Namibia			
Sales	Swakopmund	DB MINING & INDUSTRIAL SUPPLIES CC Einstein Street Strauss Industrial Park Unit1 Swakopmund	Tel. +264 64 462 738 Fax +264 64 462 734 anton@dbminingnam.com
Netherlands			
Assembly Sales Service	Rotterdam	SEW-EURODRIVE B.V. Industrieweg 175 3044 AS Rotterdam Postbus 10085 3004 AB Rotterdam	Tel. +31 10 4463-700 Fax +31 10 4155-552 Service: 0800-SEWHELP http://www.sew-eurodrive.nl info@sew-eurodrive.nl

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	Christchurch	SEW-EURODRIVE NEW ZEALAND LTD. 30 Lodestar Avenue, Wigram Christchurch	Tel. +64 3 384-6251 Fax +64 3 384-6455 sales@sew-eurodrive.co.nz
Nigeria			
Sales	Lagos	Greenpeg Nig. Ltd Plot 296A, Adeyemo Akapo Str. Omole GRA Ikeja Lagos-Nigeria	Tel. +234-701-821-9200-1 http://www.greenpegltd.com bolaji.adekunle@greenpegltd.com
Norway			
Assembly Sales Service	Moss	SEW-EURODRIVE A/S Solgaard skog 71 1599 Moss	Tel. +47 69 24 10 20 Fax +47 69 24 10 40 http://www.sew-eurodrive.no sew@sew-eurodrive.no
Pakistan			
Sales	Karachi	Industrial Power Drives Al-Fatah Chamber A/3, 1st Floor Central Commercial Area, Sultan Ahmed Shah Road, Block 7/8, Karachi	Tel. +92 21 452 9369 Fax +92-21-454 7365 seweurodrive@cyber.net.pk
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Sales	Fernando de la Mora	SEW-EURODRIVE PARAGUAY S.R.L De la Victoria 112, Esquina nueva Asunción Departamento Central Fernando de la Mora, Barrio Bernardino	Tel. +595 991 519695 Fax +595 21 3285539 sewpy@sew-eurodrive.com.py
Peru			
Assembly Sales Service	Lima	SEW EURODRIVE DEL PERU S.A.C. Los Calderos, 120-124 Urbanizacion Industrial Vulcano, ATE, Lima	Tel. +51 1 3495280 Fax +51 1 3493002 http://www.sew-eurodrive.com.pe sewperu@sew-eurodrive.com.pe
Philippines			
Sales	Makati	P.T. Cerna Corporation 4137 Ponte St., Brgy. Sta. Cruz Makati City 1205	Tel. +63 2 519 6214 Fax +63 2 890 2802 mech_drive_sys@ptcerna.com http://www.ptcerna.com
Poland			
Assembly Sales Service	Łódź	SEW-EURODRIVE Polska Sp.z.o.o. ul. Techniczna 5 92-518 Łódź	Tel. +48 42 293 00 00 Fax +48 42 293 00 49 http://www.sew-eurodrive.pl sew@sew-eurodrive.pl
	Service	Tel. +48 42 293 0030 Fax +48 42 293 0043	24 Hour Service Tel. +48 602 739 739 (+48 602 SEW SEW) serwis@sew-eurodrive.pl
Portugal			
Assembly Sales Service	Coimbra	SEW-EURODRIVE, LDA. Av. da Fonte Nova, n.º 86 3050-379 Mealhada	Tel. +351 231 20 9670 Fax +351 231 20 3685 http://www.sew-eurodrive.pt infosew@sew-eurodrive.pt
Romania			
Sales Service	Bucharest	Sialco Trading SRL str. Brazilia nr. 36 011783 Bucuresti	Tel. +40 21 230-1328 Fax +40 21 230-7170 sialco@sialco.ro
Russia			
Assembly Sales Service	St. Petersburg	ЗАО «СЕВ-ЕВРОДРАЙФ» а. я. 36 195220 Санкт-Петербург	Tel. +7 812 3332522 / +7 812 5357142 Fax +7 812 3332523 http://www.sew-eurodrive.ru sew@sew-eurodrive.ru

