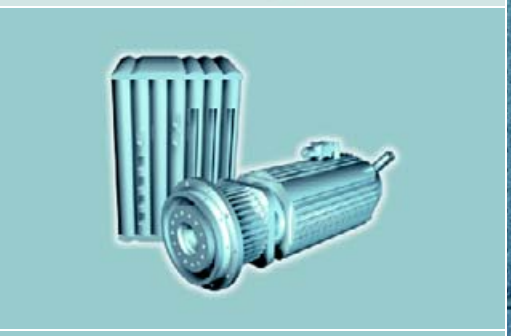
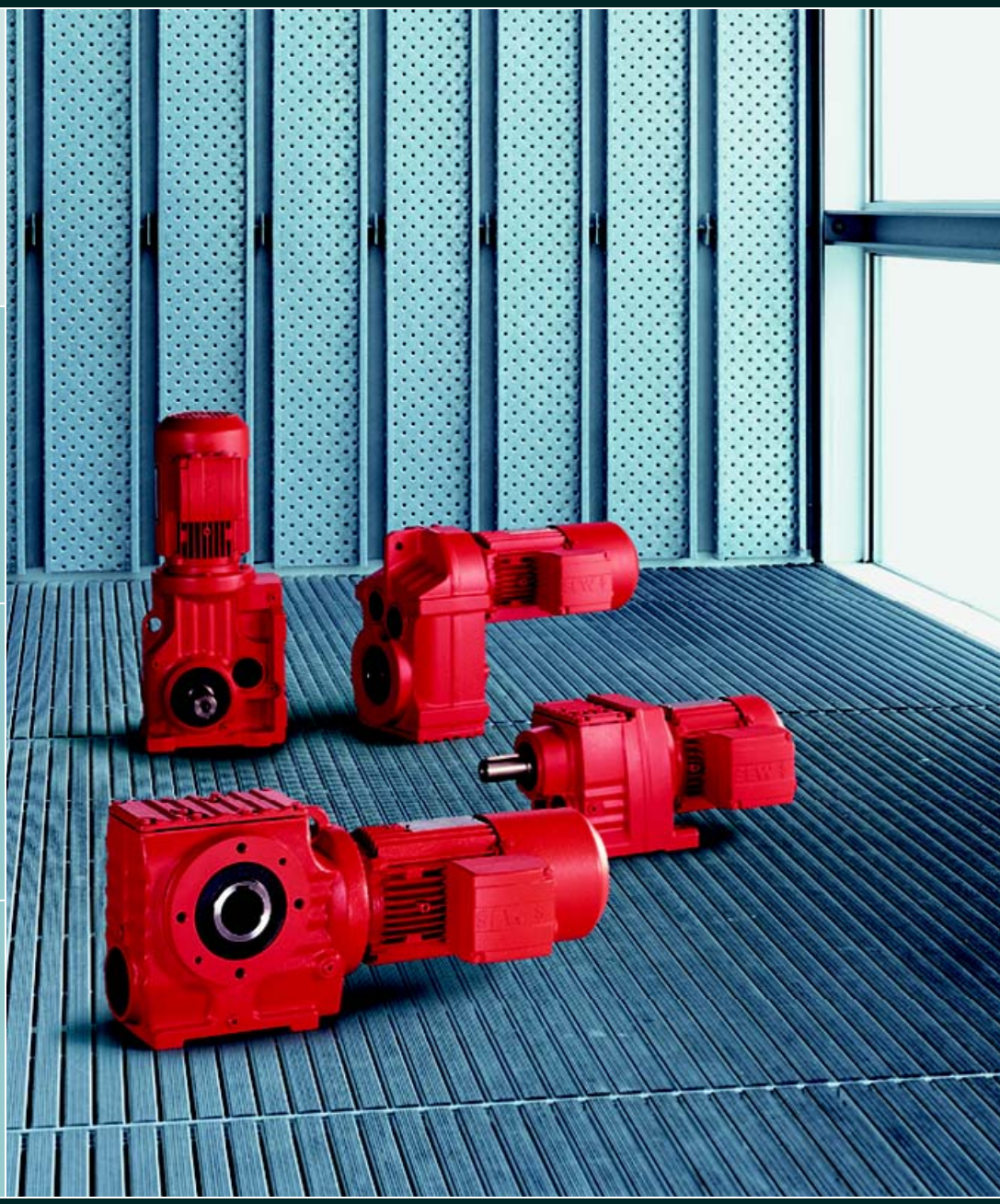
SEW EURODRIVE





Gear Units and Gearmotors

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Manual

SEW EURODRIVE

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1 Introduction

1.1 The SEW-EURODRIVE Group of Companies

Global presence

Driving the world with innovative drive solutions for all branches and for every application. Products and systems from SEW-EURODRIVE are used in a multitude of applications - worldwide. These include the automotive, building materials, food and beverage as well as metal-processing industries. The decision to use drive technology "made by SEW-EURODRIVE" stands for reliability for both functionality and investment.

We are represented in the most important branches of industry there are today all over the world: With eleven manufacturing plants and 58 assembly plants in 44 countries and our comprehensive range of services, which we consider an integrative service adequately continuing our commitment to outstanding quality.

Always the right drive

The SEW-EURODRIVE modular concept offers millions of combinations. This wide selection enables you to choose the correct drive for all applications, each based on the required speed and torque range, space available and the ambient conditions. Gear units and gearmotors offering a unique and finely tuned performance range and the best economic prerequisites to face your drive challenges.

The gearmotors are electronically empowered by MOVITRAC® frequency inverters, MOVIDRIVE® drive and MOVIAXIS® multi-axis servo drives, a combination that blends perfectly with the existing SEW-EURODRIVE systems program. As in the case of the mechanical systems, development, production and assembly is carried out completely by SEW-EURODRIVE. In combination with our drive electronics, these drives will provide the utmost in flexibility.

Products of the servo drive system, such as low backlash servo gear units, compact servomotors or MOVIAXIS® multi-axis servo drives provide precision and dynamics. From single-axis or multi-axis applications all the way to synchronized process sequences, servo drive systems by SEW-EURODRIVE offer a flexible and customized implementation of your application.

For economical, decentralized installations, SEW-EURODRIVE offers components from its decentralized drive system, such as MOVIMOT®, the gearmotor with integrated frequency inverter or MOVI-SWITCH®, the gearmotor with integrated switching and protection function. SEW-EURODRIVE hybrid cables have been designed specifically to ensure cost-effective solutions, independent of the philosophy behind or size of the system. The latest developments from SEWEURODRIVE: MOVITRANS® - system components for contactless energy transfer, MOVIPRO® - the decentralized drive control and MOVIFIT - the new decentralized intelligence.

Power, quality and sturdy design combined in one standard product: Industrial gear units from SEW-EURODRIVE provide major movements that need great torques. The modular concept will once again provide optimum adaptation of industrial gear units to meet a wide range of different applications.

Your ideal partner

Its global presence, extensive product range and broad spectrum of services make SEW-EURODRIVE the ideal partner for the machinery and plant construction industry when it comes to providing drive systems for demanding applications in all branches of industries and applications.

1.2 Products and systems from SEW-EURODRIVE

The products and systems from SEW-EURODRIVE are divided into four product groups. These four product groups are:

1. Gearmotors and frequency inverters
2. Servo drive systems
3. Decentralized drive systems
4. Industrial gear units

Products and systems used in several group applications are listed in a separate group "Products and systems covering several product groups." Consult the following tables to locate the products and systems included in the respective product group:

1) Gearmotors and frequency inverters		
Gear units / gearmotors	**Motors**	**Frequency inverters**
• Helical gear units/ helical gearmotors • Parallel shaft helical gear units / parallel shaft helical gearmotors • Helical-bevel gear units / helical-bevel gearmotors • Helical-worm gear units/ helical-worm gearmotors • Spiroplan® right-angle gearmotors • Drives for overhead trolley systems • Geared torque motors • Pole-changing gearmotors • Variable speed gear units / variable speed gearmotors • Aseptic gearmotors • Gear units / gearmotors to ATEX standard • Variable speed gear units / variable speed gearmotors to ATEX standard	• Asynchronous AC motors / AC brake motors • Multi-speed AC motors / AC brake motors • Energy efficient motors • Explosion-proof AC motors / AC brake motors • Torque motors • Single-phase motors / single-phase brake motors • Asynchronous linear motors	• MOVITRAC® frequency inverters • MOVIDRIVE® drive inverters • Control, technology and communication options for inverters

2) Servo drive systems		
Servo gear units / servo gearmotors	**Servomotors**	**Servo drive inverters / servo inverters**
• Low backlash servo planetary gear units / planetary gear-motors • Low backlash helical-bevel servo gear units / helical-bevel gearmotors • Explosion-proof servo gear units / geared servomotors	• Asynchronous servomotors / servo brake motors • Synchronous servomotors / servo brake motors • Explosion-proof servomotors / servo brake motors • Synchronous linear motors	• MOVIDRIVE® servo drive inverters • MOVIAXIS® multi-axis servo inverter • Control, technology and communication options for servo drive inverters and servo inverters

3) Decentralized drive systems		
Decentralized drives	**Communication and installation**	**Contactless energy transfer system**
• MOVIMOT® gearmotors with integrated frequency inverter • MOVIMOT® motors/brake motors with integrated frequency inverter • MOVI-SWITCH® geamotor with integrated switching and protection function • MOVI-SWITCH® motors/brake motors with integrated switching and protection function • Explosion-proof MOVIMOT® and MOVI-SWITCH® gearmotors	• Fieldbus interfaces • Field distributors for decentralized installation • MOVIFIT® product range – MOVIFIT® MC to control MOVIMOT® drives – MOVIFIT® SC with integrated electronic motor switch – MOVIFIT®-FC with integrated frequency inverter	• MOVITRANS® system – Stationary components for energy supply – Mobile components for energy consumption – Line cables and installation material

4) Industrial gear units
• Helical gear units • Helical-bevel gear unit • Planetary gear units

Products and systems for several groups of products
• Operator terminals • MOVI-PLC® drive-based control system

In addition to its products and systems, SEW-EURODRIVE offers a comprehensive range of services. These are:

- Technical consulting
- Application software
- Seminars and training
- Extensive technical documentation
- International customer service

Visit our home page:

→ **www.sew-eurodrive.com**

The website offers a lot of information and services.

1.3 Additional documentation

Contents of this publication

This manual "Gear Units and Gearmotors" includes a detailed description of the following SEW-EURODRIVE product groups:

- Helical gear units and helical gearmotors
- Parallel shaft helical gear units and parallel shaft helical gearmotors
- Helical-bevel gear units and helical-bevel gearmotors
- Helical-worm gear units and helical-worm gearmotors
- Gear unit components at the input end
- Spiroplan® gearmotors
- MOVIMOT® gearmotors
- AC motors

The descriptions have the contents:

- Product descriptions
- Type overviews
- Project planning notes
- Visual representation of mounting positions
- Explanation on the order information
- Design and operating notes

Additional documentation

In addition to this "Gear Units and Gearmotors" manual, the following catalogs and price catalogs are available from SEW-EURODRIVE:

- Gearmotors (helical, parallel shaft helical, helical-bevel and helical-worm designs as well as Spiroplan®)
- MOVIMOT® gearmotors
- Gear units (helical, parallel shaft helical, helical-bevel and helical-worm designs)

The price catalogs and catalogs offer the following information:

- Important information on tables and dimension sheets
- Visual representation of the different types
- Overview of all permitted combinations
- Selection tables
- Dimension sheets
- Technical data
- In the price catalogs → Prices and option pricing for special features

This manual includes references to let you know which price catalog / catalog includes the technical data / or dimension drawings associated with the description. Reference is made with the following pictograms and cross references:

	The associated technical data and / or dimension drawings are listed in the price catalog / catalog "Gearmotors." Also note the cross reference "(→ GM) in the section title and the header.
	The associated technical data and / or dimension drawings are listed in the price catalog / catalog "MOVIMOT® Gearmotors." Also note the cross reference "(→ MM) in the section title and the header.
	The associated technical data and / or dimension drawings are listed in the price catalog / catalog "Gear Units." Also note the cross reference "(→ GK) in the section title and the header.

The "Gear Units and Gearmotors" manual and the listed price catalogs / catalogs can be ordered separately or as a box set. The following box sets are available:

Gear units and gearmotors manual	with	Gearmotors price catalog	Part number German edition: Part number English edition:	11474602 11474610
		Gearmotors catalog	Part number German edition: Part number English edition:	11475005 11475013
		MOVIMOT® gearmotors price catalog	Part number German edition: Part number English edition:	11481803 11481811
		MOVIMOT® gearmotors catalog	Part number German edition: Part number English edition:	11482206 11482214
		Gear units price catalog	Part number German edition: Part number English edition:	11482605 11482613
		Gear units catalog	Part number German edition: Part number English edition:	11483008 11483016

Please note that the complete range of technical documentation is available on our home page:

→ **www.sew-eurodrive.com**

2 Product Description

2.1 General notes on product description

Power and torque

The power and torque ratings listed in the catalogs refer to mounting position M1 and similar mounting positions in which the input stage is not completely submerged in oil. In addition, the gearmotors are assumed to be standard versions with standard lubrication and under normal ambient conditions.

Please note that the motor power shown in the selection tables for gearmotors is subject to selection. However, the output torque for the desired output speed is essential for the application and needs to be checked.

Speeds

The quoted output speeds of the gearmotors are recommended values. You can calculate the rated output speed based on the rated motor speed and the gear unit ratio. Please note that the actual output speed depends on the motor load and the supply system conditions.

Noise levels

The noise levels of all SEW-EURODRIVE gearmotors and motors (brake motors) are well within the maximum permitted noise levels set forth in the VDI guideline 2159 for gear units and IEC/EN 60034 for motors.

Coating

Gear units, motors and gearmotors from SEW-EURODRIVE are painted with "blue/gray" machine paint RAL 7031 to DIN 1843 as standard. Special coatings are available on request.

Exception: Spiroplan® W..10 DT56 gearmotors have an aluminum housing and are supplied unpainted as standard.

Surface and corrosion protection

If required, all SEW-EURODRIVE gear units, motors and gearmotors can also be supplied with special surface protection for applications in extremely humid and chemically aggressive environments.

Weights

Please note that all weights shown in the catalog exclude the oil fill for the gear units and gearmotors. The weights vary according to gear unit design and gear unit size. The lubricant fill depends on the mounting position selected, which means that in this case no universally applicable information can be given. Please refer to "Lubricants" in the "Design and Operating Notes" section for recommended lubricant fill quantities depending on the mounting position. The exact weight is given in the order confirmation.

Air admission and accessibility

The gearmotors/brake motors must be mounted on the driven machine in such a way that both axially and radially there is enough space left for unimpeded air admission and for the purposes of maintenance of the brake and MOVIMOT® inverter, if necessary. Please also refer to the notes in the motor dimension sheets.

Multi-stage gearmotors

You can achieve particularly low output speeds by using multi-stage gear units or multi-stage gearmotors. This involves mounting a helical gear unit or helical gearmotor on the input end as a second gear unit.

It may be necessary to limit the motor power to match the maximum permitted output torque of the gear unit.

Design with reduced backlash

Helical, parallel shaft helical and helical-bevel gear units with reduced backlash are available from gear unit size 37 and up. The circumferential backlash of these gear units is considerably less than that of the standard versions so that positioning tasks can be performed with great precision. The circumferential backlash is specified in angular minutes [’] in the technical data. The dimension drawings for the standard versions are applicable.

NOCO® fluid for protection against contact corrosion

As standard, all shaft-mounted gear units and gearmotors are supplied with NOCO® Fluid, a paste that prevents contact corrosion. Use this paste in accordance with the instructions in the gear unit operating instructions. It facilitates service and stripping down jobs.

NOCO® fluid is food grade according to USDA-H1. You can tell that NOCO® fluid is a food grade oil by the USDA-H1 identification label on its packaging.

RM gear units, RM gearmotors

RM gear units and RM gearmotors are a special type of helical gear unit and helical gearmotor with an extended output bearing hub. They are specifically designed for agitating applications and can be used in applications subject to high overhung and axial loads as well as flexural torque. The remaining data correspond to the standard helical gear units and helical gearmotors. You can find special project planning notes for RM gearmotors in the "Project Planning for Gear Units/RM gear units" section.

Spiroplan® right-angle gear units/motors

Spiroplan® right-angle gearmotors are robust, single stage right-angle gearmotors with Spiroplan® gearing. The difference to the helical-worm gear units is the material combination of the steel-on-steel gearing, the special tooth meshing relationships and the aluminum housing. As a result, Spiroplan® right-angle gearmotors are wear-free, very quiet-running and lightweight.

The particularly short design and the aluminum housing make for very compact and lightweight drive solutions.

After the running-in period, Spiroplan® right-angle gearmotors are below the sound pressure level of 55 dB(A) in 4-pole operation on a 50 Hz supply system. The sound-pressure level may be 3 to 5 dB(A) higher at time of delivery than after hours of regular operation.

The wear-free gearing and the lifetime lubrication make for long periods of maintenance-free operation. The oil filling being independent of the mounting position makes any position possible for Spiroplan® right-angle gearmotors without altering the quantity of oil. The identical hole spacing in the foot and face as well as the same shaft height to both makes for a number of mounting options.

Two different flange diameters are available. On request, Spiroplan® right-angle gearmotors can be equipped with a torque arm.

Brake motors

On request, motors and gearmotors can be supplied with an integrated mechanical brake. The SEW-EURODRIVE brake is an electromagnetic disk brake with a DC coil that releases electrically and brakes using spring force. Due to its operating principle, the brake is applied if the power fails. It meets the basic safety requirements. The brake can also be released mechanically if equipped with a manual brake release. You will either receive a manual lever with automatic reset or an adjustable setscrew for this purpose. The brake is controlled by a control element that is either installed in the motor wiring space or the control cabinet.

A significant feature of the brakes is their very short length. The brake bearing end shield is a part of both the motor and the brake. The integrated construction of the SEW-EURODRIVE brake motor permits particularly compact and sturdy solutions.

International markets

SEW-EURODRIVE is a member of the AGMA (American Gear Manufacturer's Association), and as such, all its gear units and gearmotors conform to AGMA specifications.

Upon request, SEW-EURODRIVE will supply UL listed motors or motors with CSA certification meeting the connection requirements to CSA und NEMA guidelines.

Upon request, we will deliver UL listed MOVIMOT® drives with connection requirements according to NEMA guidelines.

For the Japanese market, SEW-EURODRIVE offers motors conforming to JIS standard. Contact your sales representative to assist you in such cases.

Component on the input side

The following components on the input side are available for the gear units from SEW-EURODRIVE:

- **Input covers with input shaft extension, optionally with**
  - Centering shoulder
  - Backstop
  - Motor mounting platform
- **Adapter**
  - for mounting IEC or NEMA motors with the option of a backstop
  - for mounting servomotors with a square flange
  - with torque limiting safety couplings and speed or slip monitor
  - with hydraulic centrifugal coupling, also with disc brake or backstop

Swing base

A swing base is a drive unit consisting of helical-bevel gear unit, hydraulic centrifugal coupling and electric motor. The complete arrangement is mounted to a rigid mounting rail.

Motor swings are available with the following optional accessories:

- Torque arm
- Mechanical thermal monitoring unit
- Contactless thermal monitoring unit

2.2 Explosion protection according to ATEX

Validity

EU directive 94/9/EC or ATEX 95 lays down new regulations for explosion protection in all types of devices for the European market. This means the directive also applies to gear units, motors, and gearmotors. Since July 1, 2003, EU directive 94/9/EC has been applicable without restrictions to the use of gear units, motors, and gearmotors within the European Union. Other European countries, such as Switzerland, implement this regulation as well.

Another new directive, 1999/92/EC or ATEX 137 (118a), also regulates the conditions throughout Europe for operating machines in potentially explosive atmospheres. This directive also defines zones in which, for example, electrical drives may be operated:

- Zone 1 and zone 2 with potentially explosive gas atmosphere.
- Zone 21 and zone 22 with potentially explosive dust atmosphere.

According to ATEX, the identification of motors is extended by

- equipment group II
- category 2 or 3
- potentially explosive atmosphere G (gas) and/or D (dust).

Scope

SEW-EURODRIVE now only supplies explosion-proof gear units, motors, and gearmotors in accordance with the corresponding ATEX directive. This also applies to options and accessories in explosion-proof design.

Depending on their features and dimensions, explosion-proof gear units, motors and gearmotors are suitable for:

- Potentially explosive gas atmospheres, zone 1 or 2.
- Potentially explosive dust atmospheres, zone 21 or 22.

SEW-EURODRIVE supplies gear units, motors and gearmotors for the following categories:

- II2G
- II2D
- II3GD
- II3D

The gear units, motors and gearmotors are approved for use in zones 1, 21, 2 and 22 depending on the equipment category.

Stand-alone gear units with components on the input side are available in the following categories:

- Gear units with AM and AQA adapter and input shaft assembly AD → II2GD
  Approved for operation in zones 1, 21, 2 and 22

- Gear units with adapter AR → II3GD
  Approved for operation in zones 2 and 22

The adapters AQH and AT as well as drives on a motor swing are not available according to ATEX regulation.

MOVIMOT® drives are available in category II3D and approved for operation in zone 22.

Other documentation

The "Explosion-Proof Drives according to EU Directive 94/9/EC" system description and the volume of the same name in the "Drive Engineering - Practical Implementation" series provide you with basic information about this topic.

Please refer to the "Explosion-Proof Drives" catalog and the "Variable Speed Gearmotors" catalog for detailed information on explosion-proof SEW-EURODRIVE products.

2.3 Energy efficient motors (→ GM)

CEMEP, the association of European electric motor manufacturers, has reached an agreement with the European Commission's General Directorate for Energy that all 2 and 4-pole low-voltage AC motors from 1 to 100 kW will be classified on the basis of their efficiency, and that this classification will be identified on the nameplate and in catalogs. The classification consists of EFF3, EFF2 and EFF1 classes. EFF3 refers to motors without any particular efficiency requirement. EFF2 indicates improved efficiency motors and EFF1 is for high-efficiency motors.

Type DT/DV four-pole AC motors of motor sizes 90S to 280M meet the requirements of efficiency class EFF 2.

Type DTE/DVE four-pole AC motors of motor sizes 90S to 280M meet the requirements of efficiency class EFF 1. These motors are referred to as energy efficient motors.

International regulations

DT/DV and DTE/DVE four-pole AC motors comply with the energy efficiency standards and energy efficiency regulations of the following countries:

- Australia
- New Zealand
- Brazil
- Canada
- USA

2.4 Corrosion and surface protection

General information

SEW-EURODRIVE offers various optional protective measures for operation of motors and gearmotors under special ambient conditions.

The protective measures comprise two groups:

- Corrosion protection KS for motors
- Surface protection OS for motors and gear units

For motors, optimum protection is offered by a combination of corrosion protection KS and surface protection OS.

In addition, special optional protective measures for the output shafts are also available.

Corrosion protection KS

Corrosion protection KS for motors comprises the following measures:

- All retaining screws are made of stainless steel for daily operation.
- The nameplates are made from stainless steel.
- Various motor parts are coated with a top coating.
- The flange contact surfaces and shaft ends are treated with a temporary anti-corrosion agent.
- Additional measures for brake motors.

A sticker labeled "KORROSIONSSCHUTZ" (corrosion protection) on the fan guard indicates special treatment has been applied.

Motors with a forced cooling fan and motors with a spreadshaft encoder (ES..) cannot be supplied with corrosion protection KS.

Surface protection OS

Instead of the standard surface protection, the motors and gear units are available with surface protection OS1 to OS4 as an option. The special procedure Z can also be performed in addition. The special procedure Z means that large surface recesses are sprayed with a rubber filling prior to painting.

Surface protection	Layers	NDFT[1] on gray-cast iron [µm]	Suitable for
Standard	1 × Dip primer 1 × One-pack top coat	ca. 50-70	• Normal environmental conditions • Relative humidity below 90 % • Surface temperature up to max. 120 °C • Corrosivity category C1[2]
OS1	1 × Dip primer 1 × Two-pack base coat 1 × Two-pack top coat	ca. 120-150	• Low environmental impact • Relative humidity max. 95 % • Surface temperature up to max. 120 °C • Corrosivity category C2[2]
OS2	1 × Dip primer 2 × Two-pack base coat 1 × Two-pack top coat	ca. 170-210	• Medium environmental impact • Relative humidity up to 100 % • Surface temperature up to max. 120 °C • Corrosivity category C3[2]
OS3	1 × Dip primer 2 × Two-pack base coat 2 × Two-pack top coat	ca. 220-270	• High environmental impact • Relative humidity up to 100 % • Surface temperature up to max. 120 °C • Corrosivity category C4[2]
OS4	1 × Dip primer 2 × Two-pack epoxy base layer 2 × Two-pack top coat	ca. 320	• Very high environmental impact • Relative humidity up to 100 % • Surface temperature up to max. 120 °C • Corrosivity category C5-1[2]

1) NDFT (**n**ominal **d**ry **f**ilm **t**hickness) = Required coating thickness; Minimum thickness = 80 % NDFT; Maximum thickness = 3 x NDFT (DIN EN ISO 12944-5)

2) in accordance with DIN EN ISO 12 944-2

Special protective measures

Gearmotor output shafts can be treated with special optional protective measures for operation subject to severe environmental pollution or in particularly demanding applications.

Measure	Protection principle	Suitable for
FKM oil seal (Viton)	High quality material	Drives subject to chemicals
Kanisil coating	Surface coating of the contact surface of the oil seal	Severe environmental pollution and in conjunction with FKM oil seal (Viton)
Output shaft made of stainless steel	Surface protection due to high-quality material	Particularly demanding applications in terms of surface protection

NOCO® fluid

As standard, SEW-EURODRIVE supplies NOCO® fluid corrosion protection and lubricant with every hollow shaft gear unit. Use NOCO® fluid when installing hollow shaft gear units. Using this fluid helps prevent contact corrosion and makes it easier to assemble the drive at a later date.

NOCO® fluid is also suitable for protecting machined metal surfaces that do not have corrosion protection. including parts of shaft ends or flanges. You can also order larger quantities of NOCO® fluid from SEW-EURODRIVE.

NOCO® fluid is food grade according to USDA-H1. You can tell that NOCO® fluid is a food grade oil by the USDA-H1 identification label on its packaging.

2.5 Extended storage

Type

You can also order gear units prepared for "extended storage." SEW-EURODRIVE recommends the "extended storage" type for storage periods longer than 9 months.

In this case, a VCI (volatile corrosion inhibitor) is added to the lubricant in these gear units. Please note that this VCI corrosion inibitor is only effective in a temperature range of -25 °C ... +50 °C. The flange contact surfaces and shaft ends are also treated with an anti-corrosion agent. If not specified otherwise in your order, the gear unit will be supplied with OS1 surface protection. You can order OS2, OS3 or OS4 instead of OS1.

Surface protection	Suitable for
OS1	Low environmental impact
OS2	Medium environmental impact
OS3	High environmental impact
OS4	Very high environmental impact

The gear units must remain tightly sealed until taken into operation to prevent the VCI corrosion protection agent from evaporating.

Gear units will be supplied with an oil fill according to the mounting position (M1 ... M6) and are ready for operation. Check the oil level before you start operating the gear unit for the first time!

Storage conditions

For extended storage, observe the storage conditions specified in the following table:

Climate zone	Packaging[1)]	Storage location[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.	With roof, protected against rain and snow, no shock loads.	Up to three years with regular checks of the packaging and moisture indicator (rel. humidity < 50 %).
	open	Under roof, enclosed at constant temperature and atmospheric humidity (5°C < ϑ < 60°C, < 50% relative atmospheric humidity). No sudden temperature fluctuations and controlled ventilation with filter (free of dust and dirt). No aggressive vapors and no shocks.	Two years or more given regular inspections. During inspection, check for cleanliness and mechanical damages. Check corrosion protection.
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 mold through chemical treatment.	Under roof, protected against rain, no shock loads.	Up to three years with regular checks of the packaging and moisture indicator (rel. humidity < 50 %).
	open	Under roof, enclosed at constant temperature and atmospheric humidity (5°C < ϑ < 50°C, < 50% relative atmospheric humidity). No sudden temperature fluctuations and controlled ventilation with filter (free of dust and dirt). No aggressive vapors and no shock loads. Protection against insect damage.	Two years or more given regular inspections. During inspection, check for cleanliness and mechanical damages. Check corrosion protection.

1) Packaging must be performed by an experienced company using the packaging materials that have been expressly specified for the particular application.

2) SEW-EURODRIVE recommends to store the gear units according to the mounting position.

2.6 Drives for applications in hygienic areas

High demands are placed on hygiene both for the production of beverages and food and in the chemical and pharmaceutical industries. Often, regulations stipulate a completely germ-free environment. The drive solutions used in the past made it very hard to clean the production system as thoroughly as required Standard motors usually have cooling fins and fans. Dirt can collect in these components, from where it cannot be fully removed due to problems of accessibility. This can lead to a build up of germs!

SEW-EURODRIVE solves this problem by using special gearmotors in hygienic design. Thanks to their smooth surface, the helical, parallel shaft, helical-bevel or helical-worm gearmotors in hygienic design are easy to clean and prevent a build up of germs or bacteria on the surface.

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Figure 1: Gearmotors in hygienic design from SEW-EURODRIVE

The drives for applications in hygienic areas are equipped with special AC motors of the DAS80 ... DAS100 series. These motors have the following characteristics:

- Motors with a smooth surface without cooling fins
- Pure convection cooling (without fan)
- Rated power in S1 mode 0.25 kW ... 1.5 kW
- Motor enclosure IP66 as standard (brake motors IP65)
- Electrical connection via plug connector in enclosure IP66
- Motor to be mounted directly on standard R, F, K and S gear units
- with KS corrosion protection
- Surface protection coating to protect against chemicals and solvents
- All surface recesses sprayed with elastic rubber compound as an option
- Optional with brake for 110 ... 500 V
- Optional with encoder for speed-controlled inverter operation

Gearmotors in hygienic design from SEW-EURODRIVE also create the perfect conditions in your production system for the hygienic production and packaging of food and beverages.

You will find detailed information on gearmotors in hygienic design from SEW-EURODRIVE in the "Aseptic Drives DAS" catalog available from SEW-EURODRIVE.

Drive package ASEPTIC^{plus}

The ASEPTIC^{plus} drive package combines the following additional measures and specific components for the gearmotor in hygienic design for the best possible protection for the gearmotor against cleaning agents, chemicals and aggressive environmental conditions.

The ASEPTIC^{plus} drive package includes the following additional measures:

- IP69K enclosure for the DAS motor (brakemotor IP65)
- OS4 surface protection coating
- Contour recesses sprayed with rubber (special procedure Z)
- Double oil seals at gear unit output made of Viton (FKM)
- Stainless steel breather valve (Nirosta)
- Cable entry on the IS connector with stainless steel screw plugs
- Gear unit output shaft made of stainless steel as solid shaft, hollow shaft with key or TorqLOC® for the gear unit types R17-97, F37-97, K37-97, S37-97 and W30

3 Unit Designations and Versions

3.1 Unit designations for gear units and options

Helical gear units

RX..	Single-stage foot mounted version
RXF..	Single-stage B5 flange-mounted version
R..	Foot-mounted version
R..F	Foot-mounted and B5 flange-mounted version
RF..	B5 flange-mounted version
RZ..	B14 flange-mounted version
RM..	B5 flange-mounted version with extended bearing housing

Parallel shaft helical gear units

F..	Foot-mounted version
FA..B	Foot-mounted version and hollow shaft
FH..B	Foot-mounted and hollow shaft with shrink disc
FV..B	Foot-mounted version and hollow shaft with splined hollow shaft to DIN 5480
FF..	B5 flange-mounted version
FAF..	B5 flange-mounted version and hollow shaft
FHF..	B5 flange-mounted and hollow shaft with shrink disc
FVF..	B5 flange-mounted version and hollow shaft with splined hollow shaft to DIN 5480
FA..	Hollow shaft
FH..	Hollow shaft with shrink disc
FT..	Hollow shaft with TorqLOC® hollow shaft mounting system
FV..	Hollow shaft with splined hollow shaft to DIN 5480
FAZ..	B14 flange-mounted version and hollow shaft
FHZ..	B14 flange-mounted and hollow shaft with shrink disc
FVZ..	B14 flange-mounted version and hollow shaft with splined hollow shaft to DIN 5480

Helical-bevel gear units

K..	Foot-mounted version
KA..B	Foot-mounted version and hollow shaft
KH..B	Foot-mounted version and hollow shaft with shrink disc
KV..B	Foot-mounted version and hollow shaft with splined hollow shaft to DIN 5480
KF..	B5 flange-mounted version
KAF..	B5 flange-mounted version and hollow shaft
KHF..	B5 flange-mounted and hollow shaft with shrink disc
KVF..	B5 flange-mounted version and hollow shaft with splined hollow shaft to DIN 5480
KA..	Hollow shaft
KH..	Hollow shaft with shrink disc

KT..	Hollow shaft with TorqLOC® hollow shaft mounting system
KV..	Hollow shaft with splined hollow shaft to DIN 5480
KAZ..	B14 flange-mounted version and hollow shaft
KHZ..	B14 flange-mounted and hollow shaft with shrink disc
KVZ..	B14 flange-mounted version and hollow shaft with splined hollow shaft to DIN 5480

Helical-worm gear units

S..	Foot-mounted version
SF..	B5 flange-mounted version
SAF..	B5 flange-mounted version and hollow shaft
SHF..	B5 flange-mounted and hollow shaft with shrink disc
SA..	Hollow shaft
SH..	Hollow shaft with shrink disc
ST..	Hollow shaft with TorqLOC® hollow shaft mounting system
SAZ..	B14 flange-mounted version and hollow shaft
SHZ..	B14 flange-mounted and hollow shaft with shrink disc

Spiroplan® right-angle gear units

W..	Foot-mounted version
WF..	Flange-mounted version
WA..	Hollow shaft
WAF..	Flange-mounted version and hollow shaft

R, F and K gear unit option

/R	reduced backlash

K, W and S gear unit option

/T	with torque arm

F gear unit option

/G	with rubber buffer

3.2 Unit designations for components on the input side

Adapter

AM..	Adapter for mounting IEC/NEMA motors
	../RS ..and backstop
AQ..	Adapter for mounting servomotors
	AQA with keyway
	AQH with clamping ring hub
AR..	Adapter with torque limiting coupling
	../W ..and speed monitoring
	../WS ..and slip monitoring
AT ..	Adapter with hydraulic centrifugal coupling
	../RS ..and backstop
	../BM(G) ..and disc brake
	../HF ..with manual brake release, lockable
	../HR ..with automatic manual brake disengaging

Input shaft assembly

AD ..	Input shaft assembly
	../P ..with motor mounting platform
	../RS ..with backstop
	../ZR ..with centering shoulder

3.3 Unit designations for the swing base

MK..	Swing base
	../MTS Mechanical thermal monitoring unit
	../BTS Proximity-type thermal monitoring unit
	../T Torque arm

3.4 Example for the unit designation of a gear unit

The unit designation of the gear unit starts from the component on the output end. For example, a helical-bevel multi-stage gear unit with hydraulic centrifugal coupling has the following unit designation:

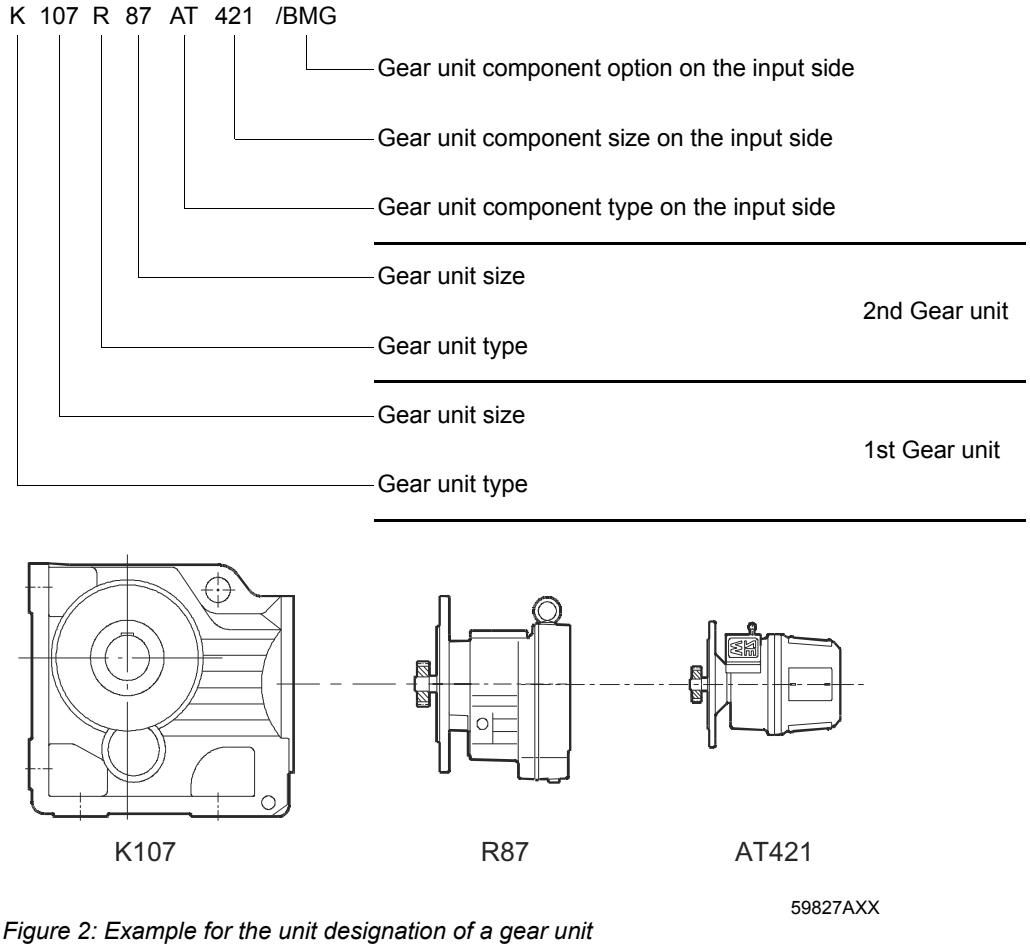


Figure 2: Example for the unit designation of a gear unit

Other examples:

- RF 97 AD 3 /P
  - Gear unit type: RF flange-mounted helical gear unit
  - Gear unit size: 97
  - Gear unit component on the input side: AD3/P input shaft assembly with size 3 motor mounting platform

- FH 47 /R /G AQH 100/3
  - Gear unit type: FH parallel shaft helical gear unit with hollow shaft and shrink disc
  - Gear unit size: 47
  - Gear unit option: /R Reduced backlash version
  - Gear unit option: /G Rubber buffer
  - Gear unit component on the input side: AQH 100/3 Adapter for mounting servo-motors with size 100/3 clamping ring hub

3.5 Unit designations for AC motors and options

Standard AC motor of the series

DT.., DV..	Foot-mounted version
DR.., ..DT.., ..DV..	Attached motor for gear units
DFR.., DFT.., DFV..	Flange-mounted version
DT..F, DV..F	Foot and flange-mounted version

Multi-speed AC motors with soft start

SDT.., SDV..	Foot-mounted version
SDFT.., SDFV..	Flange-mounted version
SDT..F, SDV..F	Foot and flange-mounted version

Motor options

/BR, /BM(G)	Brake (noise-reduced)
../HF	.. with lock-type manual brake release
../HR	.. with automatic manual brake release
/MM..	MOVIMOT® (integrated frequency inverter)
/MSW..	MOVI-SWITCH® (integrated switching and protection function)
/LN	Low-noise fan guard for motor sizes 71 to 132S
/RI	Reinforced insulation for inverter operation > 500 V
/RS	Backstop
/TF	Thermistor (PTC resistor)
/TH	Thermostat (bimetallic switch)
/U	Non-ventilated
/VR	Forced cooling fan, 1 × DC 24 V
/VR	Forced cooling fan, 1 × 100 ... AC 240 V, 50/60 Hz
/VS	Forced cooling fan, 1 × 220 ... AC 266 V, 50 Hz
/V	Forced cooling fan, 3 × AC 380 ... 415 V, 50 Hz
/Z	Additional flywheel mass (flywheel fan)
/C	Protection canopy for the fan guard

Plug connector on AC motor options

/IS	Integrated plug connector
/AMA..	HAN modular 10B plug connector on terminal box with two-clamp closure
/AMB..	HAN modular 10B plug connector on terminal box with two-clamp closure and EMC housing
/AMD..	HAN modular 10B plug connector on terminal box with one-clamp closure
/AME..	HAN modular 10B plug connector on terminal box with one-clamp closure and EMC housing
/ASB..	HAN modular 10ES plug connector on terminal box with two-clamp closure and EMC housing
/ASD..	HAN 10ES plug connector on terminal box with one-clamp closure
/ACB	HAN modular 10E plug connector on terminal box with two-clamp closure and EMC housing
/ASE..	HAN modular 10ES plug connector on terminal box with one-clamp closure and EMC housing
/ASK..	HAN 10ES ECOFAST® plug connector on terminal box with one-clamp closure, additionally with mounting screws for optional carrier plate

Encoder on AC motor options

/AV1Y	Multi-turn absolute encoder with solid shaft, MSI and sin/cos signals
/AV1H	Multi-turn absolute encoder with solid shaft, Hiperface® and sin/cos signals
/AS..H	Multi-turn absolute encoder with spreadshaft, Hiperface® and sin/cos signals
/ES..H	Single-turn absolute encoder with spreadshaft, Hiperface® and sin/cos signals
/ES..T	Encoder with spreadshaft, TTL (RS-422), signals
/ES..S	Encoder with spreadshaft, sin/cos signals
/ES..R	Encoder with spreadshaft, TTL (RS-422), signals
/ES..2	Encoder with spreadshaft, HTL signals, either 1 or 2 pulses per revolution
/ES..6	Encoder with spreadshaft, HTL signals, 6 pulses per revolution
/EV1T	Encoder with solid shaft, TTL (RS-422), signals
/EV1S	Encoder with solid shaft, sin/cos signals
/EV1R	Encoder with solid shaft, TTL (RS-422), signals
/EV1H	Single-turn absolute encoder with solid shaft, Hiperface® and sin/cos signals
/EH1T	Encoder with hollow shaft, TTL (RS-422), signals
/EH1S	Encoder with hollow shaft, sin/cos signals
/EH1R	Encoder with hollow shaft, TTL (RS-422), signals
/NV1..	Proximity sensor with A track
/NV2..	Proximity sensor with A and B tracks

Mounting device for encoders on AC motor options

ES..A	.. with spreadshaft
EV1A	.. with solid shaft

3.6 Example for the unit designation of a gearmotor

The unit designation of the gearmotor starts from the component on the output end. For instance, a multi-staged helical-bevel gearmotor with thermistor sensor in the motor winding has the following unit designation:

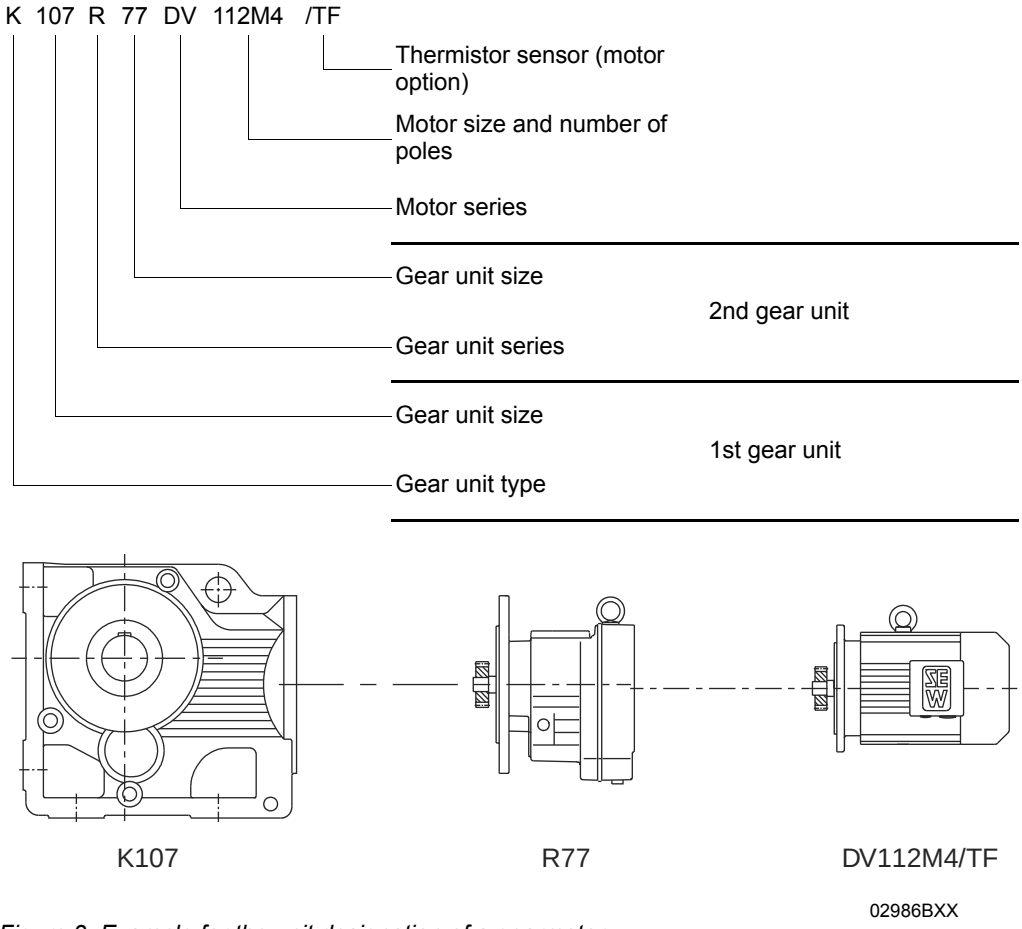
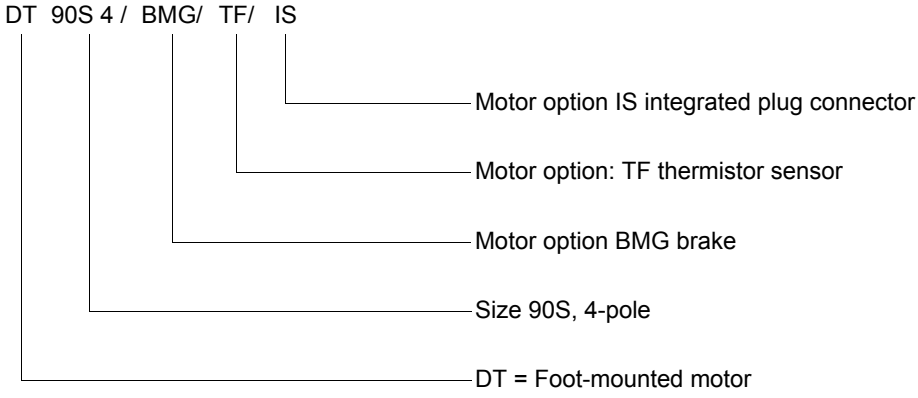


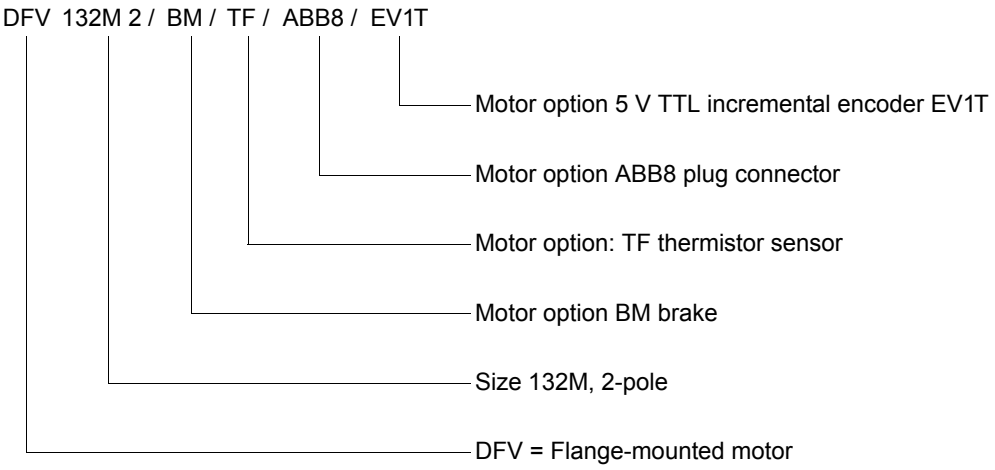
Figure 3: Example for the unit designation of a gearmotor

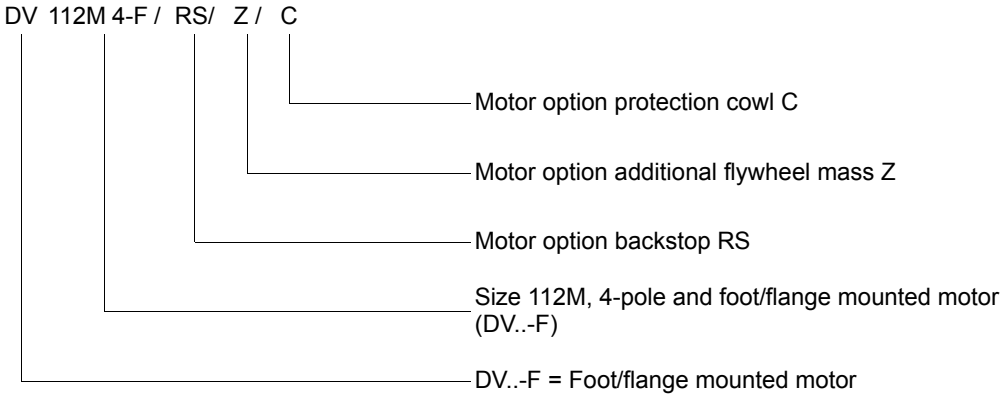
Other examples:

- RF 97 / R DV100M4 / BMG / HR
  - Gear unit type: Reduced backlash (/ R) helical gear unit in flange-mounted version
  - Gear unit size: 97
  - Motor series: DV AC motor
  - Motor size 100M, 4-pole
  - Motor options: Low-noise brake (/ BMG) with automatic manual brake disengagement (/ HR)
- FAF 47 / R DT90L4 / BMG / C
  - Gear unit type: Reduced backlash (/ R) parallel shaft helical gear unit in B5 flange-mounted version with hollow shaft
  - Gear unit size: 47
  - Motor series: DT AC motor
  - Motor size 90L, 4-pole
  - Motor options: Low-noise brake (/ BMG) and protection cowl for the fan guard (/ C)

3.7 Examples for the unit designation of AC (brake) motors







3.8 Unit designations MOVIMOT® standard design

Mechanical versions

DT.. MM.., DV.. MM..	Foot-mounted version
..DT.. MM.., ..DV.. MM..	Attached motor for gear units
DFT.. MM.., DFV.. MM..	Flange-mounted version
DT..F MM.., DV..F MM..	Foot and flange-mounted version

Plug connector

/AVT1	M12 plug connector for RS-485 connection
/RE.A/ASA3	HAN® 10ES plug connector with two-clip closure for power
/RE.A/ASA3/AVT1	HAN® 10ES plug connector with two-clip closure for power and M12-plug connector for RS-485 connection
/RE.A/AMA6	HAN® Modular plug connector with two-clip closure for power and RS-485 connection
/RE.A/AMD6	HAN® Modular plug connector with one-clip closure for power and RS-485 connection

Options

/BMG	Brake (noise-reduced)
../HF	.. with lock-type manual brake release
../HR	.. with automatic manual brake release
/RS	Backstop
/LN	Low-noise fan guard
/Z	Additional flywheel mass (flywheel fan)
/C	Protection canopy for the fan guard
/ES..2	Encoder with spreadshaft, HTL signals, either 1 or 2 pulses per revolution
/ES..6	Encoder with spreadshaft, HTL signals, 6 pulses per revolution
/NV1..	Proximity sensor with A track
/NV2..	Proximity sensor with A and B tracks
/R..A/../BGM	Brake control system
/R..A/../BSM	Brake control system
/R..A/../URM	Fast excitation brake
/MLU..A	DC 24 V supply
/MLG..A	Speed control module with DC 24 V supply
/MBG11A	Setpoint generator
/MWA21A	Setpoint converter
/MDG11A	Diagnostic unit
/KPF..	Hybrid cable with plug connector (installed)
/MF...	Fieldbus interfaces
/MQ...	MQ.. intelligent fieldbus modules

3.9 Unit designations for MOVIMOT® with integrated AS-interface

Mechanical versions

DT.. MM.., DV.. MM..	Foot-mounted version
..DT.. MM.., ..DV.. MM..	Attached motor for gear units
DFT.. MM.., DFV.. MM..	Flange-mounted version
DT..F MM.., DV..F MM..	Foot and flange-mounted version

Plug connector

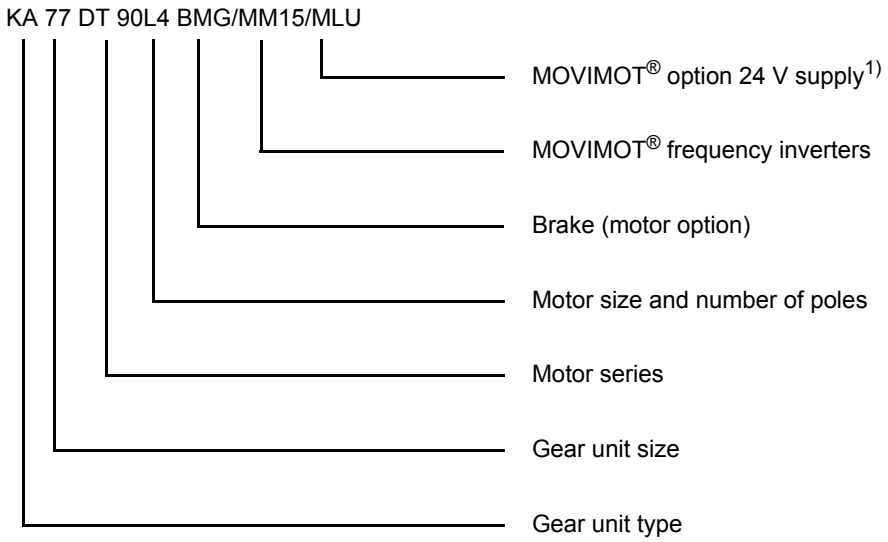
/AVSK	MOVIMOT® with integrated AS-interface and M12 plug connector for AS-interface
/AZSK	3 x M12 plug connector for AS-interface, AUX PWR and sensor connection
/AND3/AZSK	3 x M12 plug connector for AS-interface, AUX PWR, sensor connection and AND3 plug connector for power connection

Options

/BMG	Brake (noise-reduced)
../HF	.. with lock-type manual brake release
../HR	.. with automatic manual brake release
/RS	Backstop
/LN	Low-noise fan guard
/Z	Additional flywheel mass (flywheel fan)
/C	Protection canopy for the fan guard
/ES..2	Encoder with spreadshaft, HTL signals, either 1 or 2 pulses per revolution
/ES..6	Encoder with spreadshaft, HTL signals, 6 pulses per revolution
/NV1..	Proximity sensor with A track
/NV2..	Proximity sensor with A and B tracks
/R..A/../URM	Fast excitation brake

3.10 Example for the unit designation of a MOVIMOT® gearmotor

The unit designation of the MOVIMOT® gearmotor starts from the component on the output end. For example, a MOVIMOT® helical-bevel gearmotor with brake has the follwing unit designation:



1) Only options installed at the factory are listed on the nameplate.

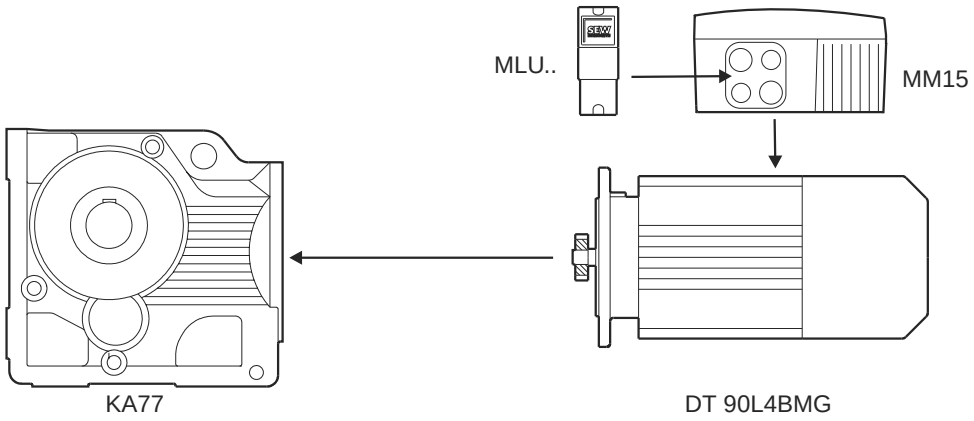


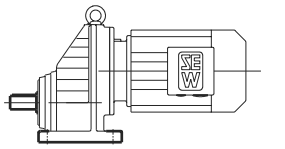
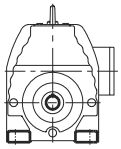
Figure 4: Example for the unit designation of a MOVIMOT® gearmotor

3.11 Gearmotor types

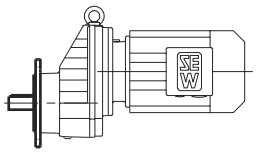
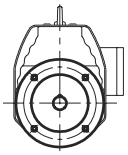
The types described in this section refer to gearmotors from SEW-EURODRIVE. They also apply to gear units without motor (without DR/DT/DV) and for MOVIMOT® gearmotors (../MM..).

Helical gearmotors

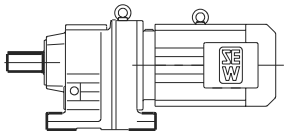
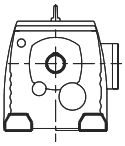
The following types of helical gearmotors can be supplied:

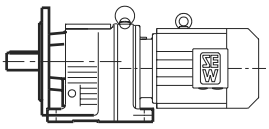
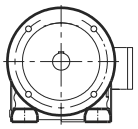
RX..DR/DT/DV..
Single-stage foot-mounted helical gearmotor

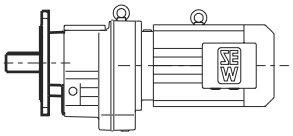
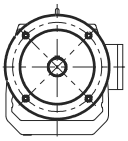
RXF..DR/DT/DV..
Single-stage B5 flange-mounted helical gearmotor

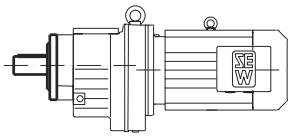
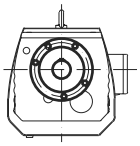
R..DR/DT/DV..
Foot-mounted helical gearmotor

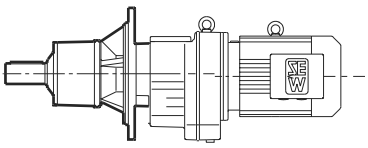
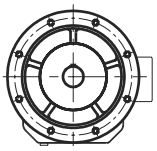
R..F DR/DT/DV..
Foot and B5 flange-mounted helical gearmotor

RF..DR/DT/DV..
Helical gearmotor in B5 flange-mounted version

RZ..DR/DT/DV..
Helical gearmotor in B14 flange-mounted version

RM..DR/DT/DV..
B5 flange-mounted helical gearmotor with extended bearing hub

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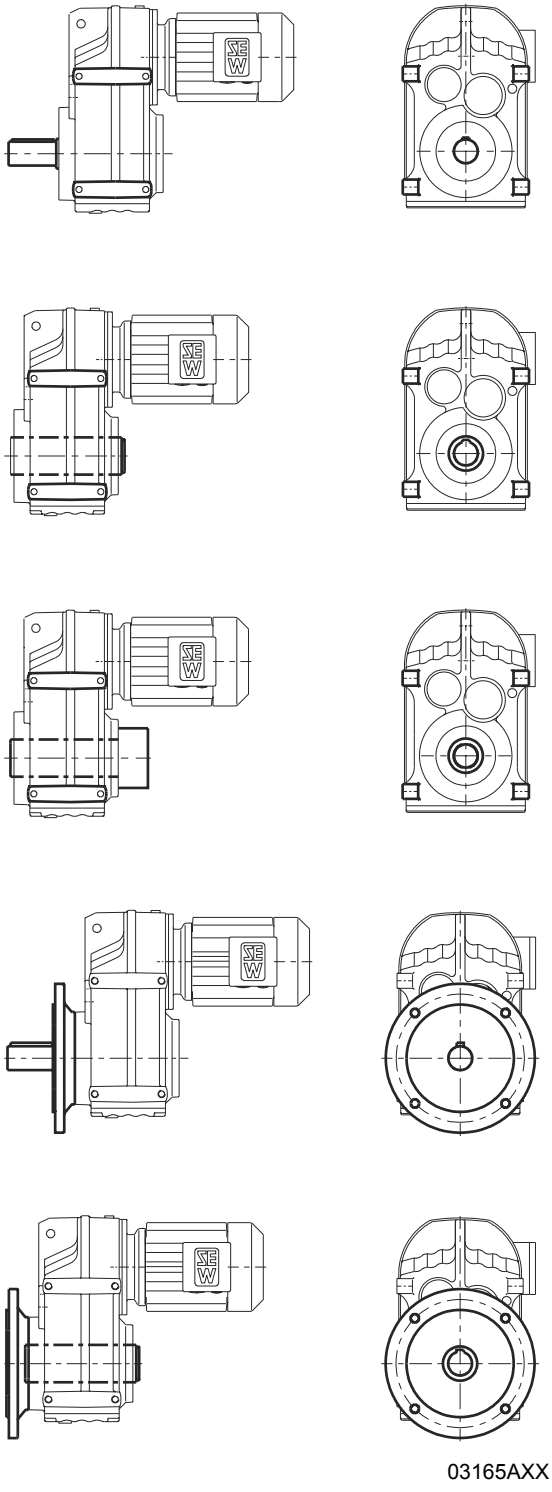
Parallel shaft helical gearmotors

The following types of parallel shaft helical gearmotors can be supplied:



F..DR/DT/DV..
Foot-mounted parallel shaft helical gearmotor

FA..B DR/DT/DV..
Foot-mounted parallel shaft helical gearmotor with hollow shaft

FV..B DR/DT/DV..
Foot-mounted parallel shaft helical gearmotor with hollow shaft and splined hollow shaft to DIN 5480

FH..B DR/DT/DV..
Foot-mounted parallel shaft helical gearmotor with hollow shaft and shrink disc

FF..DR/DT/DV..
B5 flange-mounted parallel shaft helical gearmotor

FAF..DR/DT/DV..
Parallel shaft helical gearmotor in B5 flange-mounted version with hollow shaft

FVF..DR/DT/DV..
Parallel shaft helical gearmotor in B5 flange-mounted version with hollow shaft and splined hollow shaft to DIN 5480

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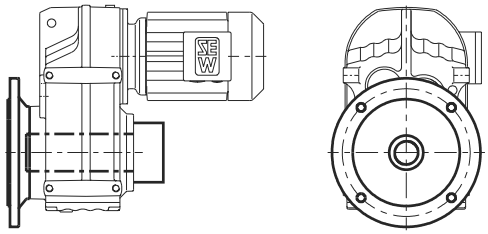
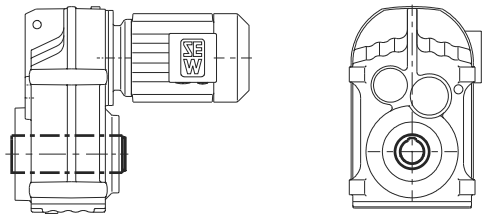
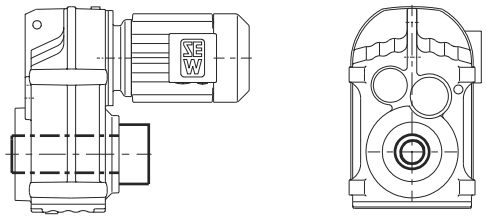


FHF..DR/DT/DV..
Parallel shaft helical gearmotor in B5 flange-mounted version with hollow shaft and shrink disc



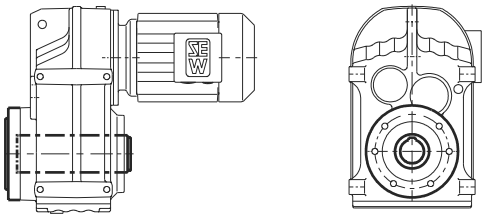
FA..DR/DT/DV..
Parallel shaft helical gearmotor with hollow shaft

FV..DR/DT/DV..
Parallel shaft helical gearmotor with hollow shaft and splined hollow shaft to DIN 5480



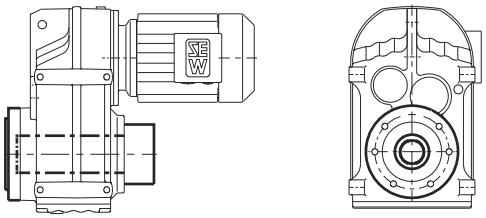
FH..DR/DT/DV..
Parallel shaft helical gearmotor with hollow shaft and shrink disc

FT..DR/DT/DV
Parallel shaft helical gearmotor with hollow shaft and TorqLOC® hollow shaft mounting system



FAZ..DR/DT/DV..
Parallel shaft helical gearmotor in B14 flange-mounted version with hollow shaft

FVZ..DR/DT/DV..
Parallel shaft helical gearmotor in B14 flange-mounted version with hollow shaft and splined hollow shaft to DIN 5480

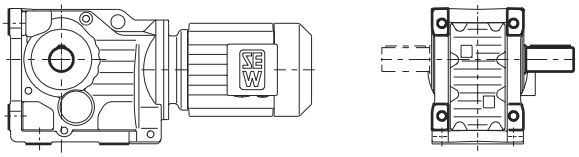


FHZ..DR/DT/DV..
Parallel shaft helical gearmotor in B14 flange-mounted version with hollow shaft and shrink disc

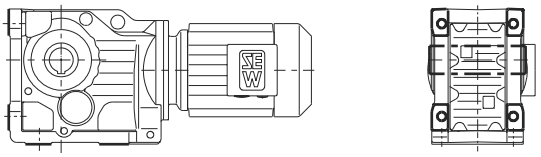
03166AXX

Helical-bevel gearmotors

The following types of helical-bevel gearmotors can be supplied:

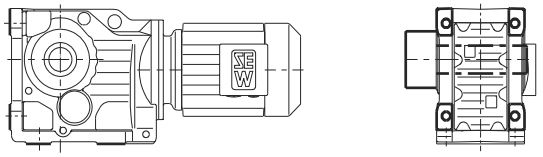


K..DR/DT/DV..
Foot-mounted helical-bevel gearmotor

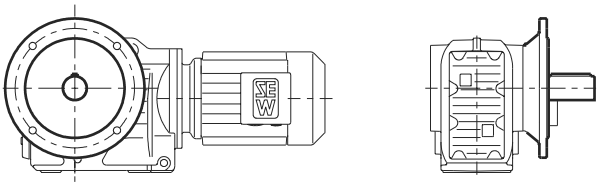


KA..B DR/DT/DV..
Foot-mounted helical-bevel gearmotor with hollow shaft

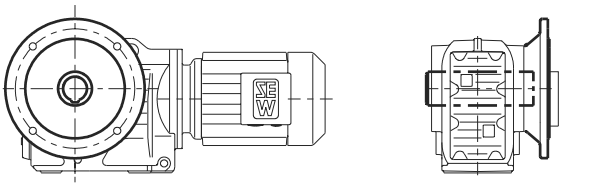
KV..B DR/DT/DV..
Foot-mounted helical-bevel gearmotor with hollow shaft and splined hollow shaft to DIN 5480



KH..B DR/DT/DV..
Foot-mounted helical-bevel gearmotor with hollow shaft and shrink disc