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Senegal			
Sales	Dakar	SENEMECA Mécanique Générale Km 8, Route de Rufisque B.P. 3251, Dakar	Tel. +221 338 494 770 Fax +221 338 494 771 http://www.senemeca.com senemeca@senemeca.sn
Serbia			
Sales	Belgrade	DIPAR d.o.o. Ustanicka 128a PC Košum, IV floor 11000 Beograd	Tel. +381 11 347 3244 / +381 11 288 0393 Fax +381 11 347 1337 office@dipar.rs
Singapore			
Assembly Sales Service	Singapore	SEW-EURODRIVE PTE. LTD. No 9, Tuas Drive 2 Jurong Industrial Estate Singapore 638644	Tel. +65 68621701 Fax +65 68612827 http://www.sew-eurodrive.com.sg sewsingapore@sew-eurodrive.com
Slovakia			
Sales	Bratislava	SEW-Eurodrive SK s.r.o. Rybničná 40 831 06 Bratislava	Tel.+421 2 33595 202, 217, 201 Fax +421 2 33595 200 http://www.sew-eurodrive.sk sew@sew-eurodrive.sk
	Košice	SEW-Eurodrive SK s.r.o. Slovenská ulica 26 040 01 Košice	Tel. +421 55 671 2245 Fax +421 55 671 2254 Mobile +421 907 671 976 sew@sew-eurodrive.sk
Slovenia			
Sales Service	Celje	Pakman - Pogonska Tehnika d.o.o. UI. XIV. divizije 14 3000 Celje	Tel. +386 3 490 83-20 Fax +386 3 490 83-21 pakman@siol.net
South Africa			
Assembly Sales Service	Johannesburg	SEW-EURODRIVE (PROPRIETARY) LIMITED Eurodrive House Cnr. Adcock Ingram and Aerodrome Roads Aeroton Ext. 2 Johannesburg 2013 P.O.Box 90004 Bertsham 2013	Tel. +27 11 248-7000 Fax +27 11 248-7289 http://www.sew.co.za info@sew.co.za
	Cape Town	SEW-EURODRIVE (PROPRIETARY) LIMITED Rainbow Park Cnr. Racecourse & Omuramba Road Montague Gardens Cape Town P.O.Box 36556 Chempet 7442	Tel. +27 21 552-9820 Fax +27 21 552-9830 Telex 576 062 bgriffiths@sew.co.za
	Durban	SEW-EURODRIVE (PROPRIETARY) LIMITED 48 Prospecton Road Isipingo Durban P.O. Box 10433, Ashwood 3605	Tel. +27 31 902 3815 Fax +27 31 902 3826 cdejager@sew.co.za
	Nelspruit	SEW-EURODRIVE (PROPRIETARY) LIMITED 7 Christie Crescent Vintonia P.O.Box 1942 Nelspruit 1200	Tel. +27 13 752-8007 Fax +27 13 752-8008 robermeyer@sew.co.za
South Korea			
Assembly Sales Service	Ansan	SEW-EURODRIVE KOREA CO., LTD. 7, Dangjaengi-ro, Danwon-gu, Ansan-si, Gyeonggi-do, Zip 425-839	Tel. +82 31 492-8051 Fax +82 31 492-8056 http://www.sew-eurodrive.kr master.korea@sew-eurodrive.com
	Busan	SEW-EURODRIVE KOREA CO., LTD. 28, Noksansandan 262-ro 50beon-gil, Gangseo-gu, Busan, Zip 618-820	Tel. +82 51 832-0204 Fax +82 51 832-0230