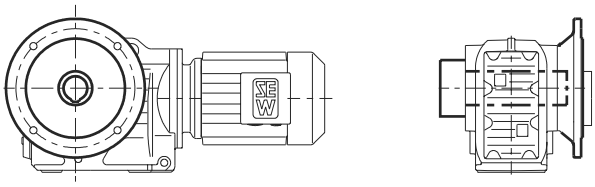
KF..DR/DT/DV..
Helical-bevel gearmotor in B5 flange-mounted version



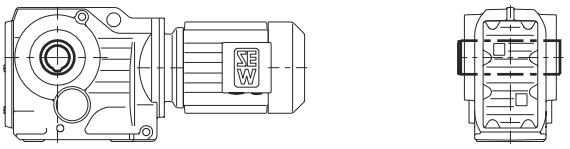
KAF..DR/DT/DV..
Helical-bevel gearmotor in B5 flange-mounted version with hollow shaft

KVF..DR/DT/DV..
Helical-bevel gearmotor in B5 flange-mounted version with hollow shaft and splined hollow shaft to DIN 5480

03173AXX

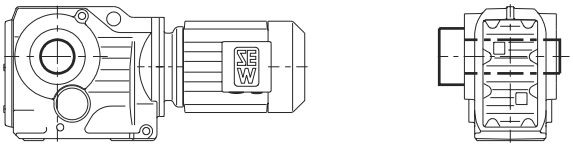


KHF..DR/DT/DV..
Helical-bevel gearmotor in B5 flange-mounted version with hollow shaft and shrink disc



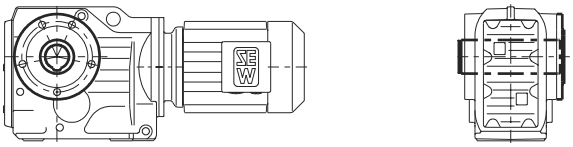
KA..DR/DT/DV..
Helical-bevel gearmotor with hollow shaft

KV..DR/DT/DV..
Helical-bevel gearmotor with hollow shaft and splined hollow shaft to DIN 5480



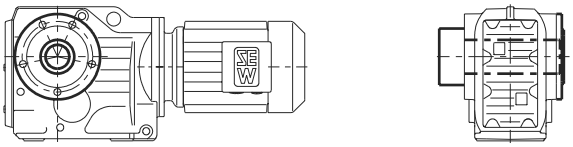
KH..DR/DT/DV..
Helical-bevel gearmotor with hollow shaft and shrink disc

KT..DR/DT/DV..
Helical-bevel gearmotor with hollow shaft and TorqLOC® hollow shaft mounting system



KAZ..DR/DT/DV..
Helical-bevel gearmotor in B14 flange-mounted version with hollow shaft

KVZ..DR/DT/DV..
Helical-bevel gearmotor in B14 flange-mounted version with hollow shaft and splined hollow shaft to DIN 5480

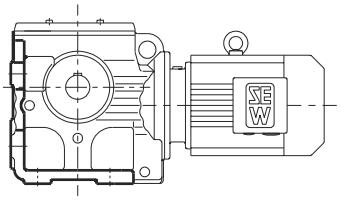
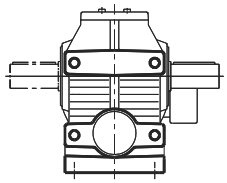


KHZ..DR/DT/DV..
Helical-bevel gearmotor in B14 flange-mounted version with hollow shaft and shrink disc

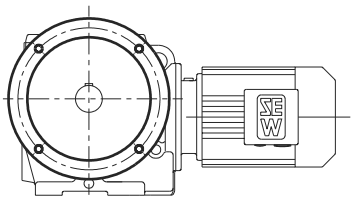
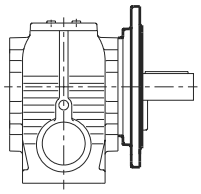
03174AXX

Helical-worm gearmotors

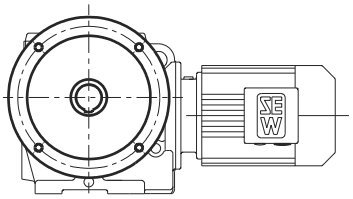
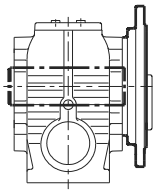
The following types of helical-worm gearmotors can be supplied:

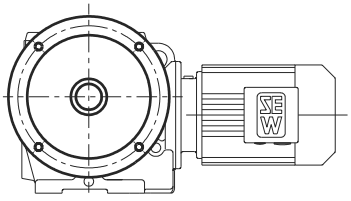
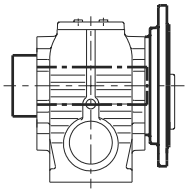
S..DR/DT/DV..
Foot-mounted helical-worm gearmotor

SF..DR/DT/DV..
Helical-worm gearmotor in B5 flange-mounted version

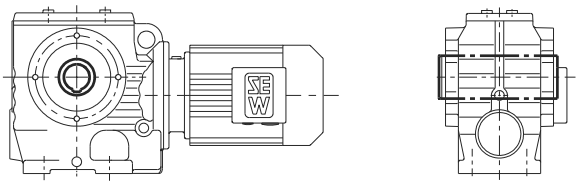



SAF..DR/DT/DV..
Helical-worm gearmotor in B5 flange-mounted version with hollow shaft

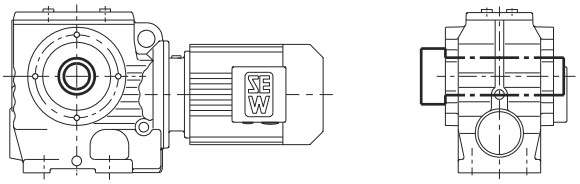



SHF..DR/DT/DV..
Helical-worm gearmotor in B5 flange-mounted version with hollow shaft and shrink disc

03180AXX

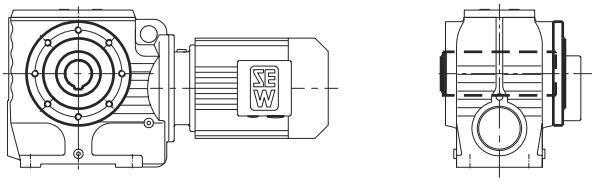


SA..DR/DT/DV..
Helical-worm gearmotor with hollow shaft

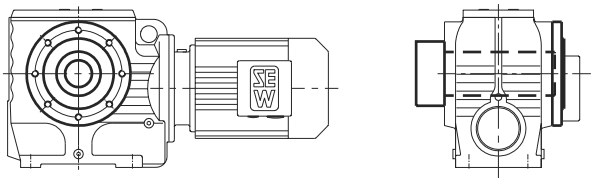


SH..DR/DT/DV..
Helical-worm gearmotor with hollow shaft and shrink disc

ST..DR/DT/DV..
Helical-worm gearmotor with hollow shaft and TorqLOC® hollow shaft mounting system



SAZ..DR/DT/DV..
Helical-worm gearmotor in B14 flange-mounted version with hollow shaft

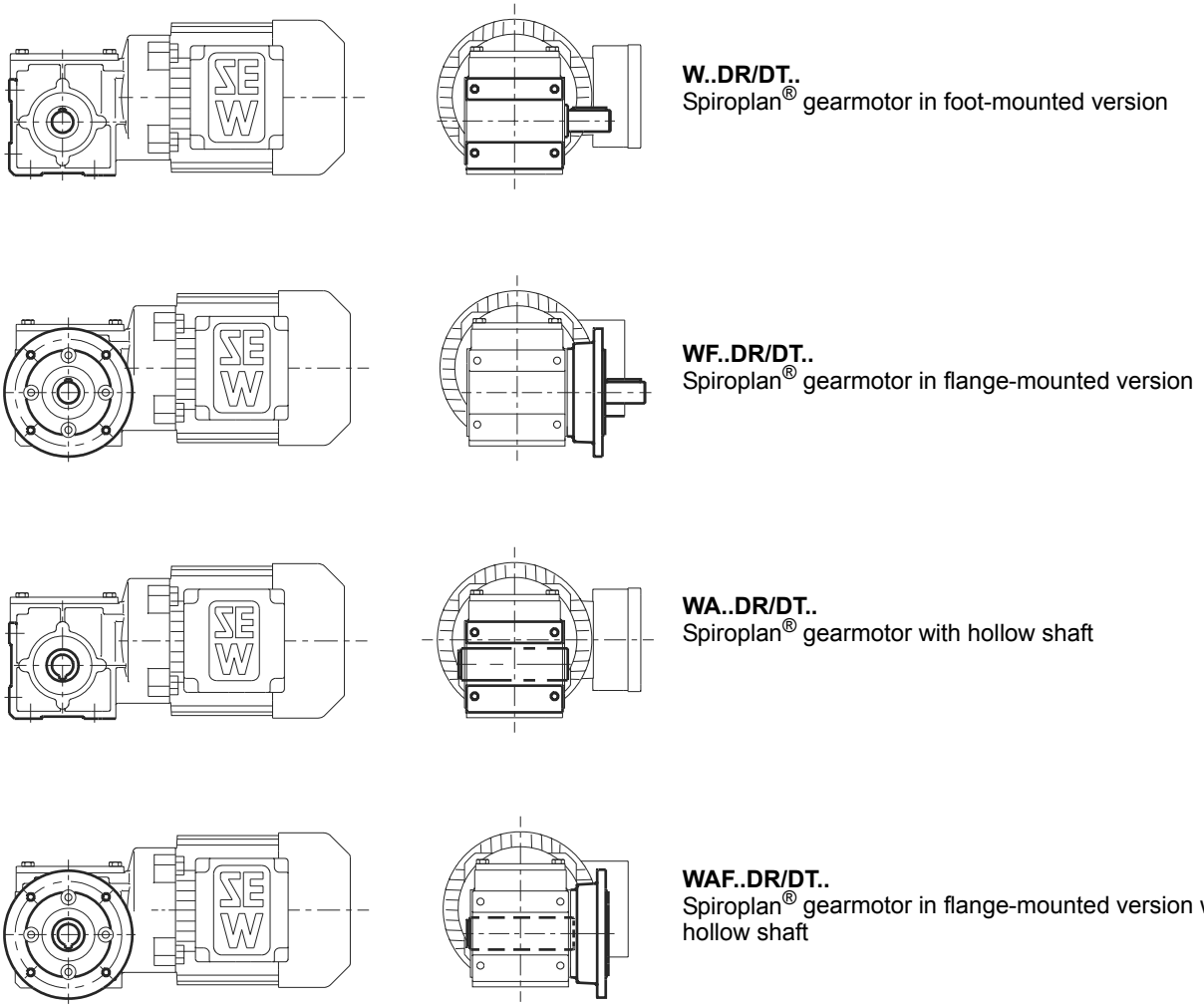


SHZ..DR/DT/DV..
Helical-worm gearmotor in B14 flange-mounted version with hollow shaft and shrink disc

03181AXX

***Spiroplan®* gearmotors**

The following types of Spiroplan® gearmotors can be supplied:



W..DR/DT..
Spiroplan® gearmotor in foot-mounted version

WF..DR/DT..
Spiroplan® gearmotor in flange-mounted version

WA..DR/DT..
Spiroplan® gearmotor with hollow shaft

WAF..DR/DT..
Spiroplan® gearmotor in flange-mounted version with hollow shaft

03188AXX

3.12 Types of components on the input side

The following figure shows the types of components on the input side:

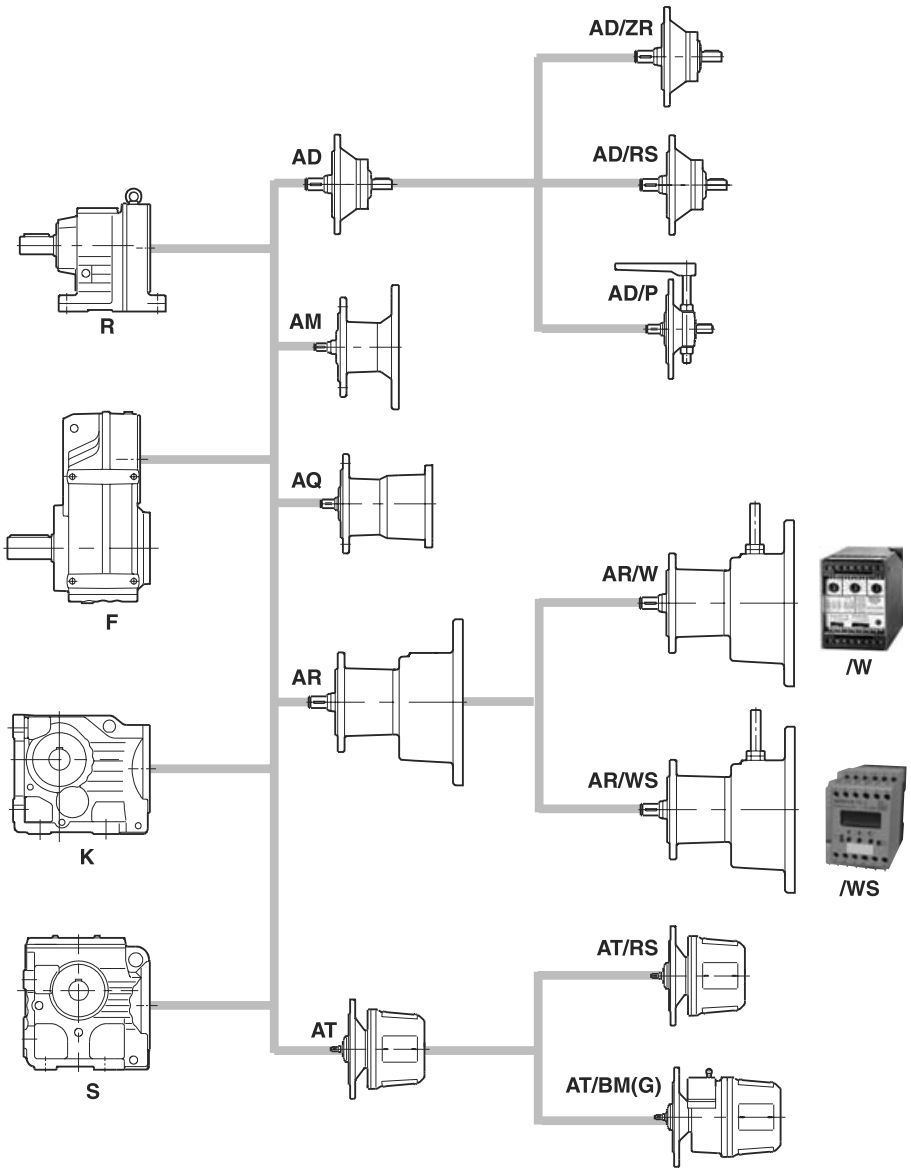


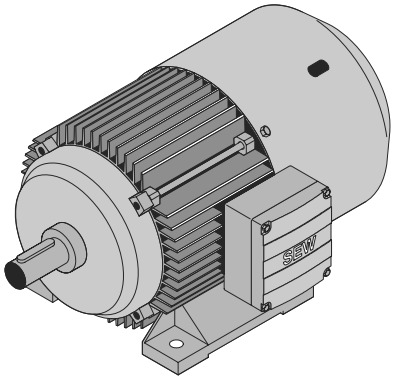
Figure 5: Overview of components on the input side

AD	Input shaft assembly	AR/W	Adapter with torque limiting coupling and speed monitoring
AD/ZR	Input shaft assembly with centering shoulder	AR/W[1)]	Adapter with torque limiting coupling and slip monitoring
AD/RS	Input shaft assembly with backstop	/W	Speed monitor
AD/P	Input shaft assembly with motor mounting platform	/WS	Slip monitor
AM	Adapter for mounting IEC/NEMA motors	AT	Adapter with hydraulic centrifugal coupling
AQ	Adapter for mounting servomotors	AT/RS	Adapter with hydraulic centrifugal coupling and backstop
AR	Adapter with torque limiting coupling	AT/BM(G)	Adapter with hydraulic centrifugal coupling and disc brake

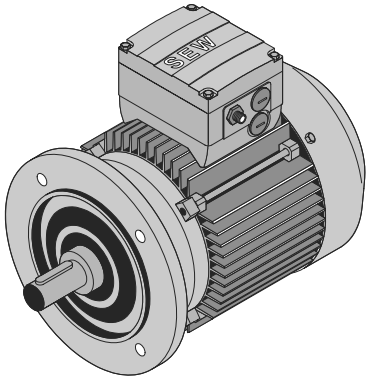
1) Only in conjunction with VARIBLOC® variable speed gear unit

3.13 Types of AC (brake) motors (→ GM)

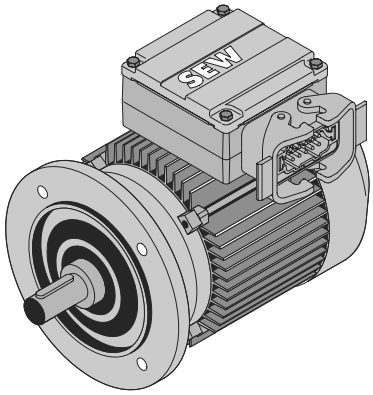
The following figure shows an example of components of AC (brake) motors:



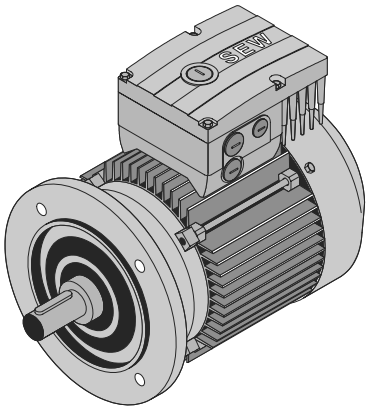
DT, DV../BM(G)



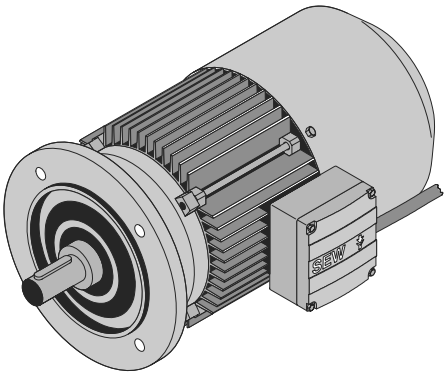
DFT, DFV../MSW



DFT, DFV../ASB1



DFT, DFV../MM



DFR../BR/IS, DFT, DFV../BM(G)/IS

50914AXX

Figure 6: AC (brake) motors

4 Project Planning for Drives

4.1 Additional documentation

In addition to the information in this manual, SEW-EURODRIVE offers extensive documentation covering the entire topic of electrical drive engineering. These are mainly the publications in the "Drive Engineering – Practical Implementation" series as well as the manuals and catalogs for electronically controlled drives. You will find additional links to a wide selection of our documentation in many languages for download on the SEW-EURODRIVE homepage (http://www.sew-eurodrive.com). The list below includes other documents that are of interest in terms of project planning. You can order these publications from SEW-EURODRIVE.

Drive Engineering - Practical Implementation

- Project Planning for Drives
- Controlled AC Drives
- EMC in Drive Engineering
- Explosion-Proof Drives to EU Directive 94/9/EC
- SEW Disc Brakes

Electronics documentation

- "Decentralized Installation" system folder (MOVIMOT®, MOVI-SWITCH®, communication and supply interfaces)
- "MOVITRAC® B" system manual
- "MOVIDRIVE® MDX60/61B" system manual

4.2 Drive selection data

Certain data is essential to specify the components for your drive precisely. These are:

Drive selection data			Your entry
n_{amin}	Minimum output speed	[1/min]	
n_{amax}	Maximum output speed	[1/min]	
P_a at n_{amin}	Output power at minimum output speed	[kW]	
P_a at n_{amax}	Output power at maximum output speed	[kW]	
M_a at n_{amin}	Output torque at minimum output speed	[Nm]	
M_a at n_{amax}	Output torque at maximum output speed	[Nm]	
F_R	Overhung loads acting on the output shaft. Force application in center of shaft end is assumed. If not, please specify the exact application point giving the application angle and direction of rotation of the shaft for recalculation.	[N]	
F_A	Axial load (tension and compression) on the output shaft	[N]	
J_{Last}	Mass moment of inertia to be driven	[10^{-4} kgm^2]	
R, F, K, S, W M1 - M6	Required gear unit type and mounting position (→ Sec. Mounting positions, churning losses)	-	
IP..	Required degree of protection	-	
ϑ_{Umg}	Ambient temperature	[°C]	
H	Installation altitude	[m above sea level]	
S.., ..% cdf	Duty type and cyclic duration factor (cdf) or exact load cycle can be entered.	-	
Z	Starting frequency; alternatively, exact load cycle can be specified	[1/h]	
f_{mains}	Supply frequency	[Hz]	
U_{Mot}, U_{Bremse}	Operating voltage of motor and brake	[V]	
M_B	Required braking torque	[Nm]	
For inverter operation: Required control type and setting range			

Determining the motor data

It is first necessary to have data on the machine to be driven (mass, speed, setting range, etc.) to design the drive correctly.

These data help determine the required power, torque and speed. Refer to the "Drive Engineering - Practical Implementation, Drive Planning" publication or the PRODRIVE project planning software for assistance.

Selecting the correct drive

The appropriate drive can be selected once the power and speed of the drive have been calculated and with regard to other mechanical requirements.

4.3 Project planning sequence

Example

The following flow diagram illustrates the project planning procedure for a positioning drive. The drive consists of a gearmotor that is powered by an inverter.

Necessary information on the machine to be driven
- Technical data and environmental conditions
- Positioning accuracy
- Speed setting range (rotational accuracy)
- Calculating the travel cycle

↓

Calculate the relevant application data
- static, dynamic, regenerative power
- Speeds
- Torque ratings
- Travel diagram

↓

Select gear unit
- Definition of gear unit size, gear unit reduction ratio and gear unit type
- Check the positioning accuracy
- Check the gear unit utilization ($M_{a\ max} \geq M_{a\ (t)}$)

↓

Select the system depending on
- Positioning accuracy
- Setting range
- Control

↓

Inverter operation
- Voltage-controlled inverter without and with speed control
- Voltage-controlled, vector-controlled inverter without and with speed control
- Current-controlled, vector-controlled inverter

↓

Motor selection
- Maximum torque
- For particularly low output speeds: Limit motor power according to $M_{a\ max}$ of the gear unit
- For dynamic drives: Effective torque at medium speed
- Maximum speed
- For dynamic drives: Torque curves
- Thermal load (setting range, cyclic duration factor)
- Selection of the correct encoder
- Motor equipment (brake, plug connector, TF temperature monitoring, etc.)

↓

Selecting the inverter
- Motor/inverter assignment
- Continuous power and peak power in voltage-controlled inverters
- Continuous current and peak current in current-controlled inverters

↓

Selecting the braking resistor:
- Based on the calculated regenerative power and cdf

↓

Options
- EMC measures
- Operation/communication
- Additional functions

↓

Make sure that all requirements have been met.

5 Project Planning for Gear Units

5.1 Efficiency of gear units

General information

The efficiency of gear units is mainly determined by the gearing and bearing friction. Keep in mind that the starting efficiency of a gear unit is always less than its efficiency at operating speed. This factor is especially pronounced in the case of helical-worm and Spiroplan® right-angle gearmotors.

R, F, K gear units

The efficiency of helical, parallel shaft and helical-bevel gear units varies with the number of gear stages, between 94 % (3-stage) and 98 % (1-stage).

S and W gear units

The gearing in helical-worm and Spiroplan® gear units produces a high proportion of sliding friction. As a result, these gear units have higher gearing losses than R, F or K gear units and thus be less efficient.

The efficiency depends on the following factors:

- Gear ratio of the helical-worm or Spiroplan® stage
- Input speed
- Gear unit temperature

Helical-worm gear units from SEW-EURODRIVE are helical gear/worm combinations that are significantly more efficient than plain worm gear units. The efficiency may reach $\eta < 0.5$ if the helical-worm or Spiroplan® stage has a very high ratio step.

Self-locking

Retrodriving torques on helical-worm or Spiroplan® gear units produce an efficiency of $\eta' = 2 - 1/\eta$, which is significantly less favorable than the forward efficiency η. The helical-worm or Spiroplan® gear unit is self-locking if the forward efficiency $\eta \leq 0.5$. Some Spiroplan® gear units are also dynamically self-locking. Contact SEW-EURODRIVE if you wish to make technical use of the braking effect of self-locking characteristics.

Do not use the self-locking effect of helical-worm and Spiroplan® gear units as sole safety function for hoist.

Run-in phase

The tooth flanks of new helical-worm and Spiroplan® gear units are not yet completely smooth. That fact makes for a greater friction angle and less efficiency than during later operation. This effect intensifies with increasing gear unit ratio. Subtract the following values from the listed efficiency during the run-in phase:

	Worm		Spiroplan®	
	i range	**η reduction**	**i range**	**η reduction**
1 start	ca. 50 ... 280	ca. 12 %	ca. 40 ... 75	ca. 15 %
2 start	ca. 20 ... 75	ca. 6 %	ca. 20 ... 30	ca. 10 %
3 start	ca. 20 ... 90	ca. 3 %	ca. 15	ca. 8 %
4 start	-	-	ca. 10	ca. 8 %
5 start	ca. 6 ... 25	ca. 3 %	ca. 8	ca. 5 %
6 start	ca. 7 ... 25	ca. 2 %	-	-
7 start	-	-	ca. 6	ca. 3 %

The run-in phase usually lasts 48 hours. Helical-worm and Spiroplan® gear units achieve their listed rated efficiency values when:

- the gear unit has been completely run in,
- the gear unit has reached nominal operating temperature,
- the recommended lubricant has been filled in and
- the gear unit is operating in the rated load range.

Churning losses

In certain gear unit mounting positions (→ Sec. "Mounting positions and important order information"), the first gearing stage is completely immersed in the lubricant. Considerable churning losses occur in larger gear units and high circumferential velocity of the input stage. Contact SEW-EURODRIVE if you wish to use gear units of this type.

If possible, use mounting position M1 for R, K and S gear units to keep the churning losses low.

5.2 Oil compensator

The oil compensator allows the lubricant/air space of the gear unit to expand. This means no lubricant can escape the breather valve at high operating temperatures.

SEW-EURODRIVE recommends to use oil compensators for gear units and gearmotors in M4 mounting position and for input speeds > 2000 min^{-1}.

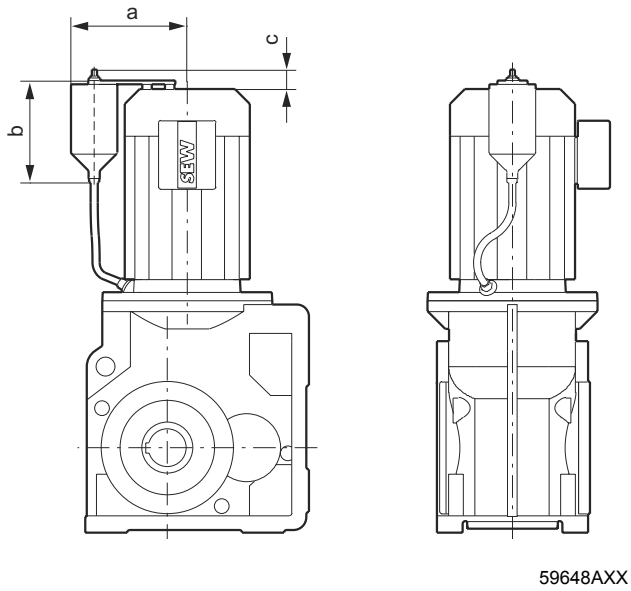


Figure 7: Oil compensator

Gear unit	Motor	Package no.	Dimension a [mm]	Dimension b [mm]	Dimension c [mm]
R27 ... R67 F37 ... F67 K37 ... K67 S37 ... S67	DT80 ... DV132	0045 627 6	85	198	40.5
R77 ... R87 F77 ... F87 K77 ... K87 S77 ... S87	DT80 ... DV100	0045 648 9	85	198	40.5
	DV112 ... DV132	0045 628 4	85	303	40.5
	DV160 ... DV180	0045 649 7	85	303	40.5
R97 ... R137 F97 ... F107 K97 ... K107 S97	DT80 ... DV100	0045 629 2	85	198	40.5
	DV112 ... DV132	0045 650 0	125	303	40.5
	DV160 ... DV250	0045 630 6	125	303	40.5
R147 F127 K127	DV132	0045 631 4	125	303	40.5
	DV160 ... DV280	0045 632 2	125	303	40.5
R167 F157 K157 ... K187	DV160 ... DV180	0045 633 0	125	303	40.5
	DV200 ... D315	0045 634 9	125	303	40.5

The oil compensator is suppled as assembly kit. It is intended for mounting onto the gearmotor. However, if installation space is limited or if the compensator is intended for gear units without motor, it can be mounted to nearby machine parts.

5.3 Multi-stage gearmotors (→ GM)

General information

You can achieve particularly low output speeds by using multi-stage gear units or multi-stage gearmotors. This means an additional second gear unit, usually a helical gear unit, is installed in front of the gear unit or between gear unit and motor.

The resulting total reduction ratio may make it necessary to protect the gear units.

Limiting the motor power

You have to reduce the maximum output motor power according to the maximum permitted output torque on the gear unit ($M_{a\ max}$). For this purpose you first have to determine the maximum permitted motor torque ($M_{N\ zul}$).

You can calculate the maximum permitted motor torque as follows:

$$M_{N\ zul} = \frac{M_{a\ max}}{i_{total} \cdot \eta_{total}}$$

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Use this maximum permitted motor torque $M_{N\ zul}$ and the load diagram of the motor to determine the associated value for the motor current.

Take suitable measures to prevent the continuous current consumption of the motor from exceeding the previously determined value for the motor torque $M_{N\ zul}$. A suitable measure is, for example, to set the trip current of the protective circuit breaker to this maximum current value. Besides, a protective circuit breaker can compensate for a brief overload, for example during the motor's starting phase. A suitable measure for inverter drives is to limit the output current of the inverter according to the determined motor current.

Checking brake torques

If you use a multi-stage brake motor, you will have to limit the braking torque (M_B) according to the maximum permitted motor torque $M_{N\ zul}$. The maximum permitted braking torque is 200 % $M_{N\ zul}$.

$M_{B\ max} \leq 200\ \%\ M_{N\ zul}$

If you have questions on the starting frequency of multi-stage brake motors, please consult SEW-EURODRIVE.

Avoiding blockage

Blockage on the output side of the multi-stage gear unit or multi-stage gearmotor is not permitted. The reason is that indeterminable torques and uncontrolled overhung and axial loads may occur. This may destroy the gear units.

Consult SEW-EURODRIVE if blockages of the multi-stage gear unit or multi-stage gearmotor cannot be avoided due to the application.

5.4 Service factor

Determining the service factor

The effect of the driven machine on the gear unit is taken into account to a sufficient level of accuracy using the service factor f_B. The service factor is determined according to the daily operating time and the starting frequency Z. Three load classifications are taken into account depending on the mass acceleration factor. You can read off the service factor applicable to your application in Figure 8 . The service factor determined from this diagram must be smaller than or equal to the service factor according to the selection tables.

$$M_a \cdot f_b \leq M_{a\,max}$$

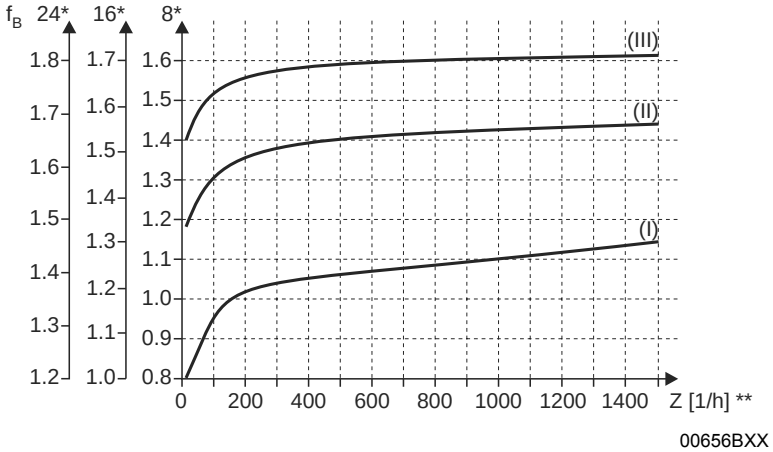

Figure 8: Service factor f_B

* Daily operating time in hours/day
** Starting frequency Z: The cycles include all starting and braking procedures as well as changes from low to high speed and vice versa.

Load classification

Three load classifications are distinguished:

(I) Uniform, permitted mass acceleration factor ≤ 0.2

(II) Non-uniform, permitted mass acceleration factor ≤ 3

(III) Extremely non-uniform, permitted mass acceleration factor ≤ 10

Mass acceleration factor

The mass acceleration factor is calculated as follows:

$$\text{Mass acceleration factor} = \frac{\text{All external mass moments of inertia}}{\text{Mass moment of inertia on the motor end}}$$

"All external mass moments of inertia" are the mass moments of inertia of the driven machine and the gear unit, scaled down to the motor speed. The calculation for scaling down to motor speed is performed using the following formula:

$$J_X = J \bullet \left(\frac{n}{n_M}\right)^2$$

J_X = Mass moment of inertia scaled down to the motor shaft
J = Mass moment of inertia with reference to the output speed of the gear unit
n = Output speed of the gear unit
n_M = Motor speed

"Mass moment of inertia at the motor end" is the mass moment of inertia of the motor and, if installed, the brake and the flywheel fan (Z fan).

Service factors f_B > 1.8 may occur with large mass acceleration factors (> 10), high levels of backlash in the transmission elements or large overhung loads. Contact SEW-EURODRIVE in such cases.

Service factor: SEW f_B

The method for determining the maximum permitted continuous torque M_{amax} and using this value to derive the service factor $f_B = M_{a\,max} / M_a$ is not defined in a standard and varies greatly from manufacturer to manufacturer. Even an SEW service factor of f_B = 1, the gear units afford an extremely high level of safety and reliability in the fatigue strength range (exception: wearing of the worm wheel in helical-worm gear units). The service factor may differ from specifications of other gear unit manufacturers. If you are in doubt, contact SEW-EURODRIVE for more detailed information on your specific drive.

Example

Mass acceleration factor 2.5 (load classification II), 14 hours/day operating time (read off at 16 h/d) and 300 cycles/hour result in a service factor f_B = 1.51 according to Figure 8. According to the selection tables, the selected gearmotor must have an SEW f_B value of 1.51 or greater.

Helical-worm gear units

For helical-worm gear units, two additional service factors will have to be taken into consideration besides service factor f_B derived from Figure 8 . These are:

- f_{B1} = Service factor from ambient temperature
- f_{B2} = Service factor from cyclic duration factor

The additional service factors f_{B1} and f_{B2} can be determined by referring to the diagrams in Figure 9 . For f_{B1}, the load classification is taken into account in the same way as for f_B.

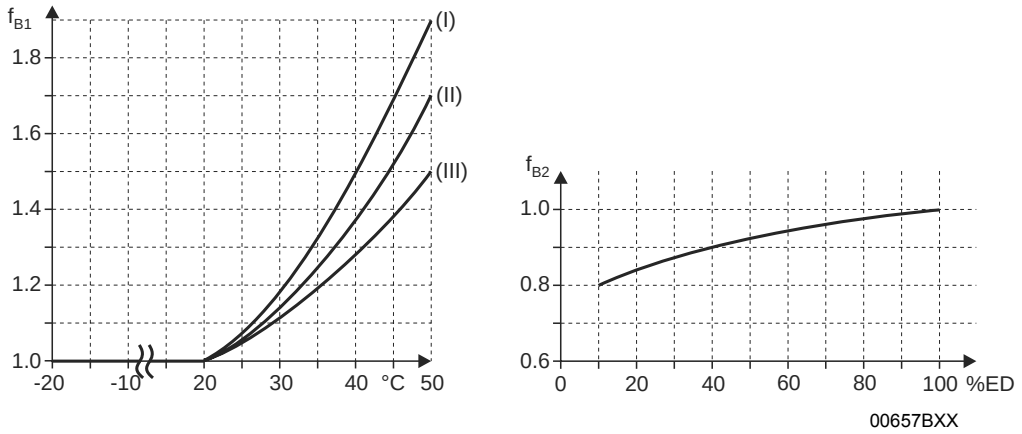

Figure 9: Additional service factors f_{B1} and f_{B2}

$$\text{ED (\%)} = \frac{\text{Time under load in min/h}}{60} \bullet 100$$

Contact SEW-EURODRIVE in case of temperatures below -20 °C ($\rightarrow f_{B1}$).

The total service factor for helical-worm gear units is calculated as follows:

$$f_{Bges} = f_B \bullet f_{B1} \bullet f_{B2}$$

Example

The gearmotor with the service factor f_B = 1.51 in the previous example is to be a helical-worm gearmotor.

Ambient temperature ϑ = 40°C $\rightarrow$ f_{B1} = 1.38 (read off at load classification II)

Time under load = 40 min/h $\rightarrow$cdf = 66.67% $\rightarrow$ f_{B2} = 0.95

The total service factor is f_{Bges} = 1.51 • 1.38 • 0.95 = 1.98

According to the selection tables, the selected helical-worm gearmotor must have an SEW f_B service factor of 1.98 or greater.

5.5 Overhung and axial loads (→ GM, → MM, → GK)

Determining overhung load

An important factor for determining the resulting overhung load is the type of transmission element mounted to the shaft end. The following transmission element factors f_Z have to be considered for various transmission elements.

Transmission element	Transmission element factor f_Z	Comments
Gears	1.15	< 17 teeth
Chain sprockets	1.40	< 13 teeth
Chain sprockets	1.25	< 20 teeth
Narrow V-belt pulleys	1.75	Influence of the tensile force
Flat-belt pulleys	2.50	Influence of the tensile force
toothed belt pulleys	1.50	Influence of the tensile force

The overhung load exerted on the motor or gear shaft is calculated as follows:

$$F_R = \frac{M_d \cdot 2000}{d_0} \cdot f_Z$$

F_R = Overhung load in N

M_d = Torque in Nm

d_0 = Mean diameter of the installed transmission element in mm

f_Z = Transmission element factor

Permitted overhung load

The basis for determining the permitted overhung loads is the computation of the rated bearing service life L_{10h} of the anti-friction bearings (according to ISO 281).

For special operating conditions, the permitted overhung loads can be determined with regard to the modified service life L_{na} on request.

The permitted overhung loads F_{Ra} for the output shafts of foot-mounted gear units with a solid shaft are listed in the selection tables for gearmotors. Contact SEW-EURODRIVE in case of other versions.

The values refer to force applied in the center of the shaft end (in right-angle gear units as viewed onto the B-end output). The worst-case conditions are assumed as regards the force application angle α and direction of rotation.

- Only 50% of the F_{Ra} value specified in the selection tables is permitted in mounting position M1 with wall attachment on the front face for K and S gear units.
- Helical-bevel gearmotors K167 and K187 in mounting positions M1 to M4: A maximum of 50% of the overhung load F_{Ra} specified in the selection tables in the case of gear unit mounting other than as shown in the mounting position sheets.
- Foot and flange-mounted helical gearmotors (R..F): A maximum of 50% of the overhung load F_{Ra} specified in the selection tables for torque transmission via flange mounting are permitted.

Higher permitted overhung loads

Exactly considering the force application angle α and the direction of rotation makes it possible to achieve a higher overhung load. Higher output shaft loads are permitted if heavy duty bearings are installed, especially with R, F and K gear units. Contact SEW-EURODRIVE in such cases.

Definition of force application point

Force application is defined according to the following figure:

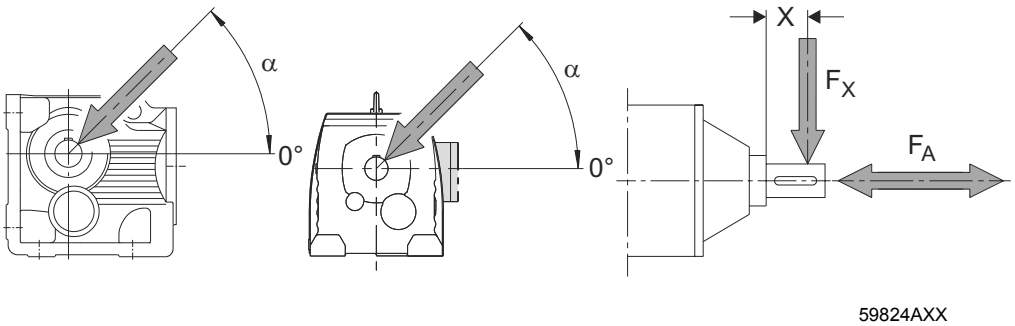

Figure 10: Definition of force application point

F_X = Permitted overhung load at point x [N]

F_A = Permitted axial load [N]

Permitted axial loads

If there is no overhung load, then an axial force F_A (tension or compression) amounting to 50 % of the overhung load given in the selection tables is permitted. This condition applies to the following gearmotors:

- Helical gearmotors except for R..137... to R..167...
- Parallel shaft and helical-bevel gearmotors with solid shaft except for F97...
- Helical-worm gearmotors with solid shaft

Contact SEW-EURODRIVE for all other types of gear units and in the event of significantly greater axial forces or combinations of overhung load and axial force.

On the input side: Overhung load conversion for off-center force application

Important: only applies to gear units with input shaft assembly:

Consult SEW-EURODRIVE for off-center force application on the drive end.

On the output side: Overhung load conversion for off-center force application

The permitted overhung loads must be calculated according the selection tables using the following formulae in the event that force is not applied at the center of the shaft end. The smaller of the two values F_{xL} (according to bearing life) and F_{xW} (according to shaft strength) is the permitted value for the overhung load at point x. Note that the calculations apply to $M_{a\,max}$.

F_{XL} according to bearing service life

$$F_{xL} = F_{Ra} \cdot \frac{a}{b + x} \; [N]$$

F_{xW} from the shaft strength:

$$F_{xW} = \frac{c}{f + x} \; [N]$$

F_{Ra} = Permitted overhung load (x = l/2) for foot-mounted gear units according to the selection tables in [N]

x = Distance from the shaft shoulder to the force application point in [mm]

a, b, f = Gear unit constant for overhung load conversion[mm]

c = Gear unit constant for overhung load conversion[mm]

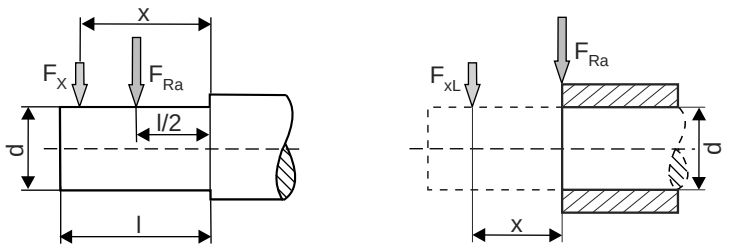

Figure 11: Overhung load F_x for off-center force application

Gear unit constants for overhung load conversion

Gear unit type	a [mm]	b [mm]	c [Nmm]	f [mm]	d [mm]	l [mm]
RX57	43.5	23.5	$1.51 \bullet 10^5$	34.2	20	40
RX67	52.5	27.5	$2.42 \bullet 10^5$	39.7	25	50
RX77	60.5	30.5	$1.95 \bullet 10^5$	0	30	60
RX87	73.5	33.5	$7.69 \bullet 10^5$	48.9	40	80
RX97	86.5	36.5	$1.43 \bullet 10^6$	53.9	50	100
RX107	102.5	42.5	$2.47 \bullet 10^6$	62.3	60	120
R07	72.0	52.0	$4.67 \bullet 10^4$	11	20	40
R17	88.5	68.5	$6.527 \bullet 10^4$	17	20	40
R27	106.5	81.5	$1.56 \bullet 10^5$	11.8	25	50
R37	118	93	$1.24 \bullet 10^5$	0	25	50
R47	137	107	$2.44 \bullet 10^5$	15	30	60
R57	147.5	112.5	$3.77 \bullet 10^5$	18	35	70
R67	168.5	133.5	$2.65 \bullet 10^5$	0	35	70
R77	173.7	133.7	$3.97 \bullet 10^5$	0	40	80
R87	216.7	166.7	$8.47 \bullet 10^5$	0	50	100
R97	255.5	195.5	$1.19 \bullet 10^6$	0	60	120
R107	285.5	215.5	$2.06 \bullet 10^6$	0	70	140
R137	343.5	258.5	$6.14 \bullet 10^6$	30	90	170
R147	402	297	$8.65 \bullet 10^6$	33	110	210
R167	450	345	$1.26 \bullet 10^7$	0	120	210
F27	109.5	84.5	$1.13 \bullet 10^5$	0	25	50
F37	123.5	98.5	$1.07 \bullet 10^5$	0	25	50
F47	153.5	123.5	$1.78 \bullet 10^5$	0	30	60
F57	170.7	135.7	$5.49 \bullet 10^5$	32	35	70
F67	181.3	141.3	$4.12 \bullet 10^5$	0	40	80
F77	215.8	165.8	$7.87 \bullet 10^5$	0	50	100
F87	263	203	$1.19 \bullet 10^6$	0	60	120
F97	350	280	$2.09 \bullet 10^6$	0	70	140
F107	373.5	288.5	$4.23 \bullet 10^6$	0	90	170
F127	442.5	337.5	$9.45 \bullet 10^6$	0	110	210
F157	512	407	$1.05 \bullet 10^7$	0	120	210
K37	123.5	98.5	$1.41 \bullet 10^5$	0	25	50
K47	153.5	123.5	$1.78 \bullet 10^5$	0	30	60
K57	169.7	134.7	$6.8 \bullet 10^5$	31	35	70
K67	181.3	141.3	$4.12 \bullet 10^5$	0	40	80
K77	215.8	165.8	$7.69 \bullet 10^5$	0	50	100
K87	252	192	$1.64 \bullet 10^6$	0	60	120
K97	319	249	$2.8 \bullet 10^6$	0	70	140
K107	373.5	288.5	$5.53 \bullet 10^6$	0	90	170
K127	443.5	338.5	$8.31 \bullet 10^6$	0	110	210
K157	509	404	$1.18 \bullet 10^7$	0	120	210
K167	621.5	496.5	$1.88 \bullet 10^7$	0	160	250
K187	720.5	560.5	$3.04 \bullet 10^7$	0	190	320
W10	84.8	64.8	$3.6 \bullet 10^4$	0	16	40
W20	98.5	78.5	$4.4 \bullet 10^4$	0	20	40
W30	109.5	89.5	$6.0 \bullet 10^4$	0	20	40
S37	118.5	98.5	$6.0 \bullet 10^4$	0	20	40
S47	130	105	$1.33 \bullet 10^5$	0	25	50
S57	150	120	$2.14 \bullet 10^5$	0	30	60
S67	184	149	$3.04 \bullet 10^5$	0	35	70
S77	224	179	$5.26 \bullet 10^5$	0	45	90
S87	281.5	221.5	$1.68 \bullet 10^6$	0	60	120
S97	326.3	256.3	$2.54 \bullet 10^6$	0	70	140

Values for types not listed are available on request.

5.6 RM gear units

Project planning You must take account of the higher overhung loads and axial forces when planning projects with RM helical gearmotors with extended bearing housing. Observe the following project planning procedure:

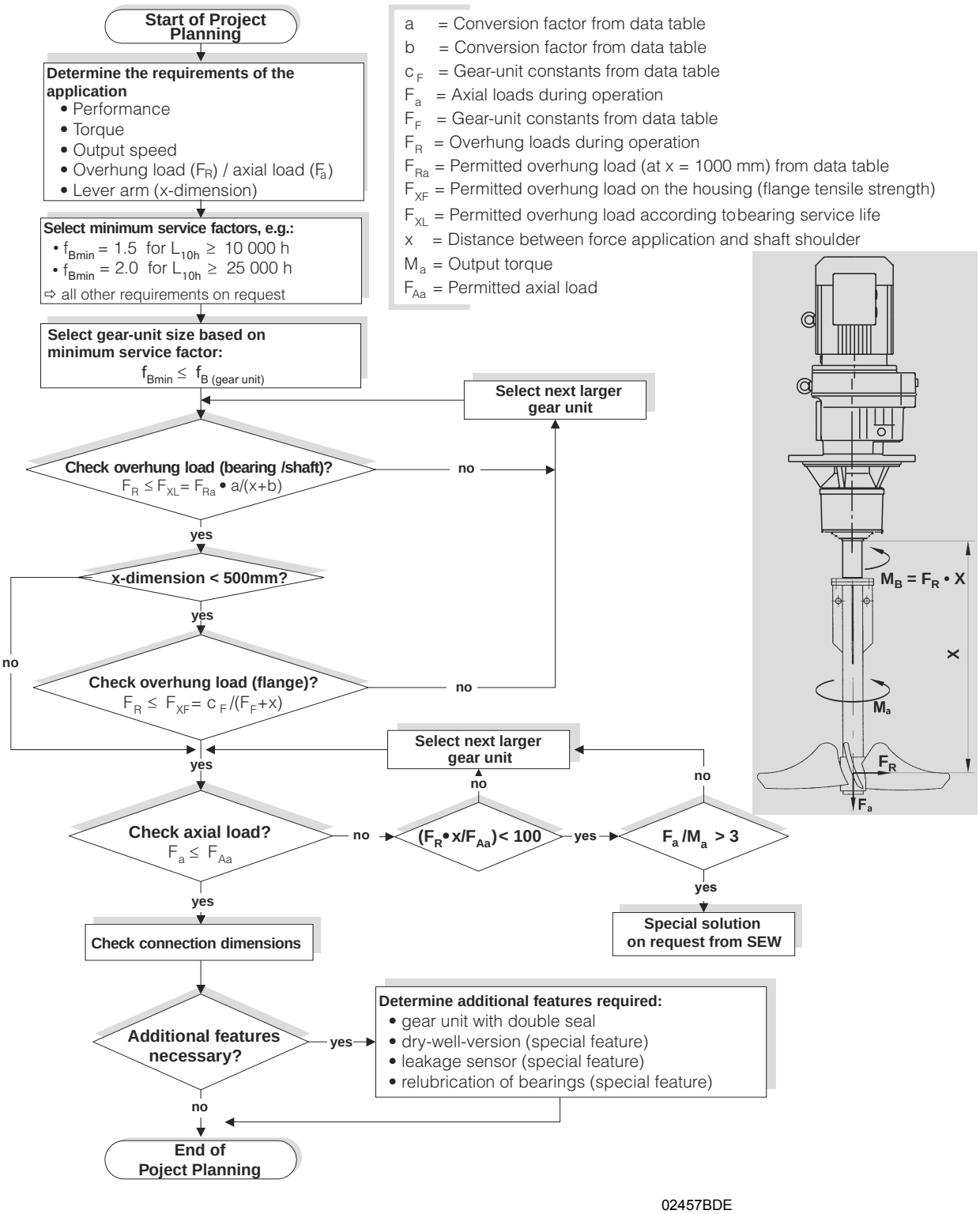

Figure 12: Project planning for RM gear units

Permitted overhung loads and axial forces

The permitted overhung loads F_{Ra} and axial forces F_{Aa} are specified for various service factors f_B and nominal bearing service life L_{10h}.

f_{Bmin} = 1.5; L_{10h} = 10,000 h

		n_a [1/min]							
		< 16	16-25	26-40	41-60	61-100	101-160	161-250	251-400
RM57	F_{Ra} [N]	400	400	400	400	400	405	410	415
	F_{Aa} [N]	18800	15000	11500	9700	7100	5650	4450	3800
RM67	F_{Ra} [N]	575	575	575	580	575	585	590	600
	F_{Aa} [N]	19000	18900	15300	11900	9210	7470	5870	5050
RM77	F_{Ra} [N]	1200	1200	1200	1200	1200	1210	1210	1220
	F_{Aa} [N]	22000	22000	19400	15100	11400	9220	7200	6710
RM87	F_{Ra} [N]	1970	1970	1970	1970	1980	1990	2000	2010
	F_{Aa} [N]	30000	30000	23600	18000	14300	11000	8940	8030
RM97	F_{Ra} [N]	2980	2980	2980	2990	3010	3050	3060	3080
	F_{Aa} [N]	40000	36100	27300	20300	15900	12600	9640	7810
RM107	F_{Ra} [N]	4230	4230	4230	4230	4230	4230	3580	3830
	F_{Aa} [N]	48000	41000	30300	23000	18000	13100	9550	9030
RM137	F_{Ra} [N]	8710	8710	8710	8710	7220	5060	3980	6750
	F_{Aa} [N]	70000	70000	70000	57600	46900	44000	35600	32400
RM147	F_{Ra} [N]	11100	11100	11100	11100	11100	10600	8640	10800
	F_{Aa} [N]	70000	70000	69700	58400	45600	38000	32800	30800
RM167	F_{Ra} [N]	14600	14600	14600	14600	14600	14700	-	-
	F_{Aa} [N]	70000	70000	70000	60300	45300	36900	-	-

f_{Bmin} = 2.0; L_{10h} = 25 000 h

		n_a [1/min]							
		< 16	16-25	26-40	41-60	61-100	101-160	161-250	251-400
RM57	F_{Ra} [N]	410	410	410	410	410	415	415	420
	F_{Aa} [N]	12100	9600	7350	6050	4300	3350	2600	2200
RM67	F_{Ra} [N]	590	590	590	595	590	595	600	605
	F_{Aa} [N]	15800	12000	9580	7330	5580	4460	3460	2930
RM77	F_{Ra} [N]	1210	1210	1210	1210	1210	1220	1220	1220
	F_{Aa} [N]	20000	15400	11900	9070	6670	5280	4010	3700
RM87	F_{Ra} [N]	2000	2000	2000	2000	2000	1720	1690	1710
	F_{Aa} [N]	24600	19200	14300	10600	8190	6100	5490	4860
RM97	F_{Ra} [N]	3040	3040	3040	3050	3070	3080	2540	2430
	F_{Aa} [N]	28400	22000	16200	11600	8850	6840	5830	4760
RM107	F_{Ra} [N]	4330	4330	4330	4330	4330	3350	2810	2990
	F_{Aa} [N]	32300	24800	17800	13000	9780	8170	5950	5620
RM137	F_{Ra} [N]	8850	8850	8850	8830	5660	4020	3200	5240
	F_{Aa} [N]	70000	59900	48000	37900	33800	31700	25600	23300
RM147	F_{Ra} [N]	11400	11400	11400	11400	11400	8320	6850	8440
	F_{Aa} [N]	70000	60600	45900	39900	33500	27900	24100	22600
RM167	F_{Ra} [N]	15100	15100	15100	15100	15100	13100	-	-
	F_{Aa} [N]	70000	63500	51600	37800	26800	23600	-	-

Conversion factors and gear unit constants

The following conversion factors and gear unit constants apply to calculating the permitted overhung load F_{xL} at point $x \neq 1000$ mm for RM gearmotors:

Gear unit type	a	b	c_F (f_B = 1.5)	c_F (f_B = 2.0)	F_F
RM57	1047	47	1220600	1260400	277
RM67	1047	47	2047600	2100000	297.5
RM77	1050	50	2512800	2574700	340.5
RM87	1056.5	56.5	4917800	5029000	414
RM97	1061	61	10911600	11124100	481
RM107	1069	69	15367000	15652000	554.5
RM137	1088	88	25291700	25993600	650
RM147	1091	91	30038700	31173900	756
RM167	1089.5	89.5	42096100	43654300	869

Additional weight RM gear units

Type	Additional weight compared to RF with reference to the smallest RF flange Δm [kg]
RM57	12.0
RM67	15.8
RM77	25.0
RM87	29.7
RM97	51.3
RM107	88.0
RM137	111.1
RM147	167.4
RM167	195.4

5.7 Drives for overhead trolley systems

Special gearmotors with integrated coupling are required for operating overhead trolley systems. SEW-EURODRIVE offers a range of drives for overhead trolley systems. You will find detailed information on this topic in the "Drives for Overhead Trolley Systems" catalog.

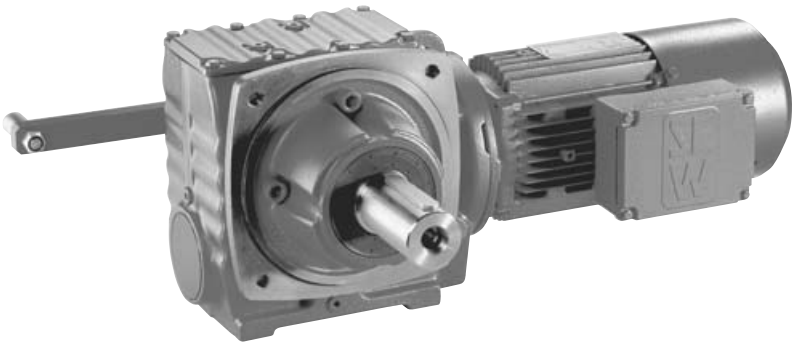

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Figure 13: Drive for overhead trolley systems

Type designation

Drives for overhead trolley systems have the following unit designation:

Type	Description
HW..	Overhead trolley drive based on Spiroplan® gear unit
HS..	Overhead trolley drive based on helical-worm gear unit
HK..	Overhead trolley drive based on helical-bevel gear unit

Division into two groups

Drives for overhead trolley systems are divided into two groups:

Group	Drives
Drives for overhead trolley systems according to VDI 3643 guideline (C1 standard)	HW30 HS40 (up to motor size DT80)
Drives for heavy duty overhead trolley systems	HS41 / HS50 / HS60 HK30 / HK40 / HK50 / HK60

Technical data

The following technical data apply to overhead trolley drives:

Type	$M_{a\ max}$ [Nm]	F_{Ra} [Nm]	Gear ratios i	Shaft end	
				d[mm]	l [mm]
HW30	70	5600	8.2 - 75	20 25	35 35
HS40	120	6500	7.28 - 201	20 25	35 35
HS41	185	10000	7.28 - 201	25	35
HS50	300	15000	7.28 - 201	30 35	60 70
HS60	600	25000	7.56 - 217.41	45	90
HK30	200	10000	13.1 - 106.38	25	35
HK40	400	18500	12.2 - 131.87	30 35	60 70
HK50	600	25000	13.25 - 145.14	45	90
HK60	820	40000	13.22 - 144.79	55	110

6 Project Planning for Components on the Input Side

6.1 Gear units with IEC or NEMA adapter AM (→ GK)

04588AXX

Figure 14: Helical-worm gear unit with adapter AM

For mounting motors according to IEC standard or NEMA (type C or TC) to SEW helical gear units, parallel shaft helical gear units, helical-bevel and helical-worm gear units.

Adapters are available for sizes 63 to 280 for IEC motors. Adapters are available for sizes 56 to 365 for NEMA motors.

The designation of the adapter size corresponds to the respective IEC or NEMA motor size.

Torque is transmitted between the motor and the gear unit via a positive and impact resistant dog clutch. Vibrations and shocks occurring during operation are effectively attenuated by an inserted polyurethane ring gear.

Power ratings, mass moments of inertia

Type (IEC)	Type (NEMA)	P_m [1] [kW]	$J_{adapter}$ [kgm²]
AM63	-	0.25	$0.44 \bullet 10^{-4}$
AM71	AM56	0.37	$0.44 \bullet 10^{-4}$
AM80	AM143	0.75	$1.9 \bullet 10^{-4}$
AM90	AM145	1.5	$1.9 \bullet 10^{-4}$
AM100	AM182	3	$5.2 \bullet 10^{-4}$
AM112	AM184	4	$5.2 \bullet 10^{-4}$
AM132S/M	AM213/215	7.5	$19 \bullet 10^{-4}$
AM132ML	-	9.2	$19 \bullet 10^{-4}$
AM160	AM254/256	15	$91 \bullet 10^{-4}$
AM180	AM284/286	22	$90 \bullet 10^{-4}$
AM200	AM324/326	30	$174 \bullet 10^{-4}$
AM225	AM364/365	45	$174 \bullet 10^{-4}$
AM250	-	55	$173 \bullet 10^{-4}$
AM280	-	90	$685 \bullet 10^{-4}$

1) Maximum rated power of the attached standard electric motor at 1400 1/min (applies to ambient temperatures of -30 °C to +60 °C)

Selecting the gear unit

Determine the gear unit type

↓

Determine the gear unit size by means of the
- maximum output torque ($M_{a\ max}$)
- Gear ratio (i)

in the gear unit selection tables with adapter AM

↓

Check the maximum permitted overhung load value on the output (F_{Ra})

↓

Check the maximum permitted input power at the adapter (P_m)
(see “Power ratings, mass moments of intertia” on page 62)

↓

Is the required adapter size available?

↓

Is the required combination feasible?

Check the input power at the gear unit (P_n)

The values in the selection tables refer to an input speed of n_e = 1400 1/min. The input power at the gear unit corresponds to a maximum torque at the input side. If the speed deviates, convert the input power by means of the maximum torque.

Backstop AM../RS

If the application requires only one direction of rotation, the AM adapter can be configured with a backstop. Backstops with centrifugal lift-off sprags are used. The advantage of this design is that the sprags move around inside the backstop without making contact above a certain speed (lift-off speed). This means backstops operate wear-free, maintenance-free and without losses and are suited for high speeds.

Dimensions:

The backstop is completely integrated in the adapter. This means the dimensions are the same as with adapter without backstop (see dimension sheets in the Adapter AM section).

Locking torques:

Type	Maximum locking torque backstop [Nm]	Lift-off speed [1/min]
AM80, AM90, AM143, AM145	90	640
AM100, AM112, AM182, AM184	340	600
AM132, AM213/215	700	550
AM160, AM180, AM254/256, AM284/286	1200	630
AM 200, AM225, AM324/326 AM364/365	1450	430

Specify output direction of rotation when ordering

When you order a gear unit with adapter and backstop, it is necessary to indicate the direction of rotation for the output shaft/output side. The direction of rotation is given looking onto the output shaft/output side of the gear unit. For drives with shaft ends at sides A and B, the direction of rotation must be specified as looking onto side A.

Check the direction of rotation of the drive before starting up the system to avoid damage.

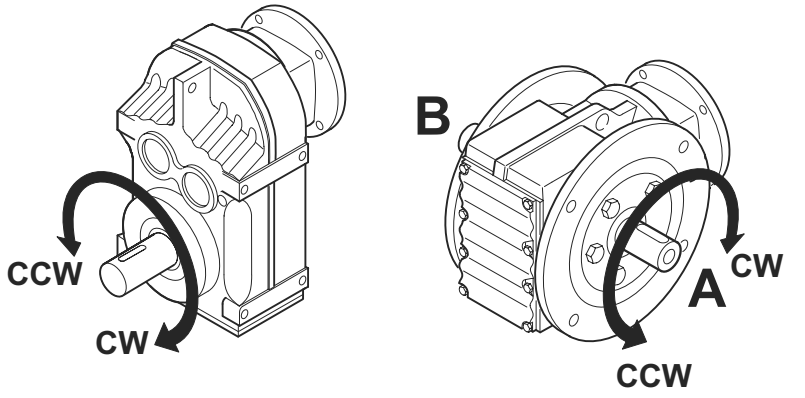

Figure 15: Direction of rotation of output

CCW = Counterclockwise rotation

CW = Clockwise rotation

6.2 Adapter AQ for servomotors (→ GK)

04595AXX

Figure 16: Helical gear unit with AQ adapter

An adapter with square flange is used for mounting servomotors onto SEW helical, parallel shaft helical, helical-bevel and helical-worm gear units.

The torque is transmitted via a dog clutch. Possible vibrations and shocks occurring during operation are effectively attenuated and dissipated by an inserted polyurethane ring gear.

Configuration variants

The clutch half on the motor side can be configured either with a clamping ring hub (non-positive, for smooth motor shafts) or a keyway (positive) as required.

- AQH = with clamping ring hub
- AQA = with keyway

Torques, mass moments of inertia

Type	d_{RZ} [1] [mm]	$M_{e\ max}$ [2] [Nm]	$J_{adapter}$ [3] [kgm²]
AQ..80/..	10	7.7	$0.9 \bullet 10^{-4}$
	12	13	
AQ..100/.. **AQ..115/1** **AQ..115/2**	10	7.7	$1.6 \bullet 10^{-4}$
	12	13	
	14	15	
	16	15	
AQ..115/3	10	7.7	$3.7 \bullet 10^{-4}$
	12	13	
	14	19	
	16	30	
AQ..140/1 **AQ..140/2**	16	30	$5.6 \bullet 10^{-4}$
	18	41	
	22	53	
AQ..140/3	16	30	$11.3 \bullet 10^{-4}$
	18	41	
	22	75	
AQ..190/1 **AQ..190/2**	22	75	$16.3 \bullet 10^{-4}$
	28	145	
AQ..190/3	22	75	$29 \bullet 10^{-4}$
	28	170	

1) The pinion spigot diameter depends on the gear ratio, please contact SEW-EURODRIVE.

2) Maximum permitted input torque (applies to ambient temperatures of -30 °C to +60 °C; with AQH → diameter tolerance of the motor shaft k6)

3) Mass moment of inertia of the adapter to be driven

Required motor data

As the dimensions of servomotors are not standardized, the following motor data must be known to select the appropriate adapter:

- Shaft diameter and length
- Flange dimensions (edge length, diameter, centering shoulder and hole circle)
- Maximum torque

Do not hesitate to contact us if you have questions on selection and project planning.

Selecting the gear unit

Determine the gear unit type

↓

Determine the gear unit size by means of the
- Maximum output torque ($M_{a\ max}$)
- Gear ratio (i)

in the selection tables AQ

↓

Check the maximum permitted overhung load value on the output (F_{Ra})

↓

Check the permitted input torques on the gear unit ($M_{e\ max}$)
(see “Power ratings, mass moments of intertia" on the previous page)

↓

Is the required adapter size available?

↓

Is the required combination feasible?

6.3 Adapter AR with torque limiting coupling (→ GK)

04604AXX

Figure 17: Helical-bevel gear unit with AR adapter

SEW helical, parallel shaft helical, helical-bevel and helical-worm gear units are designed with adapter and torque limiting coupling to protect the machine and the drive against overload. IEC standard motors of sizes 71 to 180 can be mounted.

The torque is transmitted in a non-positive manner via friction ring pads. The slip torque of the coupling can be adjusted with a setting nut and cup springs. Different slip torques are possible depending on the thickness and arrangement of the cup springs. In the event of an overload, the coupling slips and interrupts the power flow between motor and gear unit. This prevents damages to the system and drive.

Multi-stage gear unit with adapter and torque limiting coupling

In combination with multi-stage gear units, the adapter with torque limiting coupling is preferably installed between the two gear units. Please contact SEW-EURODRIVE if required.

Selecting the gear unit

The type sizes of the AR adapter with torque limiting coupling correspond to those of the AM adapter for IEC motors.

This means you can select the gear unit using the selection tables for AM adapters. In this case, substitute the unit designation AM with AR and determine the required slip torque.

Determining the slip torque

The slip torque should be about 1.5 times the rated torque of the drive. When determining the slip torque, bear in mind the maximum permitted output torque of the gear unit as well as the variations in the slip torque of the coupling (+/-20 %) which are a feature of the design.

When you order a gear unit with adapter and torque limiting coupling, you have to specify the required slip torque of the coupling.

If you do not specify the slip torque, it will be set according to the maximum permitted output torque of the gear unit.

Torques, slip torques

Type	P_m 1) [kW]	M_R 2) [Nm]	M_R 2) [Nm]	M_R 2) [Nm]
AR71	0.37	1 - 6	6.1 - 16	-
AR80	0.75	1 - 6	6.1 - 16	-
AR90	1.5	1 - 6	6.1 - 16	17 - 32
AR100	3.0	5 - 13	14 - 80	-
AR112	4.0	5 - 13	14 - 80	-
AR132S/M	7.5	15 - 130	-	-
AR132ML	9.2	15 - 130	-	-
AR160	15	30 - 85	86 - 200	-
AR180	22	30 - 85	86 - 300	-

1) Maximum rated power of the mounted standard electric motor at 1400 min-1

2) Adjustable slip torque according to the cup springs

Speed monitor /W option

We recommend monitoring the speed of the coupling using a speed monitor to avoid uncontrolled slippage of the coupling and the associated wear to the friction ring pads.

The speed of the output end coupling half of the torque limiting coupling is detected in a proximity-type method using a trigger cam and an inductive encoder. The speed monitor compares the pulses with a defined reference speed. The output relay (NC or NO contact) trips when the speed drops below the specified speed (overload). The monitor is equipped with a start bypass to suppress error messages during the startup phase. The start bypass can be set within a time window of 0.5 to 15 seconds.

Reference speed, start bypass and switching hysterisis can be set on the speed monitor.

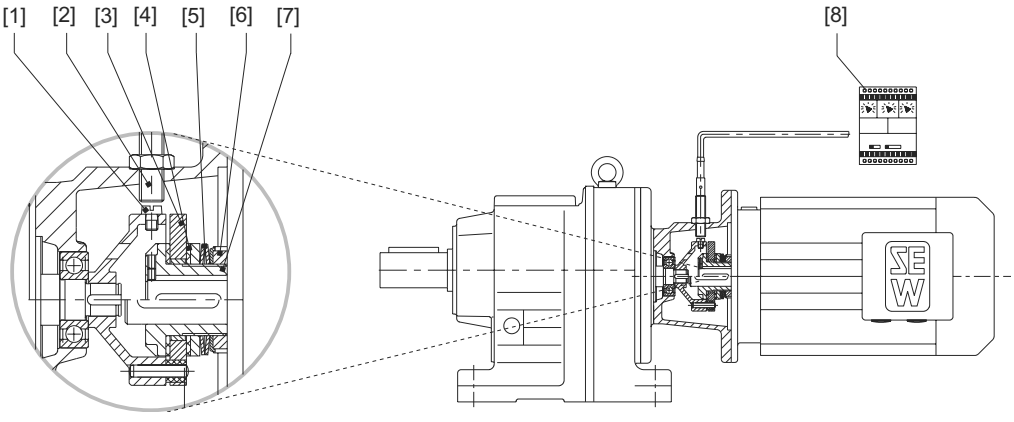

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Figure 18: : Adapter with torque limiting coupling and speed monitor /W

[1] Trigger cam
[2] Encoder (adapter)
[3] Driving disc
[4] Friction ring pads
[5] Cup spring
[6] Slotted nut
[7] Friction hub
[8] Speed monitor

Slip monitor /WS option

In conjunction with VARIBLOC® variable speed gear units (see Variable Speed Gear Units catalog), the speed monitor is replaced by a slip monitor for monitoring the speed difference between the input and output halves of the coupling.

The signal pick-up depends on the size of the variable speed gear unit and consists of two encoders or one encoder and an AC tachogenerator.

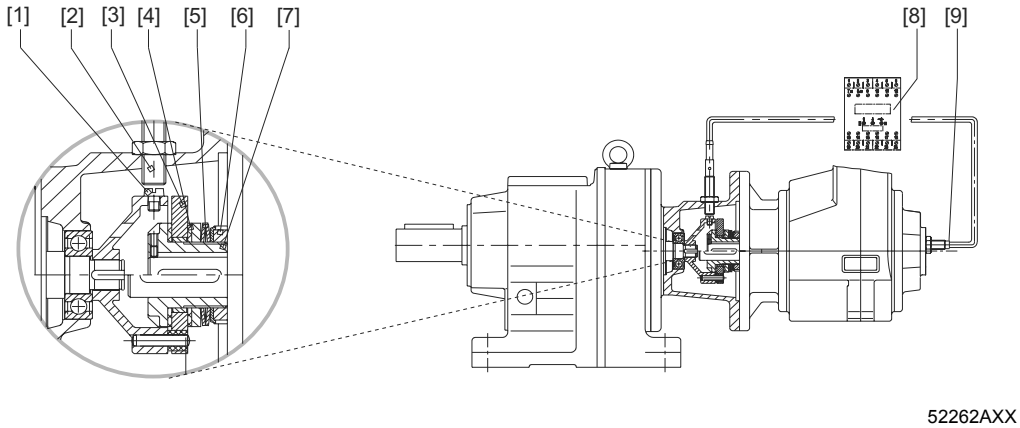


Figure 19: Adapter with a torque limiting coupling and slip monitor /WS

[1] Trigger cam
[2] Encoder (adapter)
[3] Driving disc
[4] Friction ring pads
[5] Cup spring
[6] Slotted nut
[7] Friction hub
[8] Slip monitor /WS
[9] Encoder IG

Connection

The encoder is connected to the slip monitor using a two or three-core cable (depending on the encoder type).

- Maximum cable length: 500 m with a line cross section of 1.5 mm^2
- Standard supply cable: 3-core / 2 m
- Route the signal lines separately (not in multicore cables) and shield them, if necessary.
- Enclosure: IP40 (terminals IP20)
- Operating voltage: AC 220 V or DC 24 V
- Maximum switching capability of the output relay: 6 A (AC 250 V)

Terminal assignment W

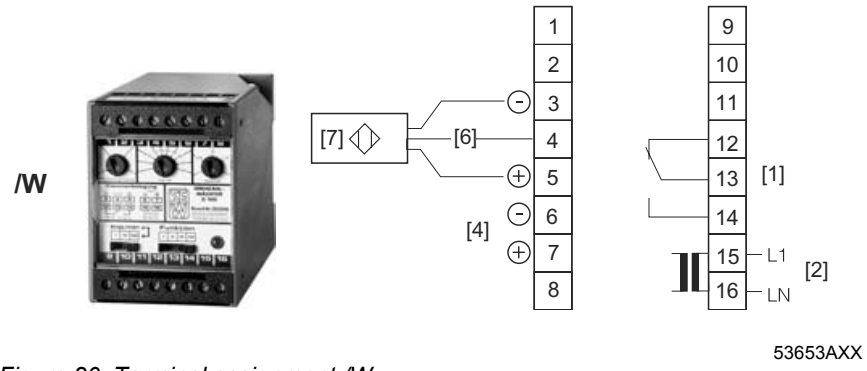


Figure 20: Terminal assignment /W

[1] Relay output
[2] Supply voltage AC 230 V (47...63Hz)
[3] External slip reset
[4] Supply voltage DC 24 V
[5] Jumper for synchronous operation monitoring
[6] Signal
[7] Encoder
[/W] Speed monitor

Terminal assignment WS

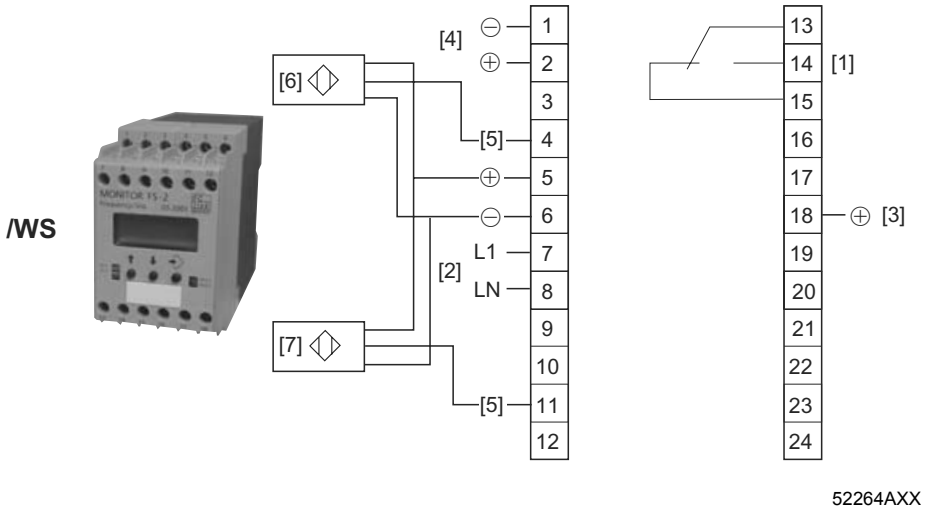


Figure 21: Terminal assignment /WS

[1] Relay output
[2] Supply voltage AC 230 V (47...63Hz)
[3] External slip reset
[4] Supply voltage DC 24 V
[5] Signal
[6] Encoder 1
[7] Encoder 2
[/WS] Slip monitor

Dimensions W

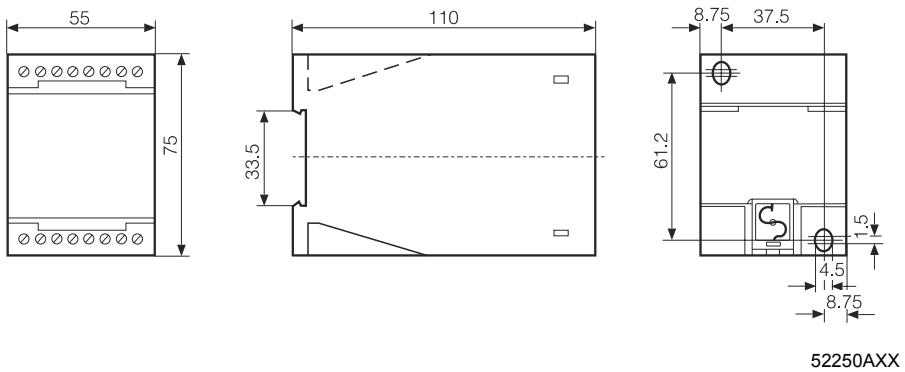


Figure 22: Dimensions /W

Dimensions WS

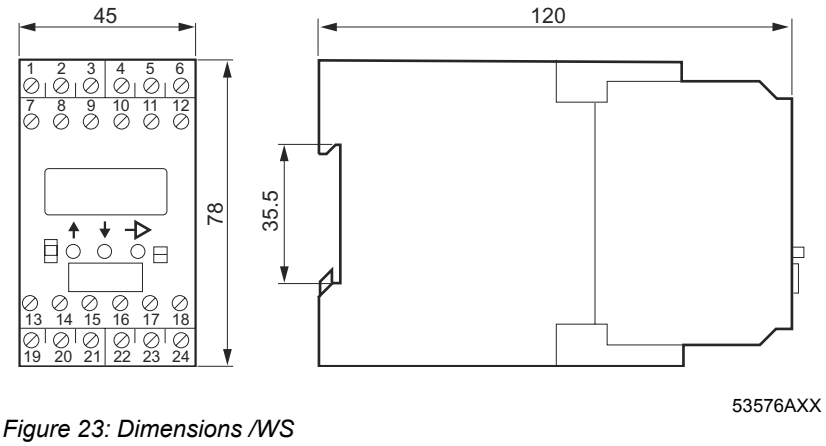


Figure 23: Dimensions /WS

6.4 Adapter with hydraulic centrifugal coupling AT AT (→ GK)

04607AXX

Figure 24: Parallel shaft helical gear unit with adapter AT

SEW helical, parallel shaft helical, helical-bevel and helical-worm gear units can be combined with adapters and hydraulic centrifugal couplings for machines with high inertia starting (e.g. mixers, agitators, etc.). The hydraulic centrifugal coupling protects the motor and the driven machine against overload during the startup phase and ensures that the machine starts up smoothly. The coupling is installed in a housing to prevent anyone touching it. Cooling of the coupling is ensured via ventilation openings in the housing. It is possible to mount SEW motor sizes 71 to 180 (0.37 to 22 kW)[1)].

Preferred speeds are 1400 1/min and 2800 1/min, i.e. 4 or 2-pole attached motors. There is increased noise development in 2-pole drive combinations.

1) Helical-bevel gear units with a hydraulic centrifugal coupling on a swing base are available for motors of size 200 to 280 (30 to 90 kW).

Centrifugal coupling

The centrifugal coupling used is a hydrodynamic coupling that operates according to the Föttinger principle. The coupling is filled with oil and consists of a pump wheel (motor side) and a turbine wheel (gear unit side). The pump wheel converts the input mechanical energy into fluid energy and the turbine wheel converts this energy back into mechanical energy.

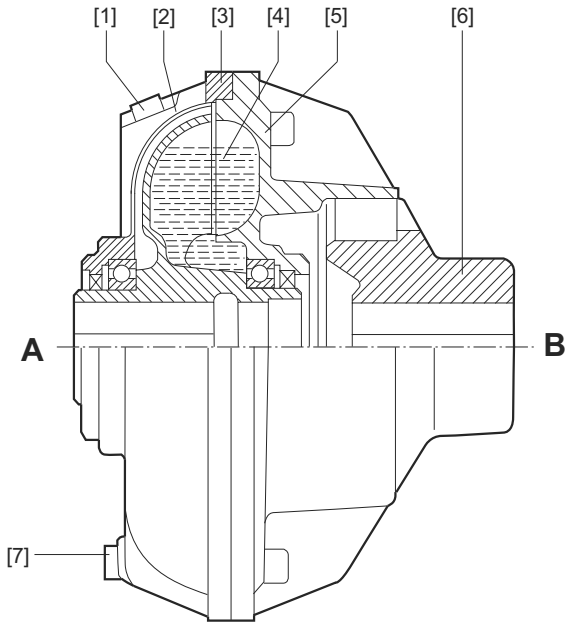


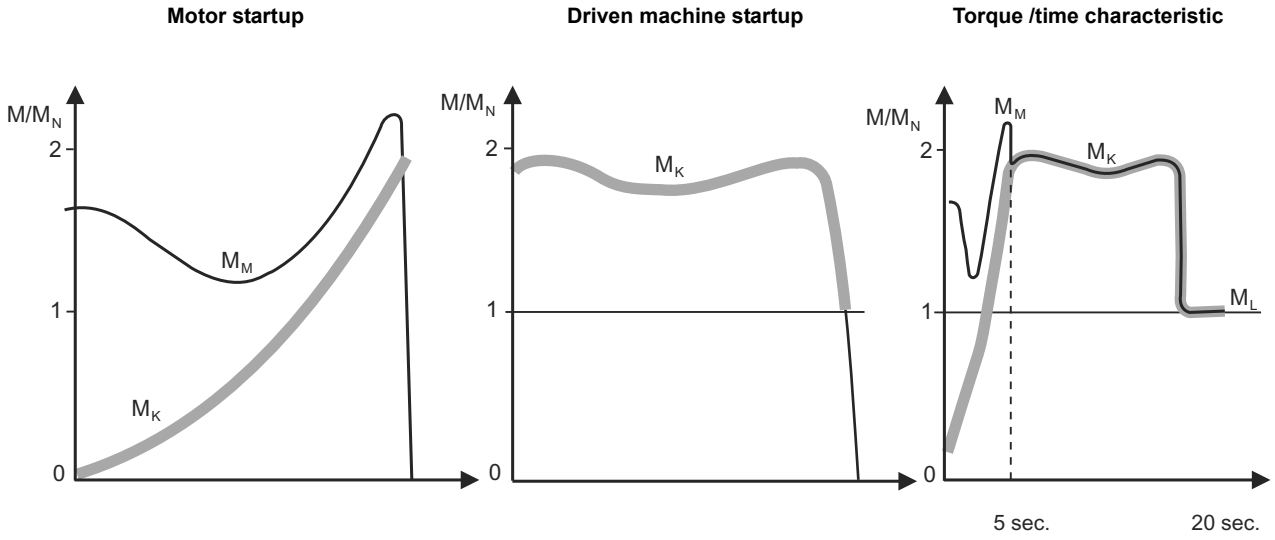
Figure 25: Centrifugal coupling

[1] Filling plug
[2] Turbine wheel
[3] Coupling half
[4] Operating fluid (hydraulic oil)
[5] Pump wheel
[6] Flexible connecting coupling
[7] Fusible safety plug
[A] Gear unit side
[B] Motor side

The power which the coupling can transmit significantly depends on the speed. A distinction is made between startup phase and stationary operation. During the startup phase, the motor starts without load until the coupling transmits torque. The machine is accelerated slowly and smoothly during this phase. Once stationary operation is reached, there will be an operating slip between motor and gear unit caused by the operating principle of the coupling. Only the load torque of the system is required from the motor. Load peaks are attenuated by the coupling.

The hydraulic centrifugal coupling is equipped with fusible safety plugs that allow the operating fluid to be evacuated in the event of excessive temperature (severe overload, blockage). In this way the coupling and system are protected from damage.

Characteristic curves



M_M Motor torque
M_L Load torque
M_K Coupling torque
M_N Fusible safety plug

Selecting the gear unit

Determine the gear unit type

↓

Determine the gear unit size by means of the
- Maximum output torque ($M_{a\ max}$)
- Gear ratio (i)

in the gear unit selection tables with **adapter AM**

↓

Determine the adapter type by means of the
- Motor speed (n_M)
- Gear unit size
- Rated power of the driving motor (P_m)

in the selection tables for **adapter AT**

Backstop AT../RS option

If the application requires only one permitted direction of rotation, the hydraulic centrifugal coupling can be configured with a backstop. Backstops with centrifugal lift-off sprags are used. The advantage of this design is that the sprags move around in the backstop without making contact above a certain speed. This means the backstops operate wear-free, maintenance-free, without losses, and are suited for high speeds.

Dimensions

The dimensions of the hydraulic centrifugal coupling with backstop AT../RS are identical to those of the hydraulic centrifugal coupling AT.. (see dimension drawings in the section Hydraulic centrifugal coupling AT..).

Locking torques

Type	Maximum locking torque backstop [Nm]	Lift-off speed [1/min]
AT311/RS - AT322/RS	340	600
AT421/RS - AT422/RS	700	550
AT522/RS - AT542/RS	1200	630

Specify output direction of rotation when ordering

When you order a gear unit with adapter and backstop, it is necessary to indicate the direction of rotation for the output shaft/output side. The direction of rotation is given looking onto the output shaft/output side of the gear unit. For drives with shaft ends at sides A and B, the direction of rotation must be specified as looking onto side A.

Check the direction of rotation of the drive before starting up the system to avoid damage.

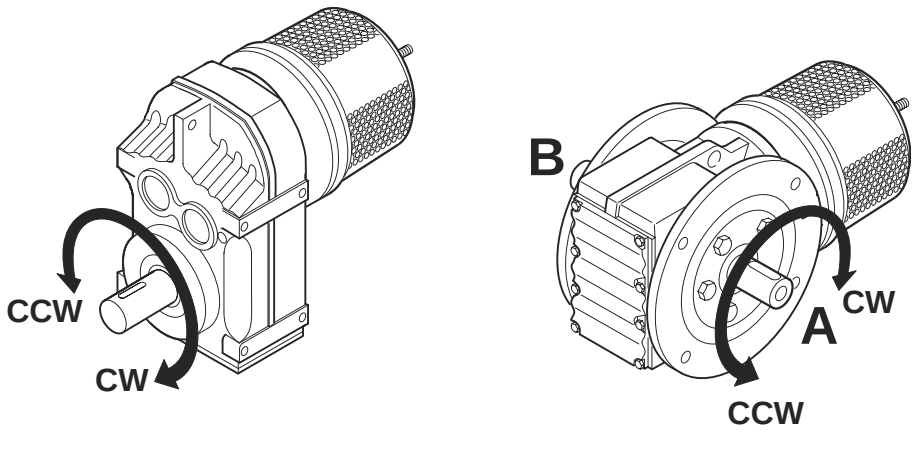


Figure 26: Specify output direction of rotation when ordering

CCW = Counterclockwise rotation

CW = Clockwise rotation

Disc brake AT../BM(G) option

04611AXX

Figure 27: Parallel shaft helical gear unit with adapter AT and disc brake BM(G)

The adapter with hydraulic centrifugal coupling can be configured with an SEW disc brake if the machine is to be braked in a defined manner. The brake is an electromagnetic disc brake with a DC coil which is released electrically and braked using spring force. As a result, the brake satisfies the safety requirement of braking in the event of a power failure. The braking torque can be varied by means of the type and number of brake springs used. The brake can be supplied with DC or AC voltage connection; the equipment needed for controlling the brake and the connection terminals are accommodated in a terminal box attached to the adapter. The brake can additionally be equipped with manual brake release on request.

Braking torques

Type	d_{rz} [1] [mm]	M_{Bmax} [2] [Nm]	Reduced braking torques (guide values) [Nm]					
AT311/BMG - AT322/BMG	10	9.5						
	12	12.6	9.5					
	16	30	19	12.6	9.5			
	22	55	45	37	30	19	12.6	9.5
AT421/BMG - AT422/BMG	16	30	19	12.6	9.5			
	22	55	45	37	30	19	12.6	9.5
	28	55	45	37	30	19	12.6	9.5
AT522/BM - AT542/BM	22	75	50					
	28	150	125	100	75	50		
	32	250	200	150	125	100	75	50

1) The pinion spigot diameter depends on the gear ratio, please contact SEW-EURODRIVE.

2) Maximum braking torque

Order information

Specify the required braking torque and brake voltage when ordering a gear unit with adapter, centrifugal coupling and brake. If you do not specify these values in your order, the maximum permitted braking torque will be set.

6.5 Project planning for helical-bevel gear units on swing base MK (→ GK)

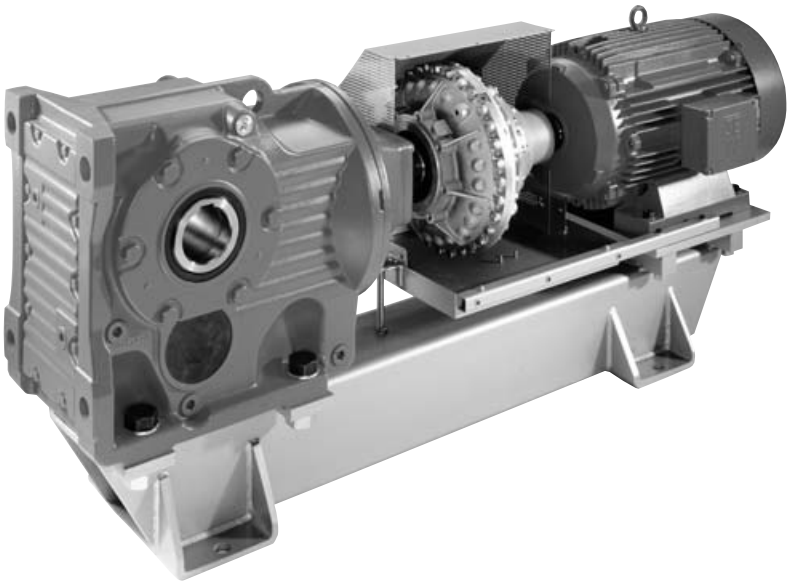


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Figure 28: Helical-bevel gear unit on swing base MK

Pre-assembled drive units comprising helical bevel gear units, hydraulic centrifugal couplings and electric motors are available especially for conveyor systems, bucket conveyors and other machines with high inertia starting. The complete arrangement is attached to a torsionally rigid mounting rail. A protective canopy serves as touch guard for the rotating parts and a collecting pan protects from leaking oil in the event of a failure. The collecting pan is only relevant for mounting position M1. For other mounting positions, the customer must take appropriate measures.

Helical-bevel gear units in type sizes 107 to 187 with 4-pole motors of sizes 200 to 280 (30 to 90 kW) are available in combination with a swing base.[1)]. The gear units can be used with a solid shaft or as shaft-mounted versions. The mounting rail is equipped with a foot mounting option as standard for use as base plate (output free from overhung loads using elastic coupling). A torque arm is available as option for shaft mounted gear units.

Horizontal mounting positions are standard for the swing base MK. Please contact SEW-EURODRIVE for other mounting positions.

1) The adapter with hydraulic centrifugal coupling is available for motors of size 71 to 180 (0.37 to 22 kW).

Structure

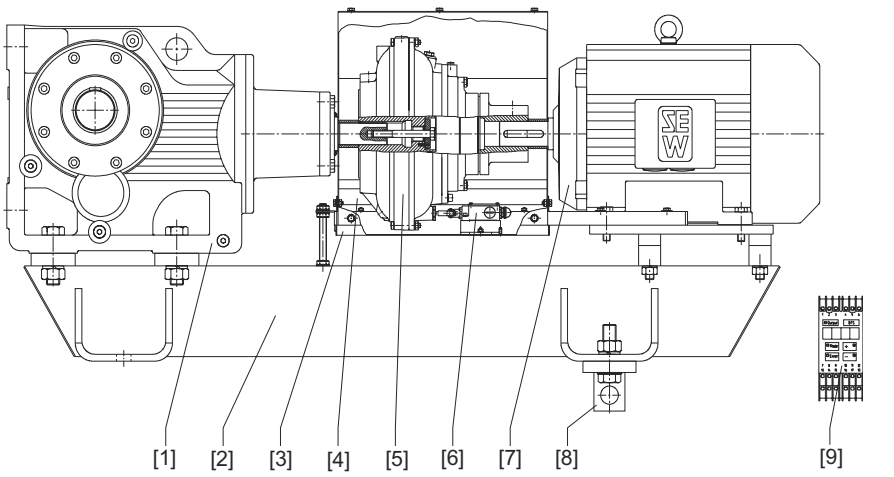

Figure 29: Helical-bevel gear unit on swing base MK

[1] Helical-bevel gear unit
[2] Mounting rail
[3] Oil pan
[4] Protective canopy
[5] Hydraulic centrifugal coupling
[6] Thermal monitoring device (optional design)
[7] Electric motor
[8] Torque arm (optional design)
[9] Speed monitor (optional design, only in conjunction with thermal monitoring BTS)

Select gear unit Please contact SEW-EURODRIVE.

Torque arm /T See dimension sheets "Helical-bevel gear unit on swing base MK" (for shaft-mounted gear units only).

Centrifugal coupling

The centrifugal coupling used is a hydrodynamic coupling that operates according to the Föttinger principle. The coupling is filled with oil and consists of a pump wheel (motor side) and a turbine wheel (gear unit side). The pump wheel converts the input mechanical energy into fluid energy and the turbine wheel converts this energy back into mechanical energy. Furthermore, the centrifugal couplings on the swing base have a deceleration chamber which holds part of the oil volume when the coupling is stationary. The oil is slowly returned to the pump and turbine wheels during the starting phase. This has a positive influence on the starting phase and reduces strain on the drive and the machine.

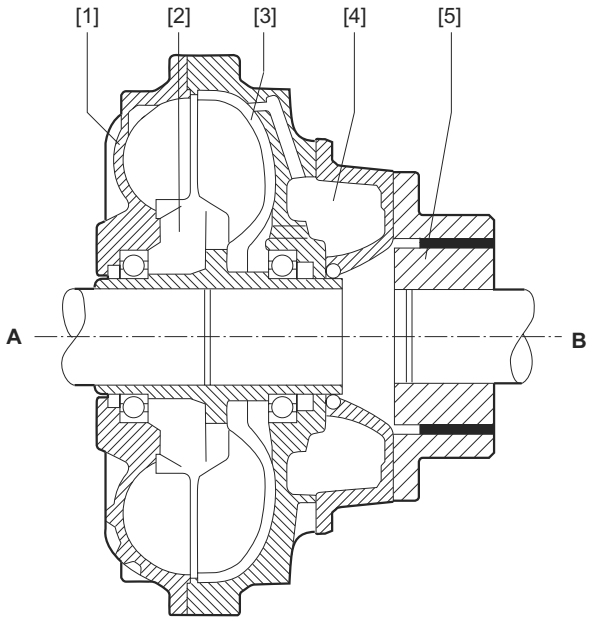

Figure 30: Centrifugal coupling

[1] Pump wheel
[2] Operating fluid (hydraulic oil)
[3] Turbine wheel
[4] Deceleration chamber
[5] Flexible connecting coupling
[A] Gear unit side
[B] Motor side

The hydraulic centrifugal coupling is equipped with fusible safety plugs that allow the operating fluid to be evacuated in the event of excessive temperature (severe overload, blockage). In this way the coupling and system are protected from damage. We recommend you use a thermal monitoring device (MTS or BTS option) to prevent the coupling from loosing oil and protect the environment in the event of an oil leakage.

Mechanical thermal monitoring device /MTS

Using a mechanical thermal monitoring device can prevent the operating fluid from being sprayed into the environment. A switch pin screwed into the coupling releases a spring-loaded switch pin if the temperature reaches an excessive level. This switch pin operates a switch by means of which a warning signal can be output or the machine can be switched off.

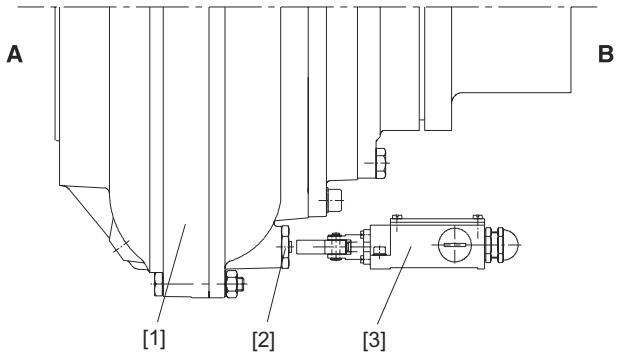

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Figure 31: Mechanical thermal monitoring device /MTS

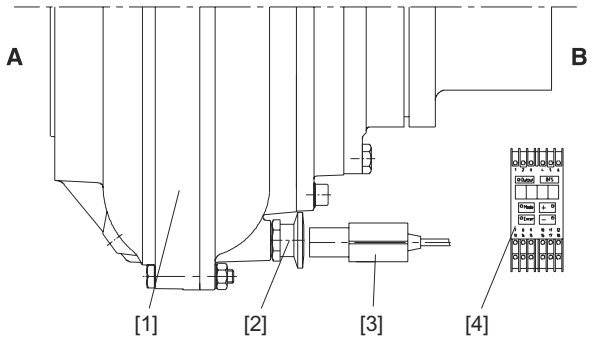
[1] Hydraulic centrifugal coupling
[2] Switch bolt
[3] Switch
[A] Gear unit side
[B] Motor side

Apart from the monitoring device, the centrifugal coupling is equipped with fusible safety plugs. However, these react considerably later than the monitoring device.

Proximity-type thermal monitoring device /BTS

Using a contactless thermal monitoring device can prevent the operating fluid from being sprayed into the environment. The monitoring device consists of three components: a switch pin, which is screwed into the coupling and that changes its inductance if the temperature reaches an excessive level, a switch which detects that the inductance of the switch bolt has changed, and an evaluation unit (speed monitor), which evaluates the signals from the switch. In turn, a warning signal can be output via the speed monitor or the machine can be switched off.

The switch pin regenerates itself and is ready for use again once the coupling has cooled down.



52259AXX

Figure 32: Proximity-type thermal monitoring device /BTS

[1] Hydraulic centrifugal coupling
[2] Switch bolt
[3] Switch
[4] Speed monitor
[A] Gear unit side
[B] Motor side

6.6 Input shaft assembly AD (→ GK)

04583AXX

Figure 33: Helical gear unit with AD input shaft assembly

SEW helical, parallel shaft helical, helical-bevel and helical-worm gear units are equipped with an input shaft assembly for drive via an exposed shaft extension. The dimensions of the drive shafts are given in metric units according to IEC standard (dimensions in inch on request). The end of the input shaft has a center bore to DIN 332 for mounting and attaching drive components.

The bearings of the input shaft are grease-lubricated. NBR oil seals and gap rings are used to seal the covers. The solid bearing of the drive shaft allows for high overhung loads.

Selecting the gear unit

Determine the gear unit type

↓

Determine the gear unit size by means of the
- Maximum output torque ($M_{a\ max}$)
- Gear ratio (i)

in the gear unit selection tables with input shaft assembly AD
When selecting AD/P, please observe the selection note on page 84 .

↓

Check the maximum permitted overhung load value on the output (F_{Ra}).

↓

Check the maximum permitted input power at the gear unit (P_e) by taking account of the thermal limit rating (see page 85).

↓

Check the overhung load at the input (F_{Re}).

↓

In the case of other requirements (such as higher overhung loads on the input side), please contact SEW-EURODRIVE.

Centering shoulder AD../ZR

The input shaft assembly can be configured with a centering shoulder as an option. In this way, a customer's application can be attached to the cover centrally in relation to the input shaft side.

Backstop AD../RS

The input shaft assembly can be supplied with a backstop if the application only requires one permitted direction of rotation. Backstops with centrifugal lift-off sprags are used. The advantage of this design is that the sprags move around inside the backstop without making contact above a certain speed (lift-off speed). This means backstops operate wear-free, maintenance-free, without losses, and they are suited for high speeds.

Dimensions:

The backstop is completely integrated in the cover. This means there is no difference in dimensions between an input shaft assembly with or without backstop (see dimension sheets in the "Input shaft assembly AD" section).

Locking torques:

Type	Maximum locking torque backstop [Nm]	Lift-off speed [1/min]
AD2/RS	90	640
AD3/RS	340	600
AD4/RS	700	550
AD5/RS	1200	630
AD6/RS	1450	430
AD7/RS	1450	430
AD8/RS	2860	430

Specify output direction of rotation in your order:

When you order a gear unit with input shaft assembly and backstop, it is necessary to indicate the direction of rotation of the output shaft/output side. The direction of rotation is given looking onto the output shaft/output side of the gear unit. For drives with shaft ends at sides A and B, the direction of rotation must be specified as looking onto side A.

Check the direction of rotation of the drive before starting up the system to avoid damage.

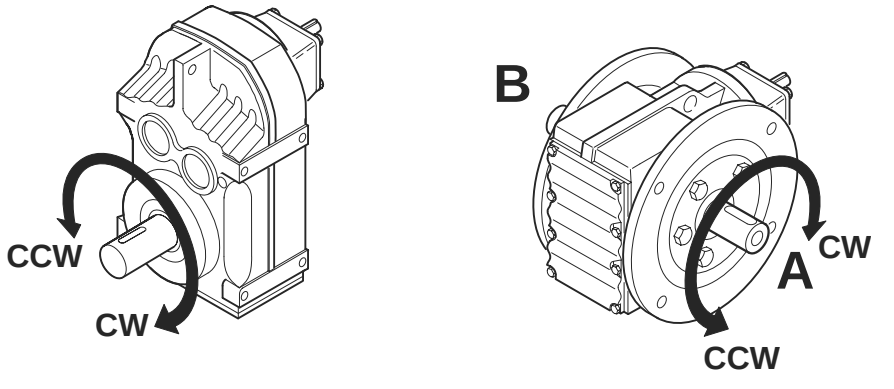


Figure 34: Specify output direction of rotation when ordering

CCW = Counterclockwise rotation

CW = Clockwise rotation

Motor mounting platform AD.. /P

Belt drives are available with adjustable motor mounting platform for space-saving installation. The motor mounting platform is arranged parallel to the drive shaft and has tapped holes for IEC standard motors (also available without tapped holes on request). The distance from the input shaft can be adjusted using threaded columns.

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Figure 35: Helical gear unit with input shaft assembly and motor mounting platform AD../P

Selection note (available combinations)

See the following table for motors available for the various motor mounting platforms.

	Motor mounting platform					
Motor type	**AD2/P**	**AD3/P**	**AD4/P**	**AD5/P**	**AD6/P**	**AD7/P**
DT71	5.5					
DT80	5.5					
DT90	5.5	11				
DV100		11				
DV112		11				
DV132			23			
DV160				41		
DV180				41		
DV200					62	
DV225					62	
DV250						103
DV280						103

Combination is available / additional weight in kg

If the selected gearcase cover (motor mounting platform) cannot be combined with the required motor, please contact SEW-EURODRIVE.

You find available gear unit/motor combinations for input shaft assembly with motor mounting platform in the relevant dimension drawings.

Thermal limit power for gear units with input shaft assembly

The power values given in the selection tables for gear units with input shaft assemblies are mechanical limit powers. Depending on the mounting position, however, gear units may become thermally overloaded before they reach the mechanical power limit. Relevant cases for mineral oils are identified in the selection tables (see column under the arrow) by giving their mounting position.

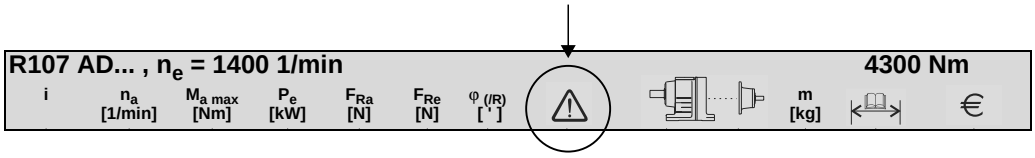

Figure 36: Selection table

If the required mounting position corresponds with an indicated one, please consult SEW. By considering the actual operating conditions, it will then be possible to recalculate the thermal limit rating based on the specific application. Alternatively, suitable measures can be taken (e.g. using a synthetic lubricant with higher thermal stability) to increase the thermal limit rating of the gear unit. The following data are required for recalculation:

Gear unit type			
Output speed [n_a]	..... 1/min	**Gear ratio i**	.....
Ambient temperature	..... °C	**Cyclic duration factor cdf**	.....%
Power drawn [P]	..... kW		
Installation site:			
...in small, enclosed rooms			
...in large rooms, halls			
...outdoors			
Installation on site:			
.....			
e.g. base made of steel or concrete			

7 Project Planning for AC Motors

7.1 Possible motor options (→ GM, → MM)

Overview

The following motor options are available in various combinations:

- BM(G)/BR disc brakes (→ page 106)
- IS integrated plug connector (→ page 118)
- Plug connectors AS.., AC.., AM.., AB.., AD.., AK.. (→ page 119)
- APG plug connector. (→ page 120)
- ASK1 plug connector (→ page 121)
- Encoders and pre-fabricated cables for encoder connection (→ page 123)
- Encoder mounting adapter (→ page 126)
- Forced cooling fan VR/VS/V (→ page 131)
- Backstop RS (→ page 132)
- Additional flywheel mass Z (flywheel fan) (→ page 132)
- Protection canopy C (→ page 133)
- MOVIMOT® integrated frequency inverter (→ page 134)
- Integrated motor circuit breaker/motor protection MOVI-SWITCH® (→ page 143)
- Smooth pole-changing unit WPU (→ page 147)

Technical data and dimension drawings

The technical data and dimension drawings for the motor options are listed in the price catalog / catalog "Gearmotors."

7.2 Standards and regulations (→ GM)

Conformance to standards

AC motors and AC brake motors from SEW-EURODRIVE conform to the relevant standards and regulations, in particular:

- IEC 60034-1, EN 60034-1

  Rotating electrical machinery, rating and performance.
- EN 60529

  IP degrees of protection provided by enclosures of electrical equipment.
- IEC 60072

  Dimensions and performance of rotating electrical machinery.
- EN 50262

  Metric threads of cable glands.
- EN 50347

  Standardized dimensions and power ratings.

Rated data

The specific data of an asynchronous AC motor (AC squirrel cage motor) are:

- Size
- Rated power
- Cyclic duration factor
- Rated speed
- Rated current
- Rated voltage
- Power factor cosφ
- Enclosure
- Thermal classification
- Efficiency class

This data is given on the nameplate of the motor. In accordance with IEC 60034 (EN 60034), the nameplate data apply to a maximum ambient temperature of 40 °C and a maximum altitude of 1000 m above sea level.

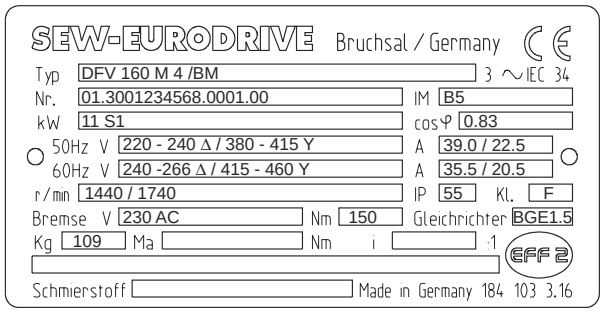

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Figure 37: Motor nameplate

Tolerances

According to IEC 60034 (EN 60034), the following tolerances are permitted for electric motors (also applies to the rated voltage range):

Voltage and frequency		Tolerance A or tolerance B
Efficiency η	$P_N \leq 50$ kW $P_N > 50$ kW	-0,15 • (1-η) -0,1 • (1-η)
Power factor cosφ		$-\frac{1 - \cos\varphi}{6}$
Slip	$P_N < 1$ kW $P_N \geq 1$ kW	±30% ±20%
Starting current		+20%
Tightening torque		-15%...+25%
Breakdown torque		-10%
Mass moment of inertia		±10%

Tolerance A, tolerance B

Tolerances A and B describe the permitted range within which the frequency and voltage are allowed to deviate from their respective rated points. The origin identified with "0" indicates the respective rated points for frequency and voltage.

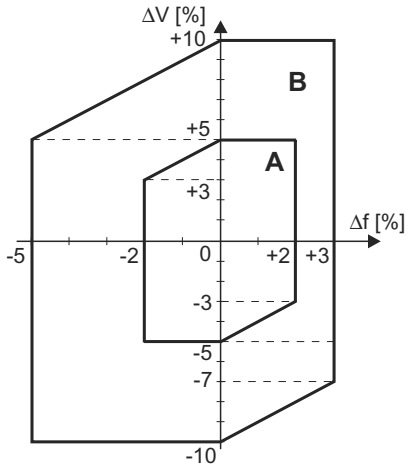

Figure 38: Tolerance ranges A and B

In the tolerance range A, the motor must be able to deliver the rated torque in continuous duty (S1). The other characteristic values and the increase in temperature may deviate slightly from the values for rated voltage and rated frequency.

In the tolerance range B, the motor must be able to deliver the rated torque but not in continuous duty. The increase in temperature and deviations from the rated data are higher than in tolerance range A. Avoid frequent operation of the motor at the limits of tolerance range B.

Undervoltage

It is not possible to achieve the values in the catalog such as power, torque and speed in the event of undervoltage due to weak supply systems or an insufficiently large motor cable. This is applies in particular to the starting up phase of the motor during which the starting current amounts to a multiple of the rated current.

7.3 Circuit breakers and protective equipment

EMC measures

AC motors, AC brake motors and MOVIMOT® drives from SEW-EURODRIVE are components for installation in machinery and systems. The designer of the machine or system is responsible for complying with the EMC Directive 89/336/EEC. Please refer to the publication "Drive Engineering - Practical Implementation, Electromagnetic Compatibility (EMC) in Drive Engineering" for detailed information about this topic. For specific information on MOVIMOT® drives, refer to the "Drive System for Decentralized Installation" system manual.

Mains operation, MOVIMOT® drives

SEW-EURODRIVE AC (brake) motors satisfy the EMC generic standards EN 50081 and EN 50082 when used in accordance with their designated use in continuous mains operation. Interference suppression measures are not necessary. MOVIMOT® drives also satisfy the EMC generic standards EN 50081 and EN 50082 when operated in accordance with their designated use.

Switching operation

For switching operation of the motor, take suitable measures for suppressing interference from the switchgear.

Inverter operation

Regarding inverter operation, please refer to the installation and EMC instructions provided by the inverter manufacturer. Also note the following points:

Brake motors on the inverter

Install the brake cables of brake motors separately from the other power cables, maintaining a distance of at least 200 mm. Joint installation is only permitted if either the brake cable or the power cable is shielded.

Tachometer connection on the inverter

Observe the following instructions when connecting the tachometer:

- Use a shielded cable with twisted pair conductors only.
- Connect the shield to the PE potential on both ends over a large surface area.
- Install signal cables separately from power cables or brake cables (min. distance 200 mm).

Positive temperature coefficient (PTC) thermistor TF connection on the inverter

Install the connecting lead of the positive temperature coefficient (PTC) thermistor TF separately from other power cables, maintaining a distance of at least 200 mm. Collective installation is only permitted if either the TF cable or the power cable is shielded.

Motor protection

Selecting the correct protection device is a significant factor in determining the operational reliability of the motor. We distinguish between protection devices that are current-dependent and those that depend on the motor temperature. Current-dependent protection devices include fuses or motor circuit breakers. Temperature dependent protection devices are PTC thermistors or bimetallic switches (thermostats) in the winding. PTC thermistors or bimetallic switches respond when the maximum permitted winding temperature is reached. Their advantage is that temperatures are measured right where they occur.

Motor circuit breakers

Motor circuit breakers offer adequate protection against overload in standard operation with a low starting frequency, brief start-ups and starting currents that are not excessive. The motor circuit breaker is set to the rated motor current.

Motor circuit breakers are not adequate as the sole means of protection given switching operation with a high starting frequency (> 60 1/h) and for high inertia starting. In these cases, we recommend you use positive temperature coefficient (PTC) thermistors TF in addition.

PTC thermistor

Three positive temperature coefficient (PTC) thermistors **TF** (PTC, characteristic curve according to DIN 44080) are connected in series in the motor and connected from the terminal box to the TF/TH input of the inverter or to a trip switch in the control cabinet. Motor protection with positive temperature coefficient (PTC) thermistors TF provide comprehensive protection against thermal overload. Motors protected in this way can be used for high inertia starting, switching and braking operation as well as with fluctuating mains power supply. A motor circuit breaker is usually installed in addition to the TF. SEW-EURODRIVE recommends always using motors equipped with TF for inverter operation.

Bimetallic switch

Three bimetallic switches **TH**, connected in series in the motor, are looped directly into the motor monitoring circuit from the terminal box.

Fuses

Fuses do not protect the motor from overload. Their only purpose is short-circuit protection.

The following table provides an overview of the various protection devices used for various causes.

○ = no protection ◑ = limited protection ● = comprehensive protection	Current dependent protection device		Temperature dependent protection device	
	Fuse	Protective circuit breaker	PTC thermistor (TF)	Bimetallic switch (TH)
Over-currents up to 200 % I_N	○	●	●	●
High inertia starting, reversal	○	◑	●	◑
Switching operation up to Z = 30 1/h	○	◑	●	●
Stalling	◑	◑	◑	◑
Single phasing	○	◑	●	●
Voltage deviation	○	●	●	●
Frequency deviation	○	●	●	●
Insufficient motor cooling	○	○	●	●

MOVIMOT® protection devices

- MOVIMOT® integrate protective equipment to prevent thermal damage.
- No other external devices are required for motor protection.

Secure switching of inductances

Note the following notes for switching of inductances:

- Switching of low-speed motor windings.

  If the cable is installed unfavorably, switching of low-speed motor windings can generate voltage peaks. Voltage peaks can damage windings and contacts. Install varistors in the incoming cable to avoid such problems.

- Switching of brake coils.

  Varistors must be used to avoid harmful switching overvoltages caused by switching operations in the DC circuit of disk brakes.

  Brake control systems from SEW-EURODRIVE are equipped with varistors as standard. Use contactors with contacts in utilization category AC3 or better to EN 60947-4-1 for switching of brake coils.

- Suppressor circuit on the switching devices.

  According to EN 60204 (Electrical Equipment of Machines), motor windings must be equipped with interference suppression to protect the numerical or programmable logic controllers. Because problems are primarily caused by switching operations, we recommend installing suppressor circuits on the switching devices.

7.4 Electrical characteristics (→ GM, → MM)

Suitability for use with an inverter

AC (brake) motors can be operated on inverters, for example SEW-EURODRIVE MOVIDRIVE®, MOVITRAC® and MOVIMOT®, thanks to the high quality of insulation (including phase separator) with which they are equipped as standard.

The winding option "reinforced insulation" is available for voltages higher than AC 500 V. The SEW unit designation for this option is "/RI".

Frequency

SEW-EURODRIVE AC motors are designed for a system frequency of 50 Hz or 60 Hz on request. As standard, the technical data for AC motors refer to a 50 Hz supply frequency.

Motor voltage

AC motors are available for rated voltages from 220 to 690 V. Pole-changing motors in sizes 63 ... 90 are available for rated voltages from 220 ... 500 V only.

Motor sizes 71 to 132S are usually supplied in a version for the voltage range 220 ... 240/380 × 415 V_{AC}, 50 Hz. The jumpers for setting the star or delta connection are supplied with the motor in a bag inside the terminal box. For motor sizes >132S, the standard design is 380 ... 415/660 ... 690 V_{AC}, 50 Hz. The star or delta jumpers are mounted on the terminal board.

For 50 Hz power supply

The **standards voltages** are:

Motors	Motor size	
	56 (4-pole only)	63...90
	Motor voltage	
2, 4 and 6-pole motors, applies to the voltage range	220...240 V_{AC} 人 380...415 V_{AC} 人	220...240/380...415 V_{AC} Δ/人
Single-speed	-	230/400 V_{AC} Δ/人 290/500 V_{AC} Δ/人
Multi-speed, Dahlander	-	400 V_{AC} Δ/人人
Multi-speed, separate winding	-	400 V_{AC} 人 / 人
	Brake voltage	
2, 4 and 6-pole motors, applies to the voltage range	220...240 V_{AC} 380...415 V_{AC}	220...240 V_{AC} 380...415 V_{AC}
Standard voltages	24 V_{DC} / 230 V_{AC} / 400 V_{AC}	
	Forced cooling fan voltage	
Standard voltage VR	-	24 V_{DC} [1]
Voltage range VS	-	1 × 220...266 V_{AC} [1]

1) not applicable for motor size

Motors	Motor size		
	100...132S	132M...225	225...280
	Motor voltage		
2, 4 and 6-pole motors, applies to the voltage range	220...240/ 380...415 V_{AC} Δ/人	220...240/380...415 V_{AC} Δ/人 380...415/660..0.690 V_{AC} Δ/人	
Single-speed	230/400 V_{AC} Δ/人 290/500 V_{AC} Δ/人 400/690 V_{AC} Δ/人 500 V_{AC} Δ		
Multi-speed, Dahlander	400 V_{AC} Δ/人人		
Multi-speed, separate winding	400 V_{AC} 人 / 人		
	Brake voltage		
2, 4 and 6-pole motors, applies to the voltage range	220..0.240 V_{AC} 380...415 V_{AC}		
Standard voltages	24 V_{DC} / 230 V_{AC} / 400 V_{AC}		
	Forced cooling fan voltage		
Standard voltage VR	24 V_{DC}	-	-
Voltage range VS	1 × 220...266 V_{AC}	-	-
Voltage range V	-	3 × 380...415 V_{AC}	3 × 346...500 V_{AC}

Motors and brakes for 230/400 V_{AC} and motors for 690 V_{AC} may also be operated on supply systems with a rated voltage of 220/380 V_{AC} or 660 V_{AC} respectively. The voltage dependent data will slightly change in this case.

Standard connections 50 Hz motors

No. of poles	Synchronous speed n_{syn} at 50 Hz [1/min]	Connection
2	3000	人 / Δ
4	1500	人 ; 人 / Δ
6	1000	人 / Δ
8	750	人 / Δ
8/4	750/1500	Δ/人人 Dahlander
8/2	750/3000	人 / 人 separate winding

50 Hz motor on 60 Hz supply system

The rated data of motors designed for 50 Hz supply systems are slightly different when the motors are operated on 60 Hz supply systems.

Motor voltage at 50 Hz	Motor connection	U [V] at 60 Hz	Changed rated data			
			n_N	P_N	M_N	M_A/M_N
230/400 V_{AC} Δ/人	Δ	230	+20%	0%	-17%	-17%
230/400 V_{AC} Δ/人	人	460	+20%	+20%	0%	0%
400/690 V_{AC} Δ/人	Δ					

For 60 Hz power supply

The **standard voltages** are indicated in **bold**:

Motors	Motor size		
	56	**63**	**71...90**
	Motor voltage		
2, 4 and 6-pole motors, applies to the voltage range	**240..0.266 V_{AC}** 人 **415..0.460 V_{AC}** 人	**240...266/415..0.460 V_{AC}** Δ/人	
Single-speed	-	**266/460 V_{AC}** Δ/人 220/380 V_{AC} Δ/人 330/575 V_{AC} Δ/人	**266/460 V_{AC}** Δ/人 220/380 V_{AC} Δ/人 330/575 V_{AC} Δ/人 200/400 V_{AC} 人人/人 220/440 V_{AC} 人人/人 230/460 V_{AC} 人人/人
Multi-speed, Dahlander	-	460 V_{AC} Δ/人人	
Multi-speed, separate winding	-	-	460 V_{AC} 人 / 人
	Brake voltage		
2, 4 and 6-pole motors, applies to the voltage range	**240..0.266 V_{AC}** **415..0.460 V_{AC}**	**240..0.266 V_{AC}** **415..0.460 V_{AC}**	
Standard voltages	**24 V_{DC} / 230 V_{AC} / 266 V_{AC} / 460 V_{AC}**		
	Forced cooling fan voltage		
Standard voltage VR	-	-	**24 V_{DC}**
Voltage range VS	-	-	**1 × 220..0.266 V_{AC}** [1)]

Motors	Motor size		
	100...132S	132M...225	250...280
	Motor voltage		
2, 4 and 6-pole motors, applies to the voltage range	240...266/ 415..0.460 V_{AC} Δ/人	240...266/415..0.460 V_{AC} Δ/人 415..0.460 V_{AC} Δ	
Single-speed	266/460 V_{AC} Δ/人 220/380 V_{AC} Δ/人 330/575 V_{AC} Δ/人 200/400 V_{AC} 人人/人 220/440 V_{AC} 人人/人 230/460 V_{AC} 人人/人		
Multi-speed, Dahlander	460 V_{AC} Δ/人人		
Multi-speed, separate winding	460 V_{AC} 人 / 人		
	Brake voltage		
2, 4 and 6-pole motors, applies to the voltage range	240..0.266 V_{AC} 415..0.460 V_{AC}		
Standard voltages	24 V_{DC} / 230 V_{AC} / 266 V_{AC} / 460 V_{AC}		
	Forced cooling fan voltage		
Standard voltage VR	24 V_{DC}	-	-
Voltage range VS	1 × 220..0.266 V_{AC}	-	-
Voltage range V	-	3 × 415..0.460 V_{AC}	3 × 346...500 V_{AC}

Standard connections 60 Hz motors

No. of poles	Synchronous speed n_{syn} at 60 Hz [1/min]	Connection
2	3600	Δ/人; 人人 / 人
4	1800	Δ/人; 人人 / 人
6	1200	Δ/人; 人人 / 人
8/4	900/1800	Δ/人人 Dahlander
8/2	900/3600	人 / 人 separate winding

60 Hz motor on 50 Hz supply system

The rated data of motors designed for 60 Hz supply systems are slightly different when these motors are operated on 50 Hz supply systems.

Example: NEMA C-motor, designed for the USA, operation on a 50 Hz supply system:

Motor voltage at 60 Hz (USA)	Motor connection	U [V] at 50 Hz	Changed rated data			
			n_N	P_N	M_N	M_A/M_N
230/460 V_{AC} 人人 / 人	人	400	-17%	-17%	0%	0%

Motors for USA and Canada

Motors for USA and Canada are designed according to NEMA or CSA regulations. Single-speed motors in NEMA or CSA design are registered with Underwriters Laboratories (UL). The following voltage assignments (60 Hz) are customary in the USA and Canada:

	Rated voltage of the supply power	Rated voltage of the motor
USA	208 V	200 V
	240 V	230 V
	480 V	460 V
Canada	600 V	575 V

The motor voltage may deviate up to ±10 % from the rated voltage. This deviation corresponds to tolerance B (→ page 88).

In the USA, 230/460 V_{AC} / 60 Hz motors are usually used (→ Sec. International and national markets on page 103).

7.5 Thermal characteristics (→ GM, → MM)

Thermal classes according to IEC 60034-1 (EN 60034-1)

AC motors, AC brake motors and MOVIMOT® drives are available in the following thermal classes:

- The standard design for all single-speed AC motors/AC brake motors and Dahlander motors is thermal class B. Thermal classes F or H are available on request.
- The standard design for all multi-speed AC motors/AC brake motors with separate winding is thermal class F. Thermal class H is available on request.
- Standard design for all MOVIMOT® drives is thermal class F. Other thermal classes are not possible for MOVIMOT® drives.

The table below lists the overtemperatures to IEC 60034-1 (EN 60034-1).

Thermal class		Overtemperature limit [K]
Old	New	
B	**130**	80 K
F	**155**	105 K
H	**180**	125 K

Power reduction

The rated power P_N of a motor depends on the ambient temperature and the altitude. The rated power stated on the nameplate applies to an ambient temperature of 40 °C and a maximum altitude of 1,000 m above sea level. The rated power must be reduced according to the following formula in the case of higher ambient temperatures or altitudes:

$$P_{Nred} = P_N \bullet f_T \bullet f_H$$

AC motors

For AC motors, the factors f_T and f_H are listed in the following diagram:

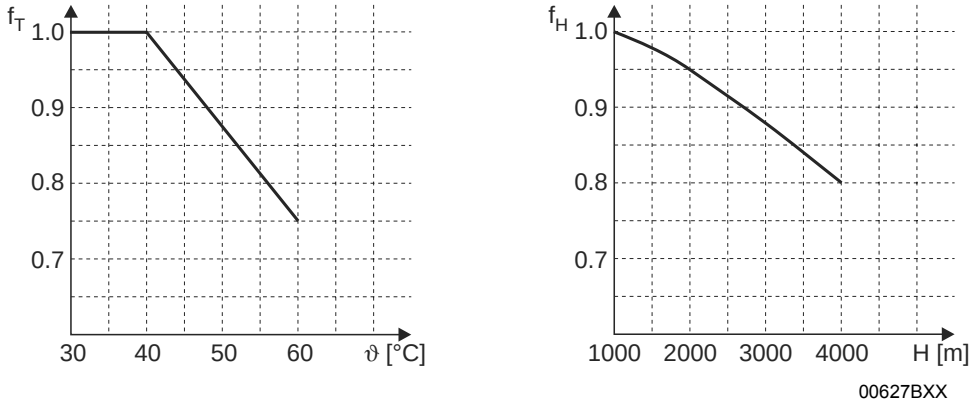

Figure 39: Power reduction dependent on ambient temperature and altitude

ϑ = Ambient temperature
H = Altitude above sea level

MOVIMOT® drives

Für MOVIMOT® drives, the factors f_T und f_H are given in the following diagrams:

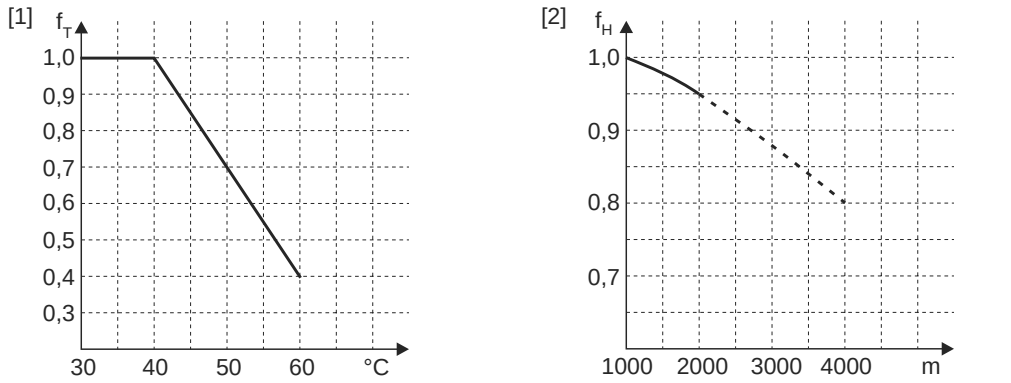

Figure 40: Power reduction dependent on ambient temperature and altitude

[1] Ambient temperature
[2] Altitude above sea level **(Altitudes of more than 2000 m subject to limitations. Observe the installation notes in the "MOVIMOT® MM03C"MM03C-MM3XC** operating instructions.

Duty types

The following duty types are defined in IEC 60034-1 (EN 60034-1):

Duty type	Explanation
S1	**Continuous duty:** Operation at a constant load; the motor reaches thermal equilibrium.
S2	**Short-time duty:** Operation at constant load for a given time followed by a time at rest. The motor returns to ambient temperature during the rest period.
S3	**Intermittent periodic duty:** The starting current does not significantly affect the temperature rise. Characterized by a sequence of identical duty cycles, each including a time of operation at constant load and a time at rest. Described by the "cyclic duration factor (cdf)" in %.
S4...S10	**Intermittent periodic duty:** The starting current affecting the temperature rise. Characterized by a sequence of identical duty cycles, each including a time of operation at constant load and a time at rest. Described by the "cyclic duration factor (cdf)" in % and the number of cycles per hour.

For inverter operation, S1 continuous duty is usually assumed. For a great number of cycles per hour, it may be necessary to assume S9 intermittent periodic duty.

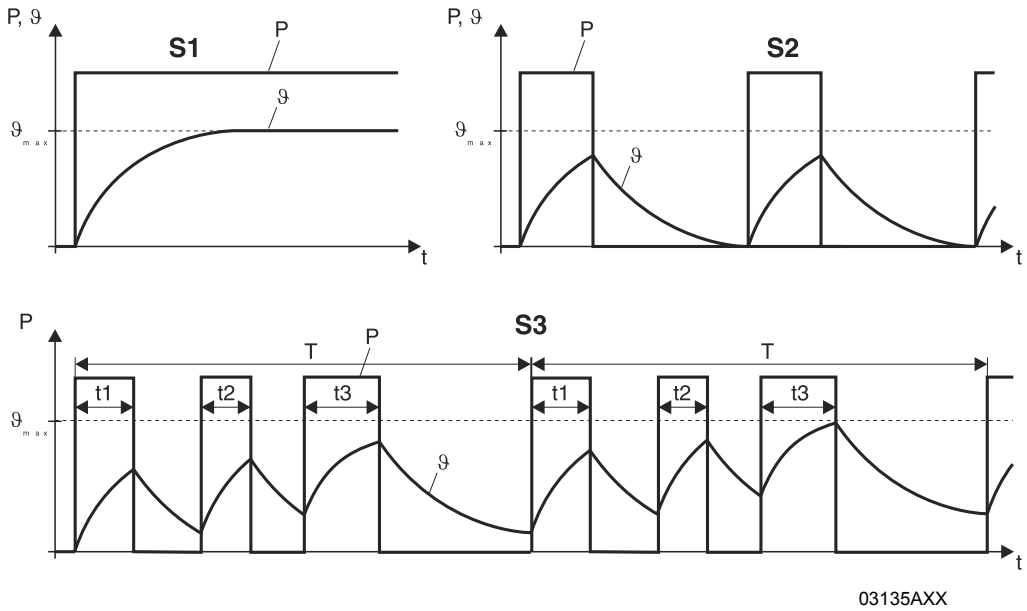

Figure 41: Duty types S1, S2 and S3

Cyclic duration factor (cdf)

The cyclic duration factor (cdf) is the ratio between the period of loading and the duration of the duty cycle. The duration of the duty cycle is the sum of times of operation and times at rest and de-energized. A typical value for the duration of the duty cycle is ten minutes.

$$\text{cdf} = \frac{\text{total on-times (t1 + t2 + t3)}}{\text{cycle duration (T)}} \bullet 100\ [\%]$$

Power increasing factor K

Unless specified otherwise, the rated power of the motor refers to duty type S1 (100 % cdf) according to IEC 60034 (EN 60034). If a motor designed for S1 and 100 % cdf is operated in mode S2 "short-time duty" or S3 "intermittent periodic duty", the rated power can be multiplied by the power increasing factor K specified on the nameplate.

Duty type			Power increasing factor K
S2	Period of operation	60 min 30 min 10 min	1.1 1.2 1.4
S3	Cyclic duration factor (cdf)	60% 40% 25% 15%	1.1 1.15 1.3 1.4
S4...S10	The following information must be specified to determine the rated power and the duty type: number and type of cycles per hour, starting time, time at load, braking type, braking time, idle time, cycle duration, period at rest and power demand.		On request

In the case of extremely high counter torques and high mass moments of inertia (high inertia starting), please contact SEW-EURODRIVE and provide the exact technical data.

7.6 Starting frequency (→ GM, → MM)

A motor is usually rated according to its thermal loading. In many applications the motor is started only once (S1 = continuous running duty = 100 % cdf). The power demand calculated from the load torque of the driven machine is the same as the rated motor power.

High starting frequency

Many applications call for a high starting frequency at low counter-torque, such as in travel drives. In this case, it is not the power demand that is the decisive factor in determining the size of the motor, but rather the number of times the motor has to start up. Frequent starting means the high starting current flows every time, leading to disproportionate heating of the motor. The windings become overheated if the heat absorbed is greater than the heat dissipated by the motor ventilation system. The thermal load capacity of the motor can be increased by selecting a suitable thermal classification or by means of forced cooling (→ Sec. "Thermal characteristics" on page 95).

No-load starting frequency Z_0

SEW-EURODRIVE specifies the permitted starting frequency of a motor as the no-load starting frequency Z_0 at 50 % cdf. This value indicates the number of times per hour that the motor can accelerate the mass moment of inertia of its rotor up to speed without counter-torque at 50 % cdf. If an additional mass moment of inertia has to be accelerated or if an additional load torque occurs, the starting time of the motor will increase. Increased current flows during this acceleration time. This means the motor is subjected to increased thermal load and the permitted starting frequency is reduced.

Permitted starting frequency of the motor

You can determine the permitted starting frequency Z of the motor in cycles/hour [1/h] using the following formula:

$$\mathbf{Z = Z_0 \bullet K_J \bullet K_M \bullet K_P}$$

You can determine the factors K_J, K_M and K_P using the following diagrams:

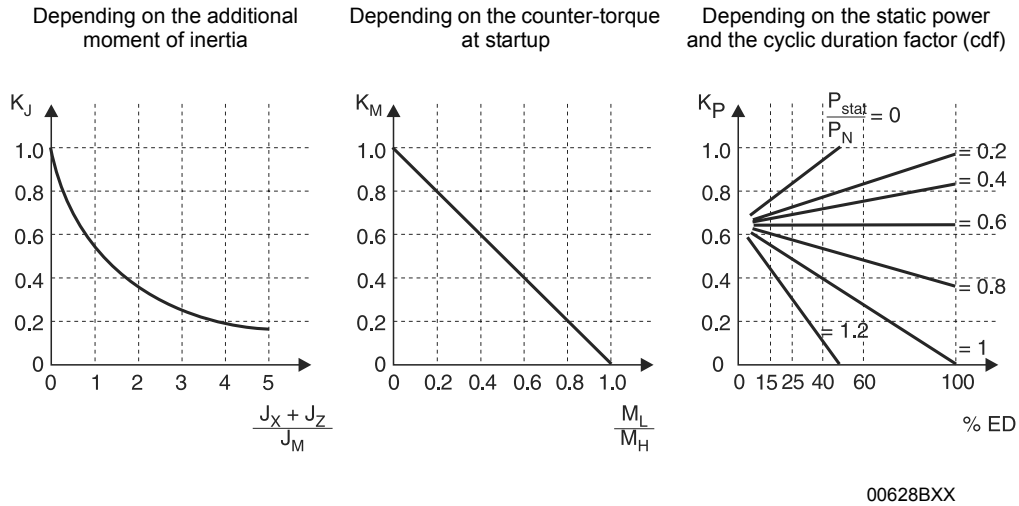

Figure 42: Dependency of the starting frequency

J_X =	Total of all external mass moments of inertia in relation to the motor axis	M_H =	Acceleration torque motor
J_Z =	Mass moment of inertia flywheel fan	P_{stat} =	Power requirement after start-up (static power)
J_M =	Mass moment of inertia of the motor	P_N =	Rated motor power
M_L =	Counter-torque during startup	%cdf =	cyclic duration factor

Example

Motor: DT80N4/BMG (→ Sec. "Technical data of AC motors")
No-load starting frequency Z_0 = 14000 1/h

1. $(J_X + J_Z) / J_M = 3.5$ → $K_J = 0.2$
2. $M_L / M_H = 0.6$ → $K_M = 0.4$
3. $P_{stat} / P_N = 0.6$ and 60% cdf → $K_P = 0.65$

$Z = Z_0 \bullet K_J \bullet K_M \bullet K_P = 14000$ c/h $\bullet$ 0.2 $\bullet$ 0.4 $\bullet$ 0.65 = 728 c/h

The cycle duration is 5 s, the operating time 3 s.

Permitted work done by the brake

If you are using a brake motor, you have to check whether the brake is approved for use with the required starting frequency Z. Refer to the information in Sec. "Permitted work done by the brake" on page 108.