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Spain			
Assembly Sales Service	Bilbao	SEW-EURODRIVE ESPAÑA, S.L. Parque Tecnológico, Edificio, 302 48170 Zamudio (Vizcaya)	Tel. +34 94 43184-70 http://www.sew-eurodrive.es sew.spain@sew-eurodrive.es
Sri Lanka			
Sales	Colombo	SM International (Pte) Ltd 254, Galle Raod Colombo 4, Sri Lanka	Tel. +94 1 2584887 Fax +94 1 2582981
Swaziland			
Sales	Manzini	C G Trading Co. (Pty) Ltd Simunye street Matsapha, Manzini	Tel. +268 7602 0790 Fax +268 2 518 5033 charles@cgtrading.co.sz www.cgtradingswaziland.com
Sweden			
Assembly Sales Service	Jönköping	SEW-EURODRIVE AB Gnejsvägen 6-8 553 03 Jönköping Box 3100 S-550 03 Jönköping	Tel. +46 36 34 42 00 Fax +46 36 34 42 80 http://www.sew-eurodrive.se jonkoping@sew.se
Switzerland			
Assembly Sales Service	Basel	Alfred Imhof A.G. Jurastrasse 10 4142 Münchenstein bei Basel	Tel. +41 61 417 1717 Fax +41 61 417 1700 http://www.imhof-sew.ch info@imhof-sew.ch
Taiwan			
Sales	Taipei	Ting Shou Trading Co., Ltd. 6F-3, No. 267, Sec. 2 Tung Huw S. Road Taipei	Tel. +886 2 27383535 Fax +886 2 27368268 Telex 27 245 sewtwn@ms63.hinet.net http://www.tingshou.com.tw
	Nan Tou	Ting Shou Trading Co., Ltd. No. 55 Kung Yeh N. Road Industrial District Nan Tou 540	Tel. +886 49 255353 Fax +886 49 257878 sewtwn@ms63.hinet.net http://www.tingshou.com.tw
Tanzania			
Sales	Daressalam	SEW-EURODRIVE PTY LIMITED TANZANIA Plot 52, Regent Estate PO Box 106274 Dar Es Salaam	Tel. +255 0 22 277 5780 Fax +255 0 22 277 5788 http://www.sew-eurodrive.co.tz info@sew.co.tz
Thailand			
Assembly Sales Service	Chonburi	SEW-EURODRIVE (Thailand) Ltd. 700/456, Moo.7, Donhuaroh Muang Chonburi 20000	Tel. +66 38 454281 Fax +66 38 454288 sewthailand@sew-eurodrive.com
Tunisia			
Sales	Tunis	T. M.S. Technic Marketing Service Zone Industrielle Mghira 2 Lot No. 39 2082 Fouchana	Tel. +216 79 40 88 77 Fax +216 79 40 88 66 http://www.tms.com.tn tms@tms.com.tn
Turkey			
Assembly Sales Service	Kocaeli-Gebze	SEW-EURODRİVE Hareket Sistemleri San. Ve TIC. Ltd. Sti Gebze Organize Sanayi Böl. 400 Sok No. 401 41480 Gebze Kocaeli	Tel. +90 262 9991000 04 Fax +90 262 9991009 http://www.sew-eurodrive.com.tr sew@sew-eurodrive.com.tr
Ukraine			
Assembly Sales Service	Dnipropetrovsk	SEW-EURODRIVE, LLC Robochya str., bld. 23-B, office 409 49008 Dnipro	Tel. +380 56 370 3211 Fax +380 56 372 2078 http://www.sew-eurodrive.ua sew@sew-eurodrive.ua

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United Arab Emirates			
Drive Technology Center	Dubai	SEW-EURODRIVE FZE PO Box 263835 Jebel Ali Free Zone – South, P.O. Box Dubai, United Arab Emirates	Tel. +971 (0)4 8806461 Fax +971 (0)4 8806464 info@sew-eurodrive.ae
Uruguay			
Assembly Sales	Montevideo	SEW-EURODRIVE Uruguay, S. A. Jose Serrato 3569 Esqina Corumbe CP 12000 Montevideo	Tel. +598 2 21181-89 Fax +598 2 21181-90 sewuy@sew-eurodrive.com.uy
USA			
Production Assembly Sales Service	Southeast Region	SEW-EURODRIVE INC. 1295 Old Spartanburg Highway P.O. Box 518 Lyman, S.C. 29365	Tel. +1 864 439-7537 Fax Sales +1 864 439-7830 Fax Production +1 864 439-9948 Fax Assembly +1 864 439-0566 Fax Confidential/HR +1 864 949-5557 http://www.seweurodrive.com cslyman@seweurodrive.com
Assembly Sales Service	Northeast Region	SEW-EURODRIVE INC. Pureland Ind. Complex 2107 High Hill Road, P.O. Box 481 Bridgeport, New Jersey 08014	Tel. +1 856 467-2277 Fax +1 856 845-3179 csbridgeport@seweurodrive.com
	Midwest Region	SEW-EURODRIVE INC. 2001 West Main Street Troy, Ohio 45373	Tel. +1 937 335-0036 Fax +1 937 332-0038 cstroy@seweurodrive.com
	Southwest Region	SEW-EURODRIVE INC. 3950 Platinum Way Dallas, Texas 75237	Tel. +1 214 330-4824 Fax +1 214 330-4724 csdallas@seweurodrive.com
	Western Region	SEW-EURODRIVE INC. 30599 San Antonio St. Hayward, CA 94544	Tel. +1 510 487-3560 Fax +1 510 487-6433 cshayward@seweurodrive.com
	Wellford	SEW-EURODRIVE INC. 148/150 Finch Rd. Wellford, S.C. 29385	Tel. +1 864 439-7537 Fax +1 864 661 1167 IGOrders@seweurodrive.com
	Additional addresses for service provided on request!		
Vietnam			
Sales	Ho Chi Minh City	SEW-EURODRIVE PTE. LTD. RO at Hochiminh City Floor 8, KV I, Loyal building, 151-151 Bis Vo Thi Sau street, ward 6, District 3, Ho Chi Minh City, Vietnam	Tel. +84 937 299 700 huytam.phan@sew-eurodrive.com
	Hanoi	MICO LTD Quảng Trị - North Vietnam / All sectors except Construction Materials 8th Floor, Ocean Park Building, 01 Dao Duy Anh St, Ha Noi, Viet Nam	Tel. +84 4 39386666 Fax +84 4 3938 6888 nam_ph@micogroup.com.vn http://www.micogroup.com.vn
Zambia			
Representation: South Africa			