7.7 Mechanical characteristics (→ GM, → MM)

Degrees of protection according to EN 60034 (IEC 60034-5)

The standard degree of protection for AC motors, AC brake motors and MOVIMOT® drives is IP54. Enclosures IP55, IP56, IP65 or IP66 are available upon request.

IP	1st digit		2nd digit
	Touch guard	Protection against foreign objects	Protection against water
0	No protection	No protection	No protection
1	Protected against access to hazardous parts with the back of your hand	Protection against solid foreign objects ∅50 mm and larger	Protection against dripping water
2	Protected against access to hazardous parts with a finger	Protection against solid foreign objects ∅12 mm and larger	Protection against dripping water when tilted up to 15°
3	Protected against access to hazardous parts with a tool	Protection against solid foreign objects ∅2.5 mm and larger	Protection against spraying water
4	Protected against access to hazardous parts with a wire	Protection against solid foreign objects ∅1 mm and larger	Protection against splashing water
5		Protection against dust	Protection against water jets
6		Dust-proof	Protection against powerful water jets
7	-	-	Protection against temporary immersion in water
8	-	-	Protection against permanent immersion in water

Other options

Increased corrosion protection for metal parts and additional impregnation of the winding (protection against moisture and acid) is available as is the supply of explosion-proof motors and brake motors with EExe enclosure (increased safety), EExed (increased safety motor, flameproof brake) and EExd (flameproof). Refer to the information in in Sec. "Product Description and Overview of Types/General information" in this regard.

Vibration properties of motors

The rotors of AC motors are dynamically balanced with a half key. Motors according to vibration severity grade "N" according to DIN ISO 2373 (EN60034-14:1997) or vibration grade "A" according to IEC 60034-14:2003. In the case of specific requirements on the mechanical running smoothness, single-speed motors without brake, forced cooling fan, encoder, etc. are available in low-vibration design vibration class "R" according to DIN ISO 2373 or vibration grade "B" according to IEC 60034-14:2003.

7.8 Overhung loads (→ GM, → MM)

Refer to the section "Project Planning for Gear Units"Overhung loads and axial forces/ for general information about overhung loads. The following table lists the permitted overhung loads (top value) and axial forces (bottom value) of AC motors:

Mounting position	[1/min] No. of poles	Permitted overhung load F_R [N] Permitted axial load F_A [N]; $F_{A\_tension} = F_{A\_pressure}$ Size													
		63	71	80	90	100	112	132S	132ML 132M	160M	160L	180	200	225	250 280
Foot mounted motor	750 8	- -	680 200	920 240	1280 320	1700 400	1750 480	1900 560	2600 640	3600 960	3800 960	5600 1280	6000 2000	- -	- -
	1000 6	- -	640 160	840 200	1200 240	1520 320	1600 400	1750 480	2400 560	3300 800	3400 800	5000 1120	5500 1900	- -	8000 2500
	1500 4	- -	560 120	720 160	1040 210	1300 270	1400 270	1500 270	2000 400	2600 640	3100 640	4500 940	4700 2400	7000 2400	8000 2500
	3000 2	- -	400 80	520 100	720 145	960 190	980 200	1100 210	1450 320	2000 480	2300 480	3450 800	3700 1850	- -	- -
Flange-mounted motor	750 8	- -	850 250	1150 300	1600 400	2100 500	2200 600	2400 700	3200 800	4600 1200	4800 1200	7000 1600	7500 2500	- -	- -
	1000 6	600 150	800 200	1050 250	1500 300	1900 400	2000 500	2200 600	2900 700	4100 1000	4300 1000	6300 1400	6800 2400	- -	11000 3000
	1500 4	500 110	700 140	900 200	1300 250	1650 350	1750 350	1900 350	2500 500	3200 800	3900 800	5600 1200	5900 3000	8700 3000	9000 2600
	3000 2	400 70	500 100	650 130	900 180	1200 240	1200 250	1300 260	1800 400	2500 600	2900 600	4300 1000	4600 2300	- -	- -

Overhung load conversion for off-center force application

The permitted overhung loads must be calculated using the following formulae in the event that force is not applied at the center of the shaft end. The smaller of the two values F_{xL} (according to bearing service life) and F_{xW} (according to shaft strength) is the permitted value for the overhung load at point x. Note that the calculations apply to M_N.

F_{xL} based on bearing life

$$F_{xL} = F_R \cdot \frac{a}{b + x} \text{ [N]}$$

F_{xW} from the shaft strength

$$F_{xW} = \frac{c}{f + x} \text{ [N]}$$

F_R = Permitted overhung load (x = l/2) [N]

x = Distance from the shaft shoulder to the force application point [mm]

a, b, f = Motor constant for overhung load conversion [mm]

c = Motor constant for overhung load conversion [mm]

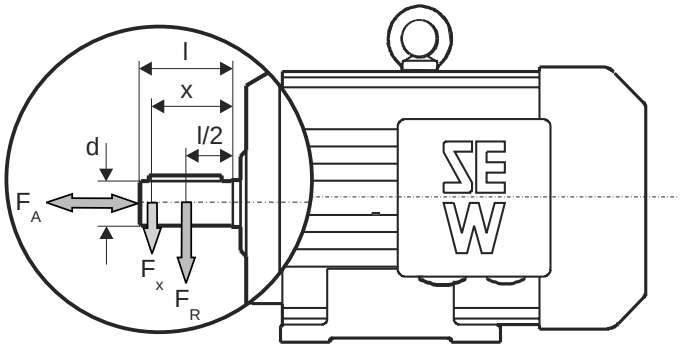

Figure 43: Overhung load FX for off-center force application

Motor constants for overhung load conversion

Size	a	b	c				f	d	l
	[mm]	[mm]	2-pole [Nmm]	4-pole [Nmm]	6-pole [Nmm]	8-pole [Nmm]	[mm]	[mm]	[mm]
63	161	146	$11.2 \bullet 10^3$	$16.8 \bullet 10^3$	$19 \bullet 10^3$	-	13	14	30
71	158.5	143.8	$11.4 \bullet 10^3$	$16 \bullet 10^3$	$18.3 \bullet 10^3$	$19.5 \bullet 10^3$	13.6	14	30
80	213.8	193.8	$17.5 \bullet 10^3$	$24.2 \bullet 10^3$	$28.2 \bullet 10^3$	$31 \bullet 10^3$	13.6	19	40
90	227.8	202.8	$27.4 \bullet 10^3$	$39.6 \bullet 10^3$	$45.7 \bullet 10^3$	$48.7 \bullet 10^3$	13.1	24	50
SDT100	270.8	240.8	$42.3 \bullet 10^3$	$57.3 \bullet 10^3$	$67 \bullet 10^3$	$75 \bullet 10^3$	14.1	28	60
DV100	270.8	240.8	$42.3 \bullet 10^3$	$57.3 \bullet 10^3$	$67 \bullet 10^3$	$75 \bullet 10^3$	14.1	28	60
112M	286.8	256.8	$53 \bullet 10^3$	$75.7 \bullet 10^3$	$86.5 \bullet 10^3$	$94.6 \bullet 10^3$	24.1	28	60
132S	341.8	301.8	$70.5 \bullet 10^3$	$96.1 \bullet 10^3$	$112 \bullet 10^3$	$122 \bullet 10^3$	24.1	38	80
132M	344.5	304.5	$87.1 \bullet 10^3$	$120 \bullet 10^3$	$144 \bullet 10^3$	$156 \bullet 10^3$	20.1	38	80
132ML	404.5	364.5	$120 \bullet 10^3$	$156 \bullet 10^3$	$198 \bullet 10^3$	$216.5 \bullet 10^3$	20.1	38	80
160M	419.5	364.5	$150 \bullet 10^3$	$195.9 \bullet 10^3$	$248 \bullet 10^3$	$270 \bullet 10^3$	20.1	42	110
160L	435.5	380.5	$177.5 \bullet 10^3$	$239 \bullet 10^3$	$262.5 \bullet 10^3$	$293 \bullet 10^3$	22.15	42	110
180	507.5	452.5	$266 \bullet 10^3$	$347 \bullet 10^3$	$386 \bullet 10^3$	$432 \bullet 10^3$	22.15	48	110
200	537.5	482.5	$203.5 \bullet 10^3$	$258.5 \bullet 10^3$	$302.5 \bullet 10^3$	$330 \bullet 10^3$	0	55	110
225	626.5	556.5	-	$490 \bullet 10^3$	-	-	0	60	140
250	658	588	-	$630 \bullet 10^3$	-	-	0	65	140
280	658	588	-	$630 \bullet 10^3$	-	-	0	75	140

2nd motor shaft

Contact SEW-EURODRIVE regarding permitted load for 2nd motor shaft end.

Motor bearings used

The following table shows which bearings are used in SEW-EURODRIVE AC (brake) motors:

Motor type	Drive-end bearing			Non drive-end bearing	
	Flange-mounted motor	Gearmotor	Foot mounted motor	without brake	with brake
56	-	6302-Z	-	6001-2RS-J	
63	6203-2Z-J	6303-2Z-J	-	6202-2Z-J	6202-2RS-J-C3
71 ... 80	6204-Z-J	6303-Z-J	6204-Z-J	6203-2Z-J	6203-2RS-J-C3
90 ... 100	6306-Z-J			6205-2Z-J	6205-2RS-J-C3
112 ... 132S	6208-Z-J	6307-Z-J	6208-Z-J	6207-2Z-J	6207-2RS-J-C3
132M ... 160M	6309-2Z-J-C3			6209-2Z-J-C3	
160L ... 180L	63122Z-J-C3			6213-2Z-J-C3	
200 ... 225	6314-2Z-J-C3			6314-2Z-J-C3	
250 ... 280	6316-2Z-J-C3			6315-2Z-J-C3	

7.9 Special markets (→ GM, → MM)

CSA/NEMA/UL-R

SEW-EURODRIVE offers the NEMA MG1 version or the "CSA/UL-R" option for drives delivered to North America (→ " Motors for the USA and Canada" on page 94). These versions have the following characteristic features:

- Terminal designation T1, T2, etc. in addition to U1, V1, etc.
- In MOVIMOT® drives additional earth terminal via an external terminal.
- Some terminal boxes are made of gray-cast iron and others of aluminum:

Motor size	Terminal box material
DT56/DR63	Aluminum (part of the motor housing)
DT71 ... DV132S	Gray-cast iron for wiring diagram DT79, otherwise aluminum
DT71 ... DV132S / BM(G) with BSR/BUR	Gray-cast iron
DV132M ... DV280	Always gray cast iron

- Cable entry in the terminal box compliant with ANSI / ASME B1.20.1.-1983 with NPT threads (conical inch threads). The following table shows the number of cable entries and NPT sizes for the respective motor sizes.

Motor size	Number and type of threads
DT56	1 × 1/2'' NPT + 1 × 3/8'' NPT (with adapter)
DR63	2 × 1/2'' NPT (with adapter)
DT71 ... DT90	2 × 1/2'' NPT
DV100 ... DV132S	1 × 3/4'' NPT + 1 × 1/2'' NPT
DV132M ... DV160M	1 × 1 1/4'' NPT + 1 × 1/2'' NPT
DV160L ... DV225	2 × 1 1/2'' NPT + 1 × 1/2'' NPT
DV250M ... DV280S	2 × 2 1/2'' NPT + 2 × 1/2'' NPT

The NPT openings are sealed with plugs for transportation and storage.

- For AC motors/AC brake motors modified nameplate with the following information: TEFC, K.V.A. code and design. With CSA/UL-R option also CSA and UR mark (UL registration no. E189357).

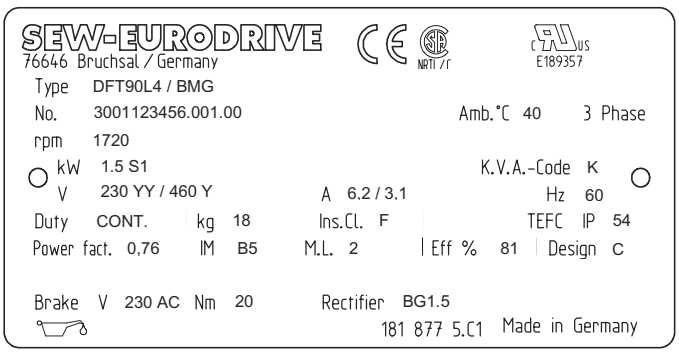

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Figure 44: Motor nameplate for the CSA/UL-R version

- For MOVIMOT® drives modified nameplate with the following information: TEFC, UL identification character (UL registration no. 2D06).

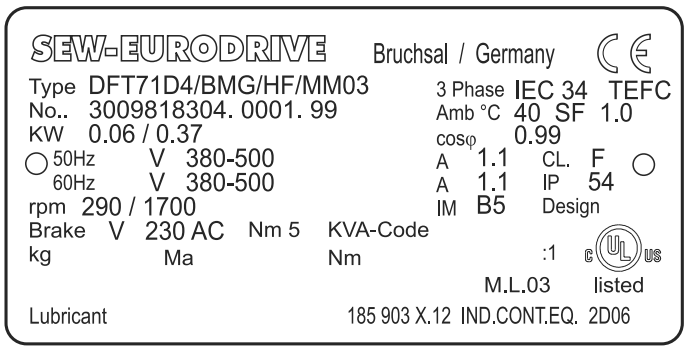

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Figure 45: Motor nameplate

JIS / JEC

The drives can be built according to JIS for delivery to Japan. SEW-EURODRIVE supplies special motor terminal boxes on request. These terminal boxes have cable entries with the PF threads (straight inch thread) customary in Japan.

V.I.K. (German Association of the Energy and Power Generation Industry)

The German association of the Energy and Power Generation Industry V.I.K. has published for its members a recommendation for the implementation of technical requirements for AC asynchronous motors.

The drives from SEW-EURODRIVE can be supplied in compliance with these requirements. The following deviations from the standard are taken into account:

- Motor with enclosure of at least IP55.
- Motor of thermal class F, permitted overtemperature only as in thermal class B.
- Corrosion protection of motor parts.
- Terminal box made of gray cast iron.
- Protection canopy for vertical motor mounting positions with fan guard on top.
- Additional earth terminal via external terminal.
- Nameplate with V.I.K. information. A second nameplate on the inside of the terminal box cover.

Note

Technical requirements issued by the V.I.K. must be applied analogously to gearmotors, pole-changing motors and motors for high inertia starting, switching operation and speed control. The requirements result in the following necessary deviations:

- Mounting position: The position of the breather valves and the lubricant fill quantities, which depend on the mounting position, means that gearmotors cannot be used in either horizontal or vertical mounting positions.
- Sign: No bores are provided for attaching an additional identification sign.

CCC

After joining the World Trade Organization (WTO), the People's Republic of China issued a certification system - CCC "China Compulsory Certification" - for products. CCC became effective on 1 May 2002 and replaced the marks "Great Wall" (CCEE China Commission for Conformity of Electric Equipment) for domestic products and "CCIB" (China Commodity Inspection Bureau) for imported products. The Chinese government is trying to improve the safety for household appliances by introducing the CCC certification. The certification requirement became effective on 1 August 2003 for many products in household applications.

That means machines and systems supplied by our customers with permanently installed motors and gearmotors are usually not subject to this mandatory certification. The only known exception are welding machines. That means CCC certification will only become an issue for machine and system supplier in case they are exporting individual products, such as spare parts.

This certification affects SEW-EURORDRIVE products as well. The drive solutions from SEW-EURODRIVE received the necessary certification on 29 July 2003.

The SEW-EURODRIVE products affected by this certification are:

- 2-pole motors up to 2.2 kW
- 4-pole motors up to 1.1 kW
- 6-pole motors up to 0.75 kW
- 8-pole motors up to 0.55 kW

These motors may be identified with the CCC mark upon request and will be delivered with the certificate attached to the drive.

7.10 Brakes (→ GM)

General

On request, SEW-EURODRIVE motors and gearmotors can be supplied with an integrated mechanical brake. The brake is a DC-operated electromagnetic disc brake that is released electrically and applied using spring force. The brake is applied in case of a power failure. It meets the basic safety requirements. The brake can also be released mechanically if equipped with manual brake release. You will either receive a manual lever with automatic reset or an adjustable setscrew for this purpose. The brake is controlled by a control element that is either installed in the motor wiring space or the control cabinet. For detailed information on brakes from SEW-EURODRIVE, refer to the publication "Drive Engineering - Practical Implementation – SEW Disc Brake."

A main advantage of brakes from SEW-EURODRIVE is their very short design. The brake bearing end shield is a part of both the motor and the brake. The integrated construction of the brake motor permits particularly compact and sturdy solutions.

Basic structure

The illustration below shows the basic structure of the brake.

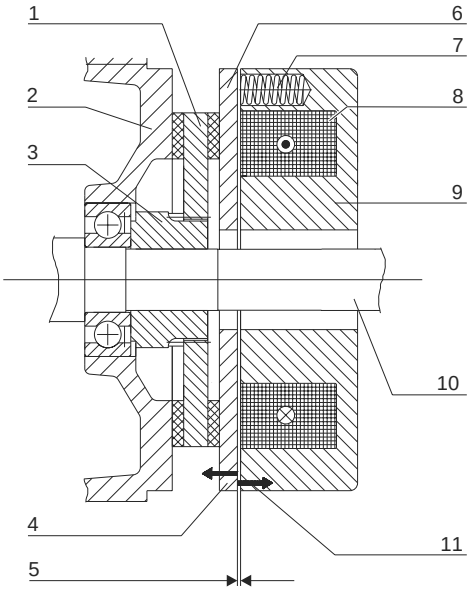

Figure 46: Basic structure of the brake

1	Brake disc	5	Working air gap	9	Brake coil body
2	Brake endshield	6	Pressure plate	10	Motor shaft
3	Driver	7	of brake spring	11	Electromagnetic force
4	Spring force	8	Brake coil		

Short response times

A characteristic feature of the brake is the patented two-coil system. This system comprises the accelerator coil BS and the coil section TS. The special SEW-EURODRIVE brake control system ensures that, when the brake is released, the accelerator coil is switched on first with a high current inrush, after which the coil section is switched on. The result is a particularly short response time when releasing the brake. The brake disk moves clear very swiftly and the motor starts up with hardly any brake friction.

This principle of the two coil system also reduces self-induction so that the brake is applied more rapidly. The result is a reduced braking distance. The brake can be switched off in the DC and AC circuit to achieve particularly short response times when applying the brake, for example in hoists.

Permitted work done by the brake

If you are using a brake motor, you have to check whether the brake is approved for use with the required starting frequency Z. The following diagrams show the permitted work done W_{max} per cycle for different brakes and rated speeds. The values are given with reference to the required starting frequency Z in cycles/hour (1/h).

Example: The rated speed is 1500 min^{-1} and the brake BM 32 is used. At 200 cycles per hour, the permitted work done per cycle is 9000 J (→ Figure 48).

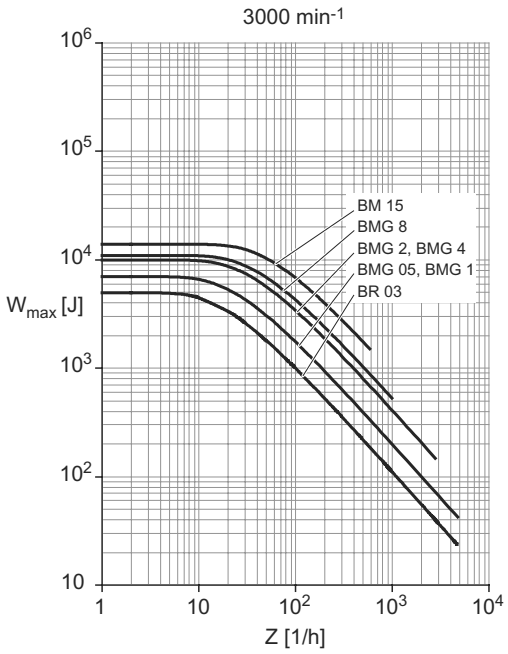

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Figure 47: Maximum permitted work done per cycle at 3000 min-1

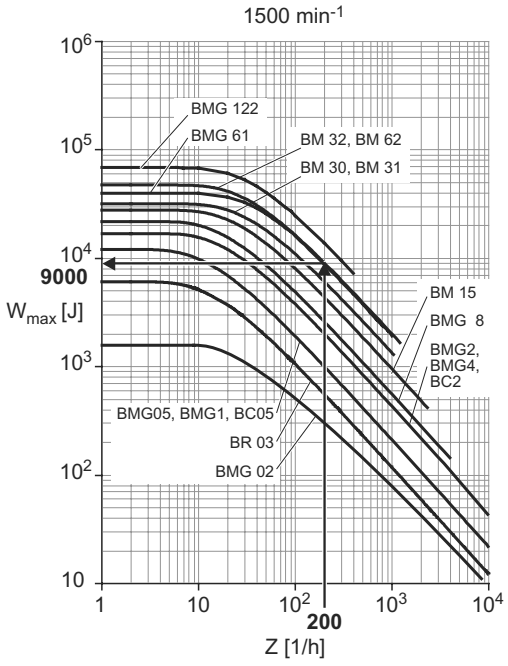

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Figure 48: Maximum permitted work done per cycle at 1500 min-1

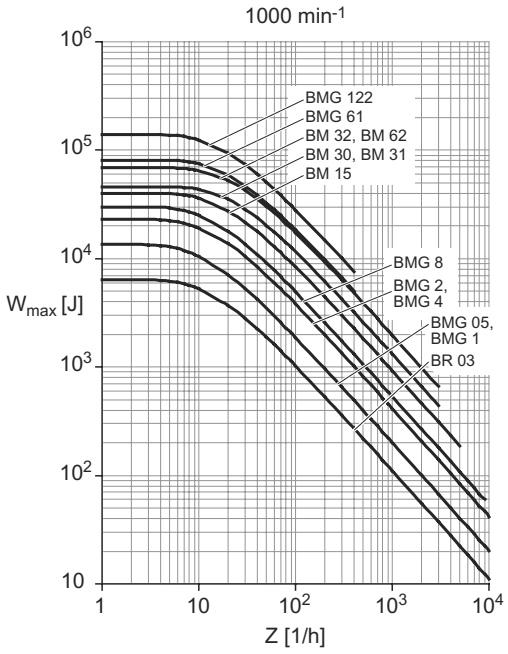

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Figure 49: Maximum permitted work done per cycle at 1000 min-1

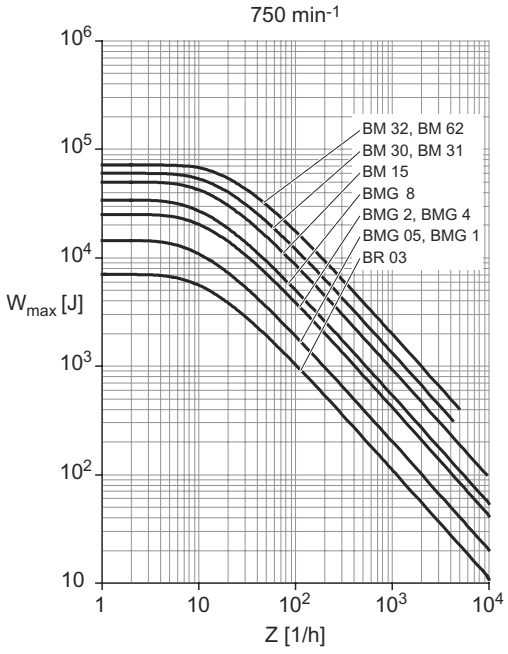

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Figure 50: Maximum permitted work done per cycle at 750 min-1

Emergency stop features

In hoist applications it is mandatory that the limits of the permitted maximum work done (maximum work done see diagrams on page 108) are not exceed even in the event of an emergency stop. In other applications, such as travel drives with reduced braking torques, much higher values can be permitted from case to case. Please consult SEW-EURODRIVE if you need values for increased brake work for emergency stops.

Brake control system

Various brake control systems are available for controlling disc brakes with a DC coil, depending on the requirements and the operating conditions. All brake control systems are fitted as standard with varistors to protect against overvoltage. Refer to the "Brakes and Accessories" manual for detailed information about SEW-EURODRIVE brakes.

The brake control systems are either installed directly on the motor in the wiring space or in the control cabinet. In case of motors of thermal class H and explosion-proof motors (eDT..BC), the control system must be installed in the control cabinet.

Standard version

As standard, DT/DV...BM(G) AC brake motors are delivered with integrated brake control system BG/BGE for AC connection or an installed control unit BS/BSG for DC 24 V connection. The motors are delivered completely ready for connection.

Motor type	AC connection	DC 24 V connection
DT56./BMG02, DR63../BR	BG	without control unit[1)]
DT71../BMG - DV100../BMG	BG	BS
DV112../BMG - DV225../BM	BGE	BSG
DV250../BMG - DV280../BMG	BGE	-

1) The overvoltage protection must be implemented by the customer, for example using varistors.

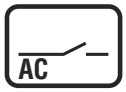
Brake control system in the wiring space

The supply voltage for brakes with an AC connection is either supplied separately or taken from the supply system of the motor in the wiring space. Only motors with a fixed speed can be supplied from the motor supply voltage. With pole-changing motors and for operation on an inverter, the supply voltage for the brake must be supplied separately.

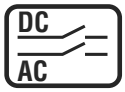
In addition, it is necessary bear in mind that brake application is delayed by the residual voltage of the motor in case the brake is powered by the motor supply voltage. The brake application time t_2I stated in the technical data for cut-off in the AC circuit applies to a separate supply only.

7.11 Block diagrams of brake control systems (→ GM)

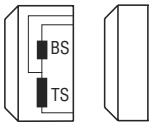
Key



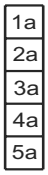
Cut-off in the AC circuit
(standard brake application)



Cut-off in the DC and AC circuits
(rapid brake application)



Brake
BS = Accelerator coil
TS = Coil section



Auxiliary terminal strip in terminal box

Motor with delta connection

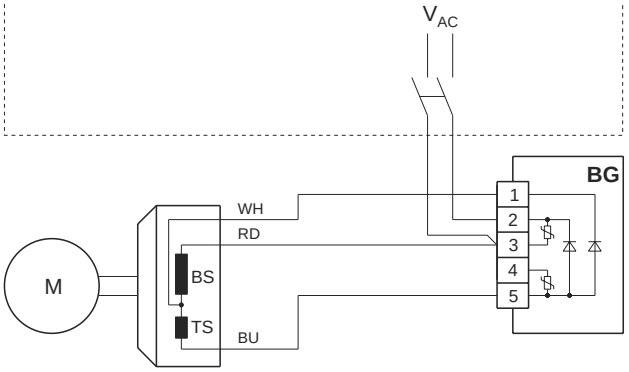
Motor with star connection

Color coding according to IEC 757:

WH	White
RD	Red
BU	Blue
BN	Brown
BK	Black

Control cabinet limit

BG, BMS



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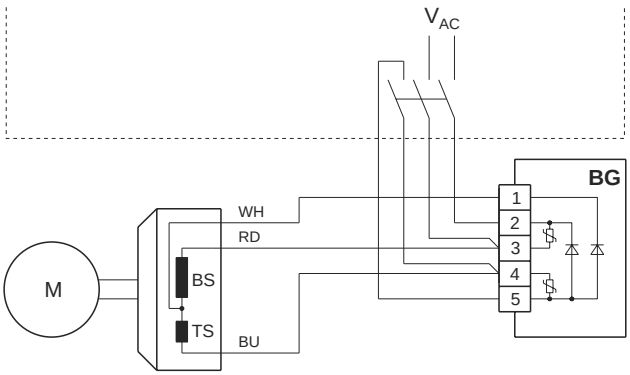

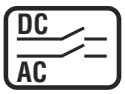

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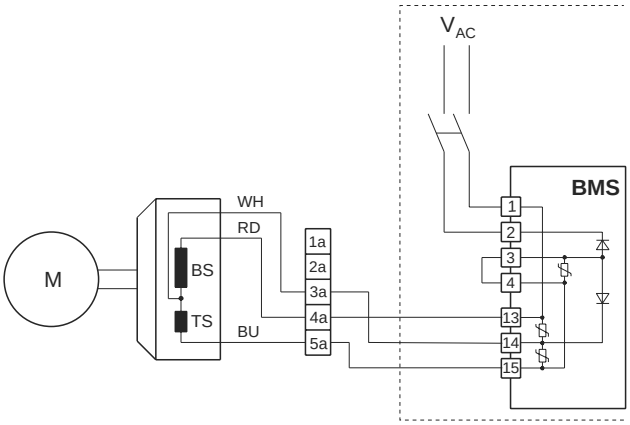

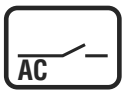

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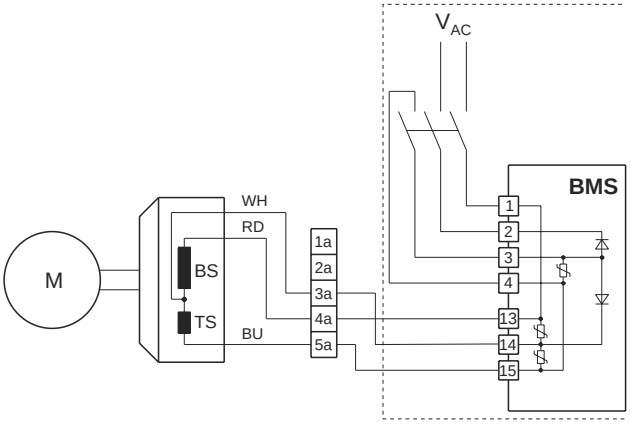

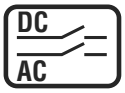

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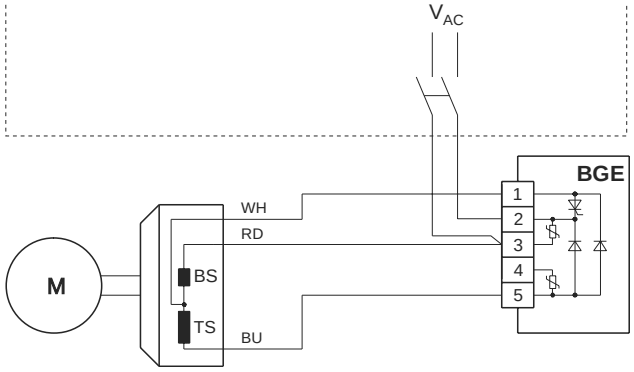
BGE, BME



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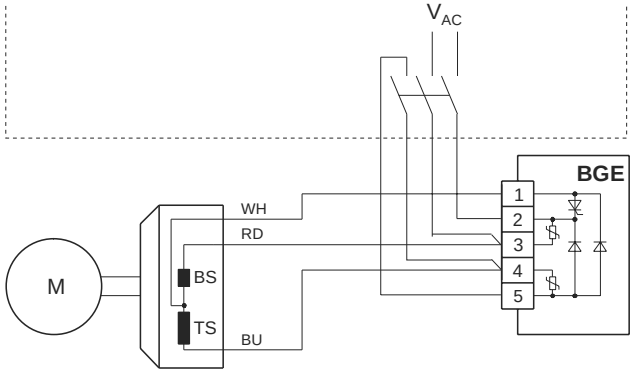

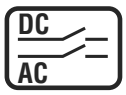

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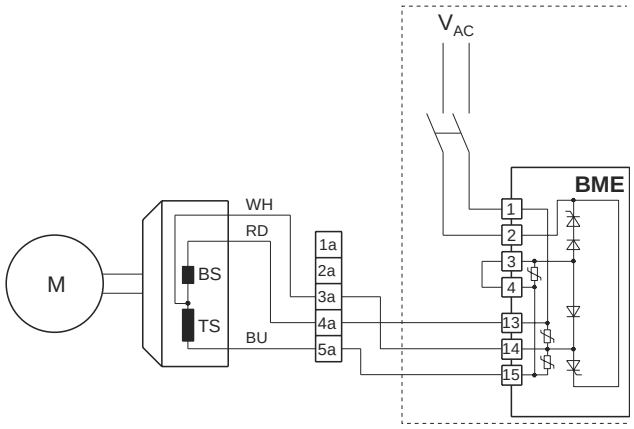

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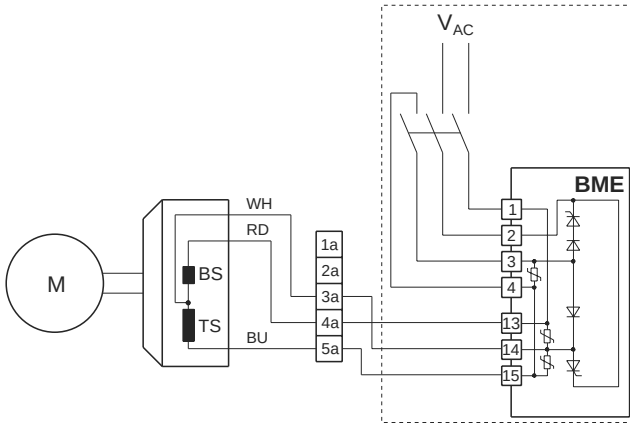

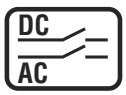

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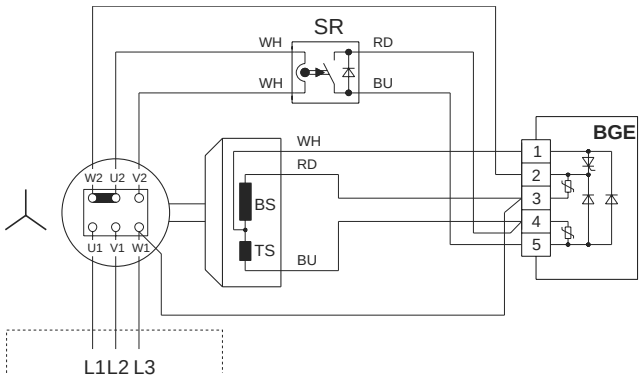
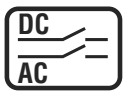
BSR





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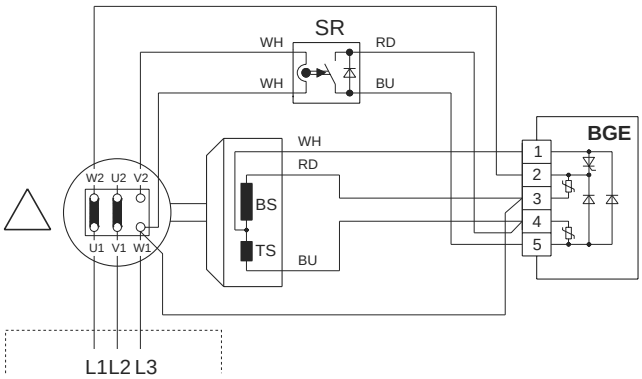

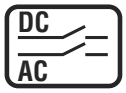

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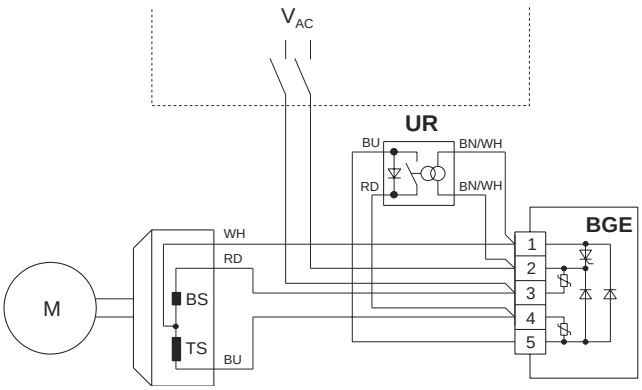
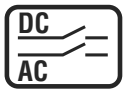
BUR





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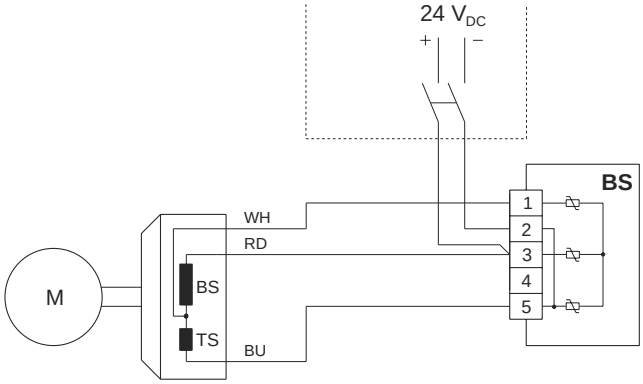
BS



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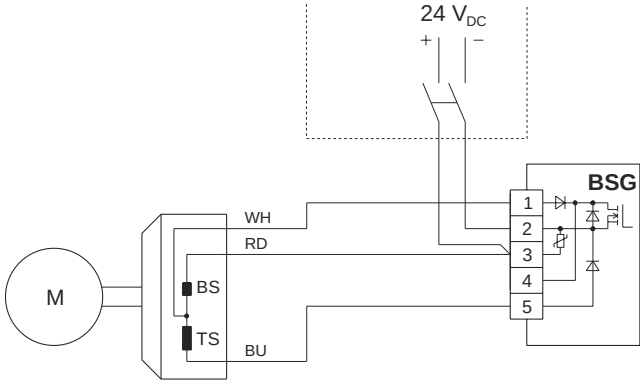
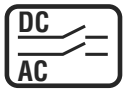
BSG





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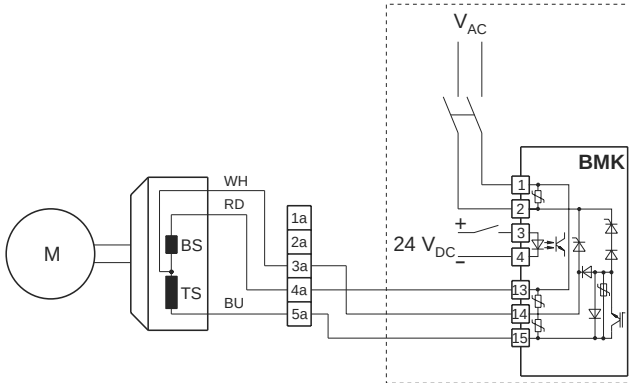
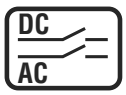
BMK





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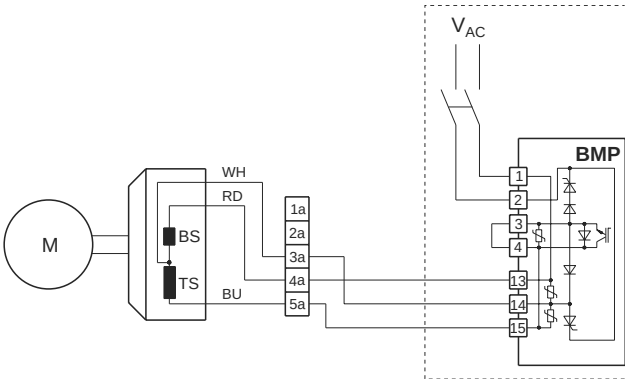
BMP, BMH



AC

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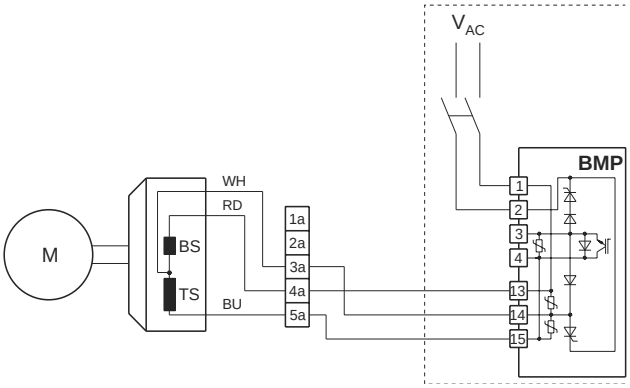
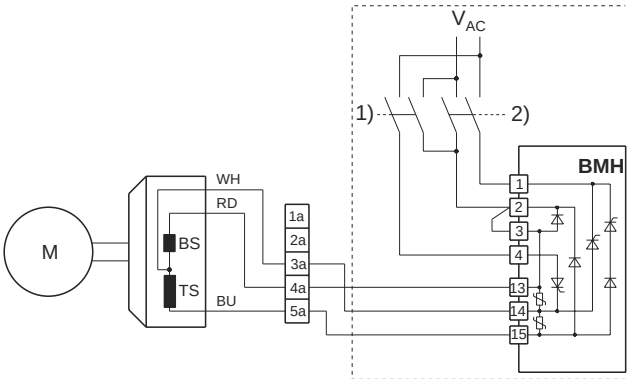


DC
AC

01541BXX

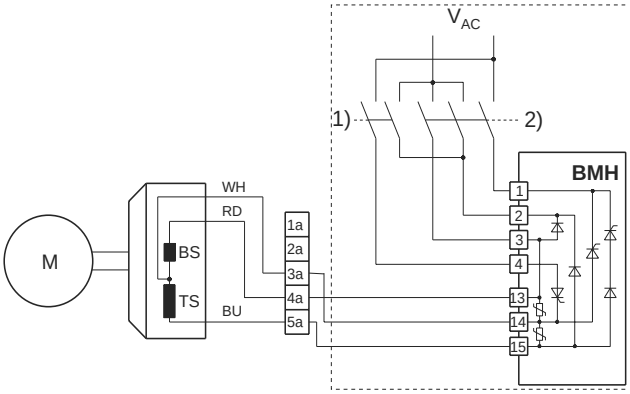
1) Heating
2) Ventilating



AC

01542BXX

1) Heating
2) Ventilating



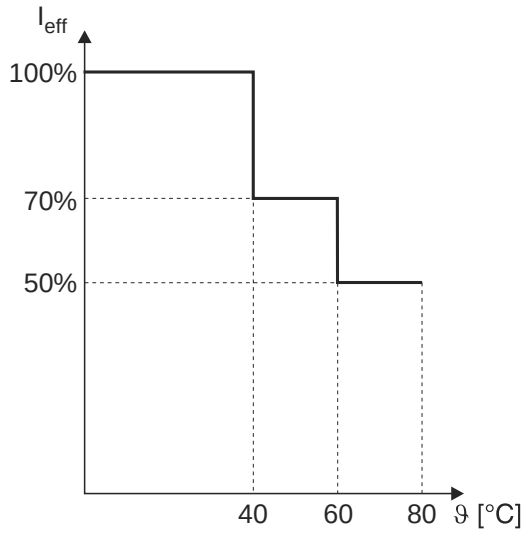
DC
AC

01543BXX

7.12 Plug connectors (→ GM)

Contact rating depending on the temperature

The "Technical data" tables for plug connectors (→ "Gearmotors" price catalog/catalog) lists electrical current values for the maximum permitted contact load (= max. contact load) of the plug connectors. These current values are valid for ambient temperatures of up to max. 40 °C. Higher ambient temperatures apply for reduced current values. The following illustration shows the permitted contact load as a function of the ambient temperature.



06443AXX

Figure 51: Permitted contact load as a function of the ambient temperature

I_{eff} = Current value of the maximum permitted contact load, 100% = value as listed in the "Technical data" table (→ "Gearmotors" price catalog/catalog).

ϑ = Ambient temperature

IS integrated plug connector

03075AXX

Figure 52: AC gearmotor with IS integrated plug connector

On request, AC (brake) motors DR63 and DT71 ... DV132S.. can be supplied with the integrated, 12-pole IS plug connector instead of the standard terminal box. The upper section of the IS plug connector (mating connector) is included in the scope of delivery. The IS plug connector is particularly compact and offers the following connection options:

- Motor, single-speed or two-speed pole changing
- Brake
- Temperature monitoring (TF or TH)

As with the terminal box, the cable run with the IS integrated plug connector can be from four different directions offset at 90°.

- IS requires a clearance of 30 mm for removing the connector.
- **For DR63 brake motors with IS size 1 only:** Only brake control systems BG1.2, BG2.4, BSR and BUR can be accommodated in the IS plug connector. Other brake control systems must be installed in the control cabinet.

Plug connectors AS.., AC.., AM.., AB.., AD.., AK..

05664AXX

Figure 53: AC motor with ASE.. plug connector

The plug connector systems AS.., AC.., AM.., AB.., AD.. and AK.. are based on plug connector systems from Harting.

- AS.., AC.. → Han 10E / 10ES
- AM.., AB.., AD.., AK.. → Han Modular®

The plug connectors are located at the side of the terminal box. They are locked either using two clamps or one clamp on the terminal box.

UL approval has been granted for the plug connectors.

The mating connector (sleeve housing) with socket contacts is not included in the scope of delivery.

AS.., AC..

The ten contacts of the AS.. and AC.. plug connector systems connect the motor winding (6 contacts), the brake (2 contacts) and the thermal motor protection (2 contacts). You can connect both motors with single speed and two-speed pole-changing motors.

Types AS.. and AC.. differ as follows:

- AS = Spring cages
- AC = Crimp contacts and shortened contacts for thermal motor protection

Applies to AS.1 and AC.1:

For brakemotors, you can select the version with brake control in the terminal box only. In this case, the disconnection in the DC circuit has to take place electronically using BSR or BUR.

The ASD.. and ASE.. types with single clip longitudinal closure correspond to the DESINA regulation issued by the Association of German Machine Tool Manufacturers (VDW).

Note the following point:

- Cable entry in position 1 is not available for motor sizes DT71... DV132S.

AM.., AB.., AD.., AK..

Plug connectors AM.., AB.., AD.. and AK.. can be used for connecting both single speed motors and two-speed pole-changing motors.

With brake motors, the brake control system can be either located in the terminal box or in the control cabinet. All versions of the brake control system are possible.

APG.. plug connector

03198AXX

Figure 54: AC motor with plug connector APG..

The plug connector with the designation APG.. is based on a plug manufactured by Phoenix Contact from the PlusCon VC product series. The mating connector is not included in the scope of delivery.

Four power contacts of the plug connector are used for the three phases and the PE connection. Other control contacts are used for the three brake lines and the thermal motor protection.

The APG.. is installed on the narrow side of the motor terminal box. The terminal box can be turned by 4 × 90 °.

The plug connector permits an easily separable hybrid cable connection between the motor/brake motor and a field distributor with an integrated MOVIMOT® inverter or a suitable third-party field control module (e.g. the Drive Shuttle open-loop speed controller made by Phoenix Contact, type IBS IP 400 VFD...).

The APG.. plug connector can also be used as standard to connect the motor for mains operation. The brake rectifier must be installed in the control cabinet in this case.

Pre-fabricated cable

SEW-EURODRIVE offers a pre-fabricated cable for connecting the field distributor and the AC (brake) motor with option APG4. The cable is prefabricated in steps of half a meter up to a maximum length of five meters. The cable can be ordered from SEW-EURODRIVE. Specify the required length (max. 5 m).

Plug connector ASK1

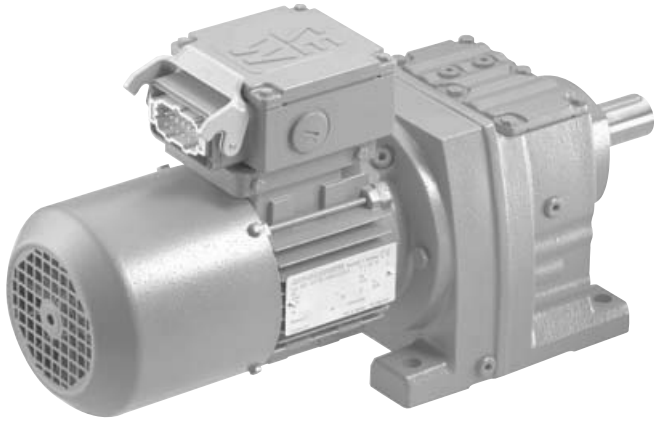


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Figure 55: AC motor with ASK1 plug connector

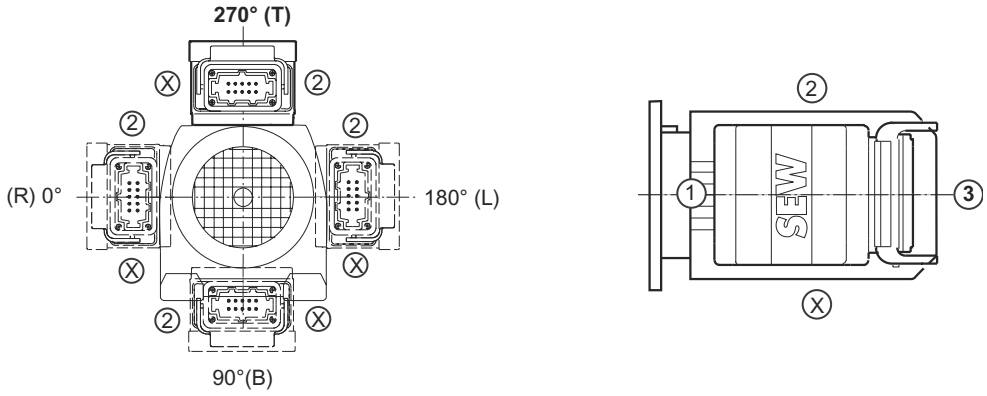
The installed ASK1 plug connector system is based on the Han 10ES plug connector system made by Harting. The plug connector is located at the side of the terminal box. It is locked in place on the terminal box with a clamp.

The ASK1 plug connector system is used for ECOFAST® compliant AC (brake) motors DT71 ... DV132S.

Refer to the ECOFAST® system manual for detailed information and project planning notes on ECOFAST®.

Position of terminal box with ASK1 plug connector

As standard, ECOFAST®-compliant AC (brake) motors are supplied with the terminal box in position 270°/3. Please contact SEW-EURODRIVE in case of other positions.



51738AXX

Figure 56: Terminal box position of ASK1

Optional carrier plate for ASK1 (part number 187390 3)

A motor-integrated installation of an ECOFAST® compliant switching or control unit requires a carrier plate onto which the switching or control unit is plugged. The carrier plate can be used regardless of the motor size.

51278AXX

Figure 57: Carrier plate option for ASK1

7.13 Encoders and prefabricated cables for encoder connection (→ GM)

Tachometer

Various types of tachometers are available for installation on DT../ DV.. AC motors as standard depending on the application and motor size. With rare exceptions, the encoders can be combined with other optional components installed in the motor, such as brakes and forced cooling fans.

Overview of encoders

Name	For motor	Encoder type	Shaft	Specification	Power supply	Signal
EH1T	DR63	Encoders	Hollow shaft	1024 pulses/revolution	DC 5 V controlled	TTL/RS-422
EH1S					9 V_{DC} ... 26 V_{DC}	1 V_{SS} sin/cos
EH1R						TTL/RS-422
ES1T	DT71...DV100		Spreadshaft		DC 5 V controlled	TTL/RS-422
ES1S					9 V_{DC} ... 26 V_{DC}	1 V_{SS} sin/cos
ES1R						TTL/RS-422
ES2T	DV112...DV132S				DC 5 V controlled	TTL/RS-422
ES2S					9 V_{DC} ... 26 V_{DC}	1 V_{SS} sin/cos
ES2R						TTL/RS-422
EV1T	DT71...DV280		Solid shaft		DC 5 V controlled	TTL/RS-422
EV1S					10 V_{DC} ... 30 V_{DC}	1 V_{SS} sin/cos
EV1R						TTL/RS-422
ES12	DT71...DV100	Encoder	Spreadshaft	A+B tracks	9 V_{DC} ... 26 V_{DC}	Either 1 or 2 pulses/revolution
ES22	DV112...DV132S					
ES16	DT71...DV100					6 pulses/revolution
ES26	DV112...DV132S					
NV11	DT71...DV100	Proximity sensor	Solid shaft	A track	10 V_{DC} ... 30 V_{DC}	1 pulse/revolution, normally open contact
NV21				A+B tracks		
NV12	DT71...DV132S			A track		2 pulses/revolution, normally open contact
NV22				A+B tracks		
NV16				A track		6 pulses/revolution, normally open contact
NV26				A+B tracks		
AV1Y	DT71...DV280	Multi-turn-absolute encoder	Solid shaft	-	10 V_{DC} ... 30 V_{DC}	MSSI interface and 1 V_{SS} sin/cos
ES3H	DT71...DV100	Single-turn HIPERFACE® encoder	Spreadshaft	-	7 V_{DC} ... 12 V_{DC}	RS-485 interface and 1 V_{SS} sin/cos
ES4H	DV112...DV132S					
AS3H	DT71...DV100	Multi-turn HIPERFACE® encoder				
AS4H	DV112...DV132S					
AV1H[1)]	DT71...DV280	Multi-turn HIPERFACE® encoder	Solid shaft	-	7 V_{DC} ... 12 V_{DC}	RS-485 interface and 1 V_{SS} sin/cos

1) recommended encoder for operation with MOVIDRIVE® MDX61B with option DEH11B

Encoder connection

When connecting the encoders to the inverters, always follow the operating instructions for the relevant inverter and the wiring diagrams supplied with the encoders!

- Maximum line length (inverter – encoder): 100 m with a cable capacitance ≤ 120 nF/km
- Conductor cross section: 0.20 ... 0.5 mm^2
- Use shielded cable with twisted pair conductors and apply shield over large area on both ends :
  - At the encoder in the cable gland or in the encoder plug
  - To the inverter on the electronics shield clamp or to the housing of the sub D plug
- Install the encoder cables separately from the power cables, maintaining a distance of at least 200 mm.
- Encoder with cable gland: Observe the permitted diameter of the encoder cable to ensure that the cable gland functions correctly.

Incremental encoder (Encoder)

The encoders from SEW-EURODRIVE are available as incremental encoders with 1024 signals/revolution or as encoder with 1, 2 or 6 pulses/revolution.

Hollow shaft encoder and spreadshaft encoder

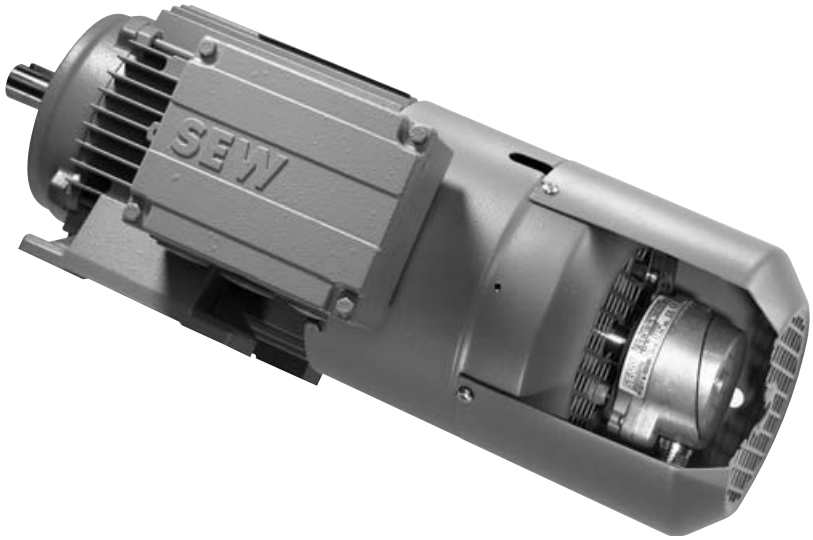


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Figure 58: Encoder with spreadshaft

Solid shaft encoder

01935CXX

Figure 59: AC motor with solid shaft encoder and forced cooling fan VR

Encoder mounting adapter

The motors can be equipped with various encoder mounting adapters for installing encoders from different manufacturers.

01949CXX

Figure 60: AC motor with encoder mounting adapter EV1A and forced cooling fan VR

The encoder is attached to the EV1A (synchro flange) using three encoder mounting clamps (bolts with eccentric discs) for 3 mm flange thickness.

Absolute encoder

The absolute encoders AV1Y from SEW-EURODRIVE are combination encoders. They contain a multi-turn absolute encoder and a high-resolution sinusoidal encoder.

03078BXX

Figure 61: AC motor with absolute encoder and forced cooling fan VR

HIPERFACE® encoder

HIPERFACE® encoders are available as single-turn or multi-turn combination encoder. They contain an absolute encoder and a high-resolution sinusoidal encoder.

59810AXX

Figure 62: AC motor with HIPERFACE® encoder AS3H

Proximity sensor

The proximity sensors from SEW-EURODRIVE can be used to easily and inexpensively monitor whether the motor is turning. If a two-track proximity sensor is used, the direction of rotation of the motor can also be detected. Proximity sensors can either be installed on the side of the fan guard (motor maintains original length) or as spreadshaft encoder on the motor.

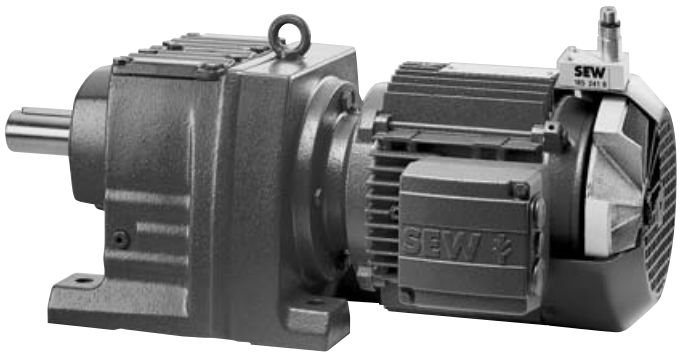

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Figure 63: Proximity sensor NV..

The connection cable is not included in the scope of delivery. Contact your retailer to purchase the appropriate connection cable.

Prefabricated cables for encoder connection

SEW-EURODRIVE offers prefabricated cables for simple and reliable connection of encoder systems. It is necessary to differentiate between cables used for fixed installation or for use in cable carriers. The cables are prefabricated in 1 m steps to the required length.

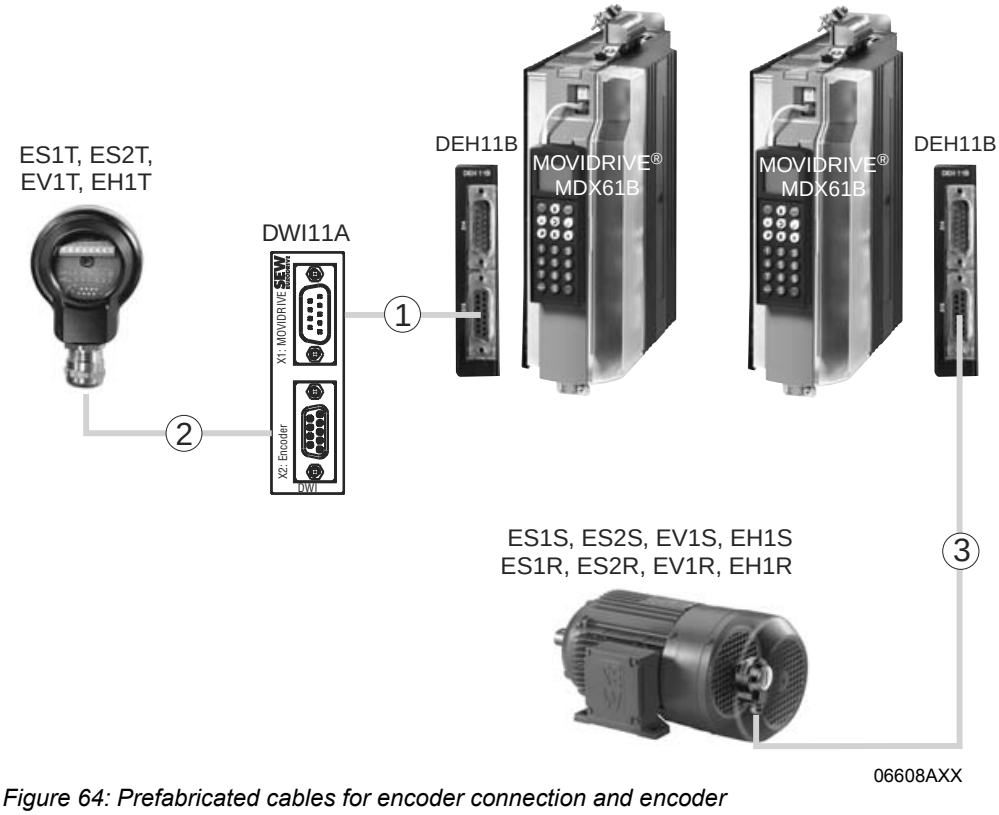

Figure 64: Prefabricated cables for encoder connection and encoder

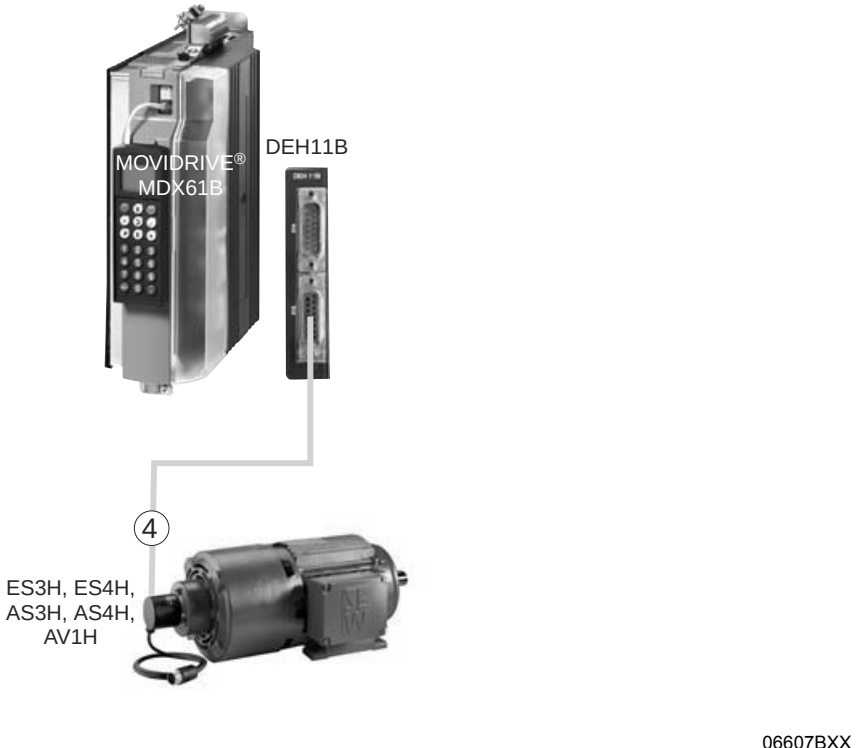

Figure 65: Prefabricated cables for HIPERFACE® encoders

(1) Prefabricated cables for encoder connection:

Part number	**817 957 3**
Installation	Fixed installation
for encoders with 5 V voltage supply	ES1T, ES2T, EV1T, EH1T
Cable cross section	4×2×0.25 mm^2 (AWG23) + 1×0.25 mm^2 (AWG23)
Conductor colors	A: Yellow (YE) A: Green (GN) B : Red (RD) B : Blue (BU) C : Pink (PK) C : Gray (GY) UB: White (WH) ⊥: Brown (BN) Sensor cable: Violet (VT)
Manufacturer and type **Lapp** **Helukabel**	 Unitronic Li2YCY (TP) Paar-Tronic-CY
For inverter	MOVIDRIVE® MDX61B with DEH11B option
Connection **on the DWI11A** **on the inverter**	 with 9-pin sub D socket with 15-pin sub D plug

(2) Prefabricated cables for incremental TTL encoders with 5V voltage supply:

Part number	**198 829 8**	**198 828 X**
Installation	Fixed installation	Cable carrier installation
for encoder	ES1T, ES2T, EV1T, EH1T via DWI11A and cable 817 957 3	
Cable cross section	4×2×0.25 mm^2 (AWG23) + 1×0.25 mm^2 (AWG23)	
Conductor colors	A: Yellow (YE) A: Green (GN) B : Red (RD) B : Blue (BU) C : Pink (PK) C : Gray (GY) UB: White (WH) ⊥: Brown (BN) Sensor cable: Violet (VT)	
Manufacturer and type **Lapp** **Helukabel**	 Unitronic Li2YCY (TP) Paar-Tronic-CY	 Unitronic LiYCY Super-Paar-Tronic-C-PUR
For inverter	MOVIDRIVE® MDX61B with DEH11B option	
Connection on **encoder / motor** **DWI11A**	 with conductor end sleeves Connect the violet conductor (VT) with the encoder at UB. with 9-pin sub D plug	

③ Prefabricated cables for incremental TTL sensors and sin/cos encoders (TTL sensors and sin/cos encoders) with 24V voltage supply:

Part number	1332 459 4	1332 458 6
Installation	Fixed installation	Cable carrier installation
for encoder	ES1S, ES2S, EV1S, EH1S, ES1R, ES2R, EV1R, EH1R	
Cable cross section	4×2×0.25 mm² (AWG23) + 1×0.25 mm² (AWG23)	
Conductor colors	A: Yellow (YE) A: Green (GN) B : Red (RD) B : Blue (BU) C : Pink (PK) C : Gray (GY) UB: White (WH) ⊥: Brown (BN) Sensor cable: Violet (VT)	
Manufacturer and type **Lapp** **Helukabel**	 Unitronic Li2YCY (TP) Paar-Tronic-CY	 Unitronic LiYCY Super-Paar-Tronic-C-PUR
For inverter	MOVIDRIVE® MDX61B with DEH11B option	
Connection on **encoder / motor** **Inverter**	 with conductor end sleeves Cut off the violet conductor (VT) of the cable at the encoder end. with 15-pin sub D plug	

④ Prefabricated cables for HIPERFACE® encoders:

Part number	1332 453 5	1332 455 1
Installation	Fixed installation	Cable carrier installation
for encoder	ES3H, ES4H, AS3H, AS4H, AV1H	
Cable cross section	6 × 2 × 0.25 mm² (AWG 23)	
Conductor colors	cos+: Red (RD) cos-: Blue (BU) sin+: Yellow (YE) sin-: Green (GN) D+: Black (BK) D-: Violet (VT) TF/TH/KTY+: Brown (BN) TF/TH/KTY-: White (WH) GND: Gray/pink + pink (GY-PK + PK) U_S: Red/blue + gray (RD-BU + GY)	
Manufacturer and type	Lapp, PVC/C/PP 303 028 1	Nexans, 493 290 70
For inverter	MOVIDRIVE® MDX61B with DEH11B option	
Connection on **encoder / motor** **Inverter**	 With 12-pin round connector plug (Intercontec, type ASTA021NN00 10 000 5 000) with 15-pin sub D plug	

Extension cables for HIPERFACE® cables

Part number	199 539 1	199 540 5
Installation	Fixed installation	Cable carrier installation
Cable cross section	6 × 2 × 0.25 mm² (AWG 23)	
Conductor colors	→ HIPERFACE® cable	
Manufacturer and type	Lapp, PVC/C/PP 303 028 1	Nexans, 493 290 70
Connection on **encoder / motor** **HIPERFACE® cable**	 With 12-pin round connector plug (Intercontec, type ASTA021NN00 10 000 5 000) with 12-pin round connector plug (Intercontec, type AKUA20)	

7.14 Forced cooling fan

Forced cooling fan VR, VS and V

The motors can be equipped with a forced cooling fan if required. A forced cooling fan is usually not required for mains operated motors in continuous duty. SEW-EURODRIVE recommends a forced cooling fan for the following applications:

- Drives with high starting frequency
- Drives with additional flywheel mass Z (flywheel fan)
- Inverter drives with a setting range ≥ 1:20
- Inverter drives that have to generate rated torque even at low speed or at standstill.

Following figure shows a typical speed-torque characteristic for a dynamic inverter drive, for example with MOVIDRIVE® MDX61B with DEH11B option in CFC operating mode.

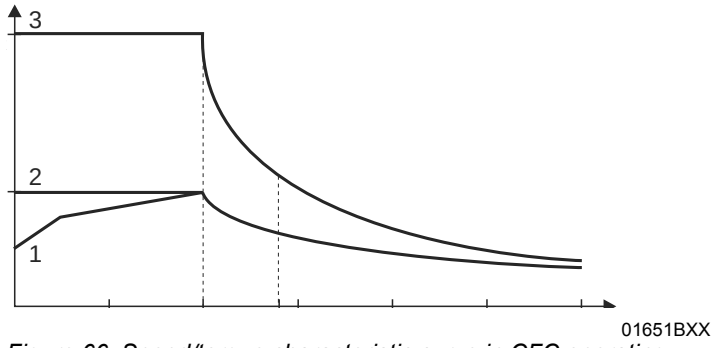

Figure 66: Speed/torque characteristic curve in CFC operating mode

M_N	= Rated torque of the motor	1	= With self-cooling
M_{max}	= Maximum torque of the motor	2	= With forced cooling
n_{base}	= Rated speed (transition speed) of the motor	3	= Maximum torque

A forced cooling fan must be used if the load torque in the 0 ... n_{Eck} is above curve 1. The motor becomes thermally overloaded without forced cooling.

VR forced cooling fan

The VR forced cooling fan is supplied with a voltage of DC 24 V. For voltage supply with 1 × AC 230 V, SEW-EURODRIVE offers switched-mode power supply type UWU52A (part number 188 181 7).

Switched-mode power supply UWU52A is mounted on a support rail in the control cabinet.

Combination with encoders

Forced cooling fans can be combined with the following motor encoders:

Motor encoder	For motor size	Forced cooling fan		
		VR	VS	V
ES1T, ES1R, ES1S, ES3H, AS3H	71 ... 100	•	-	-
ES2T, ES2R, ES2S, ES4H, AS4H	112 ... 132S	•	-	-
EV1T, EV1R, EV1S	71 ... 132S	•	•	-
EV1T, EV1R, EV1S	132M ... 280	-	-	•
AV1Y, AV1H	71 ... 132S	•	•	-
AV1Y, AV1H	132M ... 280	-	-	•

VR forced cooling fans can be combined with any encoder from SEW-EURODRIVE. Forced cooling fans VS and V can be combined with encoders with solid shaft only. In DV250M/DV280S motors, the motor encoder can only be installed in conjunction with a forced cooling fan.

7.15 Additional flywheel mass Z, backstop RS and protection canopy C (→ GM)

Additional flywheel mass Z (high inertia fan)

The motor can be equipped with additional flywheel mass, the flywheel fan, to achieve smooth startup and braking behavior of mains operated motors. In this way, the motor obtains additional mass moment of inertia J_Z. The flywheel fan is replaced by a normal fan. The outer motor dimensions remain the same. It can be installed on motors with and without a brake. For technical data of the "flywheel fan Z" option, refer to the "Gearmotors" price catalog"catalog.

Note the following points:

- Check the starting frequency. Multiply the permitted no-load starting frequency Z_0 with the factor 0.8 or use a forced cooling fan.
- Use the total mass moment of inertia $J_{ges} = J_{mot} + J_Z$ at the motor end. You find the values for the mass moments of inertia J_{Mot} and J_Z in the section "Technical data of additional flywheel mass Z and backstop RS."
- Counter-current braking and moving against the stop are not permitted.
- Not available in vibration grade R.
- **Only for DT80..:** The flywheel fan for DT71.. (part number 182 232 2) is used in combination with a solid shaft encoder or a mounting device for a solid shaft encoder . In this case $J_Z = 20 \bullet 10^{-4}$ kgm^2 must be used for configuration.

Backstop RS

The mechanical backstop RS is used for protecting equipment against reverse movement when the motor is switched off. For technical data of the "backstop Z" option, refer to the "Gearmotors" price catalog"catalog.

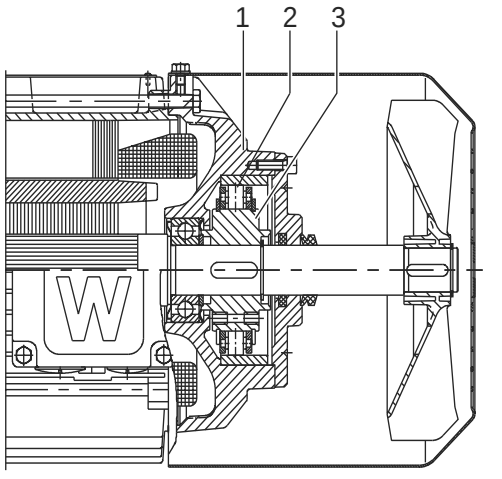

Figure 67: Design of the RS backstop

1 Non drive-end bearing shield
2 Wedge element train
3 Driver

Specify the direction of rotation for the motor or gearmotor when placing your order. CW rotation means the output shaft rotates clockwise as viewed onto its face end and is blocked to prevent it from turning counterclockwise. The vice versa principle applies to counterclockwise direction of rotation.

Protection canopy C

Liquids and/or solid foreign objects can penetrate the air outlet openings of motors in a vertical mounting position with their input shaft pointing downwards. SEW-EURODRIVE offers the motor option protection canopy C for this purpose.

All explosion-proof AC motors and AC brake motors in a vertical mounting position with their output shaft pointing downwards come equipped with protection canopy C. The same applies to motors in a vertical mounting position installed in the open.

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Figure 68: AC motor with protection canopy C

7.16 Low-noise fan guard

The noise of the gearmotor is usually louder due to the fan guards of the drives.

SEW-EURODRIVE offers the "low-noise fan guard" option for motor sizes DT71D to DV132S. This guard can reduce the noise level by about 3 db(A) compared to the standard version.

This option is only available for motors and brake motors. The "low-noise fan guard"option cannot be combined with encoders or forced cooling fans. The option is indicated by the letters "LN" in the type designation.

7.17 MOVIMOT® (→ MM)

General notes

Note the following points during project planning for MOVIMOT® AC motors:

- For detailed project planning notes, technical data and information on the communication of MOVIMOT® via fieldbus interfaces or RS-485, refer to the system folder "Decentralized Installation" (MOVIMOT®, MOVI-SWITCH®, Communication and Supply Interfaces).
- The use of MOVIMOT® for hoist applications is limited. Please contact SEW-EURODRIVE to inquire about suitable solutions with MOVITRAC® or MOVIDRIVE®.
- The suitable MOVIMOT® gearmotor is selected with regard to the speed, power, torque and spatial conditions of the application (see the selection tables in the "MOVIMOT® Gearmotors price catalog / catalog). The options are then determined depending on the control type.

Functional description

MOVIMOT® is the combination of an AC (brake) motor and a digital frequency inverter in the power range 0.37 ... 3 kW. It is the perfect match for decentralized drive configurations.

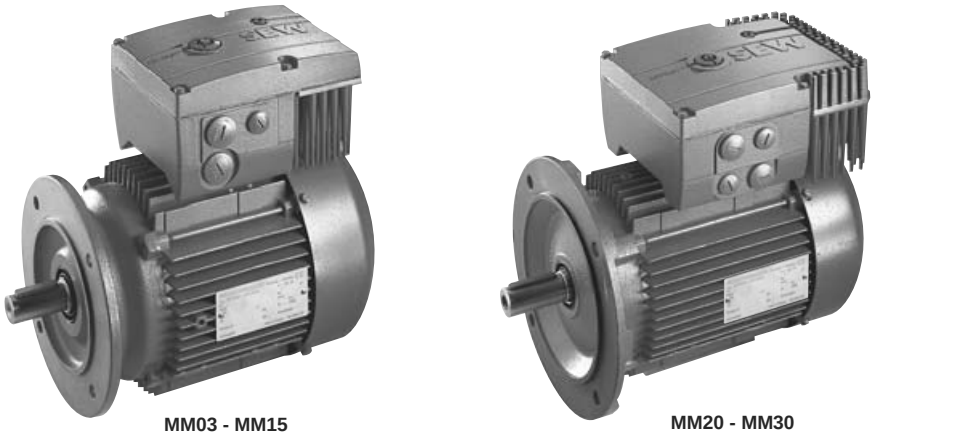

Figure 69: MOVIMOT® AC motor

Features of MOVIMOT®

MOVIMOT® is the ideal solution for a variety of decentralized drive tasks. The following functional description provides an overview of the most important features:

- MOVIMOT® is a gearmotor with integrated digital frequency inverter in the power range from 0.37 to 3.0 kW and integrated brake management.
- MOVIMOT® is available for the supply voltages 3 × 200...240 V, 50/60 Hz and 3 × 380...500 V, 50/60 Hz.
- MOVIMOT® is available for rated speeds of 1400 min^{-1} and 2900 min^{-1}.
- The brake coil is used as braking resistor in motors with mechanical brake; an internal braking resistor will be a standard component of MOVIMOT® units for motors without brake.
- MOVIMOT® is available in two designs:
  - MM..C-503-**00**: Standard version
  - MM..C-503-**30**: with integrated AS-interface

- Control takes place via binary signals, via the serial interface RS-485 or optionally via all commercial fieldbus interfaces (PROFIBUS, INTERBUS, DeviceNet, CANopen or AS-interface).
- Overview of MOVIMOT® functions (all versions):
  - Clockwise, counterclockwise operation
  - Changeover between two fixed setpoints
  - Setpoint f1 can be scaled
  - Ready signal to controller
  - Diagnostics of MOVIMOT® via status LED
  - Additional functions for specific applications
- Additional functions of version with integrated AS-interface
  - Addressing via M12 (AS-interface address 1-31)
  - Connection option for two external sensors
  - Additional LED for AS-interface status
  - Additional diagnostic interface via modular jack 4/4 plug connector
- MOVIMOT® can be supplied with UL approval (UL listed) on request.
- Design in dust /explosion protection 3D for zone 22 possible.

Advantages of MOVIMOT®

MOVIMOT® offers the following advantages:

- Compact design
- Interference-free connection between inverter and motor
- Closed design with integrated protection functions
- Inverter cooling independent of the motor speed
- No space required in the control cabinet
- Optimum presetting of all parameters for the expected application
- Compliance with EMC standards EN 50 081 (interference suppression level A) and EN 50 082
- Easy installation, startup and maintenance
- Easy to service for retrofitting and replacement

MOVIMOT® can be used to equip extensive systems or can be integrated into existing systems. MOVIMOT® is also the electronic replacement for pole-changing motors or mechanical variable speed drives.

MOVIMOT® is available as motor, brake motor, gearmotors or geared brake motor in many different standard versions and mounting positions.

Connection technology MOVIMOT® standard design

Overview

MOVIMOT® MM..C-503-00 is supplied without plug connector if not specified otherwise in the order. The plug connectors listed in the following table are preferred components. For other types, please contact SEW-EURODRIVE.

Order designation	Function	Terminal box design	Manufacturer designation
MM../AVT1	RS-485	Standard	M12 x 1 round plug connector
MM../RE.A/ASA3 RE1A = MM03-15 RE2A = MM22-3X	Power	Modular	Harting HAN® 10 ES pin element (built-on housing with two clips)
MM../RE.A/ASA3/AVT1 RE1A = MM03-15 RE2A = MM22-3X	Power/RS-485	Modular	Harting HAN® 10 ES pin element (built-on housing with two clips) + M12 x 1 round plug connector
MM../RE.A/AMA6 RE1A = MM03-15 RE2A = MM22-3X	Power/RS-485	Modular	Harting HAN® modular pin element (built-on housing with two clips)
MM../RE.A/AMD6 RE1A = MM03-15 RE2A = MM22-3X	Power/RS-485	Modular	Harting HAN® modular pin element (built-on housing with one clip)

Terminal box design:

The modular terminal box offers the following functions compared to the standard terminal box:

- The position of the cable entries/plug connectors can later be turned to the opposite side (see "MOVIMOT®" operating instructions).
- Integration of brake control systems (see Sec. "Options")

Possible plug connector positions

The following positions are possible for plug connectors:

Plug connector	Possible positions
AVT1	X (standard)
	2
RE.A/ASA3	X (standard)
	2
RE.A/ASA3/AVT1	ASA3 = X (standard) + AVT1 = X (standard)
	ASA3 = 2 + AVT1 = 2
	ASA3 = X + AVT1 = 2
	ASA3 = 2 + AVT1 = X
RE.A/AMA6 **RE.A/AMD6**	X (standard)
	2

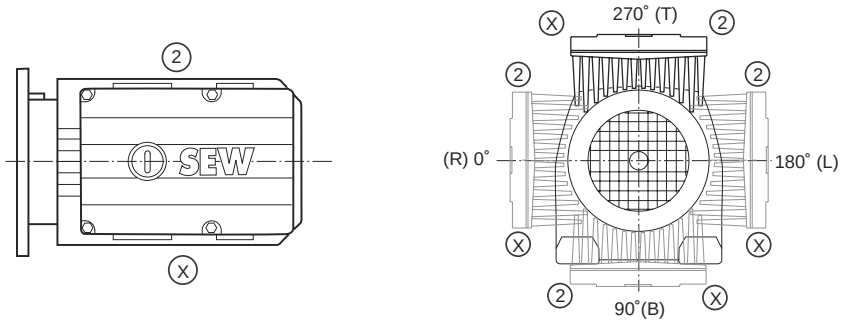

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Figure 70: Possible plug connector positions

MOVIMOT® operating modes

4Q operation of motors with mechanical brake

- The brake coil is used as braking resistor in 4Q operation.
- No external braking resistor may be connected.
- Brake voltage is generated internally within the unit, which means it is mains-independent.

Resistance and assignment of the brake coil:

Motor	Brake	Resistance of the brake coil[1)]	
		MOVIMOT® with 380–500 V_{AC} input voltage	MOVIMOT® with 200–240 V_{AC} input voltage
DT71	**BMG05**	277 Ω (230 V)	69,6 Ω (110 V)
DT80	**BMG1**	248 Ω (230 V)	62,2 Ω (110 V)
DT90	**BMG2**	216 Ω (230 V) / 54.2 Ω (110 V)	54,2 Ω (110 V)
DV100/DT100	**BMG4**	43.5 Ω (110 V)	27.3 Ω (88 V)

1) Rated value measured between the red connection (terminal 13) and the blue connection (terminal 15) at 20°C, temperature-dependent fluctuations in the range -25% / +40 % are possible.

Regenerative load capacity of the brake coil (MOVIMOT® with 380 – 500 V_{AC} supply voltage)

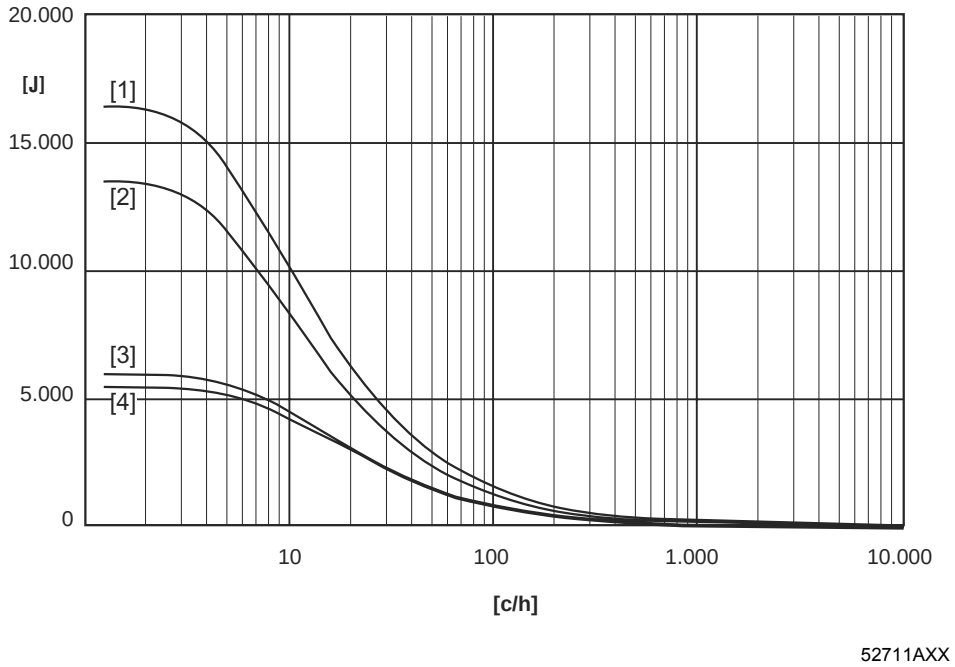

Figure 71: Regenerative load capacity

[c/h] Cycles per hour
[1] BMG2/BMG4 (110 V)
[2] BMG2 (230 V)
[3] BMG1 (230 V)
[4] BMG05 (230 V)

Regenerative load capacity of the brake coil (MOVIMOT® with 200...240 V_{AC} supply voltage)

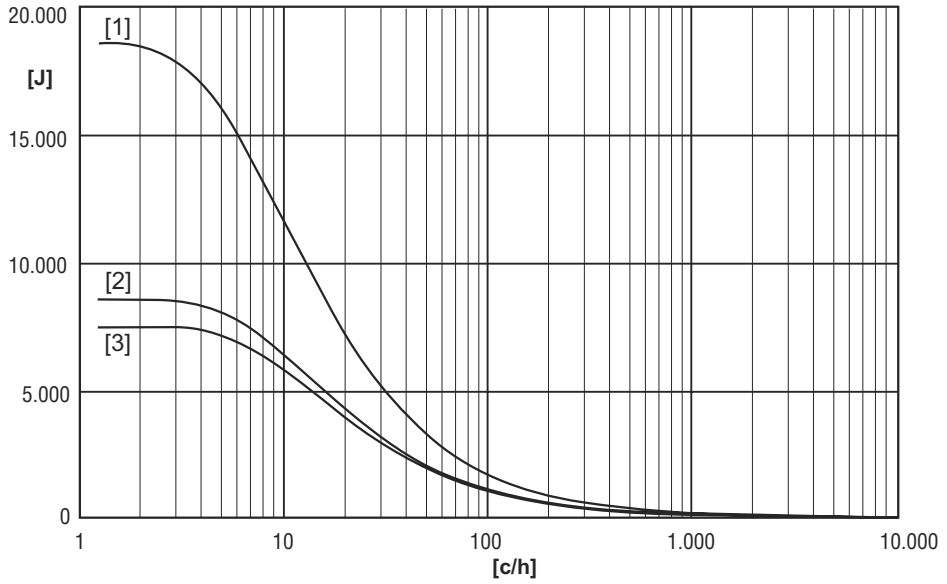

Figure 72: Regenerative load capacity

[c/h]	Cycles per hour
[1]	BMG2 (110 V), BMG4 (88 V)
[2]	BMG1 (110 V)
[3]	BMG05 (110 V)

4Q operation with integrated braking resistor BW..

- The brake resistor is integrated in the terminal box of MOVIMOT® as standard in motors without mechanical brake.
- 4Q operation with integrated braking resistor is recommended for applications in which the level of regenerative energy is low.
- The resistor protects itself (reversible) against regenerative overload by changing abruptly to high resistance and no longer consuming any more energy. The inverter then switches off and signals an overvoltage error (error code 04).
- With retrofit kits, field distributors or P2.A option for mounting the MOVIMOT® unit in close proximity to the motor, the braking resistor must be ordered separately.

Assignment of internal braking resistors:

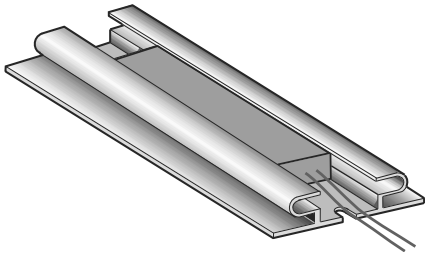

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Figure 73: Integrated BW.. braking resistor

MOVIMOT®	MOVIMOT® type	Braking resistor	Part number
with input voltage 380–500 V_{AC}	MM03..MM15	BW1	822 897 3[1)]
			800 621 0[2)]
	MM22..MM3X	BW2	823 136 2[1)]
			800 622 9[2)]
with input voltage 200–240 V_{AC}	MM03..MM07	BW3	800 623 7[2)]
	MM11..MM22	BW4	800 624 5[2)]

1) Two screws M4 x 8, included in delivery

2) Retaining screws not included in scope of delivery

Regenerative load capacity of internal braking resistors:

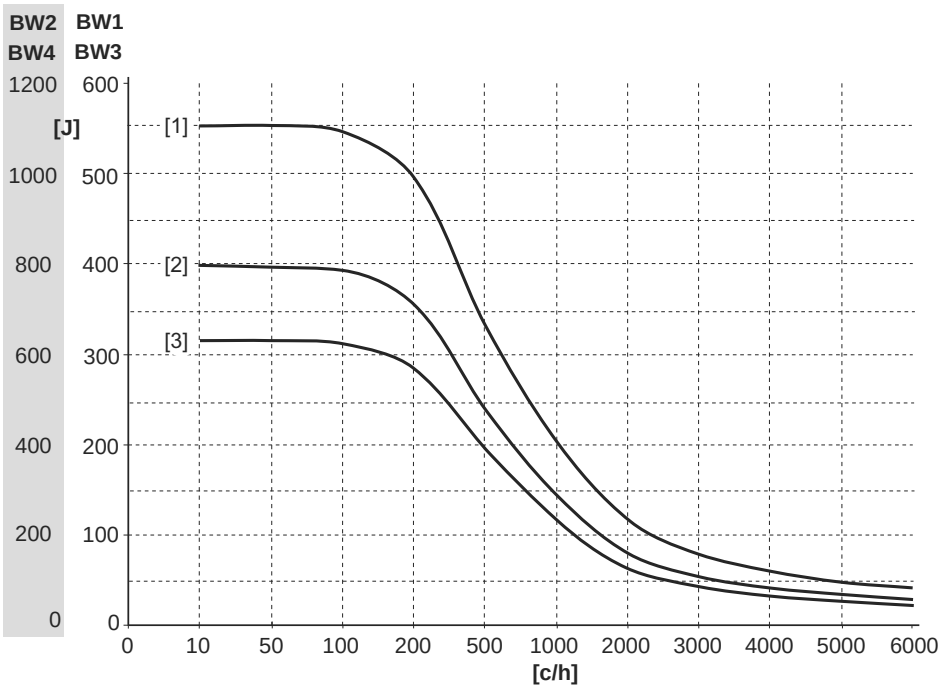


Figure 74: Regenerative load capacity

[c/h]	Cycles per hour
[1]	Brake ramp 10 s
[2]	Brake ramp 4 s
[3]	Brake ramp 0.2 s

4Q operation with brake and external braking resistor

- 4Q operation with external braking resistor is recommended for applications in which the level of regenerative energy is high.
- External braking resistors are only permitted with brake motors in combination with brake control BGM/BSM.
- When using external braking resistors and BGM/BSM brake control, MOVIMOT® special functions must be activated. Refer to the MOVIMOT® operating instructions for more information.

Assignment of external braking resistors:

MOVIMOT®	MOVIMOT® type	Braking resistor	Part number
with input voltage 380–500 V_{AC}	MM03..MM15	BW200-003/K-1.5	828 291 9
		BW200-005/K-1.5	828 283 8
		BW150-010	802 285 2
	MM22..MM3X	BW100-003/K-1.5	828 293 5
		BW100-005/K-1.5	828 286 2
		BW068-010	802 287 9
		BW068-020	802 286 0

Power diagrams of external braking resistors:

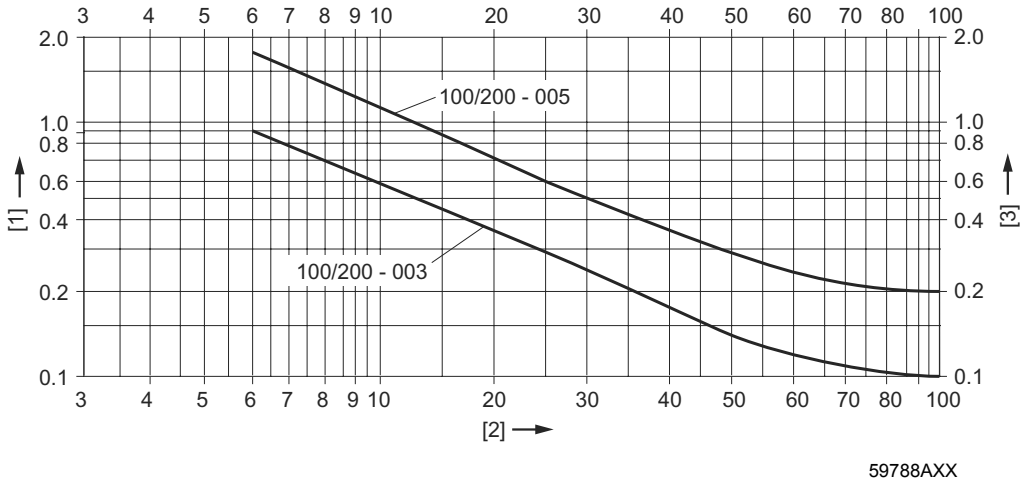


Figure 75: Power diagrams of braking resistors BW100-003, BW200-003, BW100-005 and BW200-005

[1] Short-term power in KW
[2] Cyclic duration factor cdf in %
[3] Continuous power 100 % cdf in KW

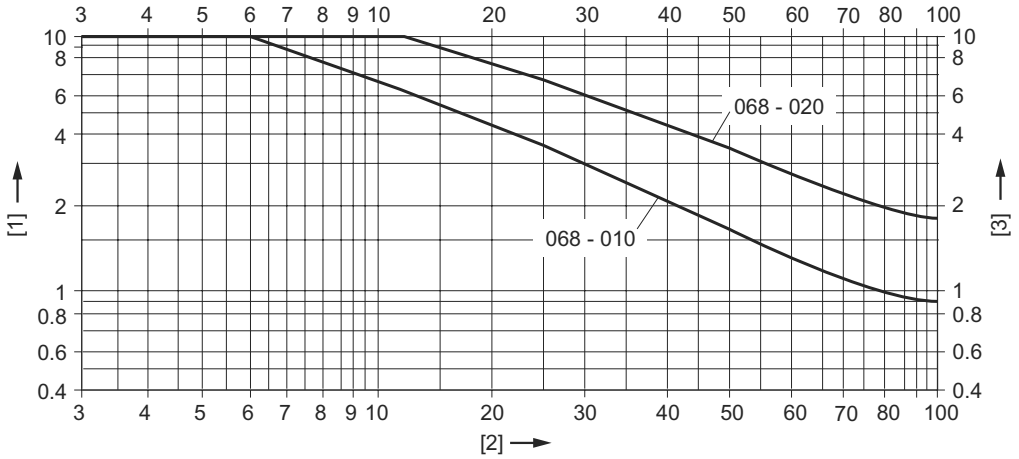


Figure 76: Power diagrams of braking resistors BW068-010 and BW068-020

[1] Short-term power in KW
[2] Cyclic duration factor cdf in %
[3] Continuous power 100 % cdf in KW

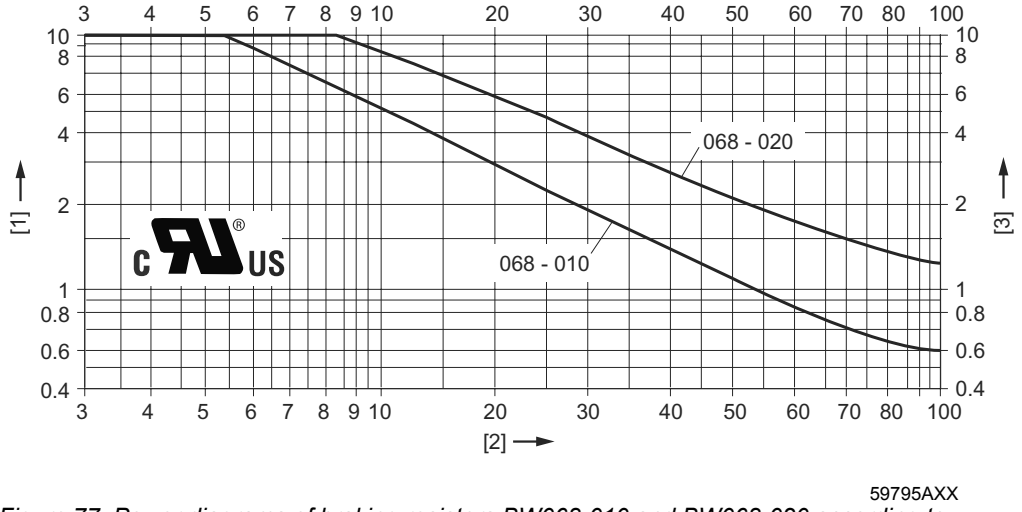


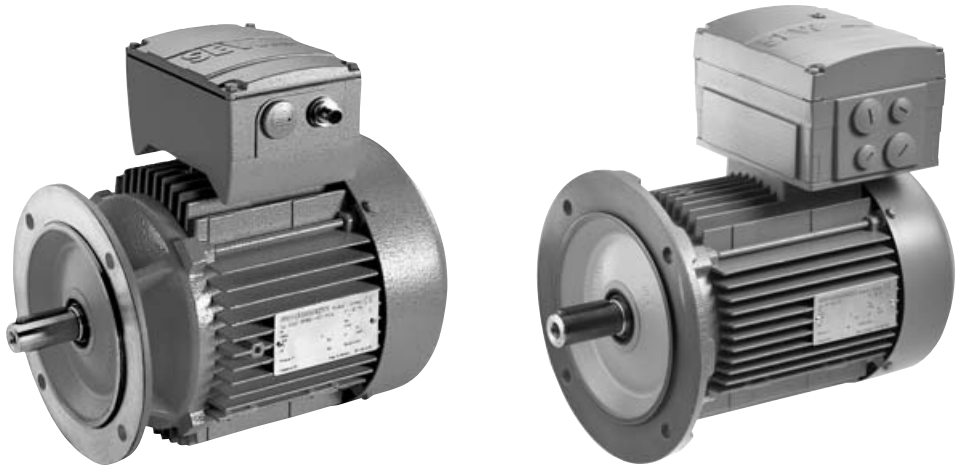
Figure 77: Power diagrams of braking resistors BW068-010 and BW068-020 according to UL approval

[1] Short-term power in KW
[2] Cyclic duration factor cdf in %
[3] Continuous power 100 % cdf in KW

7.18 MOVI-SWITCH® (→ GM)

MOVI-SWITCH® is the gearmotor with integrated switching and protection function. Single speed AC (brake) motors in sizes DT71 to DV100 can be combined with all appropriate gear units in the modular concept as part of the MOVI-SWITCH® product range. For detailed information on MOVI-SWITCH®, refer to the system folder "Decentralized Installation" (MOVIMOT®, MOVI-SWITCH®, Communication and Supply Interfaces).

MSW-1E MSW-2S



MSW1E_MSW2S

Figure 78: Gearmotor with MOVI-SWITCH®

Advantages of MOVI-SWITCH®

MOVI-SWITCH® offers the following advantages:

- The circuit breaker and protection functions are completely integrated, saving control cabinet space and cabling.
- Robust and compact, resulting in space-saving installation.
- Use MOVI-SWITCH® to operate motors in the voltage range 3 × 380 ... 500 V, 50 / 60 Hz.
- AC motors and AC brake motors with the same connection configuration, therefore simple installation.

2 versions

Two MOVI-SWITCH® versions are available: one for operation with one direction of rotation (MSW-1E); one for operation with direction of rotation reversal (MSW-2S).

The mains and control connections are the same for motors with or without brake.

MSW-1E

MOVI-SWITCH® MSW-1E is switched on and off without changing direction by means of a short circuit-proof star bridge switch. A thermal winding monitor (TF) is also integrated, which acts directly on the switch.

MSW-2S

The direction of rotation is reversed in MOVI-SWITCH® MSW-2S using a reversing relay combination with a long service life. Supply system monitoring, phase-sequence monitoring, brake control, circuit breaker and protection functions are grouped together in the controller. The various operating states are indicated by the diagnostic LED.

The pin assignment for clockwise direction of rotation (CW) is compatible with that of MSW-1E. The integrated AS-interface connection is compatible with MLK11A.

Available combinations

The following MOVI-SWITCH® AC motors and AC brake motors can be combined with all suitable gear unit types, mounting positions and versions in accordance with the selection tables for gearmotors.

Motor size	Power [kW] with pole number			
	2	4	6	8
DT71D.. (/BMG)/TF/MSW..	0.55	0.37	0.25	0.15
DT80K.. (/BMG)/TF/MSW..	0.75	0.55	0.37	-
DT80N.. (/BMG)/TF/MSW..	1.1	0.75	0.55	0.25
DT90S.. (/BMG)/TF/MSW..	1.5	1.1	0.75	0.37
DT90L.. (/BMG)/TF/MSW..	2.2	1.5	1.1	0.55
DV100M.. (/BMG)/TF/MSW..	3.0	2.2	1.5	0.75
DV100L.. (/BMG)/TF/MSW..	-	3.0	-	1.1

Order information

Note the following points when ordering AC (brake) motors or gearmotors with MOVI-SWITCH®:

- Voltage for winding in ⅄ connection only.
- Only two brake voltages are possible:
  - Motor voltage / $\sqrt{3}$ or
  - motor voltage.
- Position of the terminal box preferably 270°. Please consult SEW-EURODRIVE for other positions.

Block diagram

MSW-1E

Theory of operation of MOVI-SWITCH® MSW-1E:

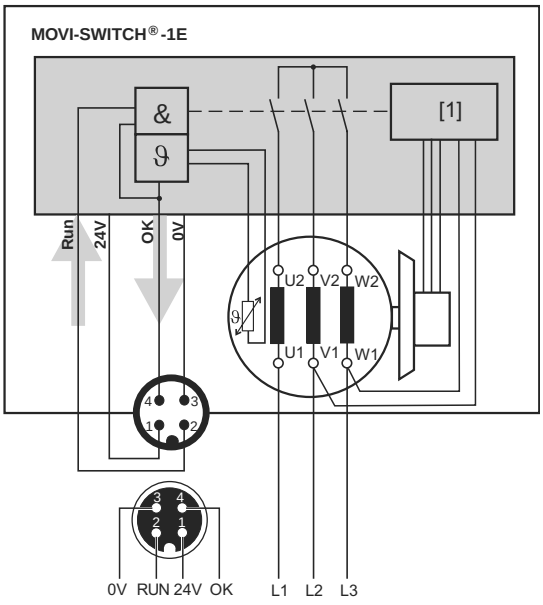


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Figure 79: Block diagram MOVI-SWITCH® MSW-1E

[1] Brake control

MSW-2S with binary control

Theory of operation of MOVI-SWITCH® MSW-2S with binary control:

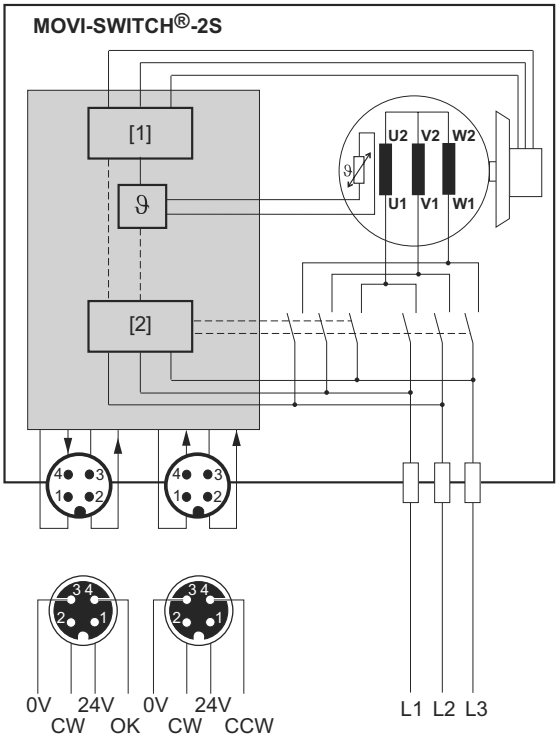

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Figure 80: Block diagram MOVI-SWITCH® MSW-2S with binary control

[1] Brake control

[2] Rotating field detection

MSW-2S with AS-interface control

Theory of operation of MOVI-SWITCH® MSW-2S with AS-interface control:

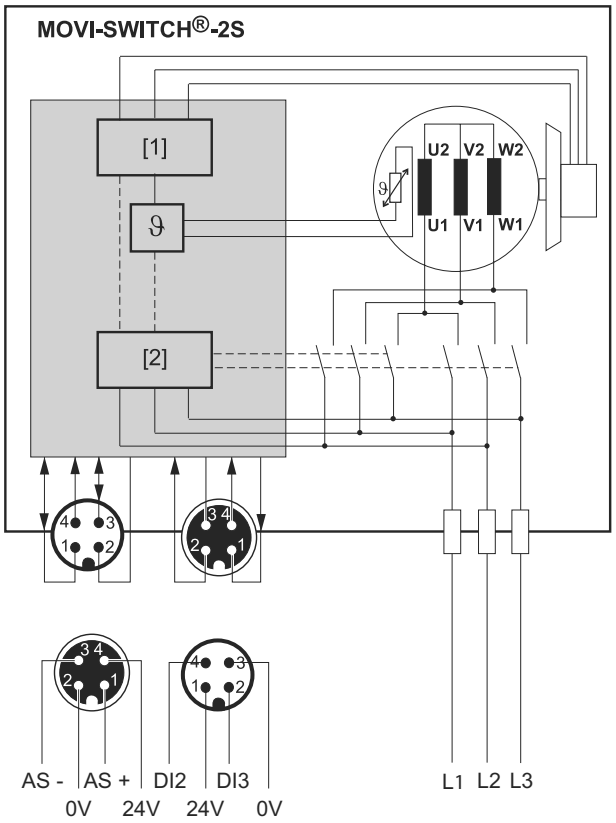

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Figure 81: Block diagram of MOVI-SWITCH® MSW-2S with AS-interface control

[1] Brake control

[2] Rotating field detection

AS AS-interface

7.19 WPU smooth pole-change unit (→ GM)

Normal pole-changing motors cannot switch from high to low speed without jerks unless special measures are taken. In order to limit the occurring regenerative braking torque, either the voltage is reduced to a lower value at the moment of changeover through chokes, a transformer or dropping resistors, or only 2-phase switchover takes place. All mentioned measures involve additional installation effort and switchgear. A time relay causes the voltage to return to normal voltage conditions. The relay is set empirically. The WPU smooth pole-change unit operates purely electronically.

Function

The changeover command blocks a phase of the mains voltage using a triac and in this way reduces the shifting down torque to about a third. As soon as the synchronous speed of the high-pole winding is reached, the third phase is activated again in a current optimized manner.

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Figure 82: Smooth pole-change unit WPU

Advantages of WPU

- Load independent and wear-free
- No energy loss which means high efficiency
- No restriction on start-up and rated torque and no restriction on the motor starting frequency
- Minimum wiring
- Suitable for any standard motor

Technical data

Type	WPU 1001	WPU 1003	WPU 1010	WPU 2030
Part number	825 742 6	825 743 4	825 744 2	825 745 0
For pole-changing motors with rated current at low speed I_N in S1 continuous running duty	0.2 ... 1 A_{AC}	1 ... 3 A_{AC}	3 ... 10 A_{AC}	10 ... 30 A_{AC}
For pole-changing motors with rated current at low speed I_N in S3 intermittent periodic duty 40/60% cdf	0.2 ... 1 A_{AC}	1 ... 5 A_{AC}	3 ... 15 A_{AC}	10 ... 50 A_{AC}
Rated supply voltage U_{mains}	$2 \times 150...500\ V_{AC}$			
Supply frequency f_{mains}	50/60 Hz			
Rated current in S1 continuous running duty I_N	1 A_{AC}	3 A_{AC}	10 A_{AC}	30 A_{AC}
Ambient temperature ϑ_{Umg}	-15 ... +45°C			
Enclosure	IP20			
Weight	0.3 kg	0.3 kg	0.6 kg	1.5 kg
Mechanical design	DIN rail housing with screw connections			Control cabinet rear panel

7.20 ECOFAST® compliant AC motors DT/DV..ASK1 (→ GM)

Under the trademark ECOFAST® (Energy and Communication Field Installation System), filed by the Automation and Drives (A&D) division of SIEMENS, the system partners offer an open and innovative solution in the area of decentralization without control cabinet for automation and drive engineering. This approach is based on the completely decentralized installation and direct installation of the units on the machines. In addition to the communication via PROFIBUS-DP and AS-interface, power supply of the consumers in the ECOFAST® system is also branch-like via power bus. All automation, drive and installation components are combined to form a standard complete solution with standardized connection technology for data and power transfer. The project planning tool ECOFAST® ES (Engineering Software) supports the power-specific dimensioning of a system. Communication via standardized fieldbuses and consistent use of standardized interfaces based on the DESINA specification make ECOFAST® an open, non-proprietary and flexible system solution. Refer to the "ECOFAST®" system manual for detailed information about ECOFAST®.

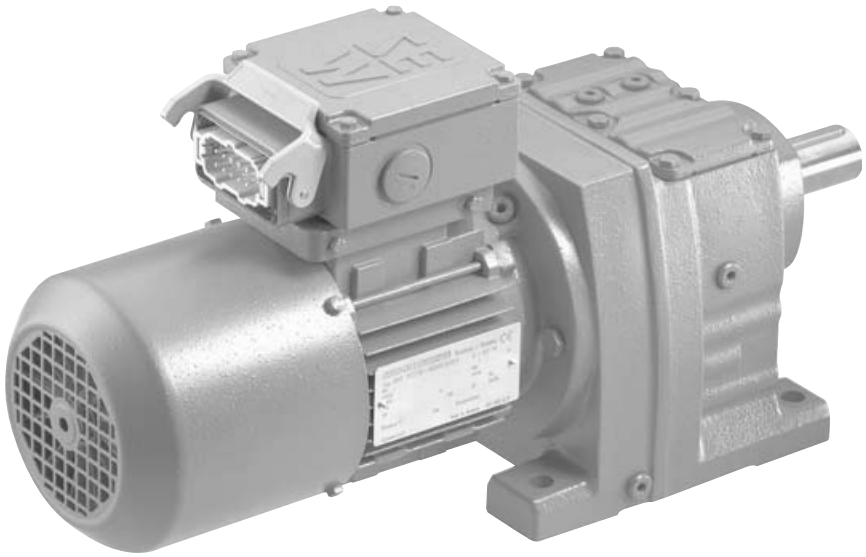

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Figure 83: AC motor with ASK1 plug connector

Function description

ECOFAST® compliant AC motors from SEW-EURODRIVE are equipped with the plug connector option ASK1 as standard. The plug connector ASK1 consists of:

- HAN10ES plug connector with pin insert, single-bracket easy lock and EMC frame.
- Possibility of installing an optional carrier plate for attaching switchgear and control units.

Possible combinations

Almost all gearmotor combinations based on the "Gearmotors" catalog can be supplied in ECOFAST® certified design. The following restrictions apply:

- Motor sizes DT71 to DV132S
- Motor voltage \always 230/400 V and 50 Hz
- Only motors with one speed
- Brake option: Brake voltage always 400 V_{AC}
- Temperature sensor option: only TF
- Brake control system option: only BGE, BG and BUR
- Only thermal classes "B" and "F"

Example unit designation

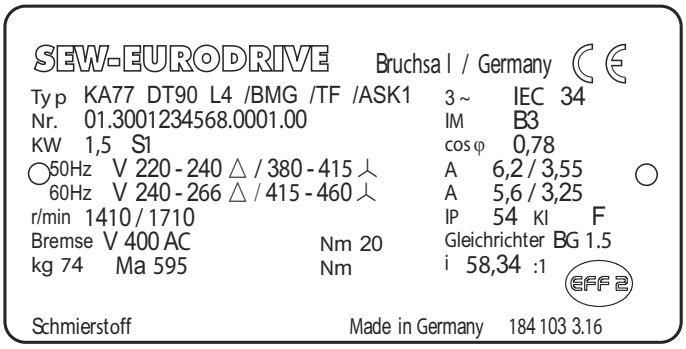

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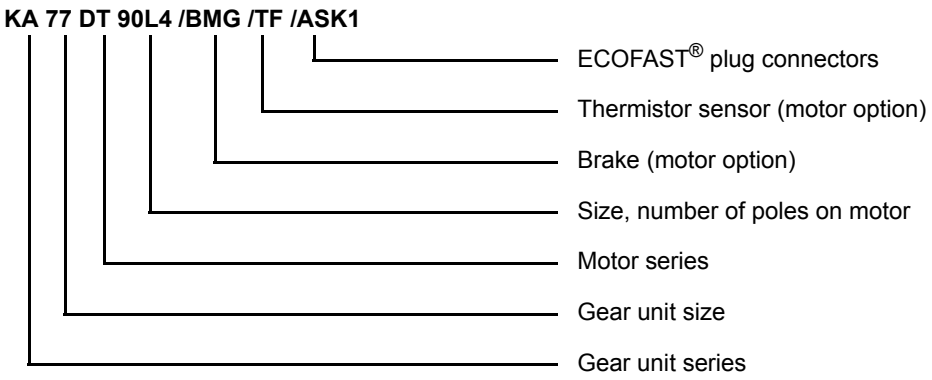
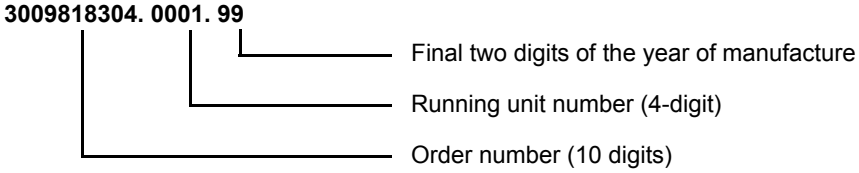
Figure 84: Example of nameplate for "AC motor with ASK1"



Structure of the serial number (example):



8 Project Planning for AC Motors with Inverter

8.1 Operation on inverter

Range of products

The extensive product range of SEW-EURODRIVE inverters is available for designing electronically controlled drives. SEW-EURODRIVE offers the following inverter series:

- **MOVITRAC® B:** Compact and inexpensive frequency inverter for the power range 0.25 ... 160 kW. Single-phase and three-phase mains connection for 230 V_{AC} and three-phase mains connection for 400 ... 500 V_{AC}.
- **MOVIDRIVE® MDX60/61B:** High-performance drive inverter for dynamic drives in the power range 0.55 ... 160 kW. Great diversity of applications due to extensive-expansion options with technology and communication options. Three phase mains connection for 230 V_{AC} und 400 ... 500 V_{AC}

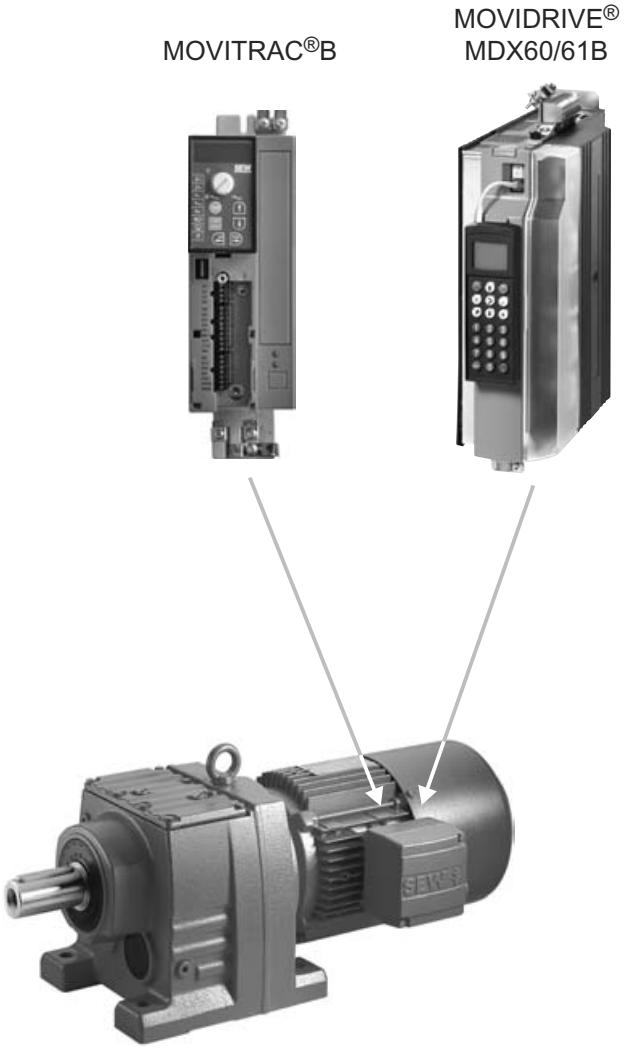


Figure 85: Range of inverters for AC motors

Product characteristics

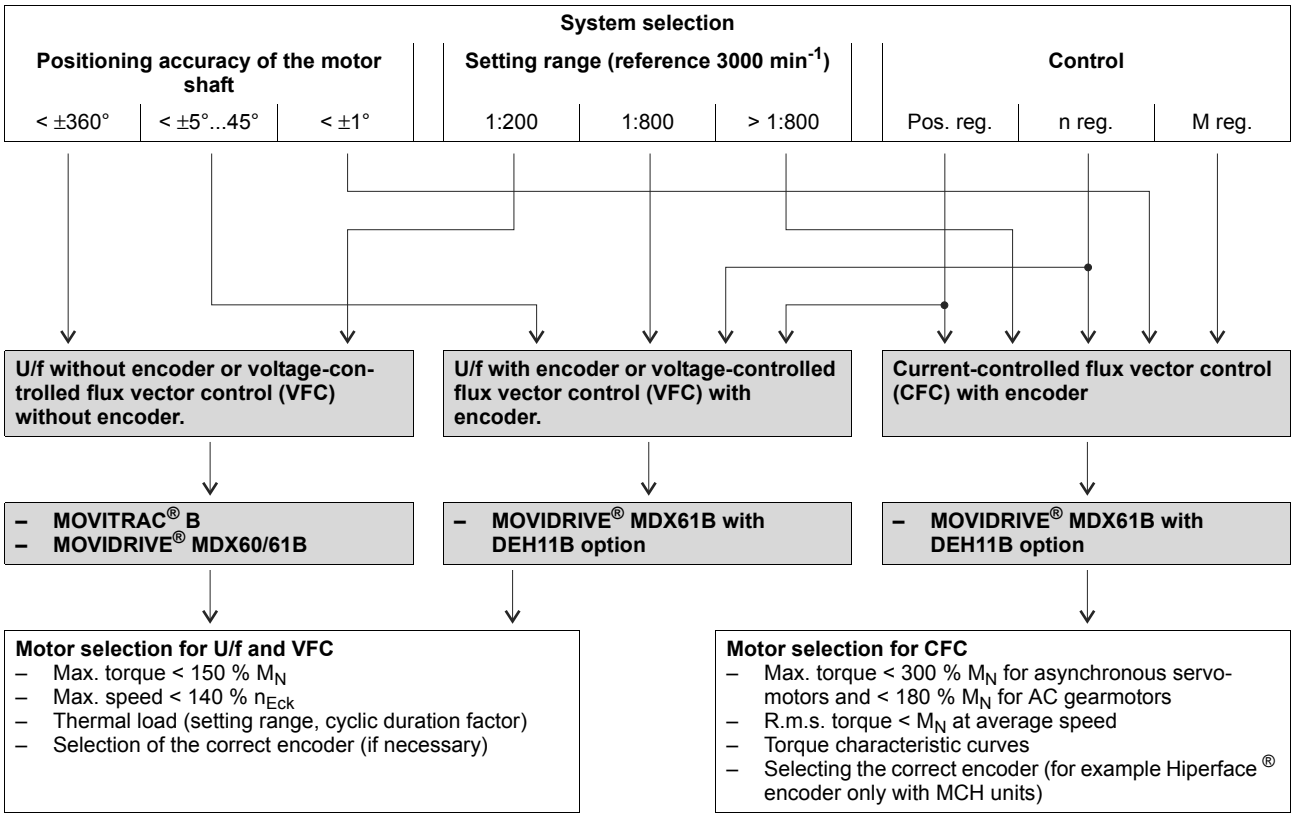
The following table lists the most important product characteristics for the various inverter series. The overview of product characteristics can help you to choose the suitable inverter series for your application.

Product characteristics	MOVITRAC® B	MOVIDRIVE® MDX60/61B
Voltage range	1×200 ... 240 V_{AC} (limited power range) 3×200 ... 240 V_{AC} (limited power range) 3×380 ... 500 V_{AC}	3×200 ... 240 V_{AC} (limited power range) 3×380 ... 500 V_{AC}
Power range	0.25...160 kW	0.55...160 kW
Overload capacity	150% I_N[1] briefly and 125% I_N permanently during operation without overload	
4Q capable	Yes, with integrated brake chopper as standard.	
Integrated line filter	At 1×200 ... 240 V_{AC}: according to class B limit At 3×200 ... 240 V_{AC} und 3×380 ... 500 V_{AC}: sizes 0, 1 and 2 according to class A limit	Sizes 0, 1 and 2 according to class A limit
TF input	Yes	
Control mode	U/f or voltage-controlled flux vector control (VFC)	U/f or voltage-controlled flux vector control (VFC), with speed feedback speed control and current-controlled flux vector control (CFC).
Speed feedback	No	Option
Integrated positioning and sequence control system	No	Standard
Serial interfaces	System bus (SBus) and RS-485	
Fieldbus interfaces	Optional via gateway PROFIBUS, INTERBUS, CANopen, DeviceNet, Ethernet	Optional PROFIBUS-DP, INTERBUS, INTERBUS LWL, CANopen, DeviceNet, Ethernet
Technology options	IEC 61131 control	Input/output card Synchronous operation Absolute encoder card IEC 61131 control
Safe stop	Yes	Yes
Approvals	UL and cUL approval, C-tick	

1) Only for MOVIDRIVE® MDX60/61B: The short-time overload capacity is 200% I_N for units of size 0 (0005 ...0014).

8.2 Drive properties

The required drive properties are the main factors determining the selection of the inverter. The following illustration serves as assistance for inverter selection.

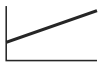


Key

Pos. reg.	= Positioning control
n reg.	= Speed control
M reg.	= Torque control
VFC	= Voltage flux control
CFC	= Current flux control
M_N	= Rated torque of the motor
n_{trans}	= Rated speed (transition speed) of the motor

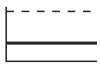
8.3 Selecting the inverter

Drive categories The large number of different drive applications can be divided into five categories. The five categories are listed below together with the recommended inverter. The assignment is based on the required setting range and the resulting control process.



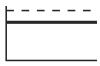
1. Drives with a base load and a speed dependent load, such as conveyor drives.

- Low requirements on the setting range.
  - MOVITRAC® B
  - MOVIDRIVE® MDX60/61B
- High requirements on the setting range (motor with encoder).
  - MOVIDRIVE® MDX61B with DEH11B option



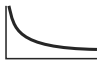
2. Dynamic load, e.g. trolleys; brief high torque demand for acceleration followed by low load.

- Low requirements on the setting range.
  - MOVITRAC® B
  - MOVIDRIVE® MDX60/61B
- High requirements on the setting range (motor with encoder).
  - MOVIDRIVE® MDX61B with DEH11B option
- High dynamic properties required (motor with encoder, preferably sin/cos encoder).
  - MOVIDRIVE® MDX61B with DEH11B option



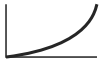
3. Static load, e.g. hoists; mainly steady high static load with overload peaks.

- Low requirements on the setting range.
  - MOVITRAC® B
  - MOVIDRIVE® MDX60/61B
- High requirements on the setting range (motor with encoder).
  - MOVIDRIVE® MDX61B with DEH11B option



4. Load falling in inverse proportion to speed, e.g. winding or coil drives.

- Torque control (motor with encoder, preferably sin/cos encoder).
  - MOVIDRIVE® MDX61B with DEH11B option



5. Variable torque load, e.g. fans and pumps.

- Low load at low speeds and no load peaks, 125% utilization (I_D = 125% I_N).
  - MOVITRAC® B
  - MOVIDRIVE® MDX60/61B

Further selection criteria

- Power range
- Communication options (serial interfaces, fieldbus)
- Expansion options (such as synchronous operation)
- PLC functionality (IPOS$^{plus®}$, application modules)

Additional documentation

For detailed information and additional project planning instructions on the individual inverter series, refer to the manuals and catalogs of electronically controlled drives. The SEW-EURODRIVE homepage (http://www.sew-eurodrive.com) provides links to a wide selection of our documentation in various languages for download as PDF files.

Electronic catalog EKAT

The electronic catalog EKAT from SEW-EURODRIVE provides a convenient way of selecting the drive components you require. You enter the data required for drive selection using interactive menus and obtain the drive selection as result. This catalog also includes selecting the appropriate inverter.

Electronics documentation

Other documents that are of interest in terms of project planning are given below. You can order these publications from SEW-EURODRIVE.

- MOVITRAC® B system manual
- MOVIDRIVE® MDX60/61B system manual

Motor selection

Note the thermally approved torque when selecting the motor. Section 14.3 lists the torque limiting curves of 4-pole asynchronous AC motor DR, DT, DV. Use these limiting curves to determine the thermally approved torque.

8.4 Torque limit curves with inverter operation

Thermally approved torque

Note thermally approved torque in project planning for operation of DR, DT, DV asynchronous AC motors with frequency inverter. The following factors determine the thermally permitted torque:

- Duty type
- Type of cooling: Self-ventilation or forced cooling
- Base frequency f_{Eck} = 50 Hz (400 V ⅄) or f_{Eck} = 87 Hz (230 V Δ)

Use the torque limit curves to determine the thermally permitted torque. The projected, effective torque has to be less than the limit curve value. The following illustration shows the limit curves for 4-pole DR, DT, DV asynchronous AC motors with f_{Eck} = 50 Hz and f_{Eck} = 87 Hz. The following peripheral conditions apply to the shown limit curves:

- Duty type S1
- Supply voltage of the inverter $U_{Netz} = 3 \times 400\ V_{AC}$
- Motor in thermal class F

f_{Eck} = 50 Hz (400 V ⅄/50 Hz)

The following diagram shows the limit curves for operation at f_{Eck} = 50 Hz. The curves are different for those motors with self-ventilation and those with forced cooling (= optional forced cooling fan).

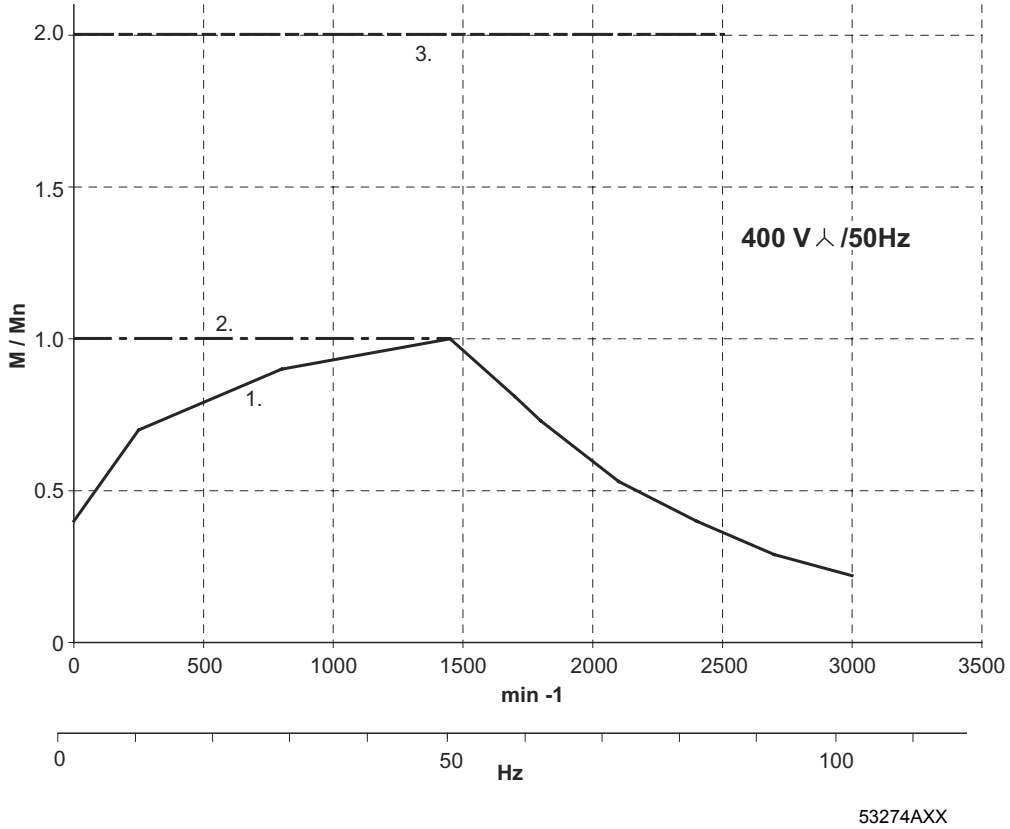


Figure 86: Torque limit curves for f_{Eck} = 50 Hz

1. S1 operation with self-ventilation (= without forced cooling fan)
2. S1 operation with forced cooling (= with forced cooling fan)
3. Mechanical limitations for gearmotors

f_{Eck} = 87 Hz (230 V △/50 Hz)

The following diagram shows the limit curves for operation at f_{Eck} = 87 Hz. The curves are different for those motors with self-ventilation and those with forced cooling (= optional forced cooling fan).

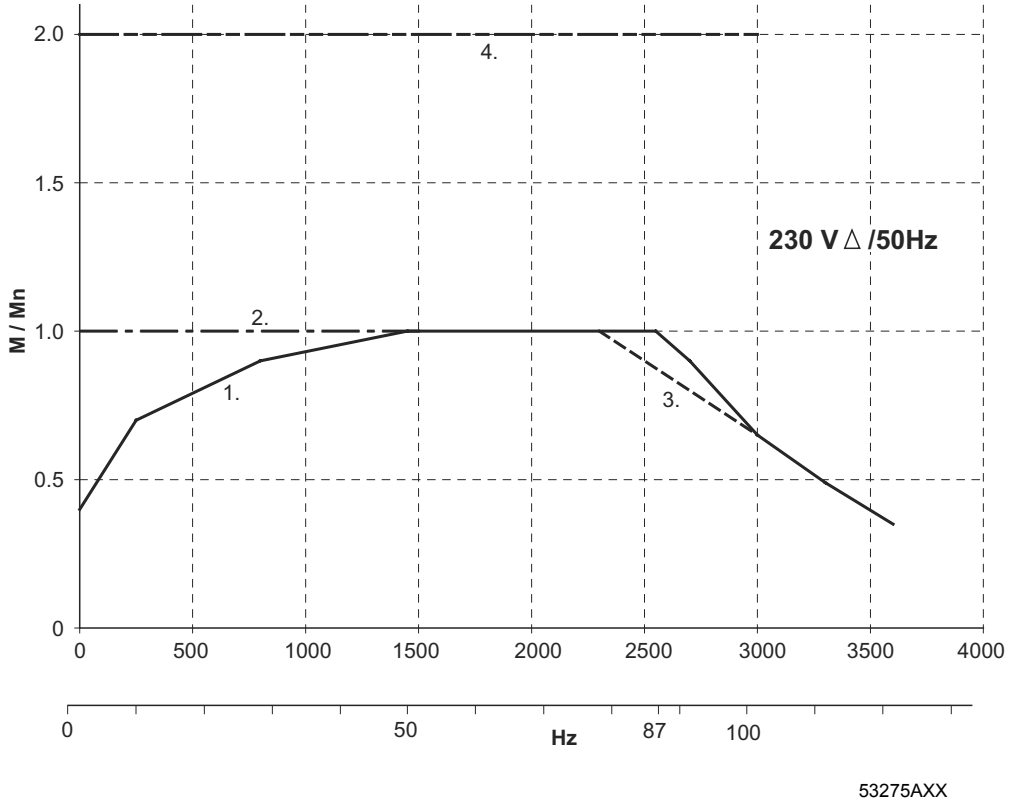


Figure 87: Torque limit curves for f_{Eck} = 87 Hz

1. S1 operation with self-ventilation (= without forced cooling fan)
2. S1 operation with forced cooling (= with forced cooling fan)
3. Deviating curves for DV200 ... DV280
4. Mechanical limitations for gearmotors

9 Mounting Positions and Important Order Information

9.1 General information on mounting positions

Mounting position designation

SEW-EURODRIVE differentiates between six mounting positions M1 ... M6 for gear units, gearmotors and MOVIMOT® gearmotors . The following figure shows the position of the gear unit in mounting positions M1 ... M6.

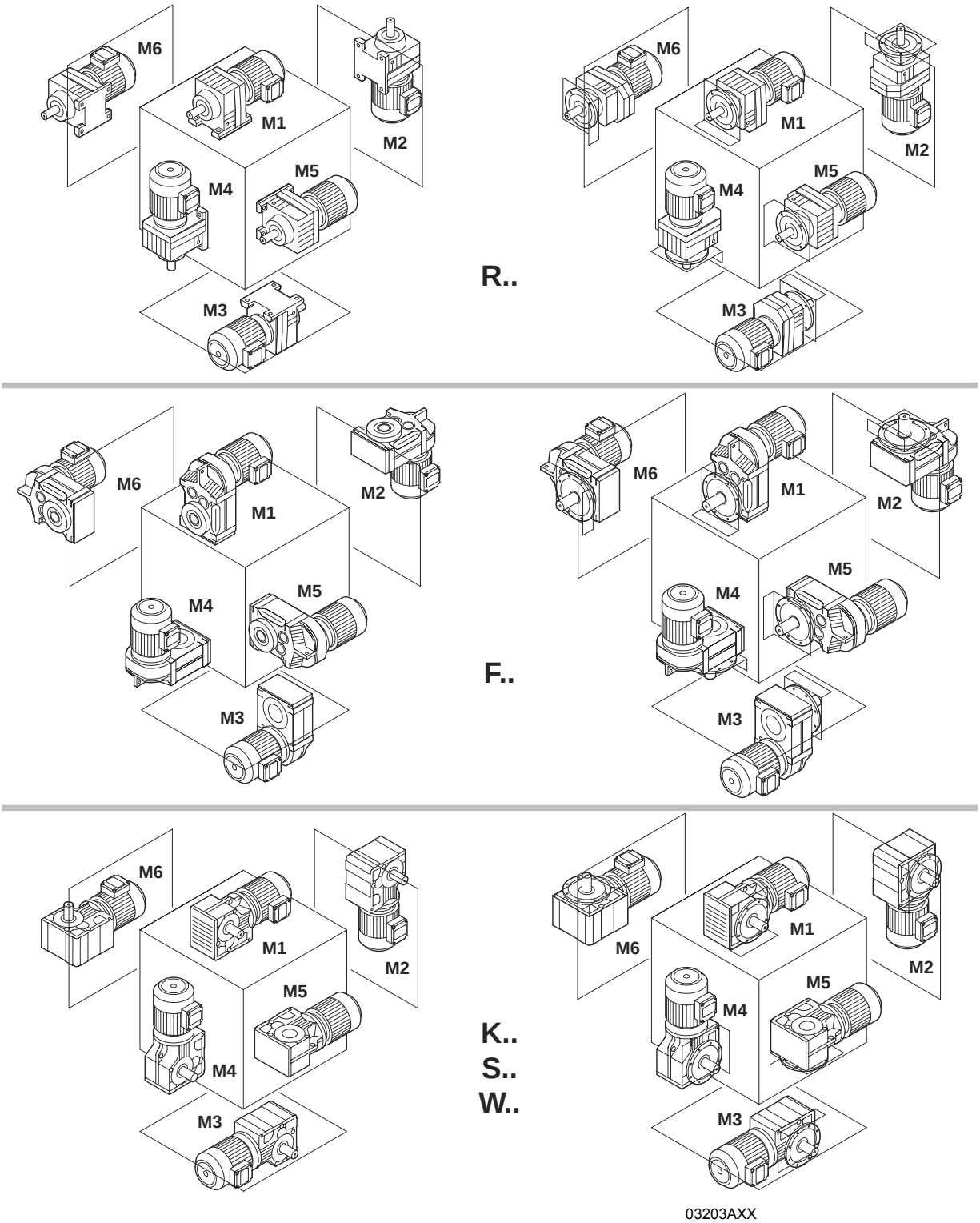


Figure 88: Depiction of mounting positions M1 ... M6

9.2 Important order information

The following order information is required for R, F, K and S gear units and gearmotors in addition to the mounting position to exactly determine the design of the drive.

This information is also required for Spiroplan® gearmotors (W gearmotors) that do not depend on a particular mounting position.

The following applies to all gear units and gearmotors

Observe the following notes for all gear units, gearmotors and MOVIMOT® gearmotors from SEW-EURODRIVE.