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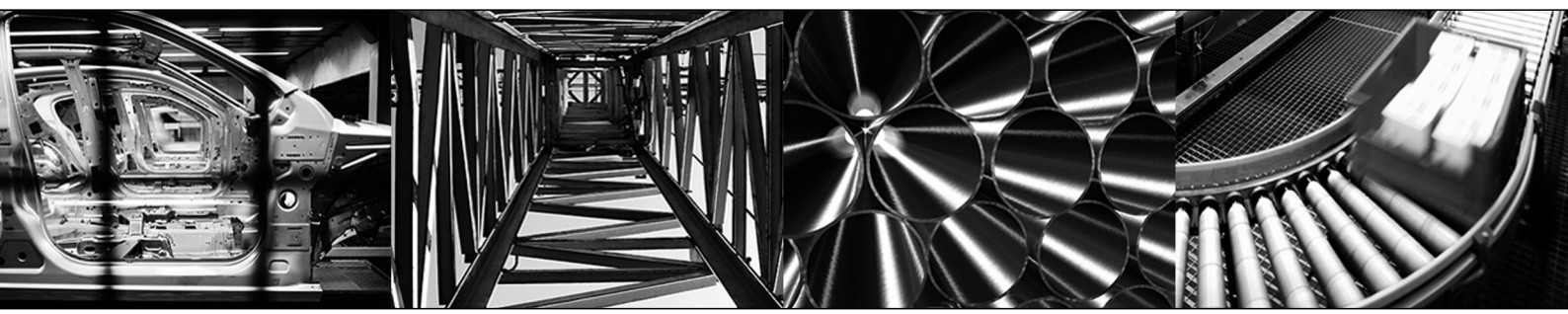

SEW-EURODRIVE
Driving the world

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Schaltbild/ Circuit diagram/ Schéma de branchement 68 043 05 06

YY/Y in Y, 6pol. Klemmbrett / Double star/star in star, 6 pin terminal board / 6 bornes pour couplage ,YY/Y en Y

Spannungsumschaltbar 1:2 / Voltage switchable 1:2 / Tensions Commutables 1:2

R76

YY-Schaltung – niedere Spannung
Beispiel: 230V

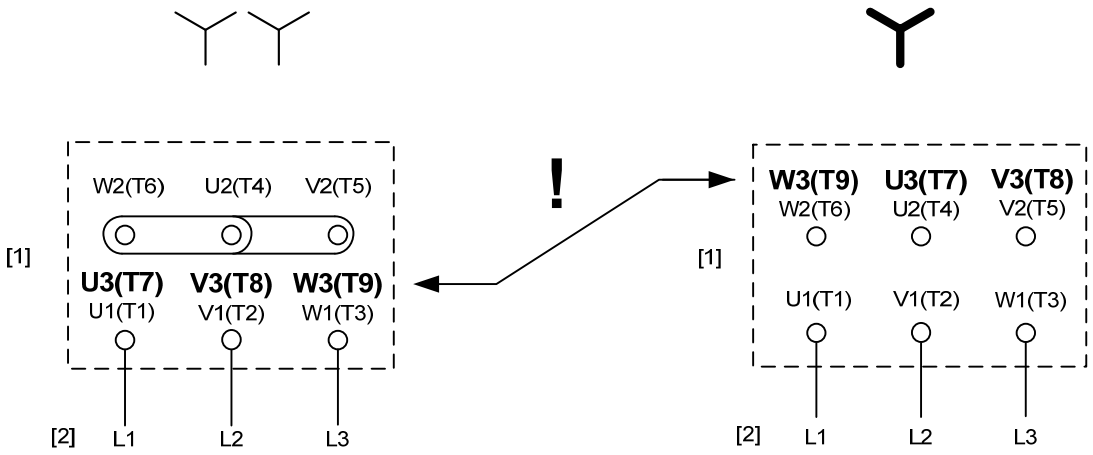
Double Star-connected – low voltage
Example: 230V

Branchement YY – basse tension
Exemple: 230V

Y-Schaltung – hohe Spannung
Beispiel: 460V

Star-connected – high voltage
Example: 460V

Branchement Y – haute tension
Exemple: 460V



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Werkseitig Y geschaltet

! Wechsel der Schaltung:
Die Anschlüsse U3(T7), V3(T8) und W3(T9) und Brücken gemäß Schaltbild umverdrahten

[1] Motorklemmenplatte
[2] Zuleitungen

Drehrichtungsumkehr: Vertauschen von 2 Zuleitungen (L1-L2)

Connected star in factory

! Voltage Change:
Move the location of wires U3(T7), V3(T8) and W3(T9). Install or remove brass jumpers according to the wiring diagram

[1] Motor terminal board
[2] Supply leads

To reverse: Interchange 2 supply leads (L1-L2)

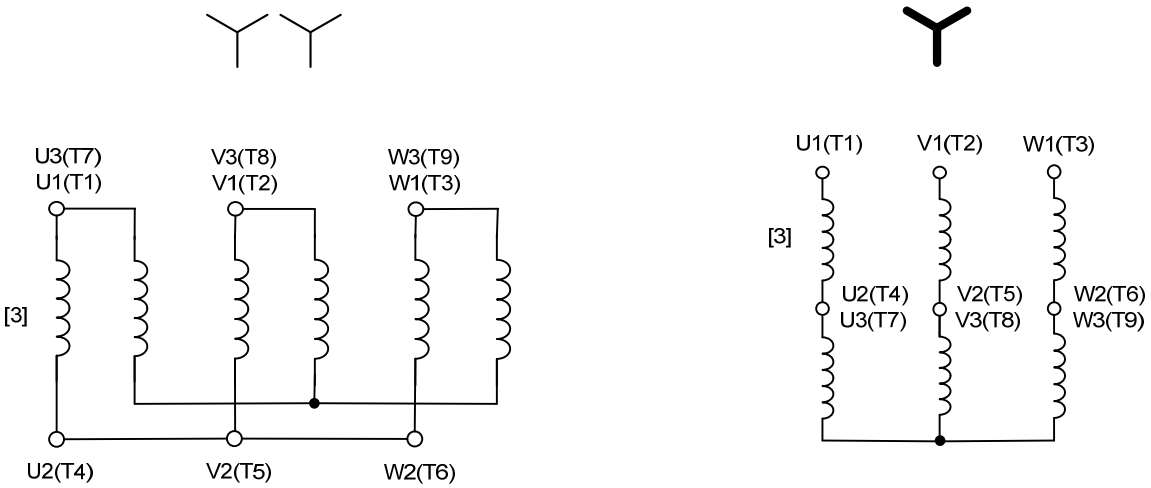
Câblée Y en usine

! Changement de couplage:
Recâbler les raccords U3(T7), V3(T8) et W3(T9) comme indiqué dans le schéma de branchement

[1] Plaques à bornes du moteur
[2] Alimentation

Changement du sens de rotation Inverser deux conducteurs d'alimentation (L1-L2)

R76



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[3] Motorwicklung

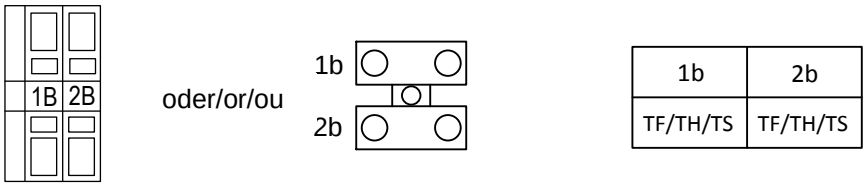
[3] Motor winding

[3] Bobinage moteur

Motorschutz mit PTC-Widerstand (TF) oder Bimetallschalter (TH/TS)

Motor protection with PTC-resistance (TF) or bimetallic switch (TH/TS)

Protection du moteur par résistance PTC (TF) ou relais bilame (TH/TS)



66000 XX 06 01 01

BK : schwarz / black / noir
BN : braun / brown / brun
BU : blau / blue / bleu
GN : grün / green / vert-jaune
GY : grau / grey / gris
OG : orange / orange / orange
PK : rosa / pink / rose
RD : rot / red / rouge
VT : violett / violet / violet
WH : weiß / white / blanc
YE : gelb / yellow / jaune

TF : 100°C – RD
130°C – BU
150°C – BK
170°C – WH/GN

TH : 100°C – GN
130°C – YE
150°C – VT
170°C – BN

TS : 100°C – GN/BK
130°C – YE/BK
150°C – VT/BK
170°C – BN/BK

Hx : 400V ±10% - OG/OG
230V ±10% - WH/OG
115V ±10% - WH/GY

8. Installation Protocol

HYPERCLASSIC® Mixer Aerator

Cover Page

General project information

Project name	Project number	Product description

Plant TAG number

Drawing number	Rotation direction shown on drawing	Distance from bottom of tank to bottom of mixer shown on drawing	Diameter of mixer body shown on drawing