Direction of rotation of the output with a backstop

If the drive has a backstop RS, you have to indicate the direction of rotation of the output for the drive. The following definition applies:

As viewed at the output shaft: Clockwise (CW) = Rotating clockwise
Counterclockwise (CCW)= Rotating counterclockwise

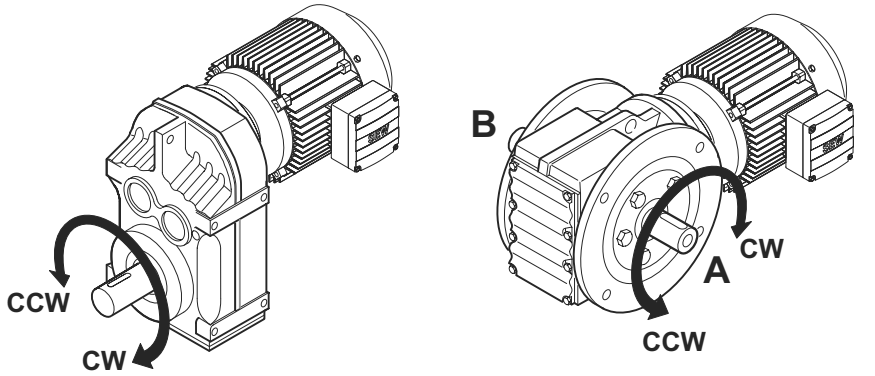


Figure 89: Direction of rotation of output

In right-angle gear units, you also have to indicate whether the direction of rotation is given looking onto the A or B end.

Position of the output shaft and output flange

In right-angle gear units, you also have to indicate the position of the output shaft and the output flange:

- A or B or AB (→ Figure 90)

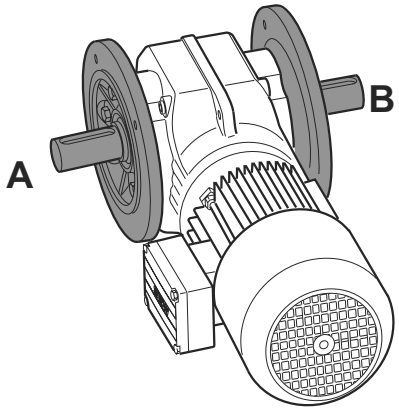


Figure 90: Position of the output shaft and the output flange

Position of output end in right-angle gear units

In shaft mounted right-angle gear units with a shrink disc, you also have to indicate whether the A or B end is the output end. In Figure 91, the A end is the output end. The shrink disc is located opposite the output end.

In shaft mounted right-angle gear units, the "output end" is equivalent to the "shaft position" of right-angle gear units with solid shaft.

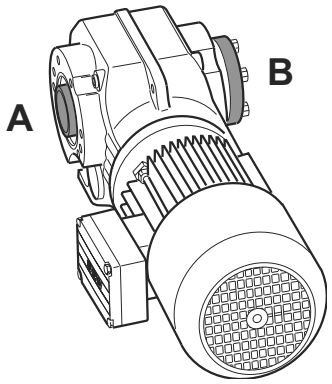


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Figure 91: Position of the output end

You will find the permitted mounting surfaces (= hatched area) in the mounting position sheets (page 164 and the following pages).

Example: Only the mounting surface at the bottom is possible with helical-bevel gear units K167/K187 in mounting positions M5 and M6.

For all gearmotors

Observe the following notes for all gearmotors and MOVIMOT gearmotors from SEW-EURODRIVE.

Position terminal box and cable entry

The position of the motor terminal box has so far been specified indicated with 0°, 90°, 180° or 270° as viewed onto the fan guard = B-end (→ Figure 92). A change in the product standard EN 60034 specifies that the following designations will have to be used for terminal box positions for foot-mounted motors in the future:

- As viewed onto the output shaft = A-end
- Designation as R (right), B (bottom), L (left) and T (top)

This new designation applies to foot-mounted motors without a gear unit in mounting position B3 (= M1). The previous designation is retained for gearmotors. Figure 92 shows both designations. Where the mounting position of the motor changes, R, B, L and T are rotated accordingly. In motor mounting position B8 (= M3), T is at the bottom.

The position of the cable entry can be selected as well. The positions are "X" (= standard position), "1", "2" or "3" (→ Figure 92).

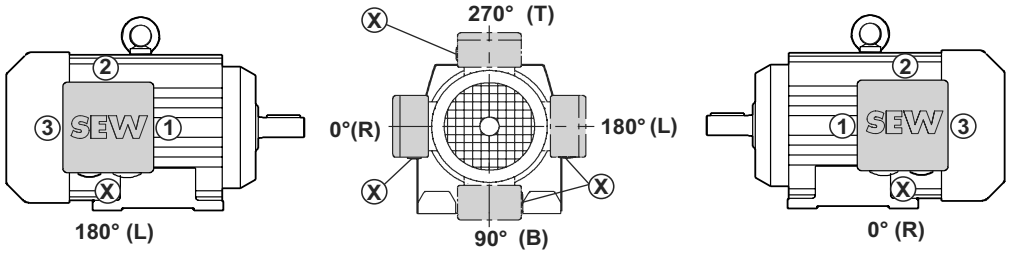


Figure 92: Position of terminal box and cable entry

Unless indicated otherwise, you will receive the terminal box type 0° (R) with cable entry "X". We recommend selecting cable entry "2" with mounting position M3.

- **When the terminal box is in the 90° (B) position**, check to see if the gearmotor has to be supported.
- **Only** cable entries **"X"** and **"2"** are possible for **DT56 and DR63** motors. **Exception: Cable entry "3"** is also possible for DR63 **with IS plug connector**.
- The following cable entries are possible in the **DT71..BMG** motor with gear unit flange diameters 160 mm and 200 mm:

Terminal box position	0° (R)	90° (B)	180° (L)	270° (T)
Possible cable entries	"X", "3"	"X", "1", "3"	"1", "2"	"X", "1", "3"

Applies to all MOVIMOT® gearmotors

The following information applies to MOVIMOT® gearmotors in addition to the gearmotors.

Position terminal box and cable entry

Position of the terminal box (MOVIMOT® inverter):

Not all positions are possible with MOVIMOT® gearmotors. Note the information in section "Position of the terminal box (MOVIMOT® inverter)" on page 188.

Position of the cable entry:

You do not have to select the position of the cable entry for MOVIMOT® gearmotors. Positions "X" (= standard position) and position "2" are always possible (see Figure 93).

Position of plug connectors/MOVIMOT® options:

You will have to select the position for MOVIMOT® options (e.g. fieldbus interface MF..) or for optional plug connectors (e.g. ASA3) (see Figure 93).

Not all position are possible. See the notes in the section "Mounting Positions, Technical Data and Dimension Sheets MOVIMOT®".

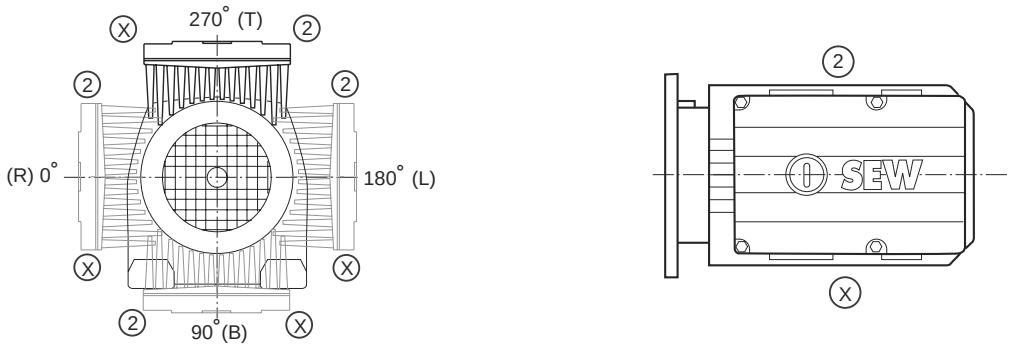


Figure 93: Position terminal box and cable entry, plug connectors, options

Sample orders

Type (Examples)	Mounting position	Shaft position	Flange position	Terminal box position	Position of cable entry	Direction of rotation of output
K47../RS	M2	A	-	0°	"X"	CW
SF77DV100L4	M6	AB	AB	90°	"3"	-
KA97DV132M4	M4	B	-	270°	"2"	-
KH107DV160L4	M1	A	-	180°	"3"	-
WF20DT71D4	-	A	A	0°	"X"	-
KAF67A	M3	A	B	-	-	-

Change in mounting position

Make sure to read the following information when you operate the gearmotor in a mounting position other than the one indicated in the order:

- Adjust lubricant fill quantity to match the new mounting position
- Adjust position of breather valve
- For helical-bevel gearmotors: Contact the SEW-EURODRIVE customer service prior to changing to mounting position M5 or M6 and when changing from M5 to M6 or vice versa.
- For helical-worm gearmotors: Contact the SEW-EURODRIVE customer service when changing to mounting position M2.

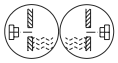
9.3 Key to the mounting position sheets

Spiroplan® gearmotors do not depend on any particular mounting position. However, mounting positions M1 to M6 are also shown for SPIROPLAN® gearmotors to assist you in working with this documentation.

Important: Spiroplan® gearmotors cannot be equipped with breather valves, oil level plugs or drain plugs.

Symbols used

The following table shows the symbols used in the mounting position sheets and their meaning:

Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug

Churning losses

* → page XX

Churning losses may occur in some mounting positions. Contact SEW-EURODRIVE in case of the following combinations:

Mounting position	Gear unit type	Gear unit size	Input speed [1/min]
M2, M4	R	97 ... 107	> 2500
		> 107	>1500
M2, M3, M4, M5, M6	F	97 ... 107	> 2500
		> 107	> 1500
	K	77 ... 107	> 2500
		> 107	> 1500
	S	77 ... 97	> 2500

Displayed shaft

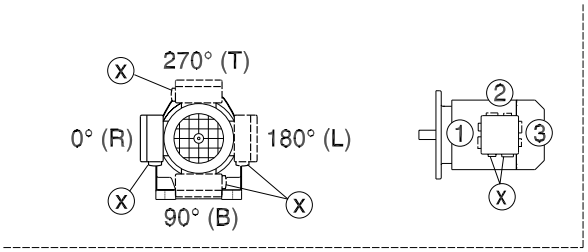
Note the following information regarding display of shafts in the mounting position sheets:

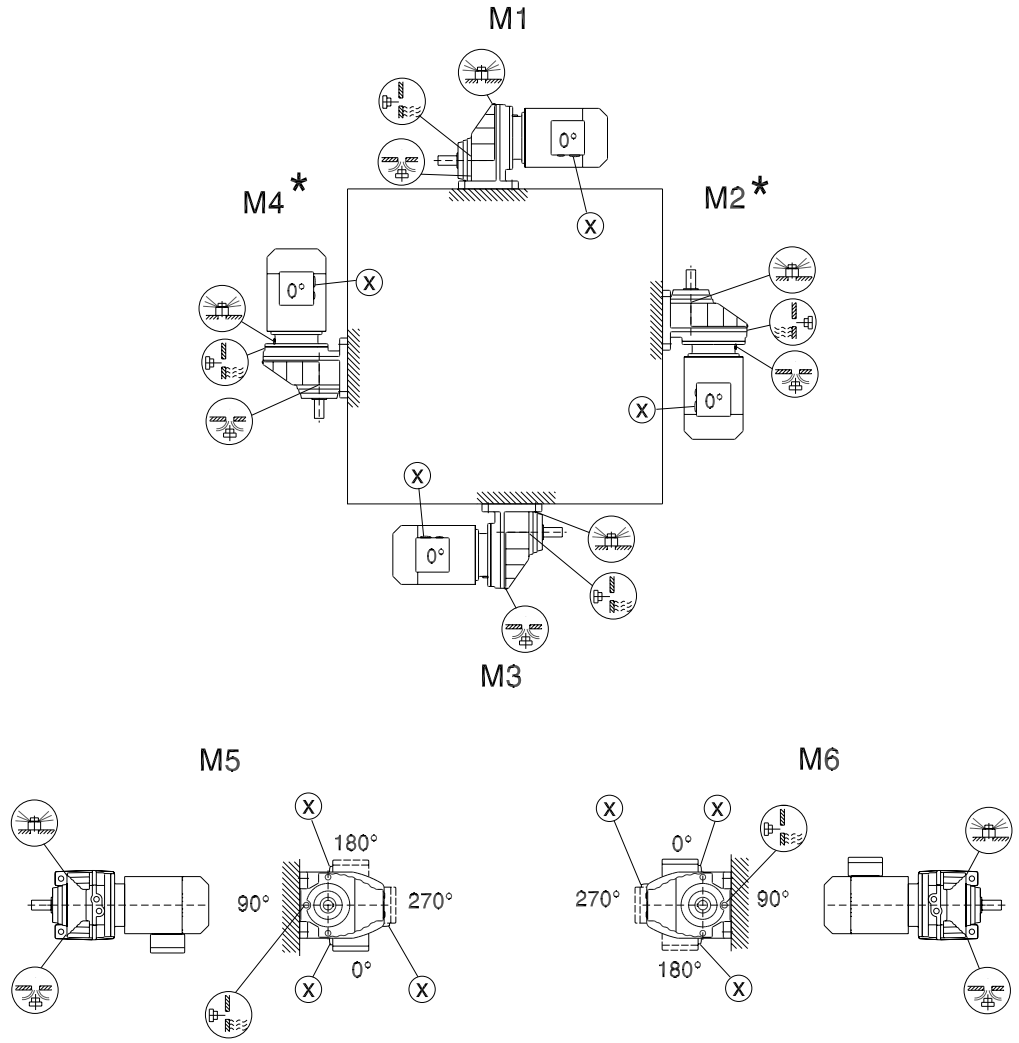
- **For gear units with solid shaft:** The displayed shaft is always on the A end.
- **For shaft mounted gear units:** The shaft with dashed lines represents the customer shaft. The output end (≙ shaft position) is always shown on the A end.

9.4 Mounting positions of helical gearmotors

RX57-RX107

04 043 02 00

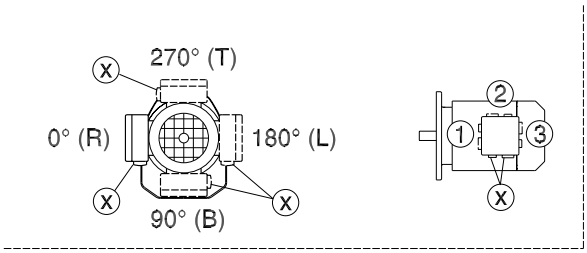


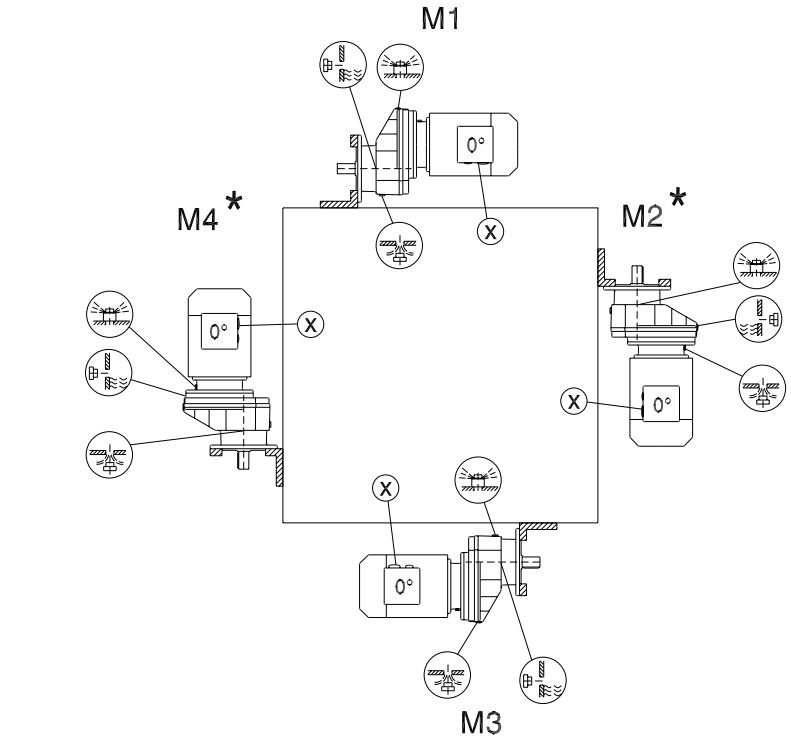


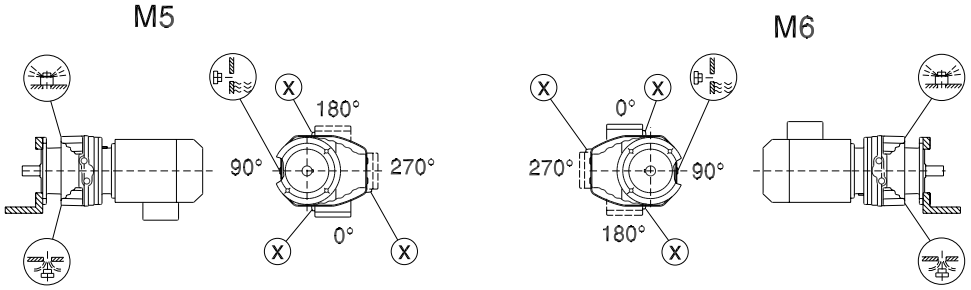
* → page 163

RXF57-RXF107

04 044 02 00



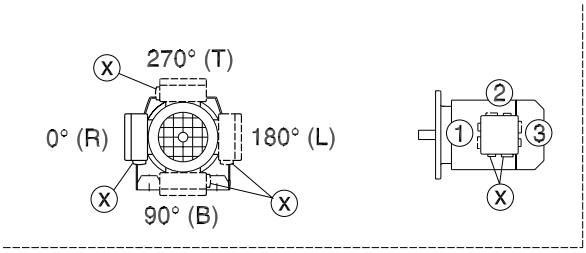


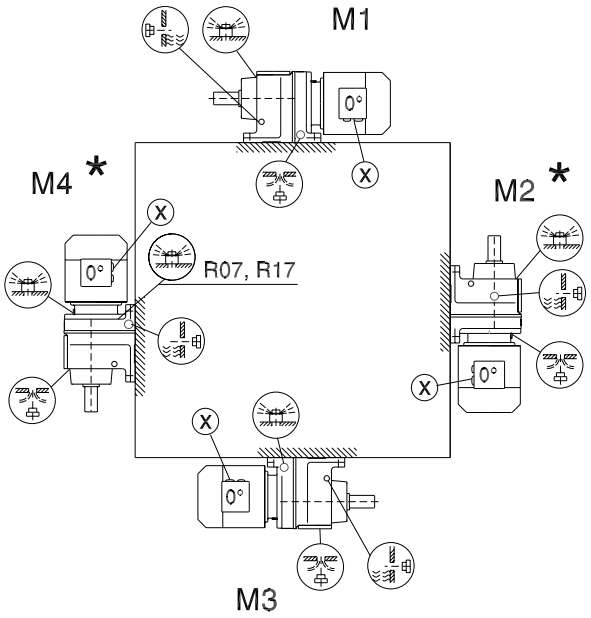


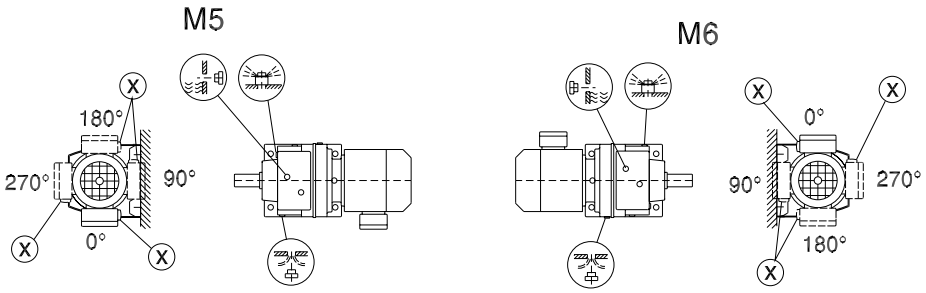
* → page 163

R07-R167

04 040 03 00





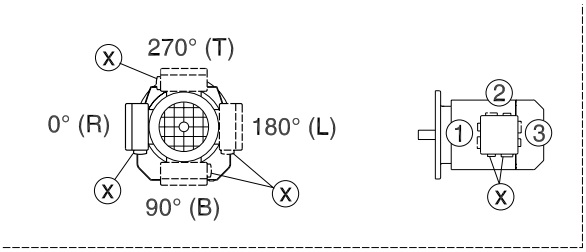


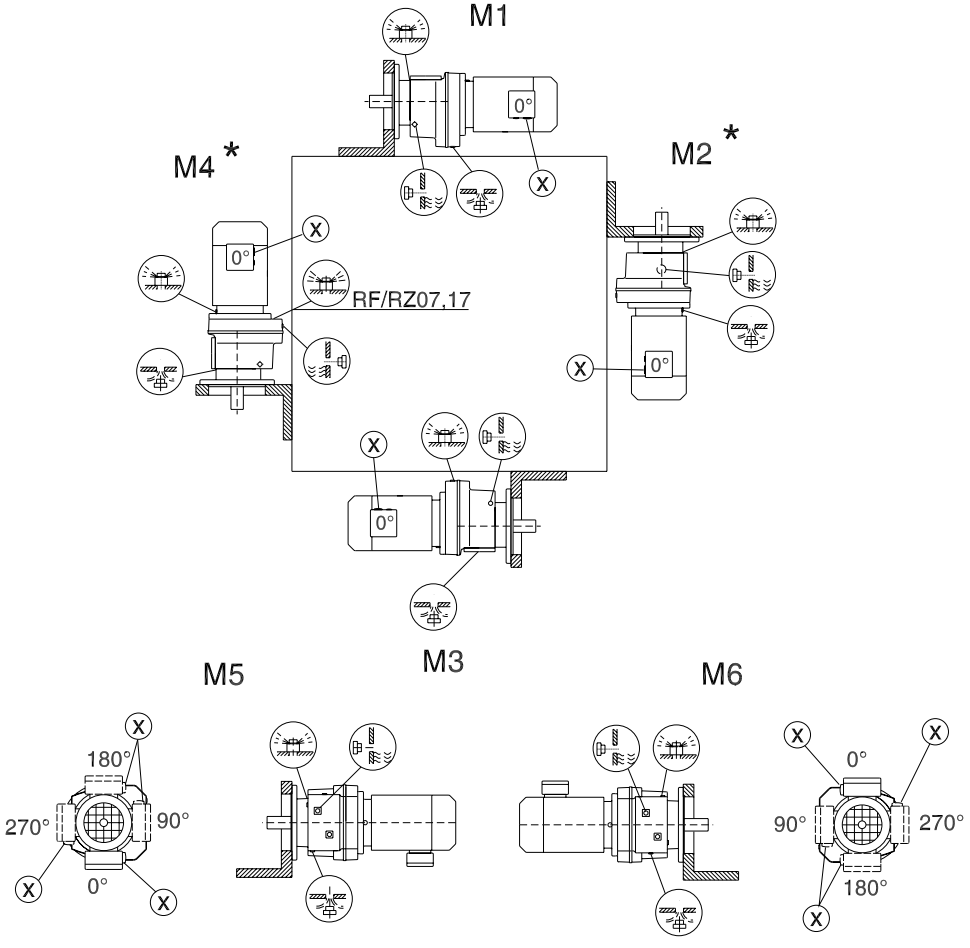
R07		M1, M2 , M3 , M5 , M6
R17, R27		M1, M3 , M5 , M6
R07, R17, R27		
R47, R57		M5

* → page 163

RF07-RF167, RZ07-RZ87

04 041 03 00



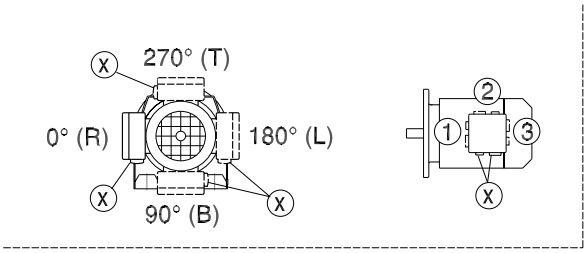


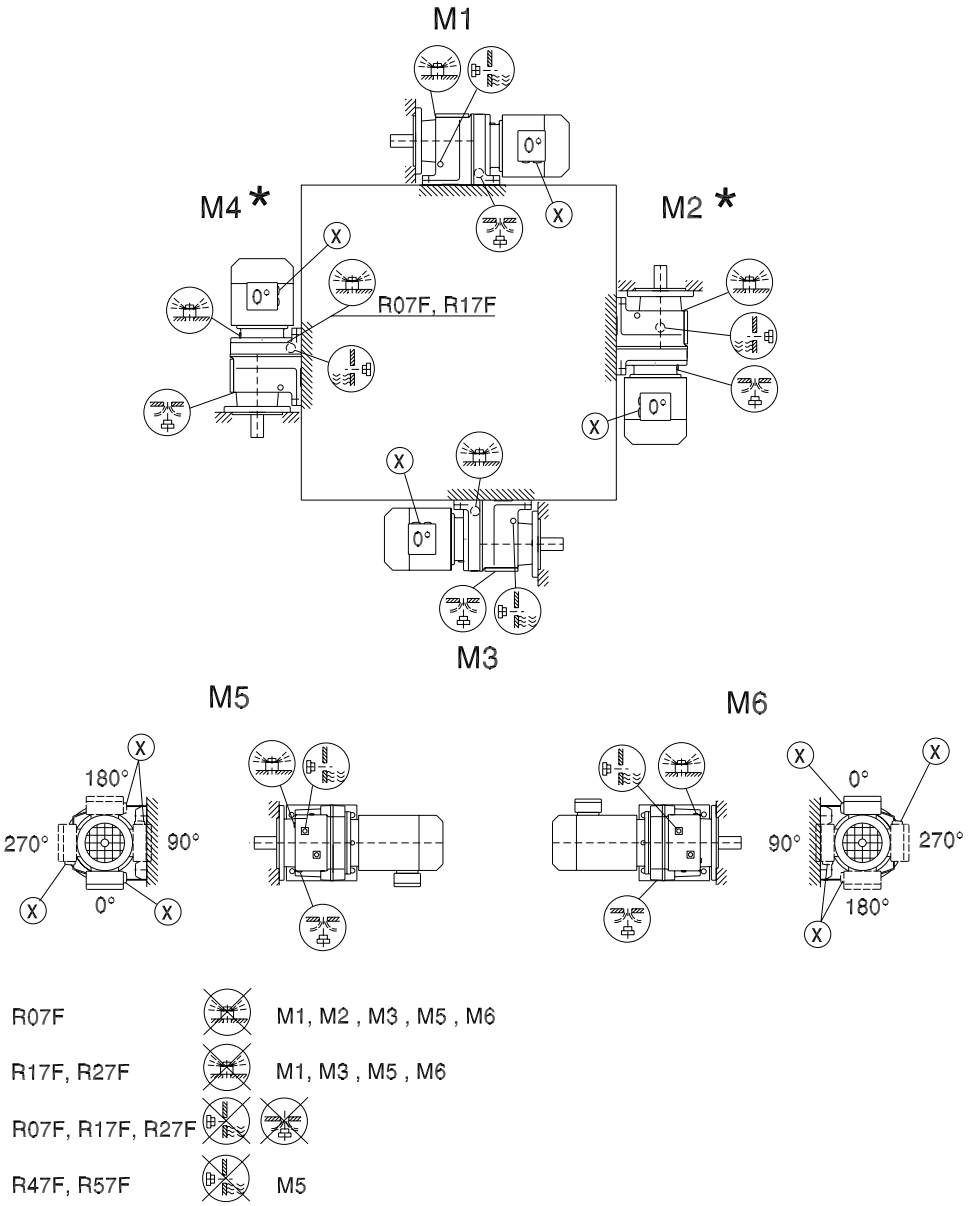
RF/RZ07		M1, M2 , M3 , M5 , M6
RF/RZ17,27		M1, M3 , M5 , M6
RF/RZ07, 17, 27		
RF/RZ47, 57		M5

* → page 163

R07F-R87F

04 042 03 00





R07F		M1, M2 , M3 , M5 , M6
R17F, R27F		M1, M3 , M5 , M6
R07F, R17F, R27F		
R47F, R57F		M5

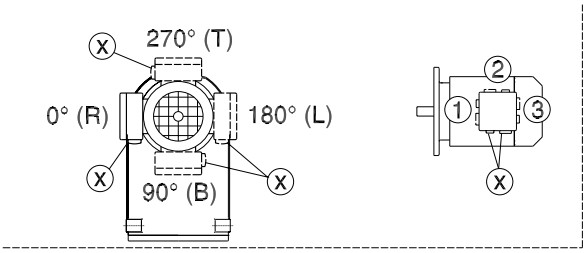
* → page 163

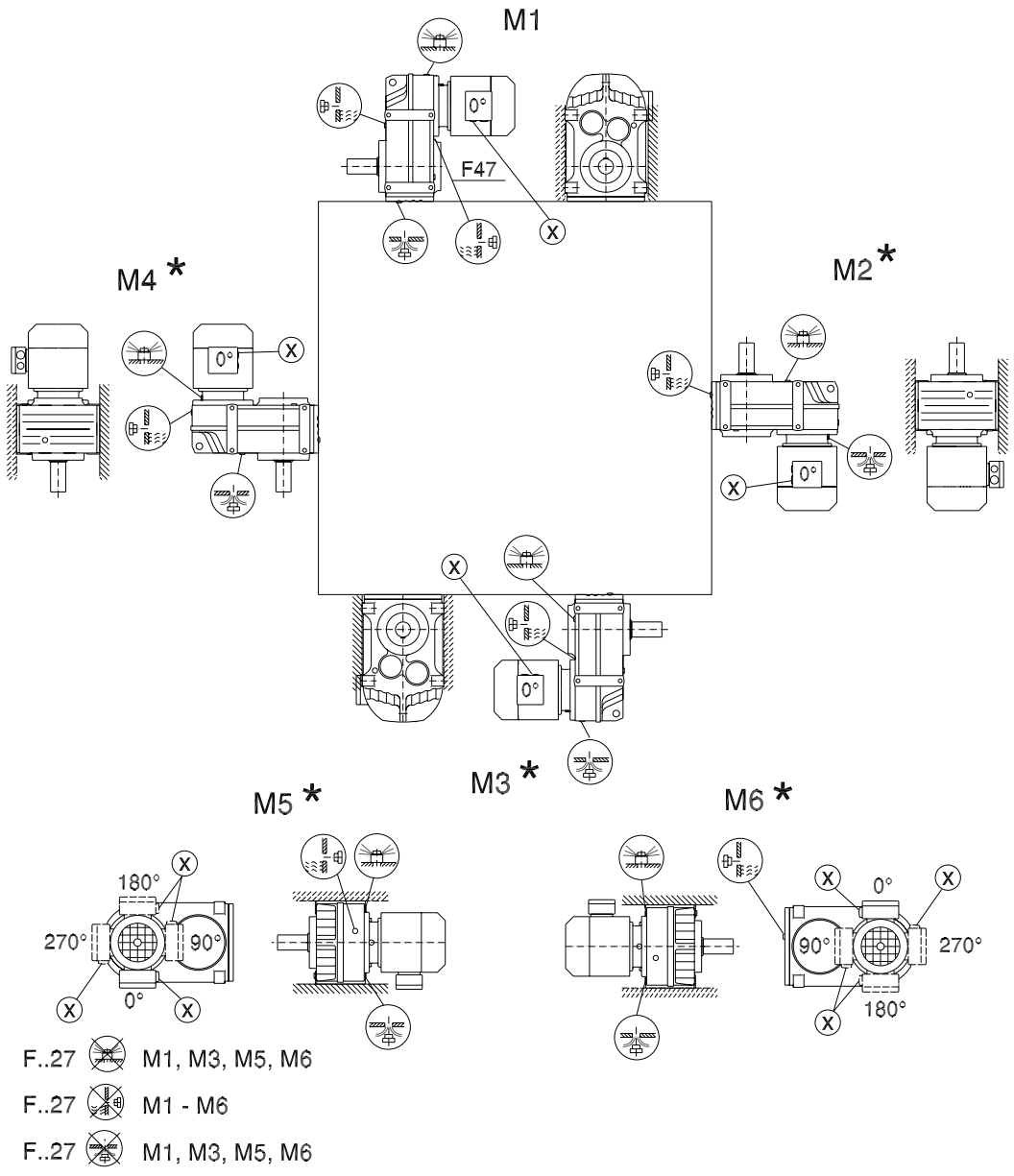
Important: See the (i) information in the "Gearmotors" catalog, section "Project Planning for Gear Units/Overhung and axial loads" (page 36).

9.5 Parallel shaft helical gearmotors

F/FA..B/FH27B-157B, FV27B-107B

42 042 03 00





F..27 M1, M3, M5, M6

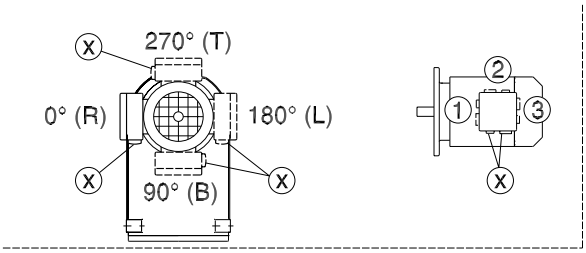
F..27 M1 - M6

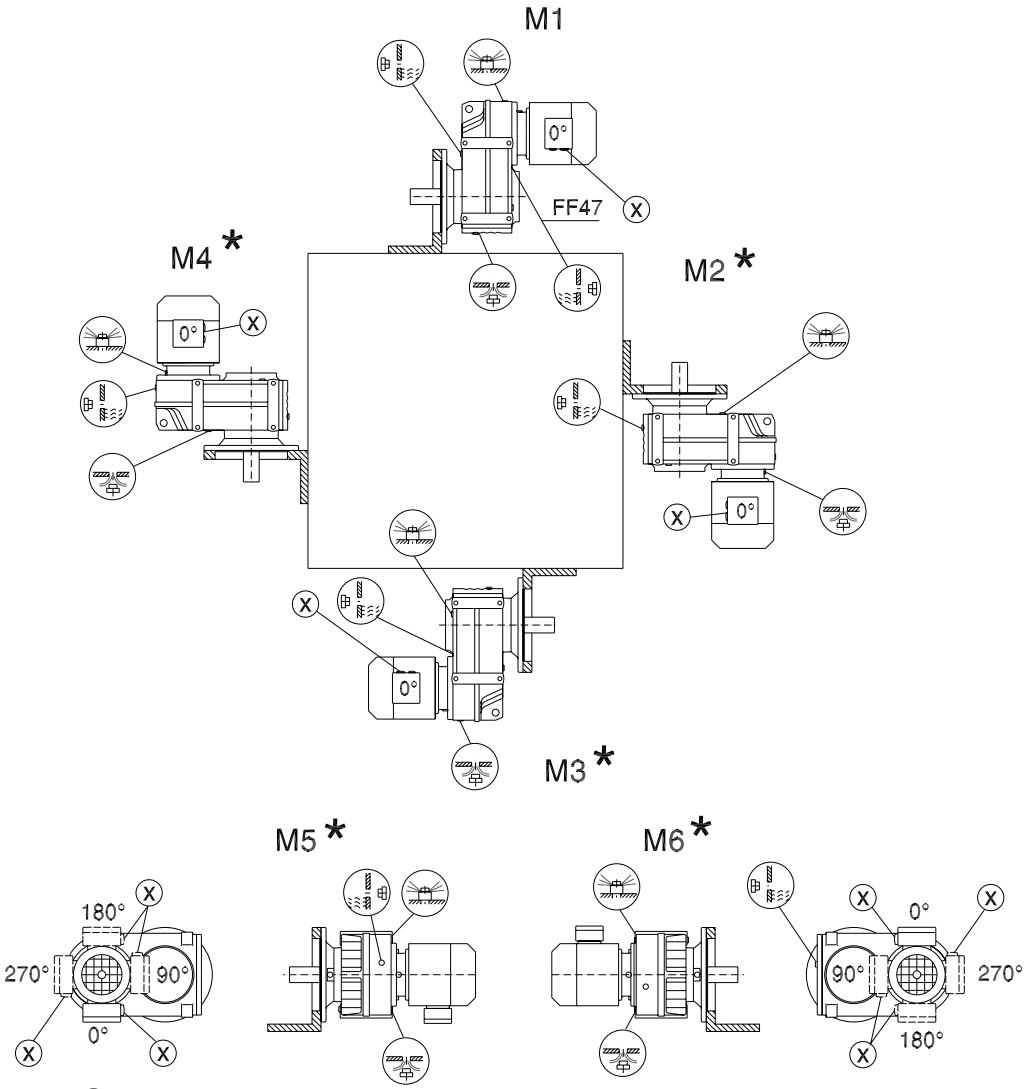
F..27 M1, M3, M5, M6

* → page 163

FF/FAF/FHF/FAZ/FHZ27-157, FVF/FVZ27-107

42 043 03 00





F..27 M1, M3, M5, M6

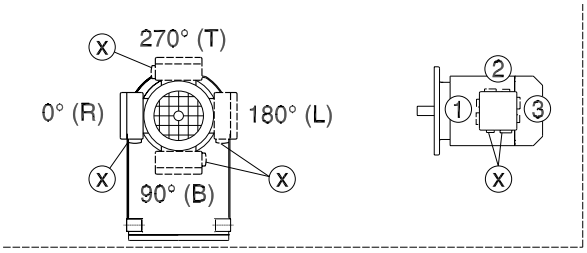
F..27 M1 - M6

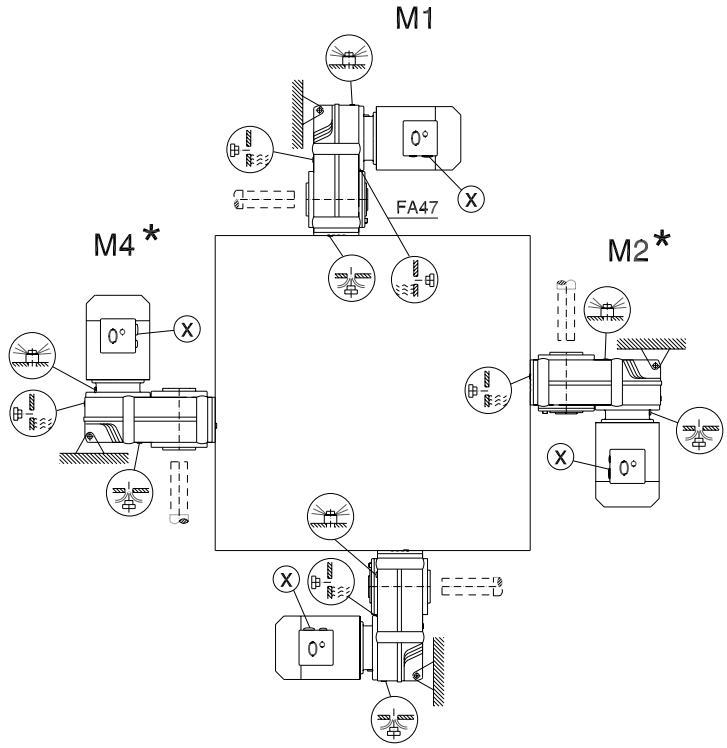
F..27 M1, M3, M5, M6

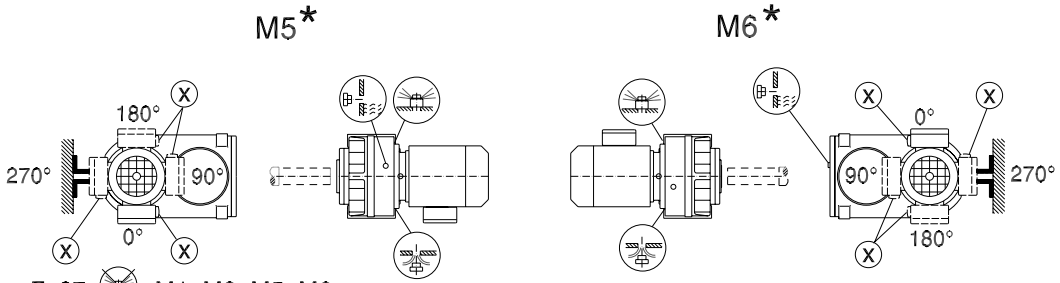
* → page 163

FA/FH27-157, FV27-107, FT37-97

42 044 03 00







F..27 M1, M3, M5, M6

F..27 M1 - M6

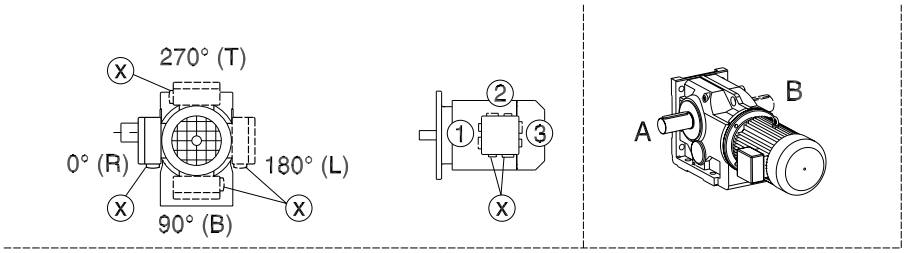
F..27 M1, M3, M5, M6

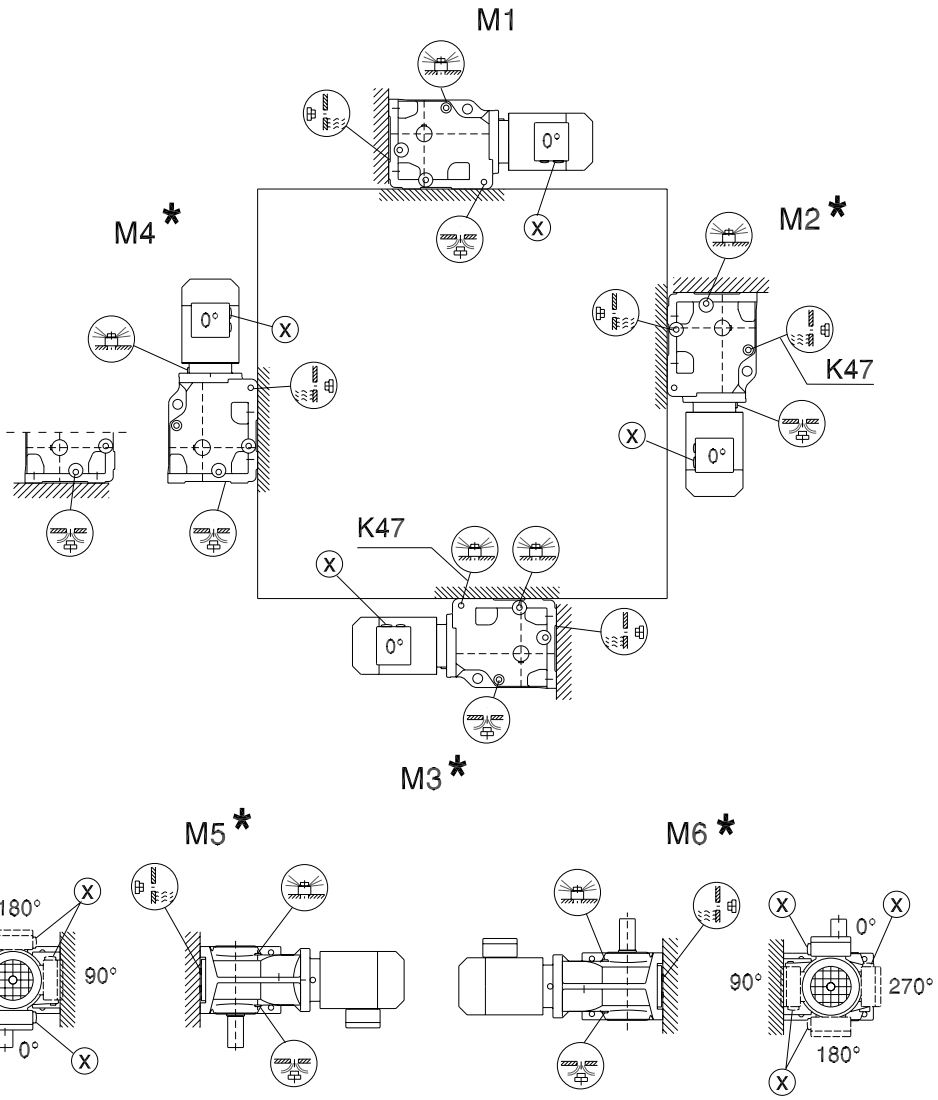
* → page 163

9.6 Mounting positions of helical-bevel gearmotors

K/KA..B/KH37B-157B, KV37B-107B

34 025 03 00



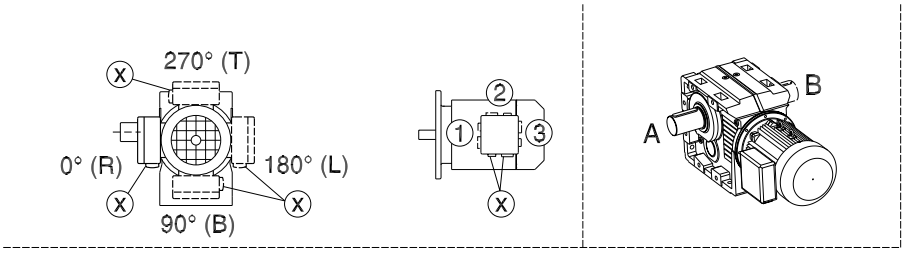


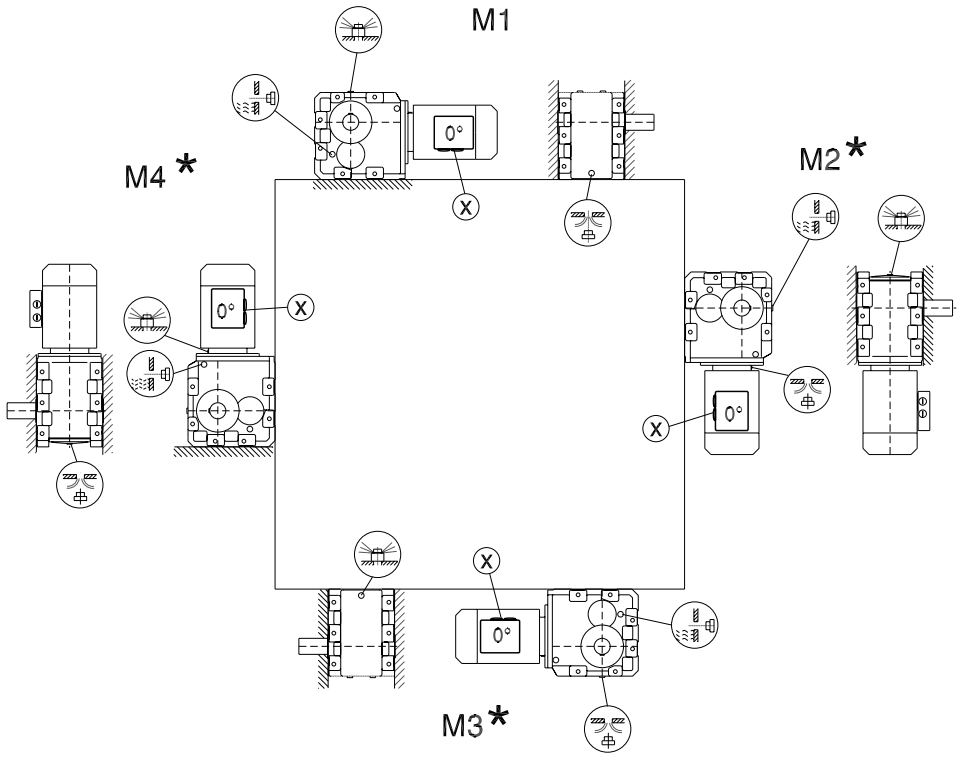
* → page 163

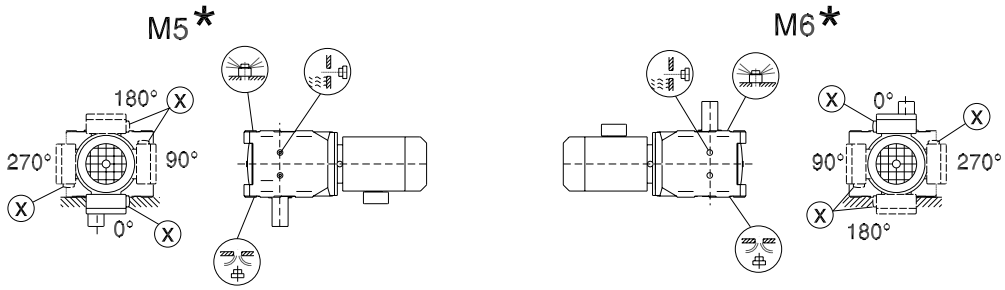
Important: See the ⓘ information in the "Gearmotors" catalog, section "Project Planning for Gear Units/Overhung and axial loads" (page 36).

K167-187, KH167B-187B

34 026 03 00





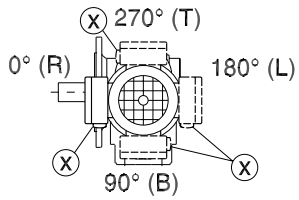


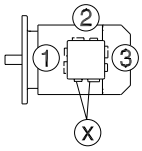
* → page 163

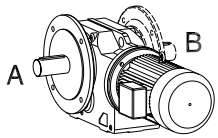
Important: See the ⓘ information in the "Gearmotors" catalog, section "Project Planning for Gear Units/Overhung and axial loads" (page 36).

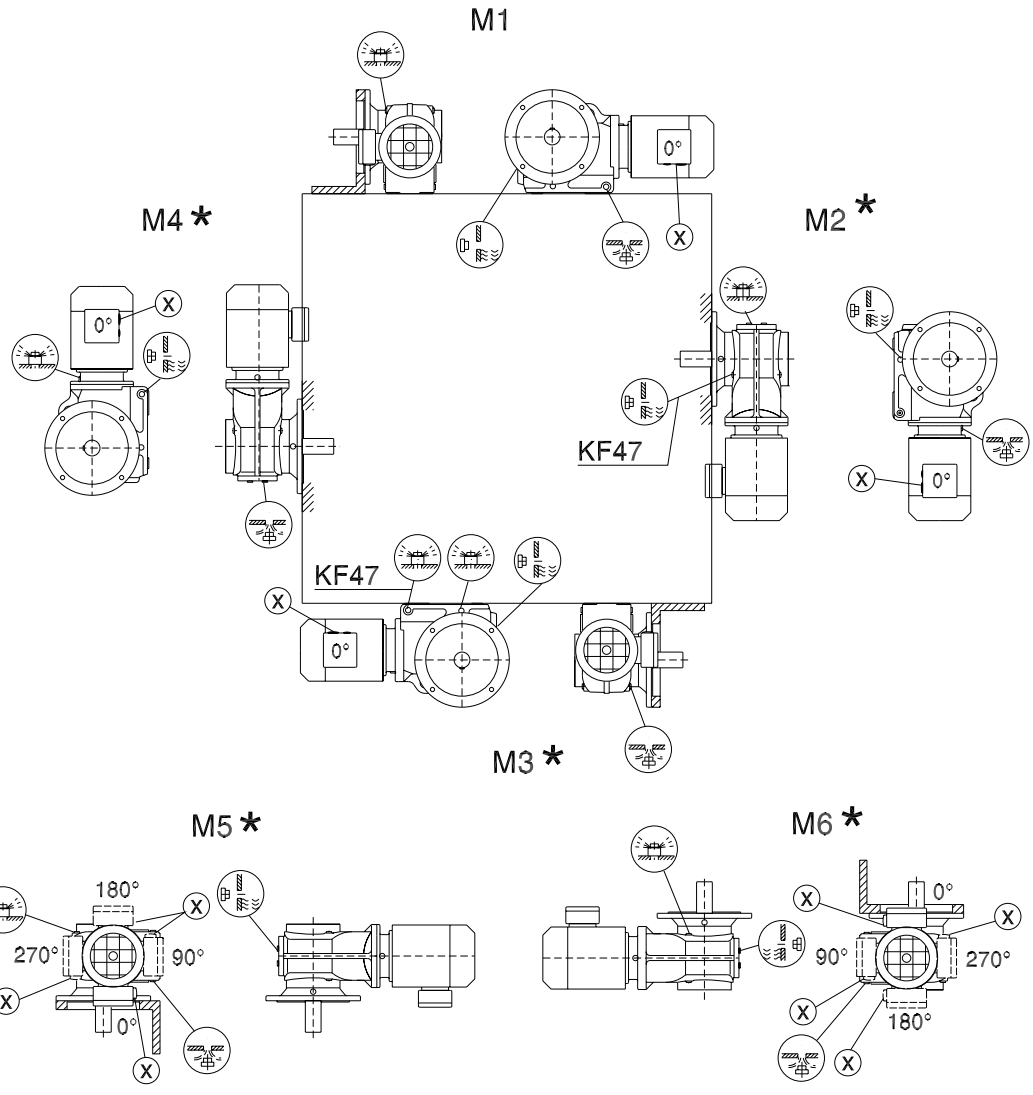
KF/KAF/KHF/KAZ/KHZ37-157, KVF/KVZ37-107

34 027 03 00





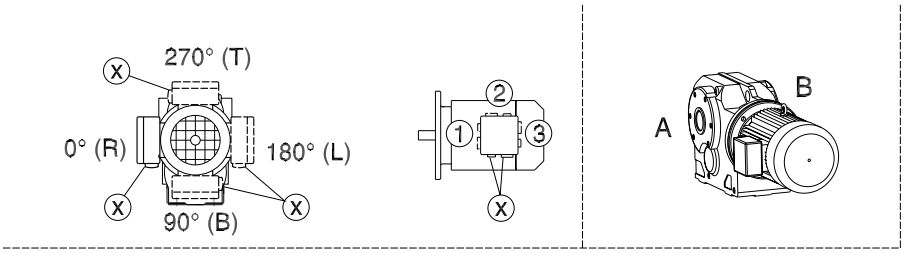


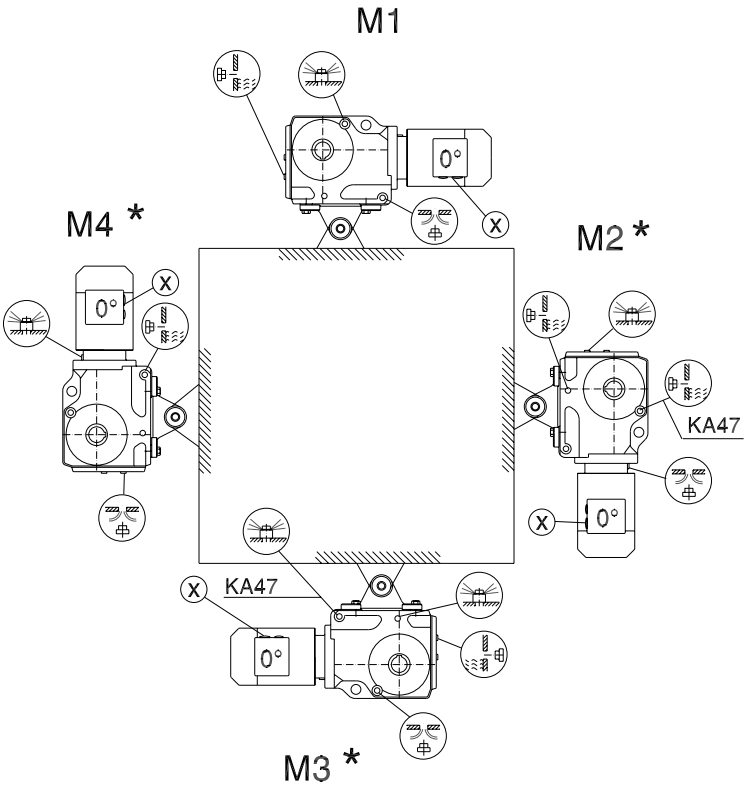


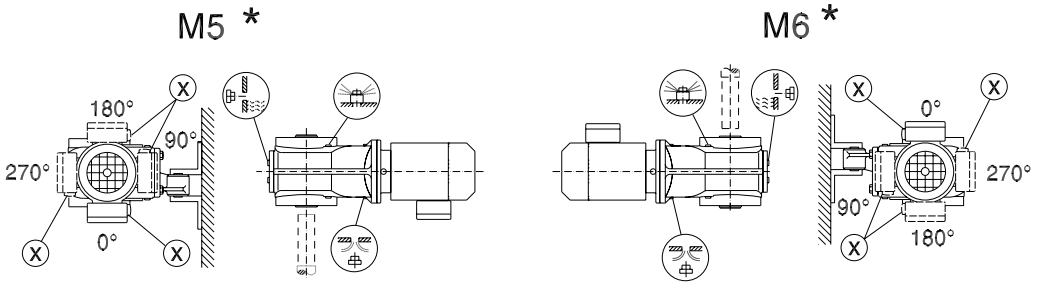
* → page 163

KA/KH37-157, KV37-107, KT37-97

39 025 04 00

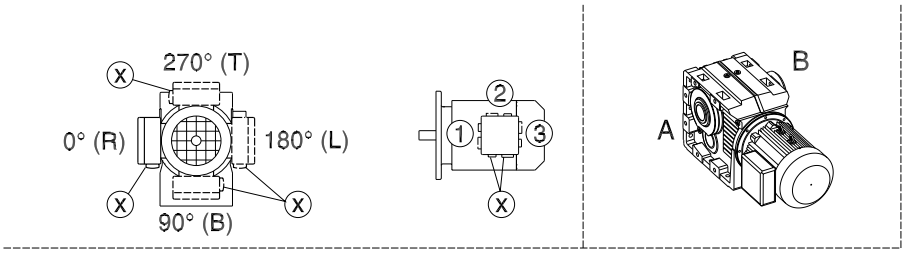


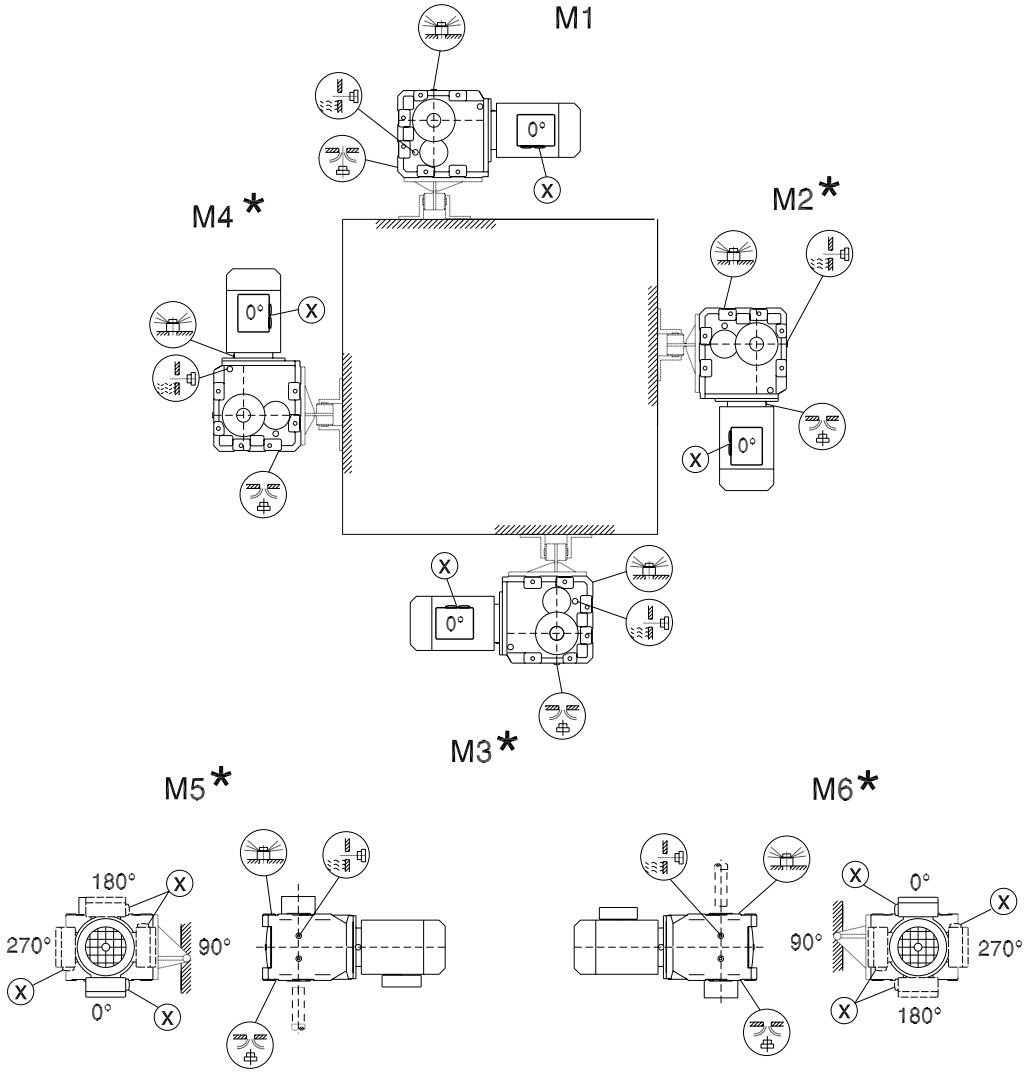




* → page 163

KH167-187

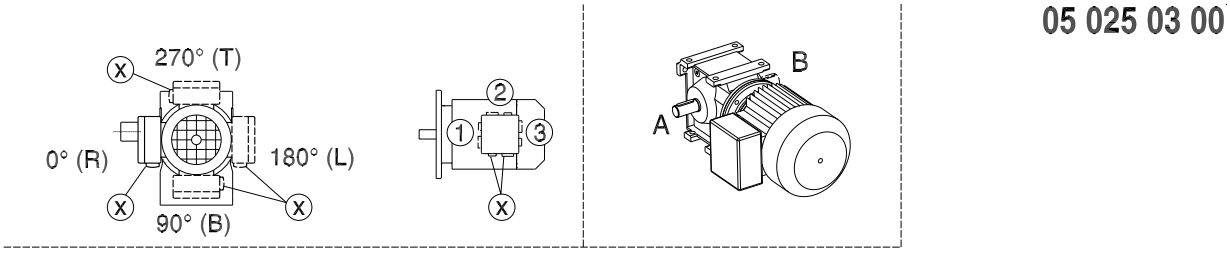


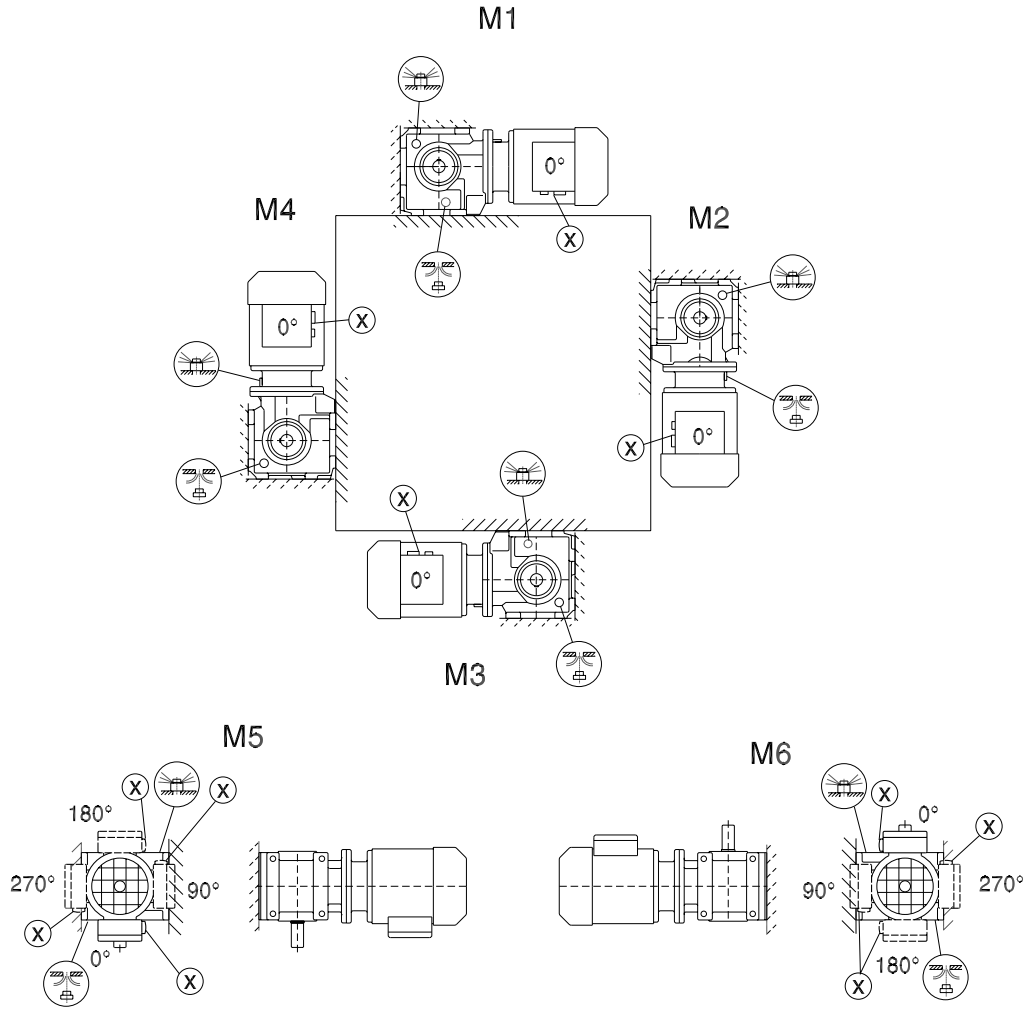


* → page 163

9.7 Mounting positions of helical-worm gearmotors

S37

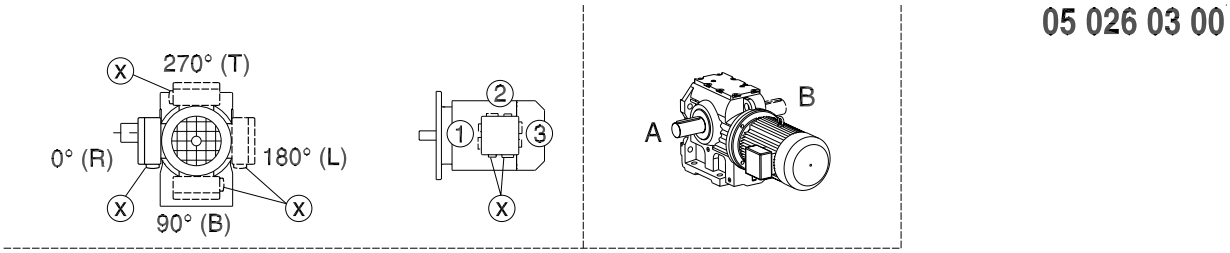


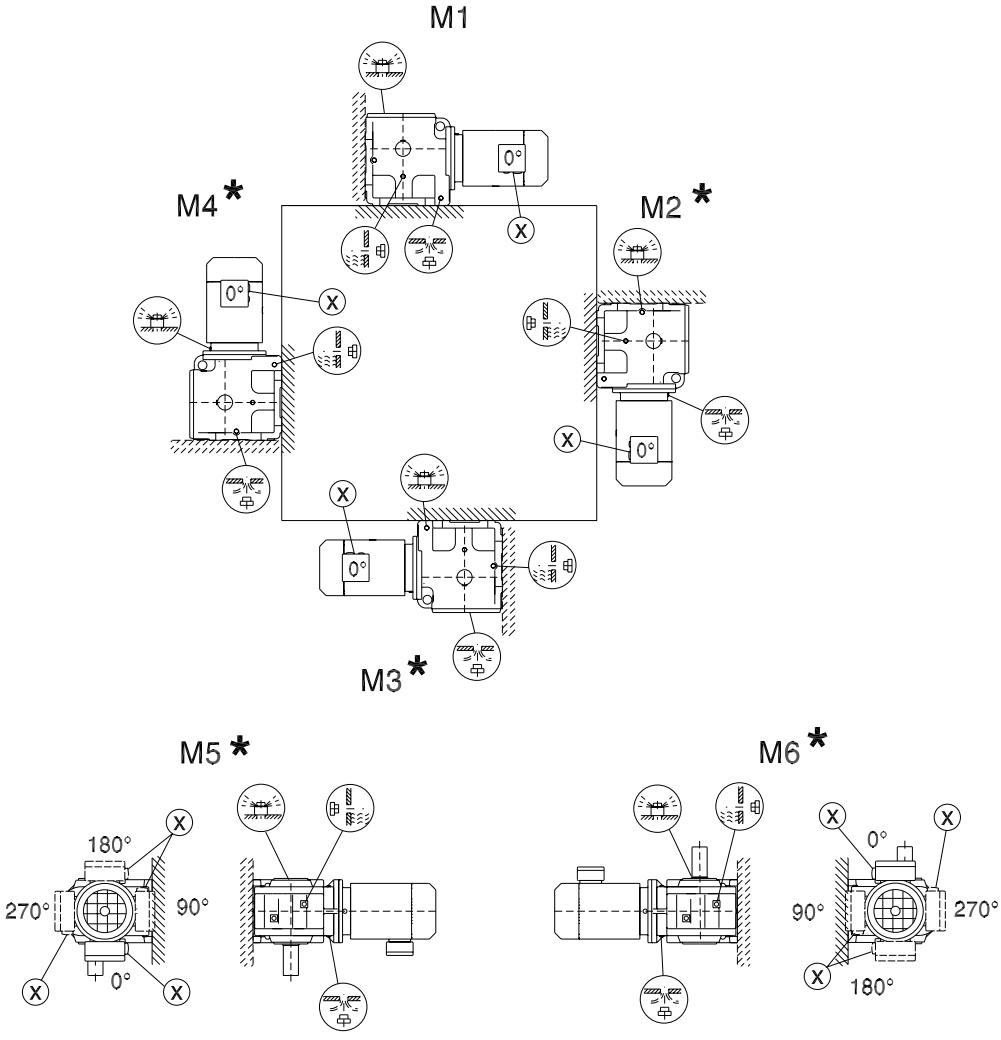


* → page 163

Important: See the (i) information in the "Gearmotors" catalog, section "Project Planning for Gear Units/Overhung and axial loads" (page 36).