Gear box serial number

Motor serial number	Connected voltage	Motor frequency	Motor nominal current	Motor power rating
	V	Hz	A	Hp

Attached documents in accordance with specifications

Document name	Required	Not required
Mechanical inspection report		
Dry test report		
Wet test report		
Sound test report		
Vibration test report		
Insulation resistance test report		

HYPERCLASSIC® Mixer Aerator

Mechanical Inspection

Note: - Access is required to inspect all items included in the mechanical inspection form. Any non inspected items will be marked as failed and the comment "Not Inspected" added to the comment field

Description	Inspection		Comments
General site layout	Pass	Fail	
- Mixer aerators in the correct position in accordance with drawing			
- Flow inlets in accordance with drawing			
- Mixing direction in accordance with drawing			Installed direction=.....
- Bridges / platforms in accordance with drawing			
- Basin clean and free of any debris			
- **INVENT** equipment and materials not already installed are stored correctly			
Air pipes connected to ring sparger			

Description	Inspection		Comments
Labels and Decals	Pass	Fail	
- **INVENT** name plate installed on mounting base has correct information.			
- Direction arrows installed on mounting base			
- Direction arrow is indicating correct rotation direction			
- **INVENT** decals and plugs plastic plugs installed onto sides of the gearbox to prevent rust issues at casting plugs.			

HYPERCLASSIC® Mixer Aerators

Mechanical Inspection

Description	Inspection		Comments
Drive	Pass	Fail	
- HCMA controlled by VFD			
- Rating of electric motor correct (Voltage, Current, Power and frequency)			
- Electric motor weather hood free from damage.			
- Termination of electrical conduits at bottom of terminal box (To stop water ingress at termination point)			
- Electrical connection box lid screws tightened correctly			
- Oil visible in oil site glass and filled to correct level.			
- Ventilation transport lock removed and free from paint			
- Drive installed level (Check level from top of shaft, left to right and front to back)			
- Shaft is drawn completely through the hollow shaft and shaft nut retaining washer bent up to shaft nut			
- Shaft nut and shaft completely covered in grease.			
- Hollow shaft cover installed			
- Drive coating not damaged			

Description	Inspection		Comments
Mounting base	Pass	Fail	**INVENT** Technician cannot verify the correct drilling depths of any set chemical anchors. Therefore, it is assumed that the installation of the anchors is in accordance with **INVENT** O&M manual and/or the directions provided with the anchors.
- Threaded rods installed perpendicular to the bridge			
- Rubber buffers installed correctly in accordance with the manual			
Frost washers installed correctly			
Configuration of suspension fixing set in accordance with installation drawing			
- Mounting base at correct elevation.			Bridge – Bottom of base plate=……
- All bolts tight and locked in position with a medium strength locking fluid.			
- Coating of mounting base not damaged			

HYPERCLASSIC® Mixer Aerators

Mechanical Inspection

Description	Inspection		Comments
Mixer body	Pass	Fail	
- Mixer body turns by hand			
- Mixer body free of damage			
- Flange screws secured using lock washers			
- Lock washers bent over as indicated in the drawing			
- Rotation direction in accordance with drawing			Installed direction=.....
- Distance from bottom of tank to bottom of mixer body in accordance with the drawing (or within tolerance)			Distance =
- Mixer body clear of any obstructions			
- Diameter of mixer body correct			Diameter
- Gas release hole is clear of obstruction			

Description	Inspection		Comments
Shaft	Pass	Fail	
Shaft and flange free of damage			

HYPERCLASSIC® Mixer Aerators

Mechanical Inspection

Description	Inspection		Comments
Bottom guide	Pass	Fail	**INVENT** Technician cannot verify the correct drilling depths of any set chemical anchors. Therefore, it is assumed that the installation of the anchors is in accordance with **INVENT** O&M manual and/or the directions provided with the anchors.
- Guide bush level OK			
- Fixings as shown on dwg. And torqued as per O&M manual.			
- Medium strength locking fluid used			
- Height of assembly correct (Sliding bush has to be completely inside of guide bush)			
- Bearing journal is centered in the guide bush			
Grouting under bottom guide in accordance with drawing.			