S47 - S97

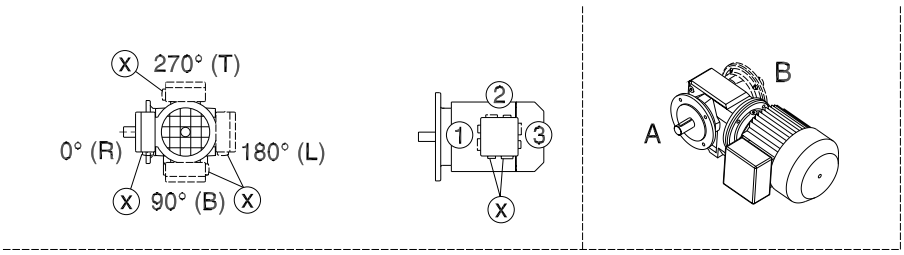


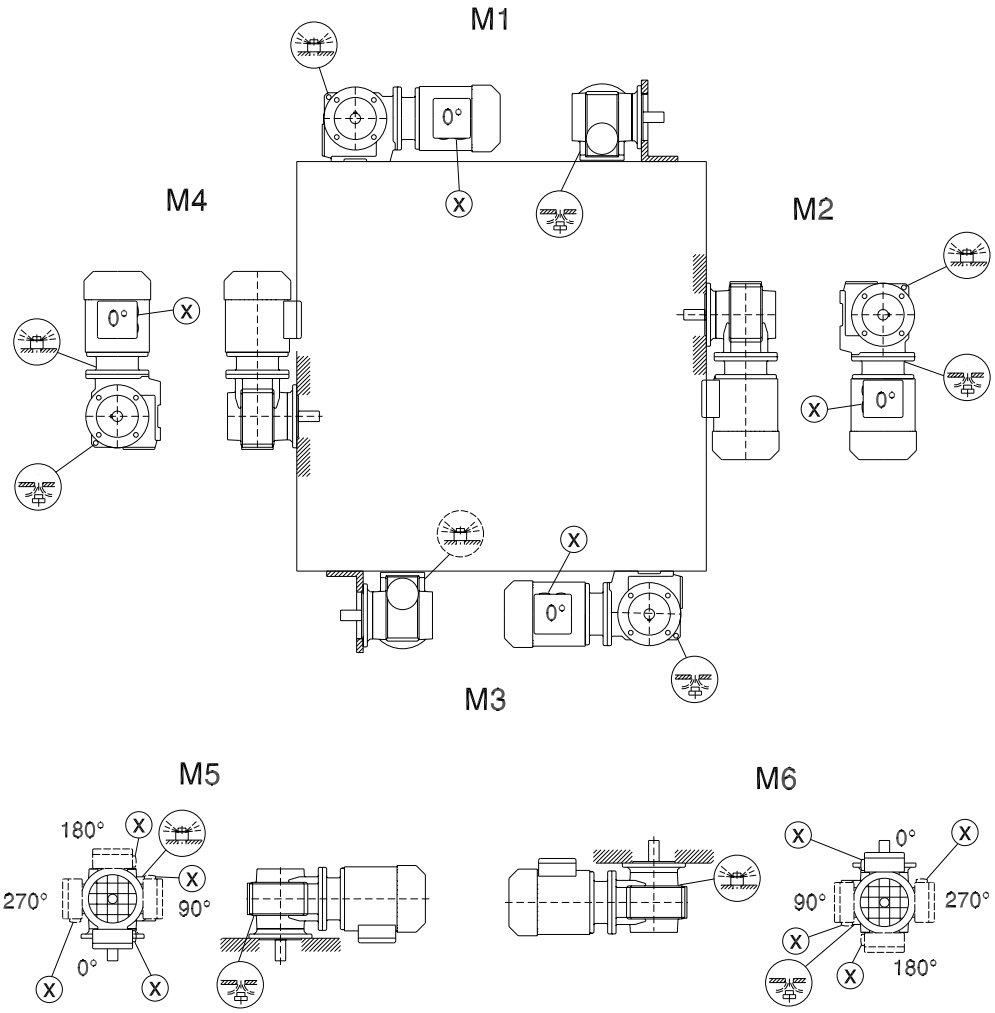


* → page 163

Important: See the (i) information in the "Gearmotors" catalog, section "Project Planning for Gear Units/Overhung and axial loads" (page 36).

SF/SAF/SHF37





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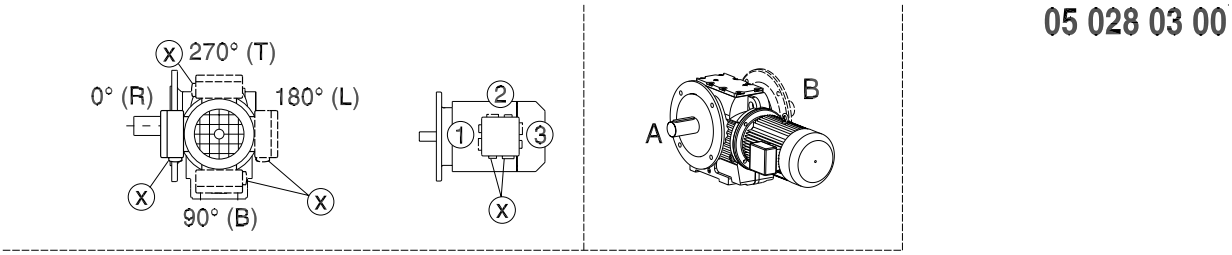
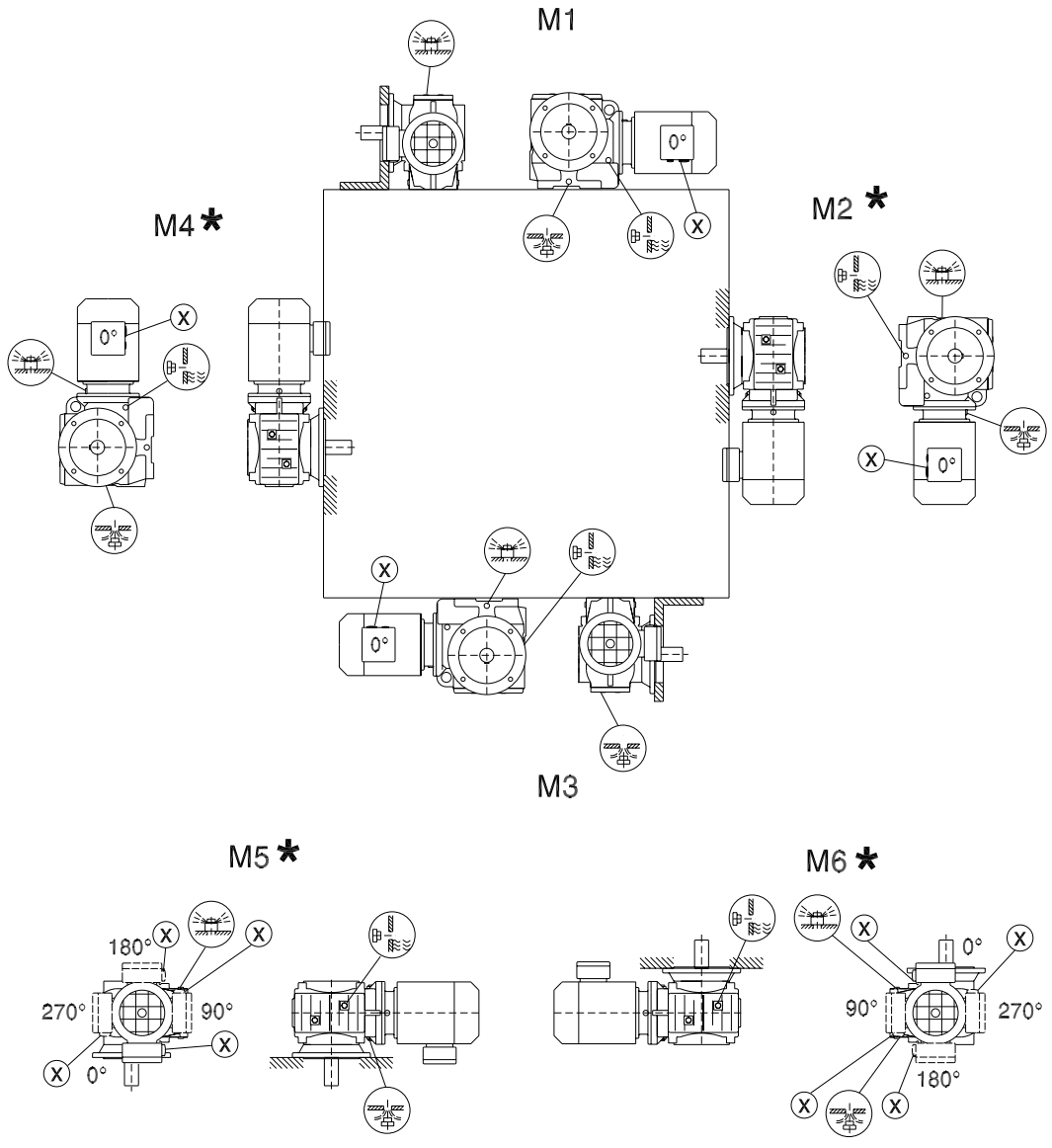
SF/SAF/SHF/SAZ/SHZ47-97

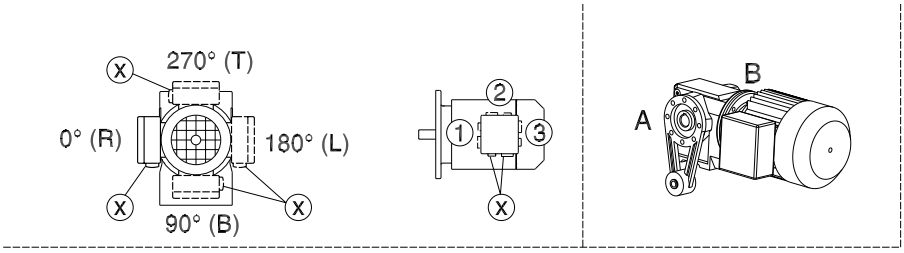


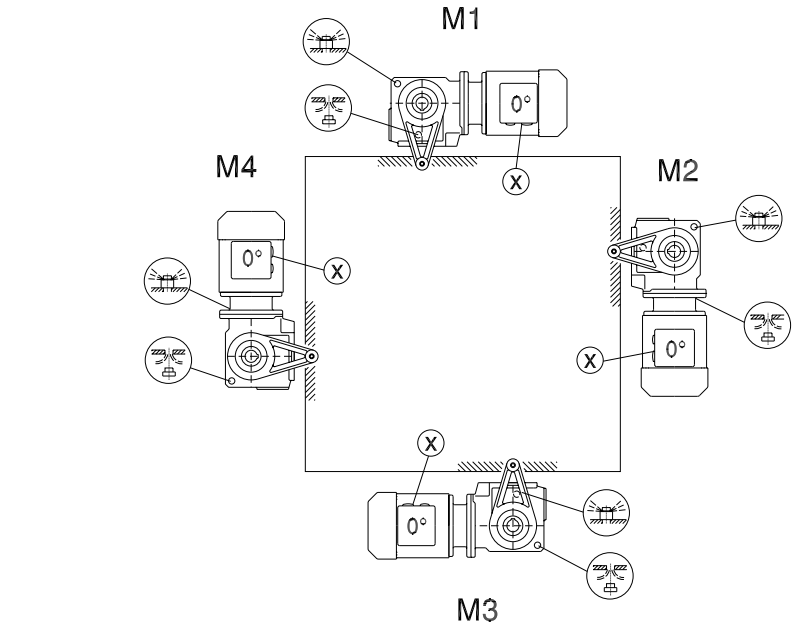


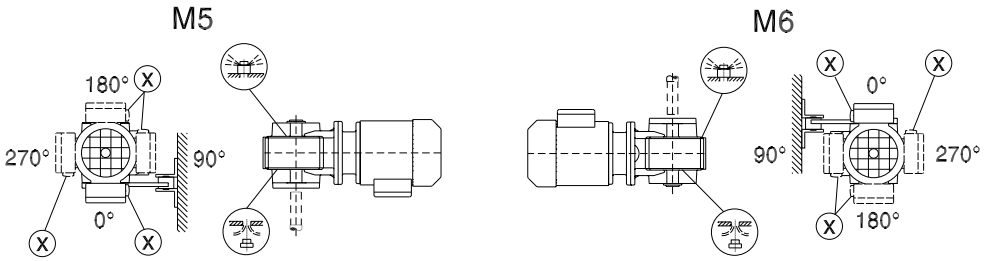
* → page 163

SA/SH/ST37

28 020 04 00







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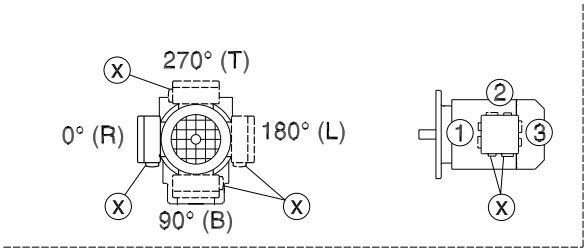
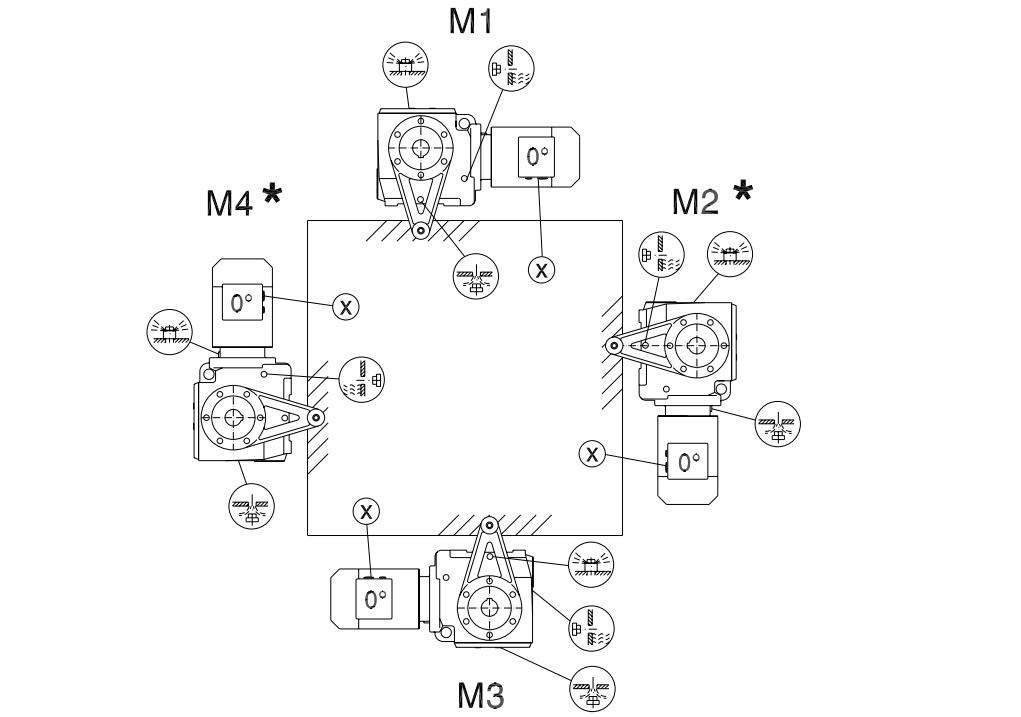
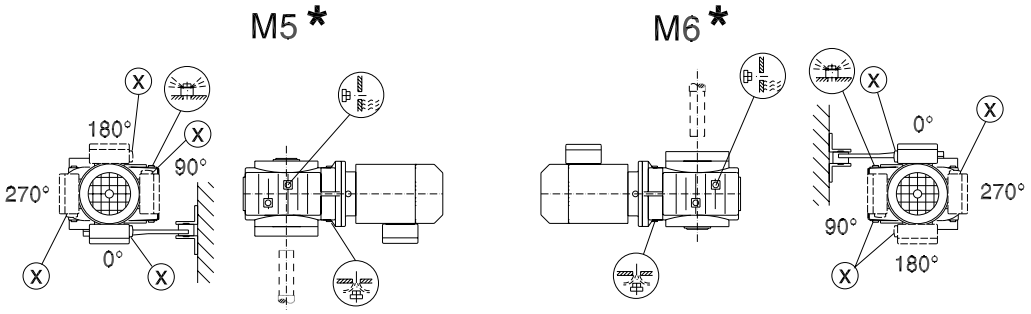
SA/SH/ST47-97

28 021 03 00







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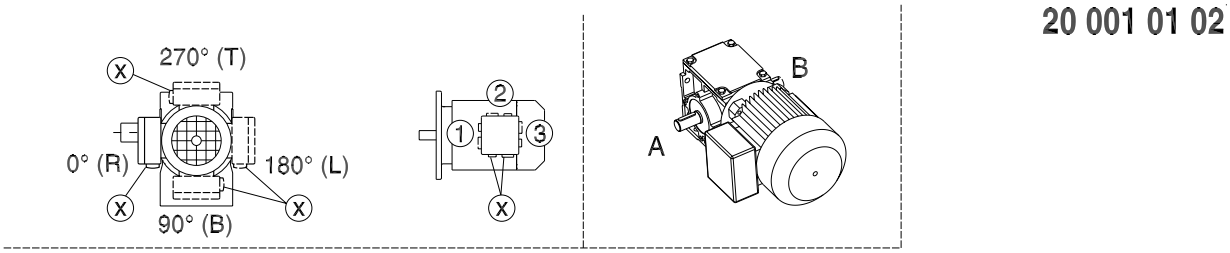
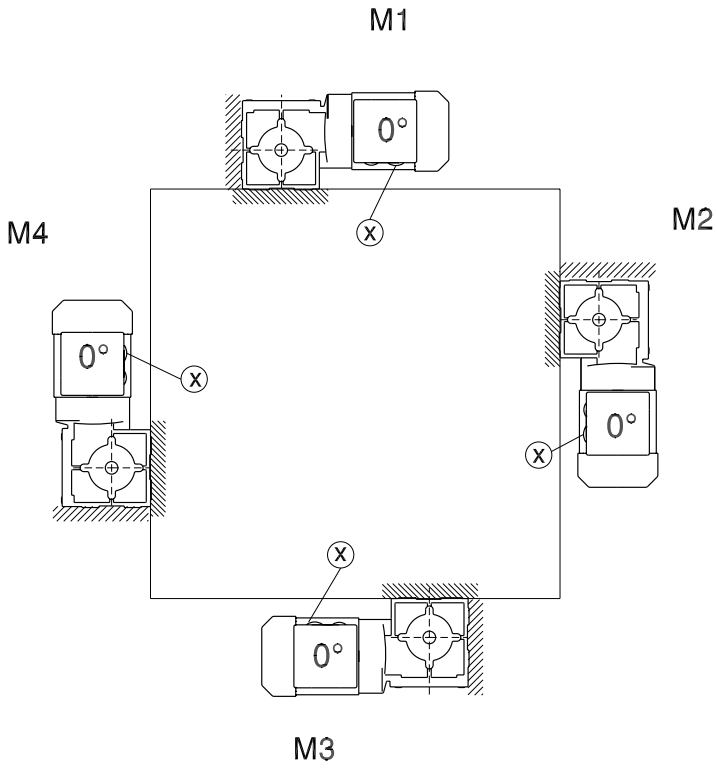
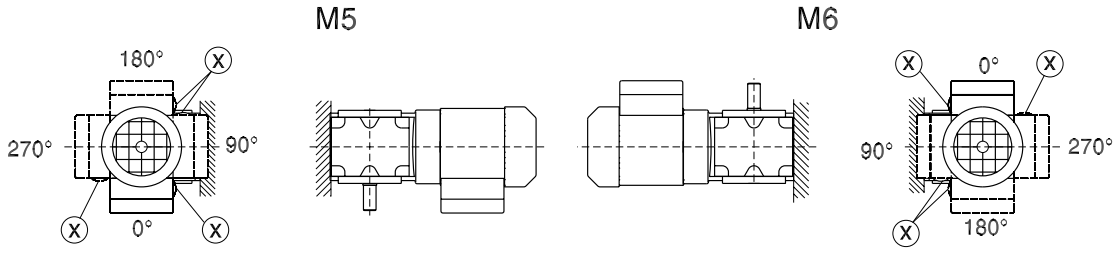
9.8 Mounting positions of Spiroplan® gearmotors

W10-30







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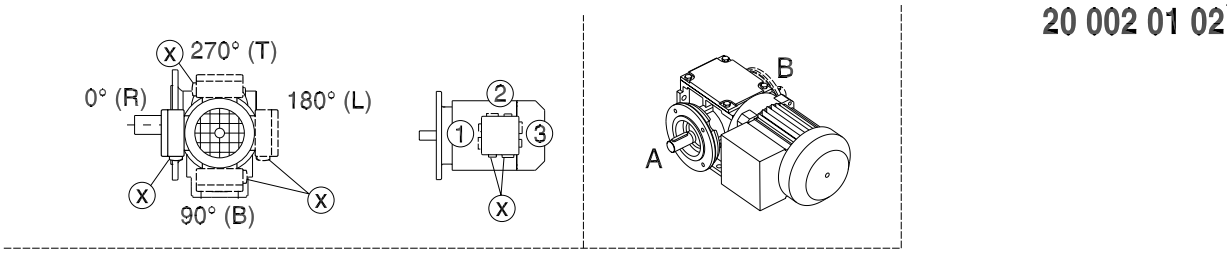
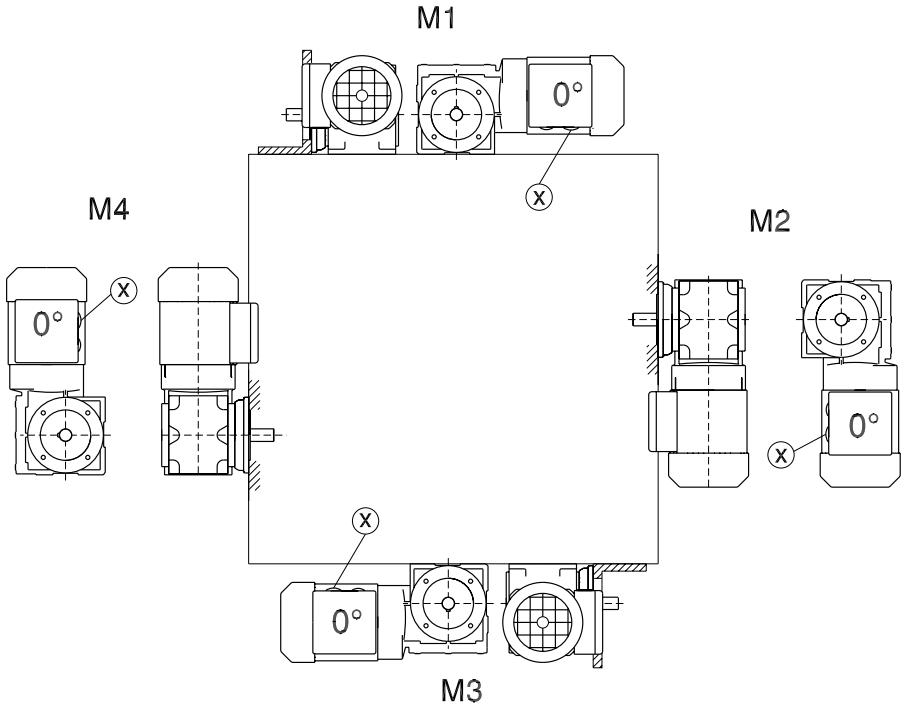
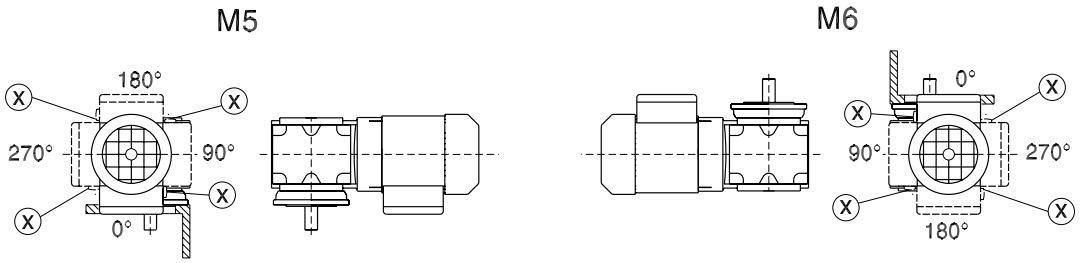
WF10-30







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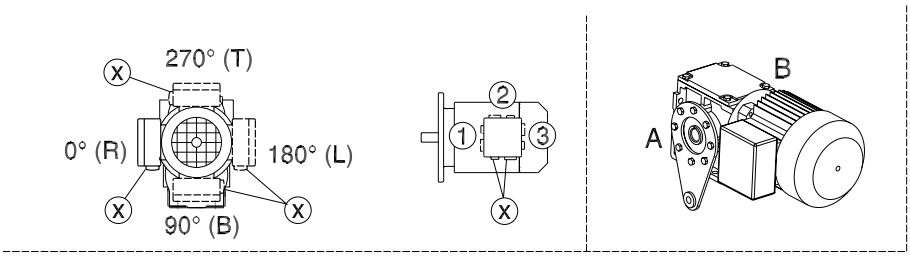
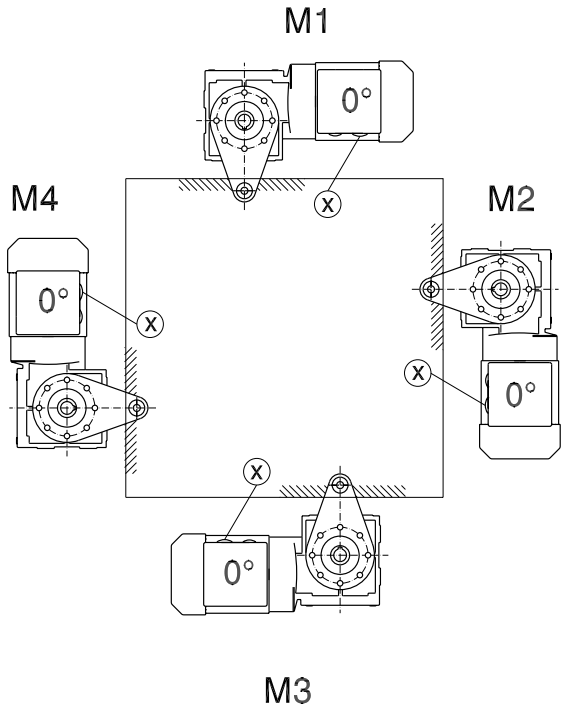
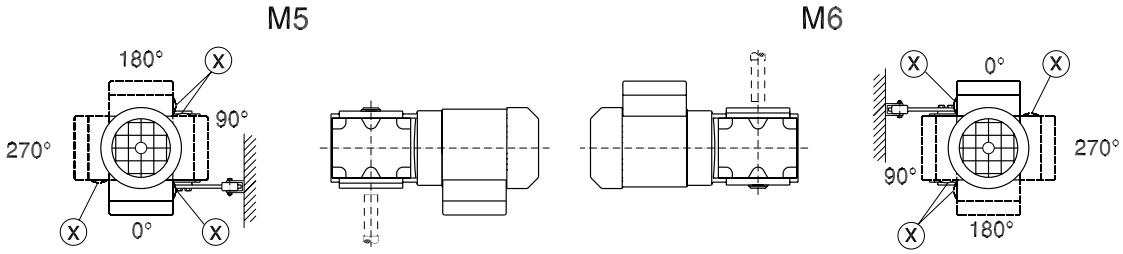
WA10-30

20 003 02 02







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9.9 Mounting position designations AC motor

Position of motor terminal box and cable entry

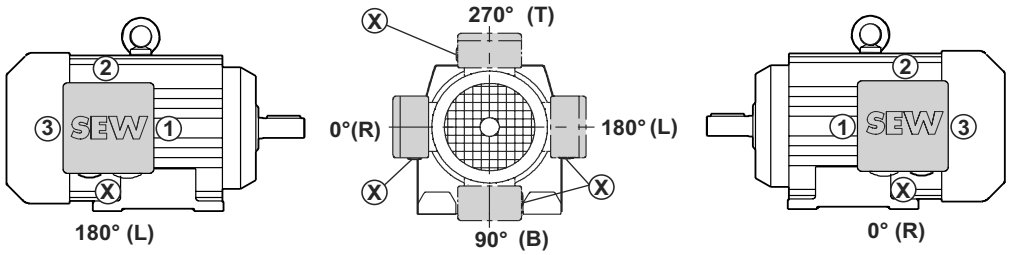

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Figure 94: Position of terminal box and cable entry

Mounting positions

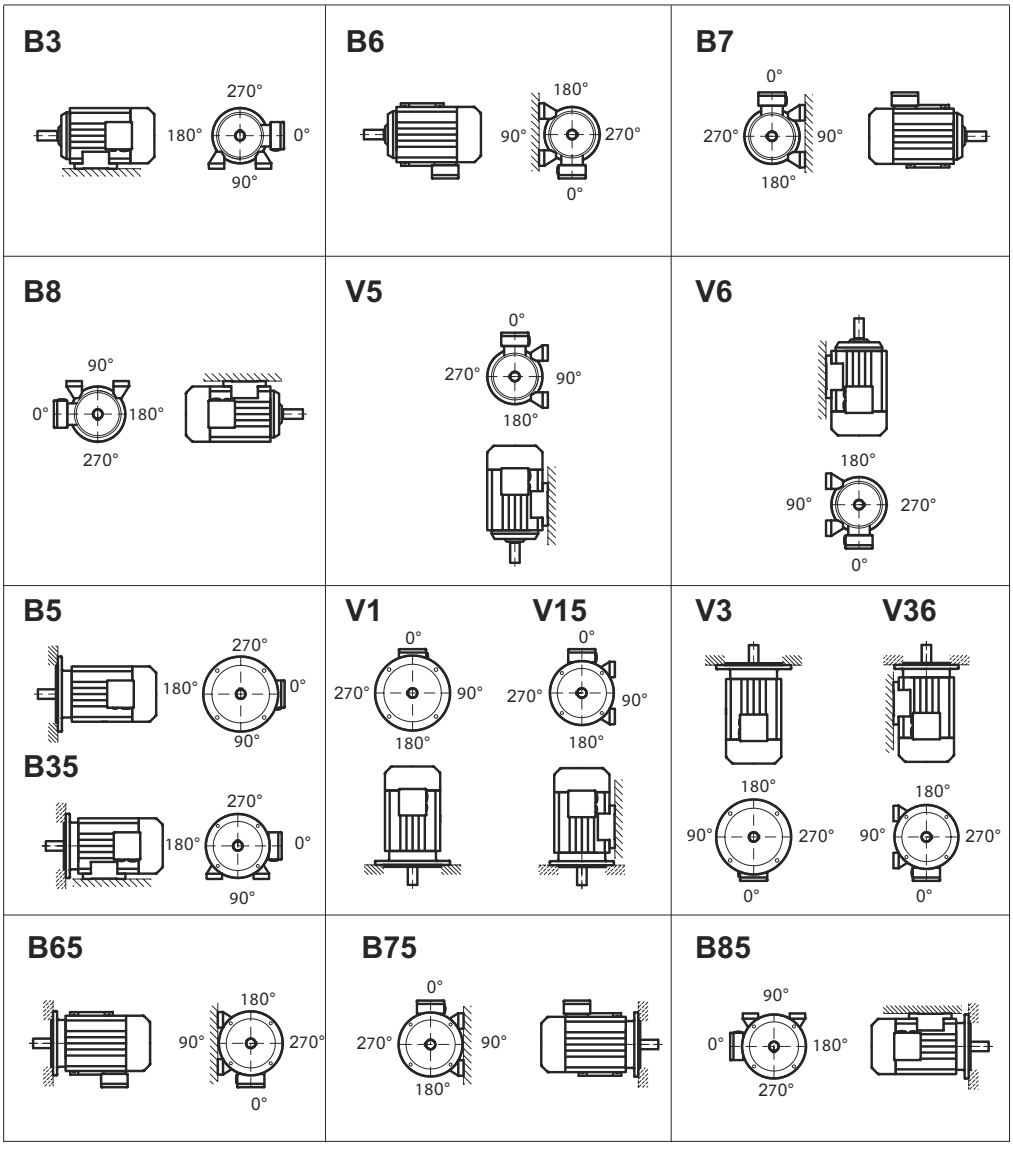

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Figure 95: Mounting positions of AC motors

9.10 Mounting position designation MOVIMOT® drives

Position of terminal box and cable entry

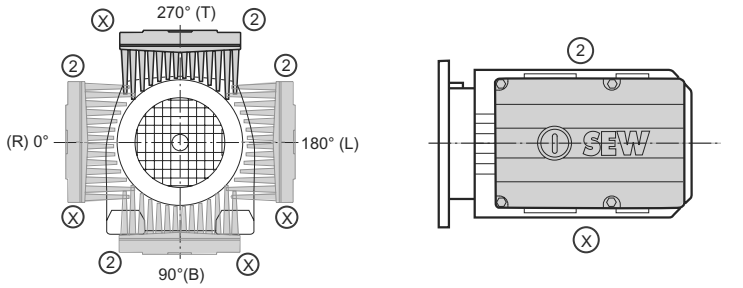


Figure 96: Position of terminal box and cable entry

Mounting positions

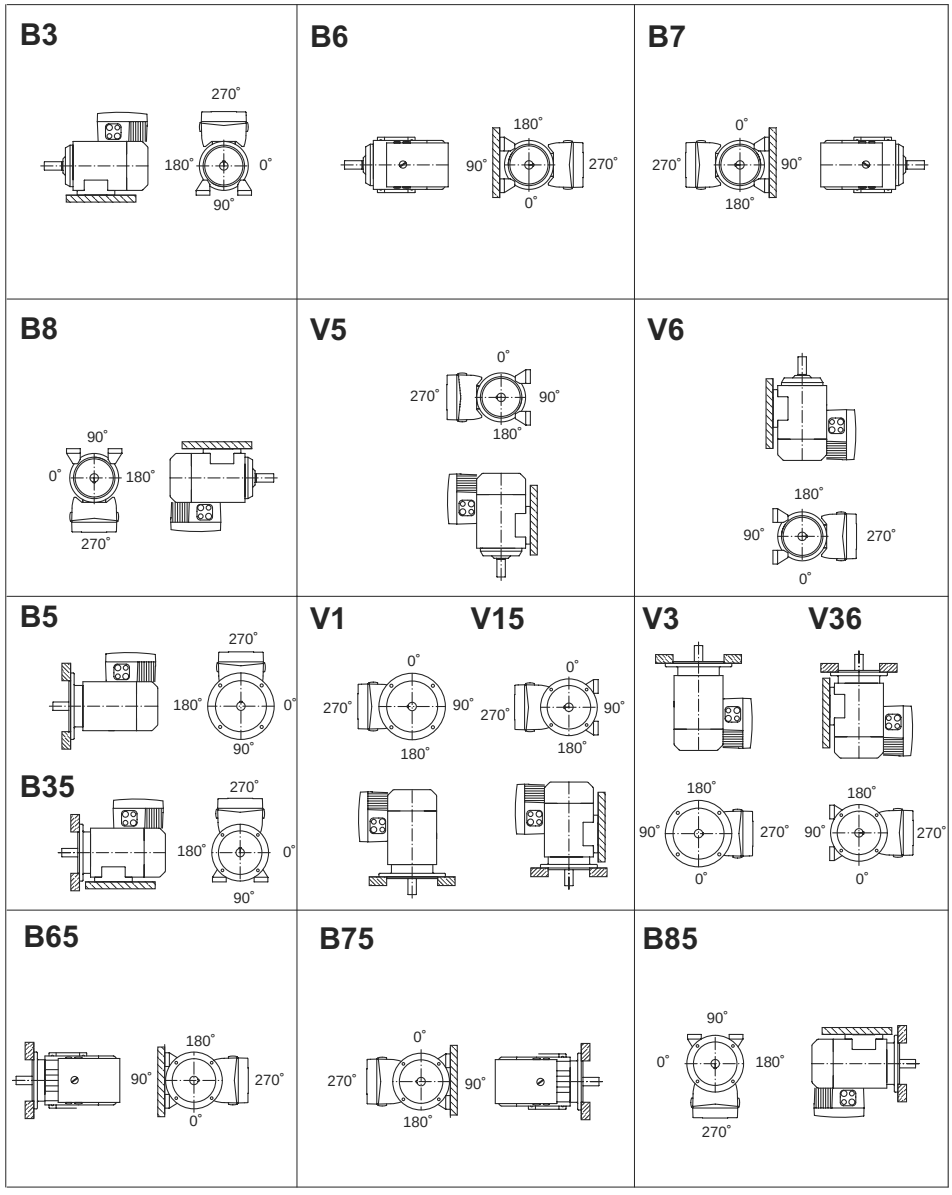
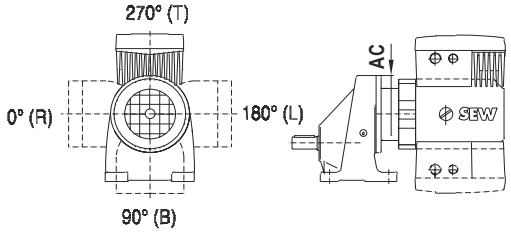


Figure 97: Mounting positions of MOVIMOT® drives

9.11 Position terminal box and cable entry (MOVIMOT® drives)

RX..DT/DV..MM..



RXF..DT/DV..MM..

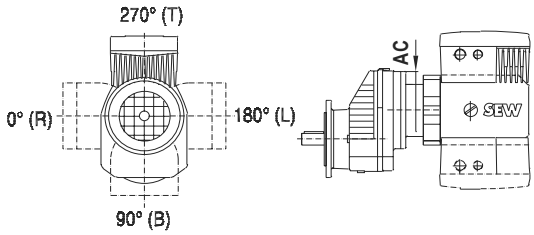


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Figure 98: Possible terminal box positions RX..D..MM..

Gear unit	Motor	AC	0°	90°	180°	270°[1]	Gear unit	Motor	AC	0°	90°	180°	270°[1]
RX57	DT71D MM..	Ø 160		[2]			RXF57	DT71D MM..	Ø 160				
	DT80..MM..			[2]				DT80..MM..					
	DT90..MM..			[2]				DT90..MM..					
	DV100..MM..			[2]				DV100..MM..					
RX67	DT71D MM..	Ø 160		[2]			RXF67	DT71D MM..	Ø 160				
	DT80..MM..			[2]				DT80..MM..					
	DT90..MM..			[2]				DT90..MM..					
	DV100..MM..			[2]				DV100..MM..					
RX77	DT80..MM..	Ø 200		[2]			RXF77	DT80..MM..	Ø 200				
	DT90..MM..			[2]				DT90..MM..					
	DV100..MM..			[2]				DV100..MM..					
RX87	DT80..MM..	Ø 250					RXF87	DT80..MM..	Ø 250				
	DT90..MM1..			[2]				DT90..MM1..					
	DV100..MM..			[2]				DV100..MM..					
RX97	DT80..MM..	Ø 300					RXF97	DT80..MM..	Ø 300				
	DT90..MM1..							DT90..MM1..					
	DV100..MM..							DV100..MM..					
RX107	DV100..MM..	Ø 350					RXF107	DV100..MM..	Ø 350				

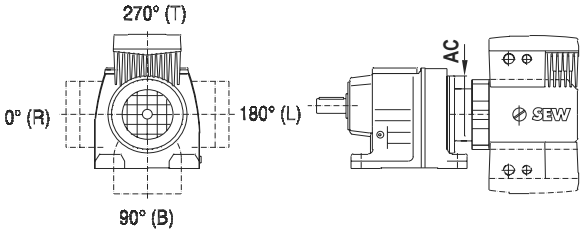
1) Standard position

2) Gear unit must be mounted on a base

Possible terminal box position

When using plug connectors/MOVIMOT® options, the number of possible positions can be even more limited. Please contact SEW-EURODRIVE.

R..DT/DV..MM..



RF/RZ..DT/DV..MM..

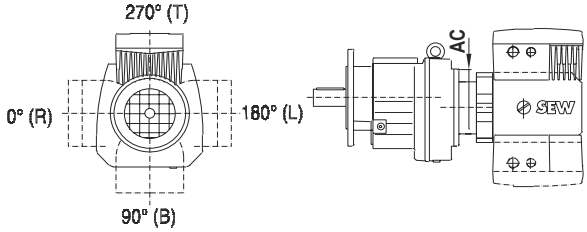


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Figure 99: Possible terminal box positions R..D..MM..

Gear unit	Motor	AC	0°	90°	180°	270°[1]	Gear unit	Motor	AC	0°	90°	180°	270°[1]
R07	DT71D MM..	Ø 135	2)	2)	2)	2)	RF/RZ07	DT71D MM..	Ø 135				
R17	DT71D MM..	Ø 135		2)			RF/RZ17	DT71D MM..	Ø 135				
	DT80..MM..			2)				DT80.. MM..					
R27	DT71D MM..	Ø 120					RF/RZ27	DT71D MM..	Ø 120				
	DT80..MM..			2)				DT80..MM..					
	DT90..MM..		2)	2)	2)	2)		DT90..MM..					
	DV100..MM..		2)	2)	2)	2)		DV100..MM..					
R37	DT71D MM..	Ø 120		2)			RF/RZ37	DT71D MM..	Ø 120				
	DT80..MM..			2)				DT80..MM..					
	DT90..MM..		2)	2)	2)	2)		DT90..MM..					
	DV100..MM..		2)	2)	2)	2)		DV100..MM..					
R47	DT71D MM..	Ø 160					RF/RZ47	DT71D MM..	Ø 160				
	DT80..MM..			2)				DT80..MM..					
	DT90..MM..			2)				DT90..MM..					
	DV100..MM..			2)				DV100..MM..					
R57	DT71D MM..	Ø 160					RF/RZ57	DT71D MM..	Ø 160				
	DT80..MM..			2)				DT80..MM..					
	DT90..MM..			2)				DT90..MM..					
	DV100..MM..			2)				DV100..MM..					
R67	DT71D MM..	Ø 160					RF/RZ67	DT71D MM..	Ø 160				
	DT80..MM..			2)				DT80..MM..					
	DT90..MM..			2)				DT90..MM..					
	DV100..MM..			2)				DV100..MM..					
R77	DT80..MM..	Ø 200		2)			RF/RZ77	DT80..MM..	Ø 200				
	DT90..MM1..			2)				DT90..MM1..					
	DT90L MM22							DT90L MM22					
	DV100..MM..			2)				DV100..MM..					
R87	DT80..MM..	Ø 250					RF/RZ87	DT80..MM..	Ø 250				
	DT90..MM1..			2)				DT90..MM1..					
	DV100..MM..			2)				DV100..MM..					
R97	DT80..MM..	Ø 300					RF97	DT80..MM..	Ø 300				
	DT90..MM1..							DT90..MM1..					
	DV100..MM..							DV100..MM..					
R107	DV100..MM..	Ø 350					RF107	DV100..MM..	Ø 350				

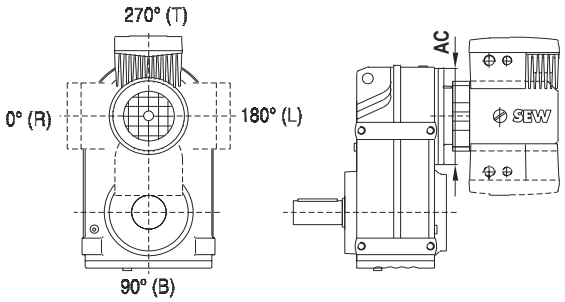
1) Standard position

2) Gear unit must be mounted on a base

Possible terminal box position

When using plug connectors/MOVIMOT® options, the number of possible positions can be even more limited. Please contact SEW-EURODRIVE.

F..DT/DV..MM..



FF..DT/DV..MM..

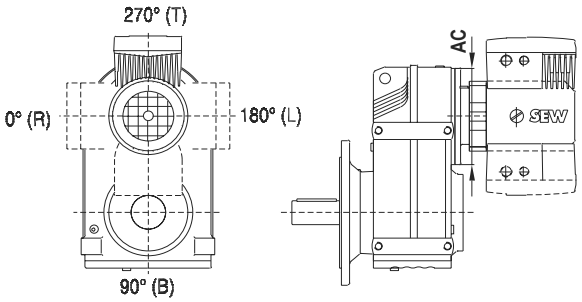


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Figure 100: Possible terminal box positions F..D..MM..

Gear unit	Motor	AC	0°	90°	180°	270°[1]	Gear unit	Motor	AC	0°	90°	180°	270°[1]
F27	DT71D MM..	Ø 120	2)		2)		FF27	DT71D MM..	Ø 120				
	DT80..MM..		2)		2)			DT80..MM..					
	DT90..MM..		2)	2)	2)	2)		DT90..MM..					
F37	DT71D MM..	Ø 120	2)		2)		FF37	DT71D MM..	Ø 120				
	DT80..MM..		2)		2)			DT80..MM..					
	DT90..MM..		2)		2)			DT90..MM..					
	DV100..MM..		2)		2)			DV100..MM..					
F47	DT71D MM..	Ø 120	2)		2)		FF47	DT71D MM..	Ø 120				
	DT80..MM..		2)		2)			DT80..MM..					
	DT90..MM..		2)		2)			DT90..MM..					
	DV100..MM..		2)		2)			DV100..MM..					
F57	DT71D MM..	Ø 160	2)		2)		FF57	DT71D MM..	Ø 160				
	DT80..MM..		2)		2)			DT80..MM..					
	DT90..MM..		2)		2)			DT90..MM..					
	DV100..MM..		2)		2)			DV100..MM..					
F67	DT71D MM..	Ø 160	2)		2)		FF67	DT71D MM..	Ø 160				
	DT80..MM..		2)		2)			DT80..MM..					
	DT90..MM..		2)		2)			DT90..MM..					
	DV100..MM..		2)		2)			DV100..MM..					
F77	DT80..MM..	Ø 200	2)		2)		FF77	DT80..MM..	Ø 200				
	DT90..MM..		2)		2)			DT90..MM..					
	DV100..MM..		2)		2)			DV100..MM..					
F87	DT80..MM..	Ø 250					FF87	DT80..MM..	Ø 250				
	DT90..MM1..		2)		2)			DT90..MM1..					
	DV100..MM..		2)		2)			DV100..MM..					
F97	DT90..MM1..	Ø 300					FF97	DT90..MM1..	Ø 300				
	DV100..MM..							DV100..MM..					
F107	DV100..MM..	Ø 350					FF107	DV100..MM..	Ø 350				

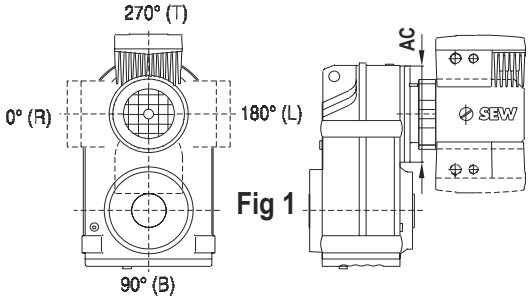
1) Standard position

2) The gear unit must be mounted on a base if the inverter is on the foot-mounting end

Possible terminal box position

When using plug connectors/MOVIMOT® options, the number of possible positions can be even more limited. Please contact SEW-EURODRIVE.

FA/FAF/FAZ..DT/DV..MM..
FV/FVF/FVZ..DT/DV..MM..



FH/FHF/FHZ..DT/DV..MM..

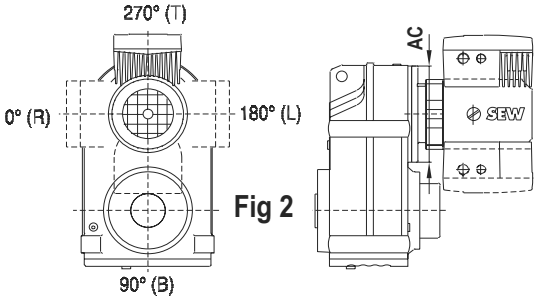


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Figure 101: Possible terminal box positions F..D..MM..

Gear unit	Motor	Fig	AC	0°	90°	180°	270°[1]
F..27	DT71D MM..	1	Ø 120	■		■	■
	DT80..MM..			■		■	■
	DT90..MM..			■		■	■
F..37	DT71D MM..		Ø 120	■		■	■
	DT80..MM..			■		■	■
	DT90..MM..			■		■	■
	DV100..MM..			■		■	■
F..47	DT71D MM..		Ø 120	■		■	■
	DT80..MM..			■		■	■
	DT90..MM..			■		■	■
	DV100..MM..			■		■	■
F..57	DT71D MM..		Ø 160	■		■	■
	DT80..MM..			■		■	■
	DT90..MM..			■		■	■
	DV100..MM..			■		■	■
F..67	DT71D MM..		Ø 160	■		■	■
	DT80..MM..			■		■	■
	DT90..MM..			■		■	■
	DV100..MM..			■		■	■
F..77	DT80..MM..		Ø 200	■	■	■	■
	DT90..MM..			■		■	■
	DV100..MM..			■		■	■
F..87	DT80..MM..		Ø 250	■	■	■	■
	DT90..MM1..			■	■	■	■
	DV100..MM..			■	■	■	■
F..97	DT90..MM1..		Ø 300	■	■	■	■
	DV100..MM..			■	■	■	■
F..107	DV100..MM..		Ø 350	■	■	■	■

Gear unit	Motor	Fig	AC	0°	90°	180°	270°[1]
F..27	DT71D MM..	2	Ø 120	■		■	■
	DT80..MM..			■	■	■	■
F..37	DT71D MM..		Ø 120	■		■	■
	DT80..MM..			■		■	■
	DT90..MM..			■		■	■
	DV100..MM..			■		■	■
F..47	DT71D MM..		Ø 120	■		■	■
	DT80..MM..			■		■	■
	DT90..MM..			■		■	■
	DV100..MM..			■		■	■
F..57	DT71D MM..		Ø 160	■		■	■
	DT80..MM..			■		■	■
	DT90..MM..			■		■	■
	DV100..MM..			■		■	■
F..67	DT71D MM..		Ø 160	■		■	■
	DT80..MM..			■		■	■
	DT90..MM..			■		■	■
	DV100..MM..			■		■	■
F..77	DT80..MM..		Ø 200	■		■	■
	DT90..MM..			■		■	■
	DV100..MM..			■		■	■
F..87	DT80..MM..		Ø 250	■		■	■
	DT90..MM1..			■		■	■
	DV100..MM..			■		■	■
F..97	DT90..MM1..		Ø 300	■		■	■
	DV100..MM..			■	■	■	■
F..107	DV100..MM..		Ø 350	■	■	■	■

1) Standard position

■ Possible terminal box position

When using plug connectors/MOVIMOT® options, the number of possible positions can be even more limited. Please contact SEW-EURODRIVE.

K..DT/DV..MM.. **S..DT/DV..MM..** **W..DT/DV..MM..**

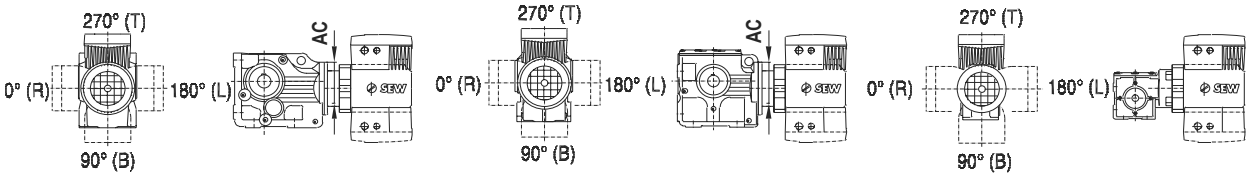

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Figure 102: Possible terminal box positions K..D..MM.., S..D..MM.., W..D..MM..

Gear unit	Motor	AC	0°	90°	180°	270°[1]
K37	DT71D MM..	Ø 120		2)		
	DT80..MM..			2)		
	DT90..MM..			2)		
	DV100..MM..			2)		
K47	DT71D MM..	Ø 160		2)		
	DT80..MM..			2)		
	DT90..MM..			2)		
	DV100..MM..			2)		
K57	DT71D MM..	Ø 160		2)		
	DT80..MM..			2)		
	DT90..MM..			2)		
	DV100..MM..			2)		
K67	DT71D MM..	Ø 160		2)		
	DT80..MM..			2)		
	DT90..MM..			2)		
	DV100..MM..			2)		
K77	DT80..MM..	Ø 200		2)		
	DT90..MM..			2)		
	DV100..MM..			2)		
K87	DT80..MM..	Ø 250				
	DT90..MM1..			2)		
	DV100..MM..			2)		
K97	DT90..MM1..	Ø 300				
	DV100..MM..					
K107	DV100..MM..	Ø 350				

Gear unit	Motor	AC	0°	90°	180°	270°[1]
S37	DT71D MM..	Ø 120		2)		
	DT80..MM..			2)		
	DT90..MM1..			2)		
S47	DT71D MM..	Ø 120		2)		
	DT80..MM..			2)		
	DT90..MM..			2)		
	DV100..MM..			2)		
S57	DT71D MM..	Ø 120		2)		
	DT80..MM..			2)		
	DT90..MM..			2)		
	DV100..MM..			2)		
S67	DT71D MM..	Ø 160		2)		
	DT80..MM..			2)		
	DT90..MM..			2)		
	DV100..MM..			2)		
S77	DT80..MM..	Ø 200		2)		
	DT90..MM..			2)		
	DV100..MM..			2)		
S87	DT80..MM..	Ø 250				
	DT90..MM1..			2)		
	DV100..MM..			2)		
S97	DT90..MM1..	Ø 300				
	DV100..MM..					

Gear unit	Motor	0°	90°	180°	270°[1]
W20	DT71D MM..		2)		
W30	DT71D MM..		2)		
	DT80..MM..		2)		

1) Standard position

2) Gear unit must be mounted on a base

Possible terminal box position

When using plug connectors/MOVIMOT® options, the number of possible positions can be even more limited. Please contact SEW-EURODRIVE.

10 Design and Operating Notes

10.1 Lubricants

General information

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 decisive factor is the mounting position (M1 – M6, → Sec. "Mounting positions and important order information" in the Gearmotor catalog) specified when ordering the drive. You must adapt the lubricant fill in case of any subsequent changes made to the mounting position (→ Lubricant fill quantities).

Lubricant table

The lubricant table on the following page shows the permitted lubricants for SEW-EURODRIVE gear units. Please refer to the following legend for the lubricant table.

Legend for the lubricant table

Abbreviations, meaning of shading and notes:

CLP	= Mineral oil
CLP PG	= Polyglycol (W gear units, conforms to USDA-H1)
CLP HC	= Synthetic hydrocarbons
E	= Ester oil (water hazard class 1 (German regulation))
HCE	= Synthetic hydrocarbons + ester oil (USDA - H1 certification)
HLP	= Hydraulic oil
	= Synthetic lubricant (= synthetic-based anti-friction bearing grease)
	= Mineral lubricant (= mineral-based anti-friction bearing grease)
1)	Helical-worm gear units with PG oil: please contact SEW-EURODRIVE.
2)	Special lubricant for Spiroplan® gear units only
3)	SEW-$f_B \geq 1.2$ required
4)	Pay attention to critical starting behavior at low temperatures!
5)	Low-viscosity grease
6)	Ambient temperature
	Lubricant for the food industry (food grade oil)
	Biodegradable oil (lubricant for agriculture, forestry, and fisheries)

Anti-friction bearing greases

The anti-friction bearings in gear units and motors are given a factory-fill with the greases listed below. SEW-EURODRIVE recommends regreasing anti-friction bearings with a grease fill at the same time as changing the oil or replacing the anti-friction bearings.

	Ambient temperature	Manufacturer	Type
Gear unit anti-friction bearings	-40 °C ... +80 °C	Fuchs	Renolit CX-TOM15[1)]
Motor anti-friction bearings[2)]	-20 °C ... +80 °C	Esso	Polyrex EM
	+20 °C ... +100 °C	Klüber	Barrierta L55/2
	-40 °C ... +60 °C	Kyodo Yushi	Multemp SRL[3)]
Special greases for gear unit anti-friction bearings:			
	-30 °C ... +40 °C	Aral	Aral Eural Grease EP 2
	-20 °C ... +40 °C	Aral	Aral Aralube BAB EP2

1) Anti-friction bearing grease based on partly synthetic base oil.

2) The motor anti-friction bearings are covered on both sides and cannot be regreased.

3) Recommended for continuous operation at ambient temperatures below 0°C, for example in a cold storage.

The following grease quantities are required:

- For fast-running bearings (gear unit input end): Fill the cavities between the rolling elements one-third full with grease.
- For slow-running bearings (in gear units and at gear unit output end): Fill the cavities between the rolling elements two-thirds full with grease.

Lubricant table

01 805 09 92

Gear unit		6) °C -50 … +100	DIN (ISO)	ISO,NLGI	Mobil	Shell	Klüber	Aral	bp	Tribol	Texaco	Optimol	Fuchs	Total
R...		Standard -10 … +40	CLP(CC)	VG 220	Mobilgear 630	Shell Omala 220	Klüberoil GEM 1-220 N	Aral Degol BG 220	BP Energol GR-XP 220	Tribol 1100/220	Meropa 220	Optigear BM 220	Renolin CLP 220	Carter EP 220
K...(HK...)		-25 … +80	CLP PG	VG 220	Mobil Glygoyle 30	Shell Tivela S 220	Klübersynth GH 6-220	Aral Degol GS 220	BP Enersyn SG-XP 220	Tribol 800/220	Synlube CLP 220	Optiflex A 220		Carter SY 220
	4)	-40 … +80	CLP HC	VG 220	Mobil SHC 630	Shell Omala HD 220	Klübersynth GEM 4-220 N	Aral Degol PAS 220		Tribol 1510/220	Pinnacle EP 220	Optigear Synthetic A 220	Renolin Unisyn CLP 220	
	4)	-40 … +40	CLP HC	VG 150	Mobil SHC 629	Shell Omala HD 150	Klübersynth GEM 4-150 N				Pinnacle EP 150			Carter SH 150
F...		-20 … +25	CLP (CC)	VG 150 VG 100	Mobilgear 627	Shell Omala 100	Klüberoil GEM 1-150 N	Aral Degol BG 100	BP Energol GR-XP 100	Tribol 1100/100	Meropa 150	Optigear BM 100	Renolin CLP 150	Carter EP 100
		-30 … +10	HLP (HM)	VG 68-46 VG 32	Mobil D.T.E. 13M	Shell Tellus T 32	Klüberoil GEM 1-68 N	Aral Degol BG 46		Tribol 1100/68	Rando EP Ashless 46	Optigear 32	Renolin B 46 HVI	Equivis ZS 46
	4)	-40 … +10	CLP HC	VG 32	Mobil SHC 624		Klüber-Summit HySyn FG-32				Cetus PAO 46			Dacnis SH 32
	4)	-40 … -20	HLP (HM)	VG 22 VG 15	Mobil D.T.E. 11M	Shell Tellus T 15	Isoflex MT 30 ROT		BP Energol HLP-HM 15		Rando HDZ 15			Equivis ZS 15
S...(HS...)		Standard 0 … +40	CLP (CC)	VG 680	Mobilgear 636	Shell Omala 680	Klüberoil GEM 1-680 N	Aral Degol BG 680	BP Energol GR-XP 680	Tribol 1100/680	Meropa 680	Optigear BM 680	Renolin CLP 680	Carter EP 680
		-20 … +60	CLP PG	VG 680 1)		Shell Tivela S 680	Klübersynth GH 6-680		BP Enersyn SG-XP 680	Tribol 800/680	Synlube CLP 680			
	4)	-30 … +80	CLP HC	VG 460	Mobil SHC 634	Shell Omala HD 460	Klübersynth GEM 4-460 N				Pinnacle EP 460			
	4)	-40 … +10	CLP HC	VG 150	Mobil SHC 629	Shell Omala HD 150	Klübersynth GEM 4-150 N				Pinnacle EP 150			Carter SH 150
		-20 … +10	CLP (CC)	VG 150 VG 100	Mobilgear 627	Shell Omala 100	Klüberoil GEM 1-150 N	Aral Degol BG 100	BP Energol GR-XP 100	Tribol 1100/100	Meropa 150	Optigear BM 100	Renolin CLP 150	Carter EP 100
		-25 … +20	CLP PG	VG 220 1)	Mobil Glygoyle 30	Shell Tivela S 220	Klübersynth GH 6-220	Aral Degol GS 220	BP Enersyn SG-XP 220	Tribol 800/220	Synlube CLP 220	Optiflex A 220		Carter SY 220
	4)	-40 … 0	CLP HC	VG 32	Mobil SHC 624		Klüber-Summit HySyn FG-32				Cetus PAO 46			Dacnis SH 32
R...,K...(HK...), F...,S...(HS...)	4)	-30 … +40	HCE	VG 460		Shell Cassida Fluid GL 460	Klüberoil 4UH1-460 N	Aral Eural Gear 460				Optileb GT 460		
		-20 … +40	E	VG 460			Klüberbio CA2-460	Aral Degol BAB 460				Optisynt BS 460		
W...(HW...)		Standard -20 … +40	SEW PG	VG 460 2)			Klüber SEW HT-460-5							
	4)	-40 … +10	API GL5	SAE 75W90 (~VG 100)	Mobilube SHC 75 W90-LS									
		-20 … +40	CLP PG	VG 460 3)			Klübersynth UH1 6-460							
R32 R302		-25 … +60	DIN 51 818 5)	00	Glygoyle Grease 00	Shell Tivela GL 00	Klübersynth GE 46-1200				Multifak 6833 EP 00			Marson SY 00
		Standard -15 … +40		000 - 0	Mobilux EP 004	Shell Alvania GL 00		Aralub MFL 00	BP Energrease LS-EP 00		Multifak EP 000	Longtime PD 00	Renolin SF 7 - 041	Multis EP 00

Lubricant fill quantities

The specified fill quantities are **recommended values**. The precise values vary depending on the number of stages and gear ratio. When filling, it is essential to check the **oil level plug since it indicates the precise oil capacity**.

The following tables show guide values for lubricant fill quantities in relation to the mounting position M1 ... M6.

Helical (R) gear units

RX..

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
RX57	0.60	0.80	1.30	1.30	0.90	0.90
RX67	0.80	0.80	1.70	1.90	1.10	1.10
RX77	1.10	1.50	2.60	2.70	1.60	1.60
RX87	1.70	2.50	4.80	4.80	2.90	2.90
RX97	2.10	3.40	7.4	7.0	4.80	4.80
RX107	3.90	5.6	11.6	11.9	7.7	7.7

RXF..

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
RXF57	0.50	0.80	1.10	1.10	0.70	0.70
RXF67	0.70	0.80	1.50	1.40	1.00	1.00
RXF77	0.90	1.30	2.40	2.00	1.60	1.60
RXF87	1.60	1.95	4.90	3.95	2.90	2.90
RXF97	2.10	3.70	7.1	6.3	4.80	4.80
RXF107	3.10	5.7	11.2	9.3	7.2	7.2

R.., R..F

Gear unit	Fill quantity in liters					
	M1[1)]	M2[1)]	M3	M4	M5	M6
R07	0.12	0.20	0.20	0.20	0.20	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	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	1.50
R57	0.80/1.70	1.90	1.70	2.10	1.70	1.70
R67	1.10/2.30	2.60/3.50	2.80	3.20	1.80	2.00
R77	1.20/3.00	3.80/4.10	3.60	4.10	2.50	3.40
R87	2.30/6.0	6.7/8.2	7.2	7.7	6.3	6.5
R97	4.60/9.8	11.7/14.0	11.7	13.4	11.3	11.7
R107	6.0/13.7	16.3	16.9	19.2	13.2	15.9
R137	10.0/25.0	28.0	29.5	31.5	25.0	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 multi-stage gear units must be filled with the larger oil volume.

RF..

Gear unit	Fill quantity in liters					
	M1[1)]	M2[1)]	M3	M4	M5	M6
RF07	0.12	0.20	0.20	0.20	0.20	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	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	1.50
RF57	0.80/1.70	1.80	1.70	2.00	1.70	1.70
RF67	1.20/2.50	2.70/3.60	2.70	2.60	1.90	2.10
RF77	1.20/2.60	3.80/4.10	3.30	4.10	2.40	3.00
RF87	2.40/6.0	6.8/7.9	7.1	7.7	6.3	6.4
RF97	5.1/10.2	11.9/14.0	11.2	14.0	11.2	11.8
RF107	6.3/14.9	15.9	17.0	19.2	13.1	15.9
RF137	9.5/25.0	27.0	29.0	32.5	25.0	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 multi-stage gear units must be filled with the larger oil volume.

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	2.60	3.50	2.10	3.50	2.80	2.90
F..67	2.70	3.80	1.90	3.80	2.90	3.20
F..77	5.9	7.3	4.30	8.0	6.0	6.3
F..87	10.8	13.0	7.7	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	37.5	27.0	27.0
F..127	40.5	54.5	34.0	61.0	46.3	47.0
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	2.80	3.50	2.10	3.70	2.90	3.00
FF67	2.70	3.80	1.90	3.80	2.90	3.20
FF77	5.9	7.3	4.30	8.1	6.0	6.3
FF87	10.8	13.2	7.8	14.1	11.0	11.2
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	41.5	55.5	34.0	63.0	46.3	49.0
FF157	72.0	105.0	64.0	106.0	87.0	79.0

FA.., FH.., FV.., FAF.., FAZ.., FHF.., FHZ.., FVF.., FVZ.., FT..