Description	Inspection		Comments
Flushing system (When installed)	Pass	Fail	
- Flushing pipe connected properly in accordance with drawing			
- Tube clamps fixed correctly and flushing pipes fixed correctly			

Description	Inspection		Comments
Ring sparger	Pass	Fail	**INVENT** Technician cannot verify the correct drilling depths of any set chemical anchors. Therefore, it is assumed that the installation of the anchors is in accordance with **INVENT** O&M manual and/or the directions provided with the anchors.
- Ring centrically mounted			
- Ring sparger level			
- Ring sparger fixings correct and locking fluid used.			
- All air holes in ring sparger clear of blockages			
All ring spargers at the same elevation throughout the basin.			
Air headers blown through to clear debris			

HYPERCLASSIC® Mixer Aerator

Dry Test

Description	Inspection		Comments
Test duration should be kept as short as possible. Maximum recommended running time is 1 minute.	Pass	Fail	
- Rotation direction of the mixer body correct			Installed direction = ……
- Mixer and shaft turn smoothly after initial start-up			
- Abnormal noise or vibration noticeable			
- Oil leakage noticeable			
- Oil visible in sight glass			

HYPERCLASSIC® Mixer Aerator

Wet Test

Description	Inspection		Comments
Mixer run time for the Wet Test should be no less than 6 hrs	Pass	Fail	
- Temperature at end of test run (Not to exceed 150º F)			Recorded temp. (end of test run) =
- Abnormal noise noticeable			
- Abnormal heat noticeable			
- Oil leakage noticeable			
- Oil visible in sight glass			
- Rotation speed correct			

HYPERCLASSIC® Mixer Aerator

Wet Test

Without air (6 hrs min)

The mixer aerators should be run for a minimum of 6 hours without air.

Start time _____ Shaft rotation speed _____rpm

Stop time _____

Test duration _____Hrs

Description	L1	L2	L3	Comments
- Amp readings at start time	A	A	A	
- Amp readings at stop time	A	A	A	
Volt readings at stop time	V	V	V	

With air (after 6 hr test run)

The mixer aerators should be run with air for long enough to establish amp readings and to confirm correct bubble patterns.

Start time _____

Stop time _____

Test duration _____Hrs

Description	L1	L2	L3	Comments
- Amp readings with air	A	A	A	

Description	Inspection		Comments
	Pass	Fail	
- No undue vibration caused by airflow			
Bubble pattern visually good (No large bubbles)			
Balance of airflow equal between all installed mixer aerators			

HYPERCLASSIC® Mixer Aerator

Sign off sheet

Additional comments

The undersigned person(s) confirms that, to the best of their knowledge, the above installation has been preformed and the results recorded are accurate.

INVENT start up technician

Date	Company / Position	Print name	Signature

Customer / Witness

Date	Company / Position	Print name	Signature

Authority / Witness 2

Date	Company / Position	Print name	Signature

9. Start up Protocol

INVENT Environmental Technoligies, Inc.
HCMA Start-up classifications

1) Mechanical Inspection

Mechanical check that all the units are installed correctly in accordance with the installation drawings. Bolts will be checked for correct torque and for the presence of medium strength locking fluid. Elevations and levels will also be checked.

- Requires access into the basin to inspect the mixer body, shaft connections, bottom guides and ring spargers. Access to the drives will also be required.
- Ladders, lifts, scaffolds etc., must be provided in order for the **INVENT** inspector to gain access to all mechanical connections on the **INVENT** equipment.
    - Note: - The **INVENT** Technician cannot verify the correct drilling depths of any set chemical anchors. Therefore, it is assumed that the installation of the anchors is in accordance with the **INVENT** O&M manual and/or the directions provided with the anchors.
    - Note: Any rectifications need to be carried out while the inspector is on-site. Any non inspected items will be marked on the start-up sheet and may void the **INVENT** warranty.

2) Dry Test (Rotation test)

Electrical connections are checked and mixers are bumped to confirm correct rotation direction. (This test is usual carried out at the same time as the mechanical inspection, but it can also be done with the Wet Test, providing the mechanical inspection has previously been carried out by **INVENT**.

- Requires permanent mains power.
    - Note: Any rectifications need to be carried out while the inspector is on-site. Any non inspected items will be marked on the start-up sheet and may void the **INVENT** warranty.

3) Wet Test

The mixers are run for 6 hours to check mechanical and electrical performance.

- Requires permanent mains power as well as the basins to be full of water to the minimum operating depth (Water can be clean, effluent or influent).
    - Note: A qualified electrician should be provided to take amp readings from the local isolator at start-up and after 6 hours of operation.

4) Product training

The **INVENT** field technician will provide product training to owners personnel.

- Product training is preferably carried out at the same time as the first Wet test (Unless specified otherwise).
- Product training will consist of classroom and hands on training at the mixer (Unless specified otherwise).

10. Machine Operator List

Machine Operator List

Every person who works on or with the product must confirm by its signature the reception, reading and understanding of the Operating and Maintenance Manual. Furthermore the person commits to conscientiously observe the instructions. The producer is not liable if the customer or third parties do not observe the instructions.

Name	Date	Signature

Table: Machine Operator List

11. Maintenance List

Maintenance List

Every maintenance and revision work has to be duly registered into the list. The person who makes the registration must confirm this by the signature of the responsible person and its own. This list is to be submitted to the control institutions on demands.

Maintenance / Inspection at	Date	Signature	Signature person in charge

Table: Maintenance List

12. Maintenance overview

Task Description	Trade Required	Skill Level Required	Amount of Time Required	No. Of Personnel Required	Task Frequency
Clean the Drive Unit and Mounting plate	Mechanic	Journeyman	1 hour/unit	1	Initial 6 weeks/1,000 hours, then annually or 8000 hours
Check the Alignment of the drive unit with an industrial sprit level and correct if necessary.	Mechanic	Journeyman	1 hour/unit	1	Initial 6 weeks/1,000 hours then annually or 8000 hours
Check all bolt connection above the waterline and tighten if necessary	Mechanic	Journeyman	1 hour/unit	1	Initial 6 weeks/1,000 hours then annually or 8000 hours
Check the oil level	Mechanic	Journeyman	1 hour/unit	1	Initial 6 weeks/1,000 hours
Examine the drive unit for leaks	Mechanic	Journeyman	1 hour/unit	1	Initial 6 weeks/1,000 hours then annually or 8000 hours
Examine the ventilation valve for contamination, and clean if necessary.	Mechanic	Journeyman	1 hour/unit	1	Initial 6 weeks/1,000 hours then Monthly/ as needed.
Check the terminal box for leak tightness	Electrician	Journeyman	1 hour/unit	1	Initial 6 weeks/1,000 hours then, annually or 8000 hours
Check current/power consumption	Electrician	Journeyman	1 hour/unit	1	Initial 6 weeks/1,000 hours
Check the working condition of safety and monitoring equipment	Mechanic	Journeyman	1 hour/unit	1	Initial 6 weeks/1,000 hours then, annually or 8000 hours
Check for obvious noises vibrations and changes	Electrician	Journeyman	1 hour/unit	1	Daily
Examine the gear unit for leaks	Mechanic	Journeyman	1 hour/unit	1	Monthly
Change the oil. (If you are using a 2-year oil-change interval, check the oil-level after 1 year)	Mechanic	Journeyman	1 hour/unit	1	1 year after start up or every 10,000 hours (if synthetic oil is used, review data sheet)

Check the condition of rubber buffers. If there is apparent wear, rubber buffers have to be replaced	Mechanic	Journeyman	4 hours/unit	1	Annually or 8000 hours
Renew the grease packing under the hollow shaft cover.	Mechanic	Journeyman	4 hours/unit	2	Annually or 8000 hours
Clean the drive unit pressure relief valve	Mechanic	Journeyman	1 hour/unit	1	Annually or 8000 hours
Check the insulation resistance against earthing	Electrician	Journeyman	4 hours/unit	2	Annually or 8000 hours
Carry out a complete inspection of drive unit	Mechanic	Journeyman	4 hours/unit	2	Annually or 8000 hours
Clean the ventilation holes in the shaft.	Mechanic	Journeyman	4 hours/unit	2	Annually or 8000 hours
Carry out a check of the alignment of the bottom guide unit.	Mechanic	Journeyman	1 hour/unit	1	3-5 Years
Check the bearing journal for wear. If abrasion is apparent, replace the sliding bush with a new one and realign the bottom guide unit.	Mechanic	Journeyman	2 hours/unit	1	3-5 Years
Clean mixer body and Shaft	Mechanic	Journeyman	8 hours/unit	2	3-5 Years
Perform visual check on the mixer body and shaft. Repair if necessary.	Mechanic	Journeyman	8 hours/unit	2	3-5 Years

Lubrication Table:

Task Description	Trade Required	Skill Level Required	Amount of Time Required	No. Of Personnel Required	Task Frequency
Check the oil level	Mechanic	Journeyman	1 hour/unit	1	Initial 6 weeks/1,000 hours
Examine the gear unit for leaks	Mechanic	Journeyman	1 hour/unit	1	Monthly
Change the oil. (If you are using a 2-year oil-change interval, check the oil-level after 1 year)	Mechanic	Journeyman	1 hour/unit	1	1 year after start up or every 10,000 hours (if synthetic oil is used, review data sheet)
Examine the drive unit for leaks	Mechanic	Journeyman	1 hour/unit	1	Initial 6 weeks/1,000 hours then annually or 8000 hours

13. Fault Report List

Fault Report List

Every person who notices a disturbance or fault at the product must register this fault into the list and has to confirm this by the signature of the responsible person and its own.

Fault at	Fault	Date	Name / Signature	Signature person in charge

Table: Fault Report List