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	2.70	3.50	2.10	3.40	2.90	3.00
F..67	2.70	3.80	1.90	3.80	2.90	3.20
F..77	5.9	7.3	4.30	8.0	6.0	6.3
F..87	10.8	13.0	7.7	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	37.5	27.0	27.0
F..127	39.0	54.5	34.0	61.0	45.0	46.5
F..157	68.0	103.0	62.0	104.0	85.0	77.0

Helical-bevel (K) gear units

K.., KA..B, KH..B, KV..B

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
K..37	0.50	1.00	1.00	1.25	0.95	0.95
K..47	0.80	1.30	1.50	2.00	1.60	1.60
K..57	1.20	2.30	2.50	2.80	2.60	2.40
K..67	1.10	2.40	2.60	3.45	2.60	2.60
K..77	2.20	4.10	4.40	5.8	4.20	4.40
K..87	3.70	8.0	8.7	10.9	8.0	8.0
K..97	7.0	14.0	15.7	20.0	15.7	15.5
K..107	10.0	21.0	25.5	33.5	24.0	24.0
K..127	21.0	41.5	44.0	54.0	40.0	41.0
K..157	31.0	62.0	65.0	90.0	58.0	62.0
K..167	33.0	95.0	105.0	123.0	85.0	84.0
K..187	53.0	152.0	167.0	200	143.0	143.0

KF..

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
KF37	0.50	1.10	1.10	1.50	1.00	1.00
KF47	0.80	1.30	1.70	2.20	1.60	1.60
KF57	1.30	2.30	2.70	3.15	2.90	2.70
KF67	1.10	2.40	2.80	3.70	2.70	2.70
KF77	2.10	4.10	4.40	5.9	4.50	4.50
KF87	3.70	8.2	9.0	11.9	8.4	8.4
KF97	7.0	14.7	17.3	21.5	15.7	16.5
KF107	10.0	21.8	25.8	35.1	25.2	25.2
KF127	21.0	41.5	46.0	55.0	41.0	41.0
KF157	31.0	66.0	69.0	92.0	62.0	62.0

KA.., KH.., KV.., KAF.., KHF.., KVF.., KAZ.., KHZ.., KVZ.., KT..

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
K..37	0.50	1.00	1.00	1.40	1.00	1.00
K..47	0.80	1.30	1.60	2.15	1.60	1.60
K..57	1.30	2.30	2.70	3.15	2.90	2.70
K..67	1.10	2.40	2.70	3.70	2.60	2.60
K..77	2.10	4.10	4.60	5.9	4.40	4.40
K..87	3.70	8.2	8.8	11.1	8.0	8.0
K..97	7.0	14.7	15.7	20.0	15.7	15.7
K..107	10.0	20.5	24.0	32.4	24.0	24.0
K..127	21.0	41.5	43.0	52.0	40.0	40.0
K..157	31.0	66.0	67.0	87.0	62.0	62.0
K..167	33.0	95.0	105.0	123.0	85.0	84.0
K..187	53.0	152.0	167.0	200	143.0	143.0

Helical-worm (S) gear units

S

Gear unit	Fill quantity in liters					
	M1	M2	M3[1)]	M4	M5	M6
S..37	0.25	0.40	0.50	0.55	0.40	0.40
S..47	0.35	0.80	0.70/0.90	1.00	0.80	0.80
S..57	0.50	1.20	1.00/1.20	1.45	1.30	1.30
S..67	1.00	2.00	2.20/3.10	3.10	2.60	2.60
S..77	1.90	4.20	3.70/5.4	5.9	4.40	4.40
S..87	3.30	8.1	6.9/10.4	11.3	8.4	8.4
S..97	6.8	15.0	13.4/18.0	21.8	17.0	17.0

1) The larger gear unit of multi-stage gear units must be filled with the larger oil volume.

SF..

Gear unit	Fill quantity in liters					
	M1	M2	M3[1)]	M4	M5	M6
SF37	0.25	0.40	0.50	0.55	0.40	0.40
SF47	0.40	0.90	0.90/1.05	1.05	1.00	1.00
SF57	0.50	1.20	1.00/1.50	1.55	1.40	1.40
SF67	1.00	2.20	2.30/3.00	3.20	2.70	2.70
SF77	1.90	4.10	3.90/5.8	6.5	4.90	4.90
SF87	3.80	8.0	7.1/10.1	12.0	9.1	9.1
SF97	7.4	15.0	13.8/18.8	22.6	18.0	18.0

1) The larger gear unit of multi-stage gear units must be filled with the larger oil volume.

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	0.50	0.40	0.40
S..47	0.40	0.80	0.70/0.90	1.00	0.80	0.80
S..57	0.50	1.10	1.00/1.50	1.50	1.20	1.20
S..67	1.00	2.00	1.80/2.60	2.90	2.50	2.50
S..77	1.80	3.90	3.60/5.0	5.8	4.50	4.50
S..87	3.80	7.4	6.0/8.7	10.8	8.0	8.0
S..97	7.0	14.0	11.4/16.0	20.5	15.7	15.7

1) The larger gear unit of multi-stage gear units must be filled with the larger oil volume.

Spiroplan® (W) gear units

The fill quantity of Spiroplan® gear units does not vary, irrespective of their mounting position.

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
W..10	0.16					
W..20	0.24					
W..30	0.40					

10.2 Installation/removal of gear units with hollow shafts and keys

- Always use the supplied NOCO® fluid for installation. The fluid prevents contact corrosion and facilitates subsequent removal.
- The keyway dimension X is specified by the customers, but X must > DK.

Installation

SEW-EURODRIVE recommends two variants for installation of gear units with hollow shaft and key onto the input shaft of the driven machine (= customer shaft):

1. Use the fastening parts supplied for installation.
2. Use the optional installation/removal kit for installation.

1) Supplied fastening parts

The following fastening parts are supplied as standard:

- Retaining screw with washer (2)
- Circlip (3)

Note the following points concerning the customer shaft:

- The installation length of the customer shaft with contact shoulder (A) must be L8 - 1 mm.
- The installation length of the customer shaft without contact shoulder (B) must equal L8.

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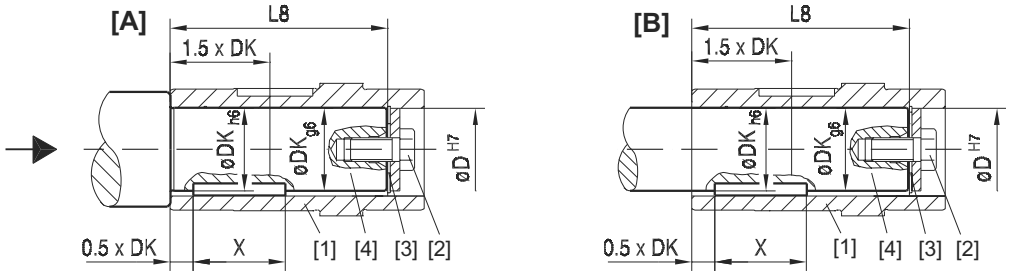

Figure 103: Customer shaft with contact shoulder (A) and without contact shoulder (B)

(1) Hollow shaft
(2) Retaining screw with washer
(3) Circlip
(4) Customer shaft

Dimensions and tightening torque:

The retaining screw (2) must be tightened to the tightening torque MS given in the following table.

Gear unit type	D^{H7} [mm]	DK [mm]	L8 [mm]	MS [Nm]
WA..10	16	16	69	8
WA..20	18	18	84	8
WA..20, WA..30, SA..37	20	20	84, 106, 104	8
FA..27, SA..47	25	25	88, 105	20
FA..37, KA..37, SA..47 **SA..57**	30	30	105 132	20
FA..47, KA..47, SA..57	35	35	132	20
FA..57, KA..57 **FA..67, KA..67** **SA..67**	40	40	142 156 144	40
SA..67	45	45	144	40
FA..77, KA..77, SA..77	50	50	183	40
FA..87, KA..87 **SA..77, SA..87**	60	60	210 180, 220	80
FA..97, KA..97 **SA..87, SA..97**	70	70	270 220, 260	80
FA..107, KA..107, SA..97	90	90	313, 313, 255	200
FA..127, KA..127	100	100	373	200
FA..157, KA..157	120	120	460	200

2) Installation /removal kit

You can also use the optional installation/removal kit for installation. You order the kit for the specific gear unit type(s) by quoting the part numbers in the table below. The delivery includes:

- Spacer tube for installation without contact shoulder (5)
- Retaining screw for installation (2)
- Forcing washer for removal (7)
- Locked nut for removal (8)

The short retaining screw delivered as standard is not required.

Note the following points concerning the customer shaft:

- The installation length of the customer shaft must be LK2. Do not use the spacer if the customer shaft **has a contact shoulder (A)**.
- The installation length of the customer shaft must be LK2. Use the spacer if the customer shaft **has a contact shoulder (B)**.

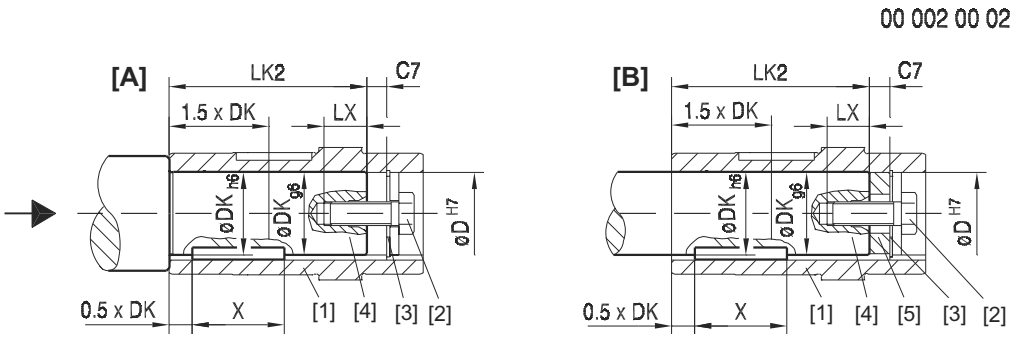

Figure 104: Customer shaft with contact shoulder (A) and without contact shoulder (B)

(1) Hollow shaft
(2) Retaining screw with washer
(3) Circlip
(4) Customer shaft
(5) Spacer

Dimensions, tightening torques and part numbers:

The retaining screw (2) must be tightened to the tightening torque MS given in the following table.

Type	D^{H7} [mm]	DK [mm]	LK2 [mm]	LX^{+2} [mm]	C7 [mm]	MS [Nm]	Part number of installation-removal kit
WA..10	16	16	57	12.5	11	8	643 712 5
WA..20	18	18	72	16	12	8	643 682 X
WA..20, WA..30 **SA..37**	20	20	72, 93 92	16	12	8	643 683 8
FA..27, SA..47	25	25	72, 89	22	16	20	643 684 6
FA..37, KA..37 **SA..47, SA..57**	30	30	89 89, 116	22	16	20	643 685 4
FA..47, KA..47, SA..57	35	35	114	28	18	20	643 686 2
FA..57, KA..57 **FA..67, KA..67, SA..67**	40	40	124 138, 138, 126	36	18	40	643 687 0
SA..67	45	45	126	36	18	40	643 688 9
FA..77, KA..77, SA..77	50	50	165	36	18	40	643 689 7
FA..87, KA..87 **SA..77, SA..87**	60	60	188 158, 198	42	22	80	643 690 0
FA..97, KA..97 **SA..87, SA..97**	70	70	248 198, 238	42	22	80	643 691 9
FA..107, KA..107 **SA..97**	90	90	287 229	50	26	200	643 692 7
FA..127, KA..127	100	100	347	50	26	200	643 693 5
FA..157, KA..157	120	120	434	50	26	200	643 694 3

Removal

Applies only if installation/removal kit was previously used for installation (→ Figure 104).

Proceed as follows for removal:

1. Loosen the retaining screw (6).
2. Remove the circlip (3) and, if used, the spacer tube (5).
3. According to Figure 105 place the forcing washer (7) and the locked nut (8) between the customer shaft (4) and circlip (3).
4. Re-install the circlip (3).
5. Re-install the retaining screw (6). Now you can force the gear unit off the shaft.

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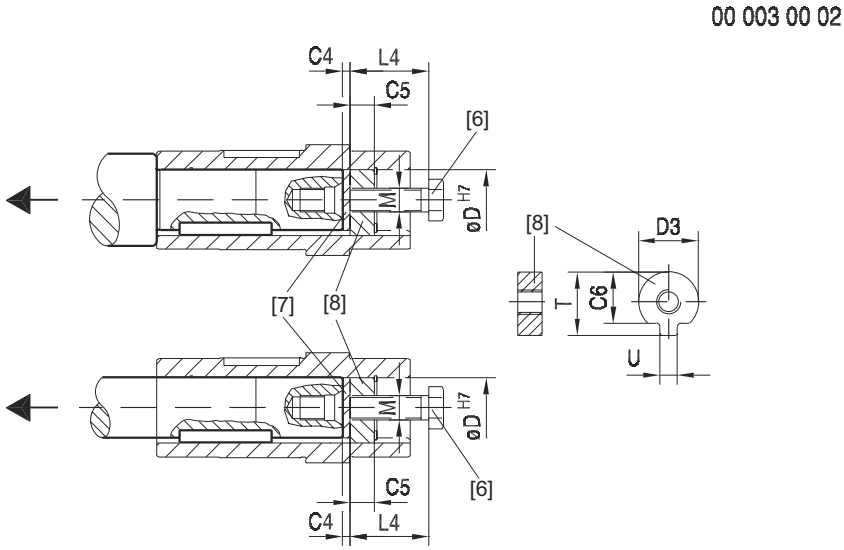


Figure 105: Removal

(6) Retaining bolt
(7) Forcing washer
(8) Locked nut for removal

Dimensions and part numbers:

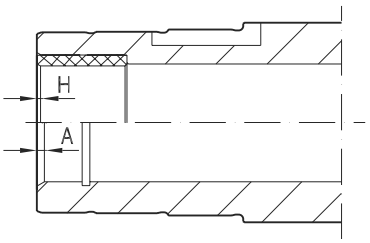
Type	D^{H7} [mm]	M	C4 [mm]	C5 [mm]	C6 [mm]	$U^{-0.5}$ [mm]	$T^{-0.5}$ [mm]	$D3^{-0.5}$ [mm]	L4 [mm]	Part number of installation/removal kit
WA..10	16	M5	5	5	12	4.5	18	15.7	50	643 712 5
WA..20	18	M6	5	6	13.5	5.5	20.5	17.7	25	643,682 X
WA..20, WA..30, SA..37	20	M6	5	6	15.5	5.5	22.5	19.7	25	643 683 8
FA27.., SA..47	25	M10	5	10	20	7.5	28	24.7	35	643 684 6
FA..37, KA..37, SA..47, SA..57	30	M10	5	10	25	7.5	33	29.7	35	643 685 4
FA..47, KA..47, SA..57	35	M12	5	12	29	9.5	38	34.7	45	643 686 2
FA..57, KA..57, FA..67, KA..67, SA..67	40	M16	5	12	34	11.5	41.9	39.7	50	643 687 0
SA..67	45	M16	5	12	38.5	13.5	48.5	44.7	50	643 688 9
FA..77, KA..77, SA..77	50	M16	5	12	43.5	13.5	53.5	49.7	50	643 689 7
FA..87, KA..87, SA..77, SA..87	60	M20	5	16	56	17.5	64	59.7	60	643 690 0
FA..97, KA..97, SA..87, SA..97	70	M20	5	16	65.5	19.5	74.5	69.7	60	643 691 9
FA..107, KA..107, SA..97	90	M24	5	20	80	24.5	95	89.7	70	643 692 7
FA..127, KA..127	100	M24	5	20	89	27.5	106	99.7	70	643 693 5
FA..157, KA..157	120	M24	5	20	107	31	127	119.7	70	643 694 3

10.3 Gear units with hollow shaft

Chamfers on hollow shafts

The following illustration shows the chamfers on parallel shaft helical, helical-bevel and helical-worm gear units with hollow shaft:

00 004 002



59845AXX

Figure 106: Chamfers on hollow shafts

Gear unit	Version	
	with hollow shaft (A)	with hollow shaft and shrink disc (H)
F..27	2 × 30°	0.5 × 45°
F../K../S..37	2 × 30°	0.5 × 45°
F../K../S..47	2 × 30°	0.5 × 45°
S..57	2 × 30°	0.5 × 45°
F../K..57	2 × 30°	3 × 2°
F../K../S..67	2 × 30°	3 × 2°
F../K../S..77	2 × 30°	3 × 2°
F../K../S..87	3 × 30°	3 × 2°
F../K../S..97	3 × 30°	3 × 2°
F../K..107	3 × 30°	3 × 2°
F../K..127	5 × 30°	1.5 × 30°
F../K..157	5 × 30°	1.5 × 30°
KH167	-	1.5 × 30°
KH187	-	1.5 × 30°

Special motor/gear unit combinations

Please note for parallel shaft helical gearmotors with hollow shaft (FA..B, FV..B, FH..B, FAF, FVF, FHF, FA, FV, FH, FT, FAZ, FVZ, FHZ):

- If you are using a customer shaft pushed through on the motor end, there may be a collision when a "small gear unit" is used in combination with a "large motor".
- Check the motor dimension AC to decide whether there will be a collision with a pushed-through customer shaft.

10.4 TorqLOC® mounting system for gear units with hollow shaft

Description of TorqLOC®

The TorqLOC® hollow shaft mounting system is used for achieving a non-positive connection between customer shaft and the hollow shaft in the gear unit. As a result, the TorqLOC® hollow shaft mounting system is an alternative to the hollow shaft with shrink disc, the hollow shaft with key and the splined hollow shaft that have been used so far.

The TorqLOC® hollow shaft mounting system consists of the following components:

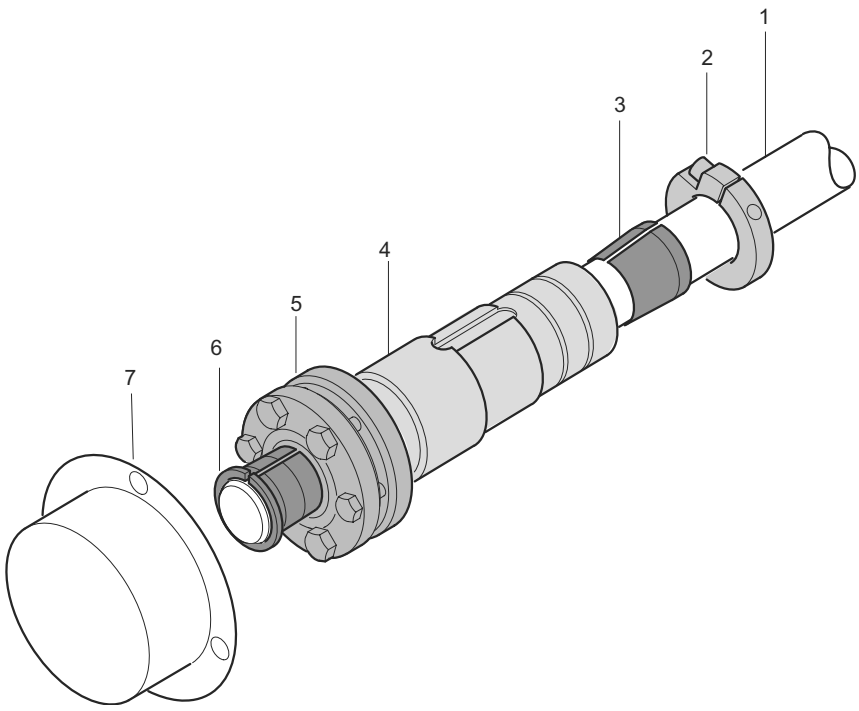


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Figure 107: Components of the TorqLOC® hollow shaft mounting system

1. Customer shaft
2. Locking collar
3. Conical bronze bushing
4. Hollow shaft in gear unit
5. Shrink disc
6. Conical steel bushing
7. Fixed cover

Advantages of TorqLOC®

The TorqLOC® hollow shaft mounting system is characterized by the following advantages:

- Cost saving because the customer shaft can be made from drawn material up to quality h11.
- Cost saving because different customer shaft diameters can be covered by one hollow shaft diameter and different bushings.
- Simple installation since there is no need to accommodate any shaft connections.
- Simple removal even after many hours of operation because the formation of contact corrosion has been reduced and the conical connections can easily be released.

Technical data

The TorqLOC® hollow shaft mounting system is approved for input torques of 92 Nm to 18000 Nm.

The following gear units are available with TorqLOC® hollow shaft mounting system:

- Parallel shaft helical gear units in gear unit sizes 37 to 157 (FT37 ... FT157)
- Helical-bevel gear units in gear unit sizes 37 to 157 (KT37 ... KT157)
- Helical-worm gear units in gear unit sizes 37 to 97 (ST37 ... ST97)

Available options

The following options are available for gear units with TorqLOC® hollow shaft mounting system:

- Helical-bevel and helical-worm gear units with TorqLOC® (KT.., ST..): The "torque arm" (../T) option is available.
- Parallel shaft helical gear units with TorqLOC® (FT..): The "rubber buffer" (../G) option is available.

10.5 Shouldered hollow shaft with shrink disc option

As an option, gear units with hollow shaft and shrink disc (parallel shaft helical gear units FH/FHF/FHZ37-157, helical-bevel gear units KH/KHF/KHZ37-157 and helical-worm gear units SH/SHF47-97) can be supplied with a larger bore diameter D'.

As standard, D' = D.

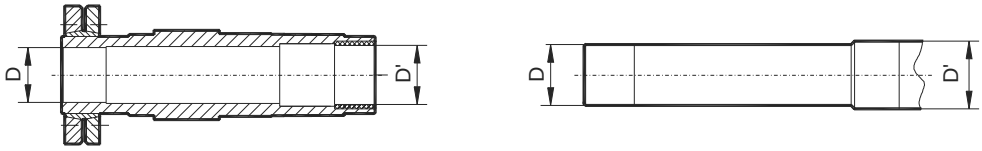


Figure 108: Optional bore diameter D'

Gear unit	Bore diameter D / optionally D' [mm]
FH/FHF/FHZ37, KH/KHF/KHZ37, SH/SHF/SHZ47	30 / 32
FH/FHF/FHZ47, KH/KHF/KHZ47, SH/SHF/SHZ57	35 / 36
FH/FHF/FHZ57, KH/KHF/KHZ57	40 / 42
FH/FHF/FHZ67, KH/KHF/KHZ67, SH/SHF/SHZ67	40 / 42
FH/FHF/FHZ77, KH/KHF/KHZ77, SH/SHF/SHZ77	50 / 52
FH/FHF/FHZ87, KH/KHF/KHZ87, SH/SHF/SHZ87	65 / 66
FH/FHF/FHZ97, KH/KHF/KHZ97, SH/SHF/SHZ97	75 / 76
FH/FHF/FHZ107, KH/KHF/KHZ107	95 / 96
FH/FHF/FHZ127, KH/KHF/KHZ127	105 / 106
FH/FHF/FHZ157, KH/KHF/KHZ157	125 / 126

Diameter D / D' must be specified when ordering gear units with a shouldered hollow shaft (optional bore diameter D').

Sample order FH37 DT80N4 with hollow shaft 30/32 mm

Parallel shaft helical gear units with shouldered hollow shaft (dimensions in mm):

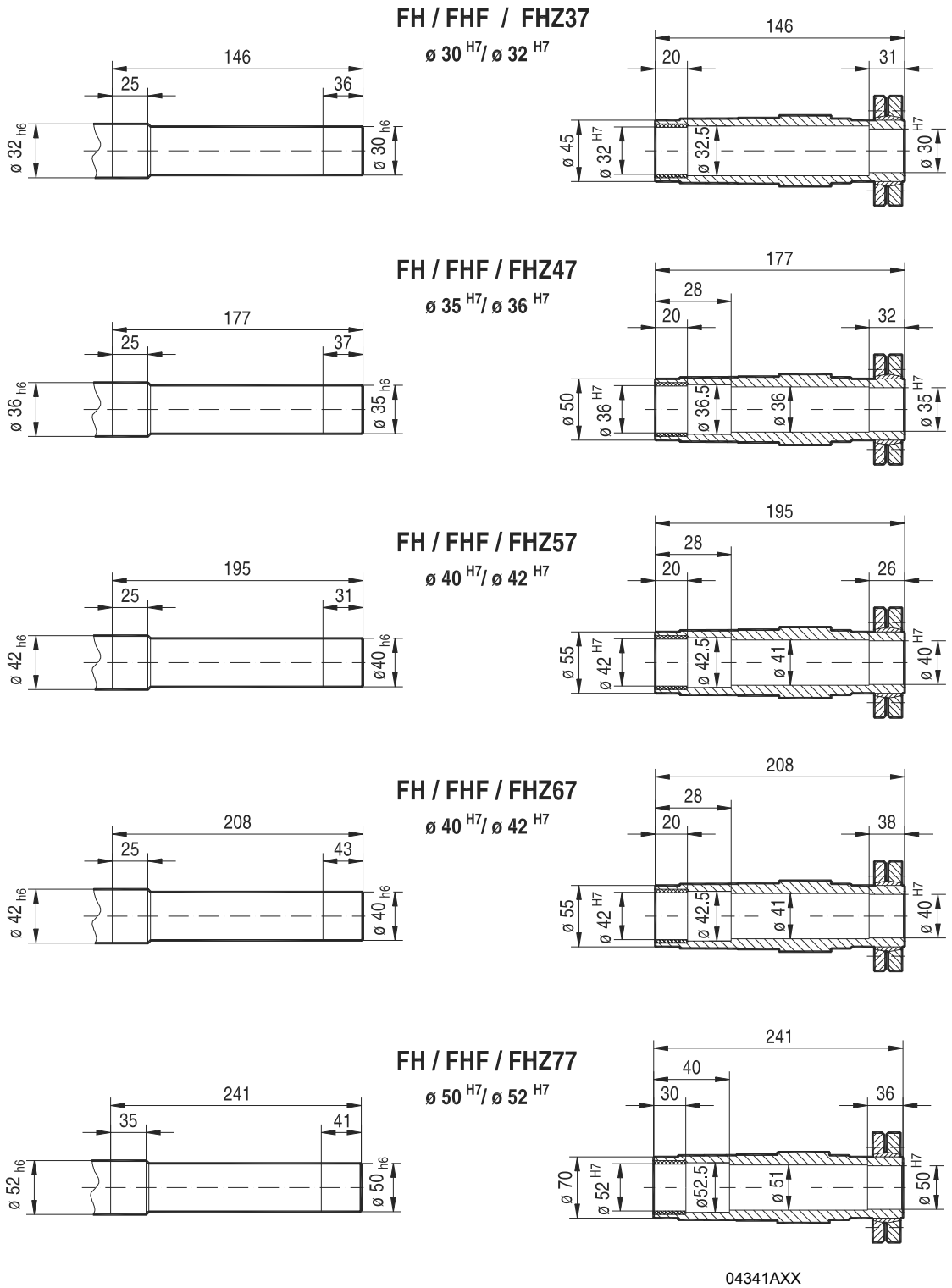


Figure 109: Shouldered hollow shaft FH/FHF/FHZ37...77

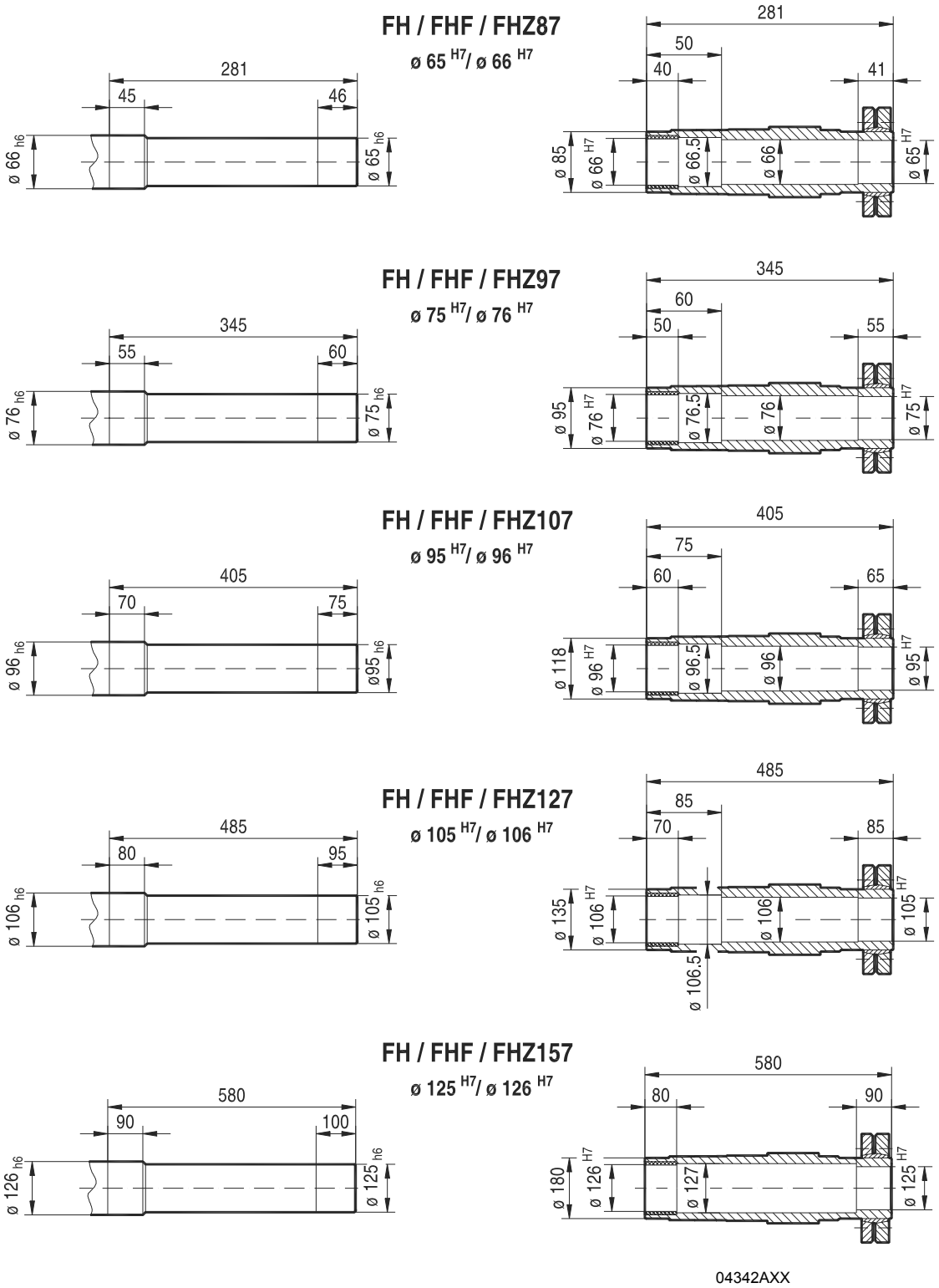


Figure 110: Shouldered hollow shaft FH/FHF/FHZ87...157

Helical-bevel gear unit with shouldered hollow shaft (dimensions in mm):

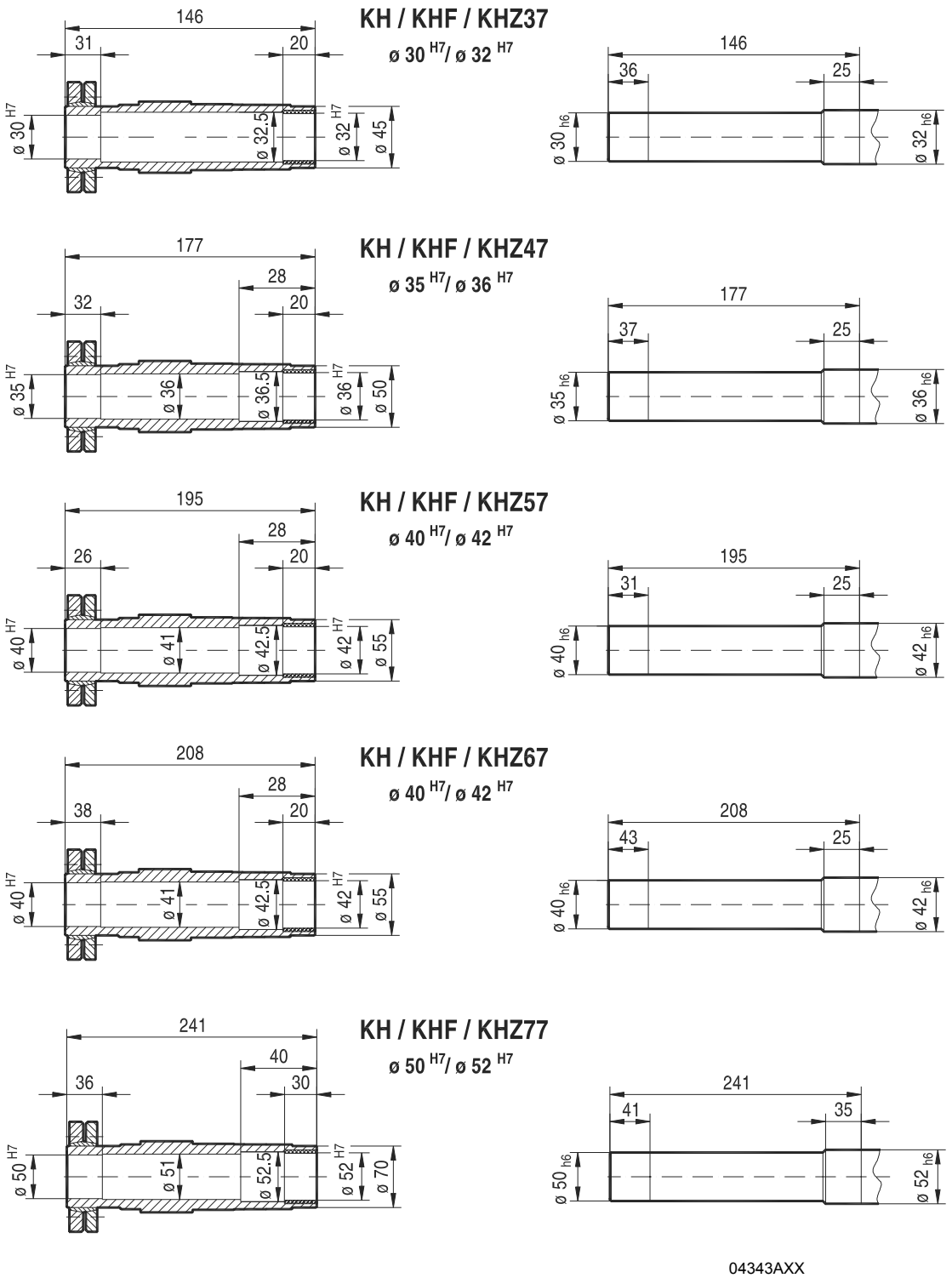


Figure 111: Shouldered hollow shaft KH/KHF/KHZ37...77

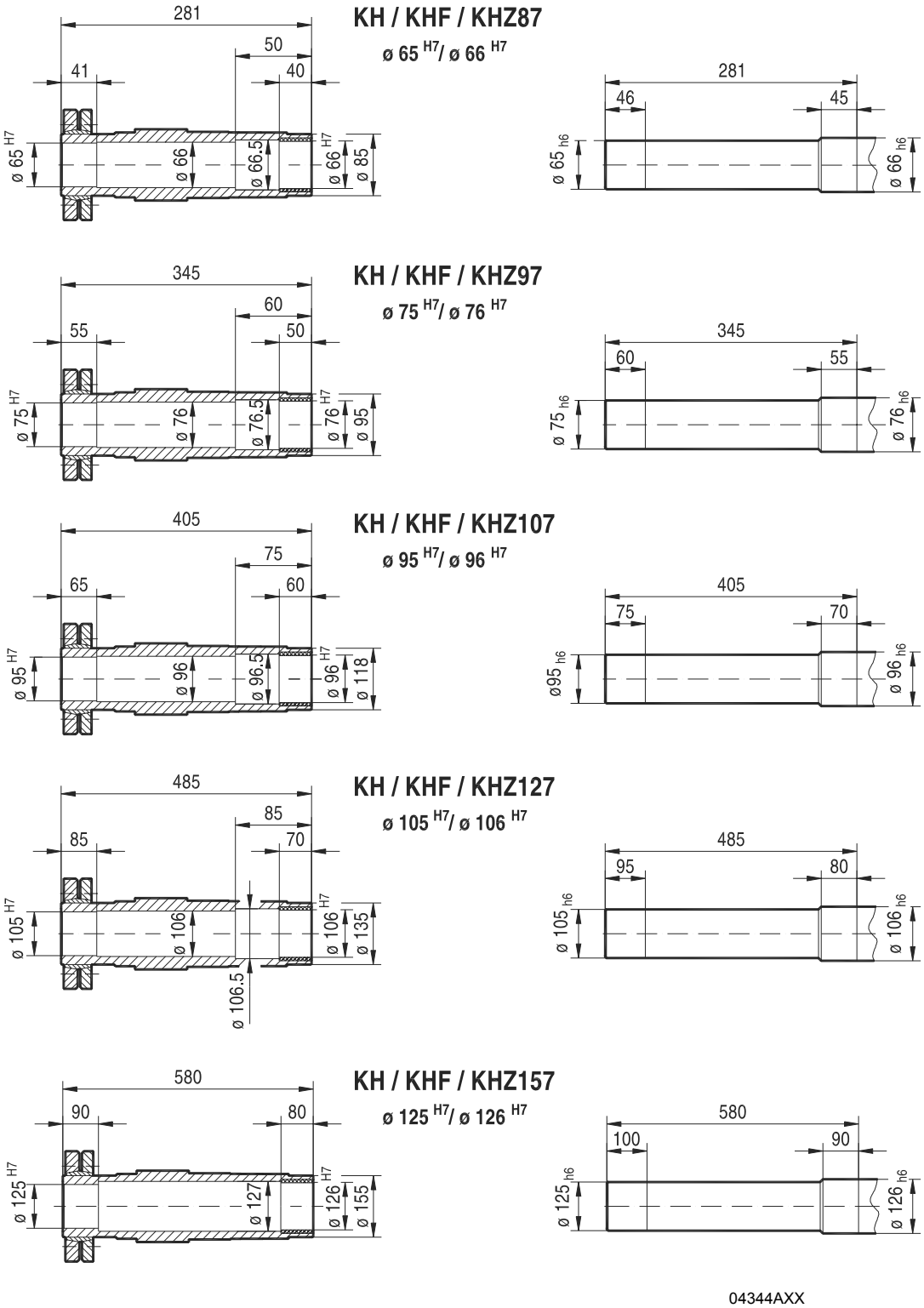


Figure 112: Shouldered hollow shaft KH/KHF/KHZ87...157

Helical-worm gear units with shouldered hollow shaft (dimensions in mm):

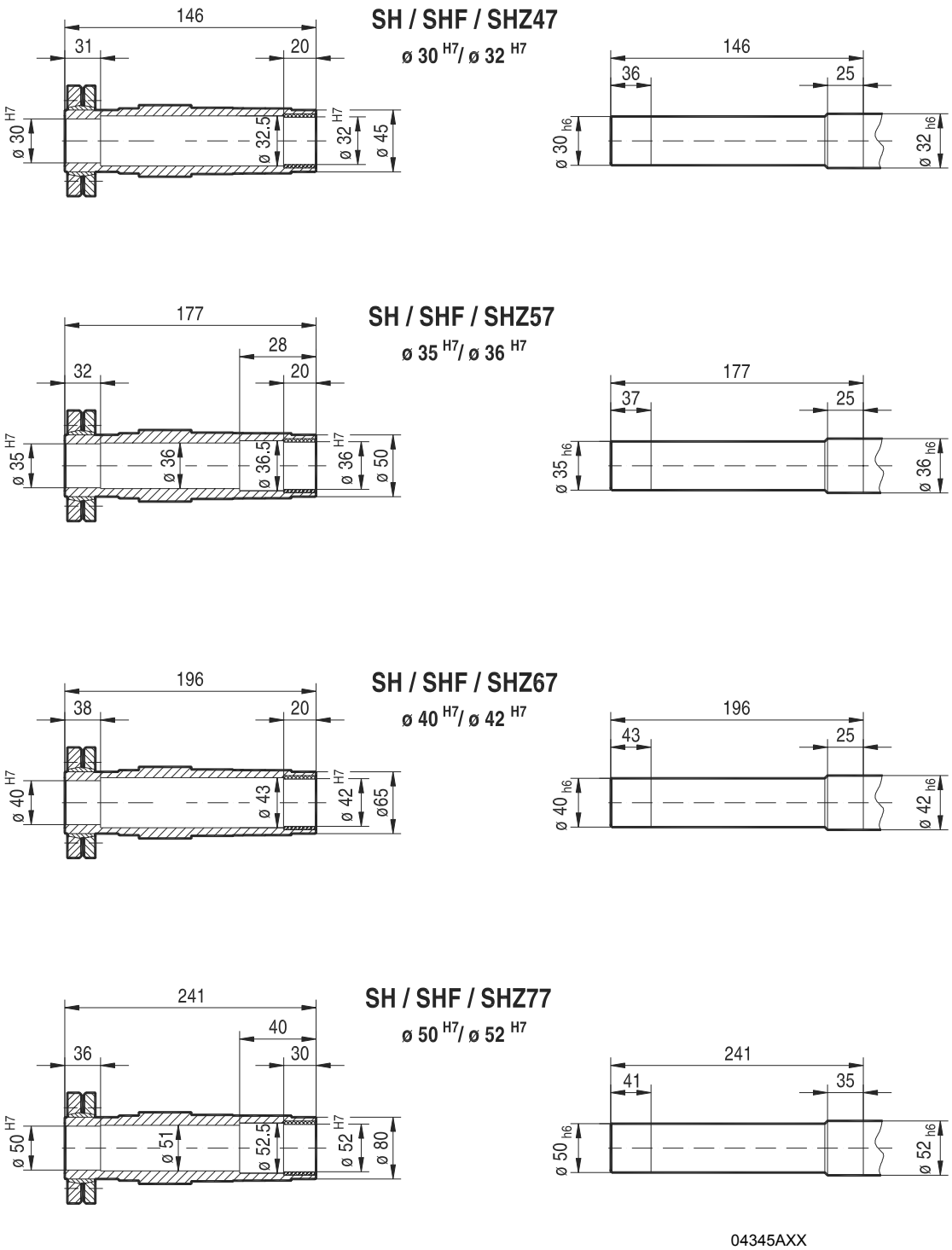


Figure 113: Shouldered hollow shaft SH/SHF/SHZ47...77

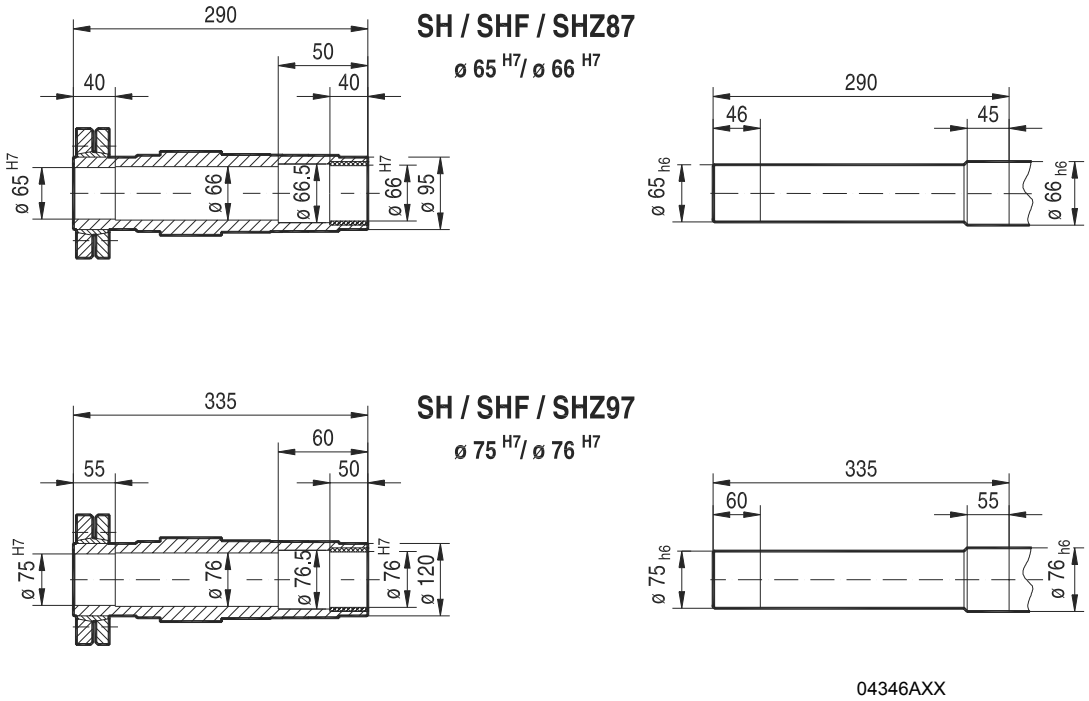
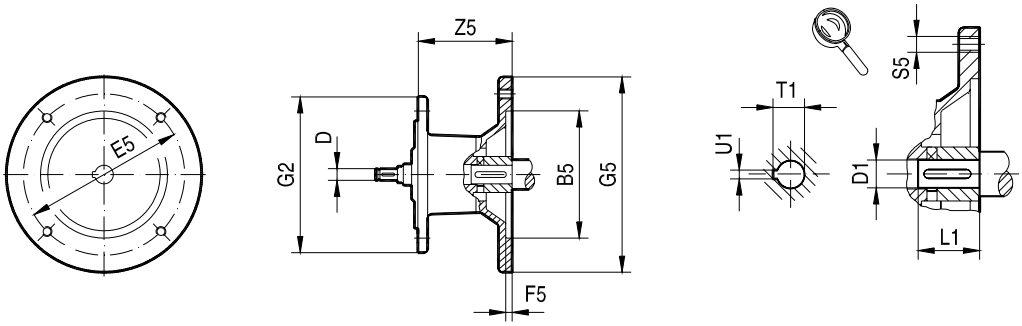


Figure 114: Shouldered hollow shaft SH/SHF/SHZ87...97

10.6 Adapters for mounting IEC motors

23 002 100



Gear unit type	Adapter type	Dimensions in mm											
		B5	D	E5	F5	G2	G5	S5	Z5	D1	L1	T1	U1
R..27, R..37 F..27, F..37, F..47 K..37 S..37, S..47, S..57	**AM63**	95	10	115	3.5	120	140	M8	72	11	23	12.8	4
	AM71[1]	110		130	4		160			14	30	16.3	5
	AM80[1]	130	12	165	4.5		200	M10	106	19	40	21.8	6
	AM90[1]		14							24	50	27.3	8
R..47[2], **R..57, R..67 F..57, F..67 K..47**[2], **K..57, K..67 S..67**	**AM63**	95	10	115	3.5	160	140	M8	66	11	23	12.8	4
	AM71	110		130	4		160			14	30	16.3	5
	AM80	130	12	165	4.5		200	M10	99	19	40	21.8	6
	AM90		14							24	50	27.3	8
	AM100[1]	180	16	215	5		250	M12	134	28	60	31.3	8
	AM112[1]		18										
	AM132S/M[1]	230	22	265			300		191	38	80	41.3	10
R..77 F..77 K..77 S..77	**AM63**	95	10	115	3.5	200	140	M8	60	11	23	12.8	4
	AM71	110		130	4		160			14	30	16.3	5
	AM80	130	12	165	4.5		200	M10	92	19	40	21.8	6
	AM90		14							24	50	27.3	8
	AM100[1]	180	16	215	5		250	M12	126	28	60	31.3	8
	AM112[1]		18										
	AM132S/M[1]	230	22	265			300		179	38	80	41.3	10
	AM132ML[1]		28										
R..87 F..87 K..87 S..87[3]	**AM80**	130	12	165	4.5	250	200	M10	87	19	40	21.8	6
	AM90		14							24	50	27.3	8
	AM100	180	16	215	5		250	M12	121	28	60	31.3	8
	AM112		18										
	AM132S/M	230	22	265			300		174	38	80	41.3	10
	AM132ML		28										
	AM160[1]	250	28	300	6		350	M16	232	42	110	45.3	12
	AM180[1]		32							48		51.8	14

1) Check dimension 2 G5 because component may protrude past foot-mounting surface if installed on R, K or S foot-mounted gear unit.

2) not with AM112

3) not with AM180

23 003 100

Fig.1

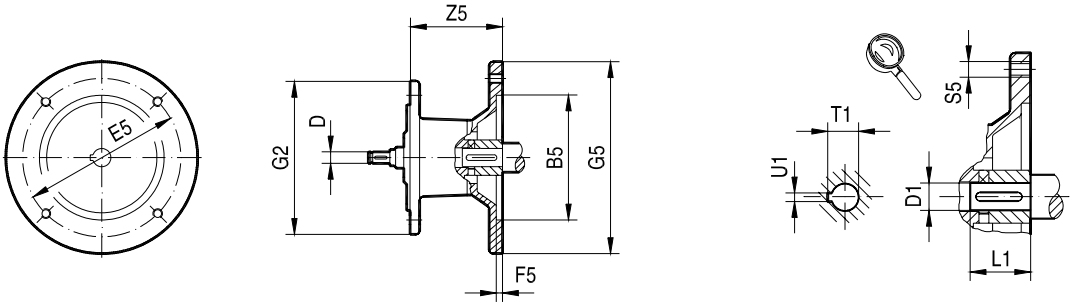
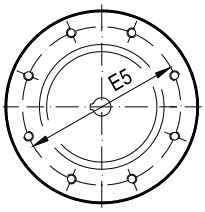


Fig.2



Gear unit type	Adapter type	Fig.	Dimensions in mm											
			B5	D	E5	F5	G2	G5	S5	Z5	D1	L1	T1	U1
R..97 F..97 K..97 S..97[1)]	**AM100**	1	180	16	215	5	300	250	M12	116	28	60	31.3	8
	AM112			18										
	AM132S/M		230	22	265			300		169	38	80	41.3	10
	AM132ML			28										
	AM160		250	28	300	6		350	M16	227	42	110	45.3	12
	AM180			32							48		51.8	14
	AM200		300	38	350	7		400		268	55		59.3	16
R..107 F..107 K..107	**AM100**	1	180	16	215	5	350	250	M12	110	28	60	31.3	8
	AM112			18										
	AM132S/M		230	22	265			300		163	38	80	41.3	10
	AM132ML			28										
	AM160		250	28	300	6		350	M16	221	42	110	45.3	12
	AM180			32							48		51.8	14
	AM200		300	38	350	7		400		262	55		59.3	16
	AM225	2	350	38	400			450		277	60	140	64.4	18
R..137	**AM132S/M**	1	230	22	265	5	400	300	M12	156	38	80	41.3	10
	AM132ML			28										
	AM160		250	28	300	6		350	M16	214	42	110	45.3	12
	AM180			32							48		51.8	14
	AM200		300	38	350	7		400		255	55		59.3	16
	AM225	2	350	38	400			450		270	60	140	64.4	18

1) Not with AM200

23 004 100

Fig.1

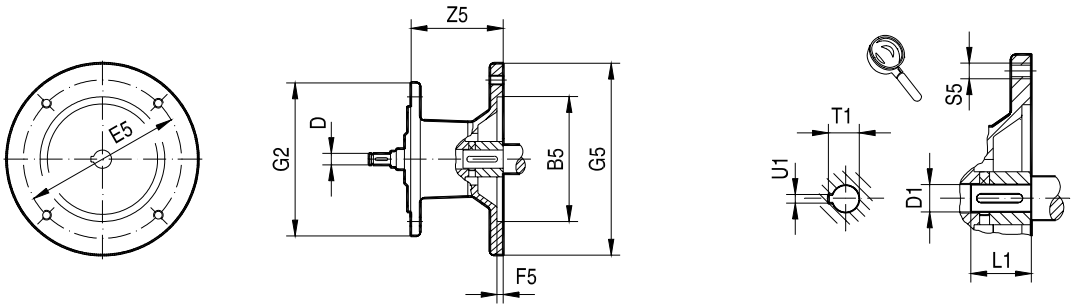
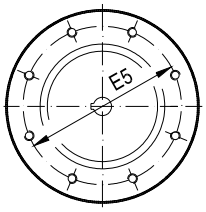


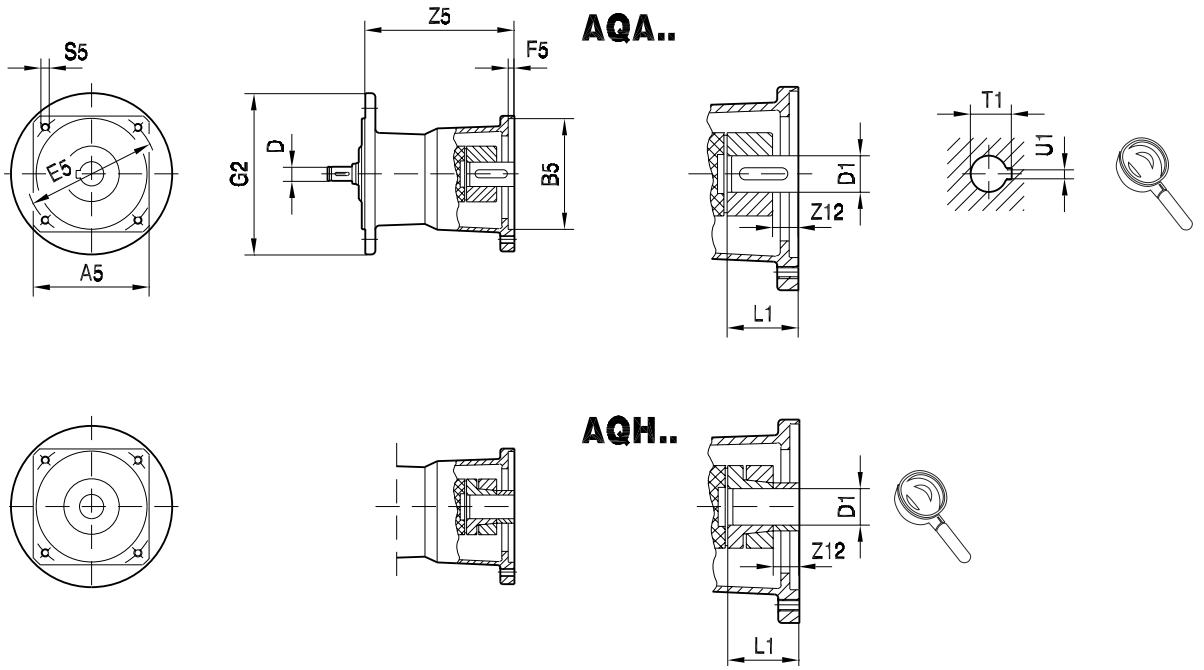
Fig.2



Gear unit type	Adapter type	Fig.	Dimensions in mm											
			B5	D	E5	F5	G2	G5	S5	Z5	D1	L1	T1	U1
R..147 F..127 K..127	**AM132S/M**	1	230	22	265	5	450	300	M12	148	38	80	41.3	10
	AM132ML			28							38			
	AM160		250	28	300	6		350	M16	206	42	110	45.3	12
	AM180			32							48		51.8	14
	AM200		300	38	350	7		400		247	55		59.3	16
	AM225	2	350	38	400			450		262	60	140	64.4	18
	AM250		450	48	500			550		336	65		69.4	
	AM280										75		79.9	20
R..167 F..157 K..157 K..167 K..187	**AM160**	1	250	28	300	6	550	350		198	42	110	45.3	12
	AM180			32							48		51.8	14
	AM200		300	38	350	7		400		239	55		59.3	16
	AM225	2	350	38	400			450		254	60	140	64.4	18
	AM250		450	48	500			550		328	65		69.4	
	AM280										75		79.9	20

10.7 Adapters for mounting servomotors

23 005 01 00



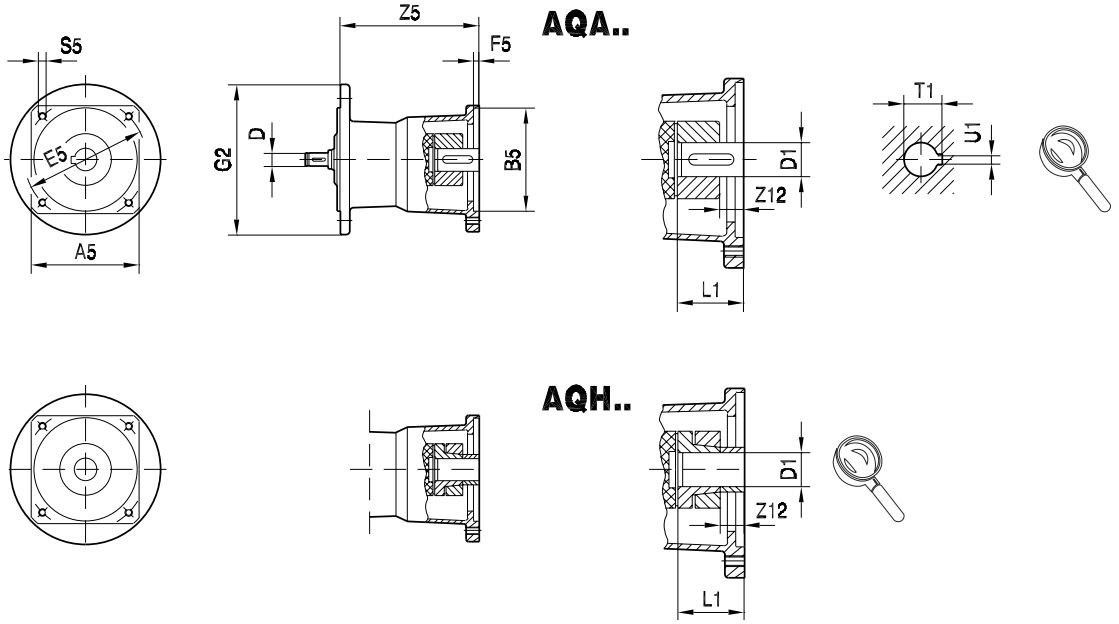
Gear unit type	Adapter type	Dimensions in mm													
		A5	B5	D	E5	F5	G2	S5	Z5	Z12[1]	Z12[2]	D1	L1	T1[1]	U1[1]
R..27, R..37 F..27, F..37, F..47 K..37 S..37, S..47, S..57	AQ..80/1	82	60	10 12	75	3	120	M5	104.5	5.5	5.5	11	23	12.8	4
	AQ..80/2											14	30	16.3	5
	AQ..80/3		50		95			M6							
	AQ..100/1	100	80	10 12 14 16	100	4		M6	129.5	-	-	14	30	16.3	5
	AQ..100/2		95		115			M8							
	AQ..100/3		80		100			M6	143.5	2	14	19	40	21.8	6
	AQ..100/4		95		115			M8							
	AQ..115/1	115	95		130			M8	152.5	11	23	19	40	21.8	6
	AQ..115/2		110												
	AQ..115/3									16	16	24	50	27.3	8
R..47, R..57, R..67 F..57, F..67 K..47[3], K..57, K..67 S..67	AQ..80/1	82	60	10 12	75	3	160	M5	98	5.5	5.5	11	23	12.8	4
	AQ..80/2											14	30	16.3	5
	AQ..80/3		50		95			M6							
	AQ..100/1	100	80	10 12 14 16	100	4		M6	122.5	-	-	14	30	16.3	5
	AQ..100/2		95		115			M8							
	AQ..100/3		80		100			M6	136.5	2	14	19	40	21.8	6
	AQ..100/4		95		115			M8							
	AQ..115/1	115	95		130			M8	145.5	11	23	19	40	21.8	6
	AQ..115/2		110												
	AQ..115/3									16	16	24	50	27.3	8
	AQ..140/1	140	110	16	165	5		M10	175	16	16	24	50	27.3	8
	AQ..140/2		130	18											
	AQ..140/3			22					188	22	22	32	60	35.5	10
	AQ..190/1	190	130	22 28	215			M12	237.5	24	24	32	60	35.3	10
	AQ..190/2		180												
	AQ..190/3								261.5	34	34	38	80	41.3	10

1) For versions with keyway (AQA..).

2) For version with clamping ring hub (AQH..).

3) Not with AQ190

23 006 01 00

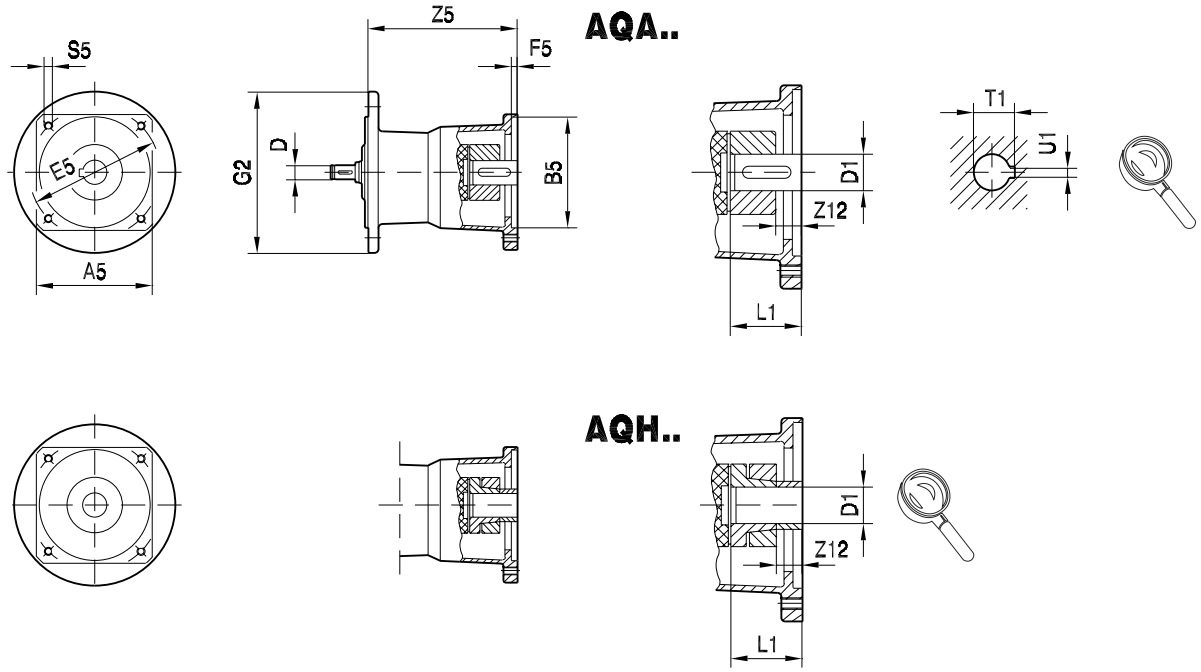


Gear unit type	Adapter type	Dimensions in mm													
		A5	B5	D	E5	F5	G2	S5	Z5	Z12[1)]	Z12[2)]	D1	L1	T1[1)]	U1[1)]
R..77 F..77 K..77 S..77	**AQ..80/1**	82	60	10 12	75	3	200	M5	92	5.5	5.5	11	23	12.8	4
	AQ..80/2				75							14	30	16.3	5
	AQ..80/3		50		95			M6							
	AQ..100/1	100	80	10 12 14 16	100	4		M6	115.5	-	-	14	30	16.3	5
	AQ..100/2		95		115			M8							
	AQ..100/3		80		100			M6	129.5	2	14	19	40	21.8	6
	AQ..100/4		95		115			M8							
	AQ..115/1	115	95		130			M8	138.5	11	23	19	40	21.8	6
	AQ..115/2		110												
	AQ..115/3									16	16	24	50	27.3	8
	AQ..140/1	140	110	16 18 22	165	5		M10	167	16	16	24	50	27.3	8
	AQ..140/2		130												
	AQ..140/3								180	22	22	32	60	35.3	10
	AQ..190/1	190	130	22 28	215			M12	225.5	24	24	32	60	35.3	10
	AQ..190/2		180												
	AQ..190/3								249.5	34	34	38	80	41.3	10
R..87 F..87 K..87 S..87	**AQ..100/1**	100	80	12 14 16	100	4	250	M6	110.5	-	-	14	30	16.3	5
	AQ..100/2		95		115			M8							
	AQ..100/3		80		100			M6	124.5	2	14	19	40	21.8	6
	AQ..100/4		95		115			M8							
	AQ..115/1	115	95		130			M8	133.5	11	23	19	40	21.8	6
	AQ..115/2		110												
	AQ..115/3									16	16	24	50	27.3	8
	AQ..140/1	140	110	16	165	5		M10	162	16	16	24	50	27.3	8
	AQ..140/2		130	18											
	AQ..140/3			22					175	22	22	32	60	35.3	10
	AQ..190/1	190	130	22 28	215			M12	220.5	24	24	32	60	35.3	10
	AQ..190/2		180												
	AQ..190/3								244.5	34	34	38	80	41.3	10

1) For versions with keyway (AQA..).

2) For version with clamping ring hub (AQH..).

23 007 01 00



Gear unit type	Adapter type	Dimensions in mm													
		A5	B5	D	E5	F5	G2	S5	Z5	Z12[1)]	Z12[2)]	D1	L1	T1[1)]	U1[1)]
R..97 F..97 K..97 S..97	AQ..140/1	140	110	16 18 22	165	5	300	M10	157	16	16	24	50	27.3	8
	AQ..140/2		130												
	AQ..140/3								170	22	22	32	60	35.3	10
	AQ..190/1	190	130	22 28	215			M12	215.5	24	24	32	60	35.3	10
	AQ..190/2		180												
	AQ..190/3								239.5	34	34	38	80	41.3	
R..107 F..107 K..107	AQ..140/1	140	110	16 18 22	165		350	M10	151	16	16	24	50	27.3	8
	AQ..140/2		130												
	AQ..140/3								164	22	22	32	60	35.3	10
	AQ..190/1	190	130	22 28	215			M12	209.5	24	24	32	60	35.3	10
	AQ..190/2		180												
	AQ..190/3								233.5	34	34	38	80	41.3	
R..137	AQ..190/1	190	130	22 28	215		400	M12	202.5	24	24	32	60	35.3	10
	AQ..190/2		180												
	AQ..190/3								226.5	34	34	38	80	41.3	
R..147 F..127 K..127	AQ..190/1		130	22 28			450		194.5	24	24	32	60	35.3	
	AQ..190/2		180												
	AQ..190/3								218.5	34	34	38	80	41.3	

1) For versions with keyway (AQA..).

2) For version with clamping ring hub (AQH..).

10.8 Fastening the gear unit

Use bolts of quality 8.8 to fasten gear units and gearmotors.

Exception

Use bolts of **quality 10.9** to fasten the customer flange to transmit the rated torques for the following flange-mounted helical gearmotors (RF ../RZ..) and foot/flange-mounted versions (R..F):

- RF37, R37F with flange ∅ 120 mm
- RF47, R47F with flange ∅ 140 mm
- RF57, R57F with flange ∅ 160 mm
- RZ37 ... RZ87

10.9 Torque arms

Available torque arms

Gear unit	Size					
	27	37	47	57	67	77
KA, KH, KV, KT	-	643 425 8	643 428 2	643 431 2	643 431 2	643 434 7
SA, SH, ST	-	126 994 1	644 237 4	644 240 4	644 243 9	644 246 3
FA, FH, FV, FT Rubber buffer (2 pieces)	013 348 5	013 348 5	013 348 5	013 348 5	013 348 5	013 349 3

Gear unit	Size				
	87	97	107	127	157
KA, KH, KV, KT	643 437 1	643 440 1	643 443 6	643 294 8	-
SA, SH, ST	644 249 8	644 252 8	-	-	-
FA, FH, FV, FT Rubber buffer (2 pieces)	013 349 3	013 350 7	013 350 7	013 351 5	013 347 7

Gear unit	Size				
	10	20	30		
WA	1 061 021 9	168 073 0	168 011 0		

Torque arms for KH167.., KH187..

As standard, torque arms are not available for gear unit sizes KH167.. and KH187... Please contact SEW-EURODRIVE for design proposals if you require torque arms for these gear units.

10.10 Flange contours of RF.. and R..F gear units

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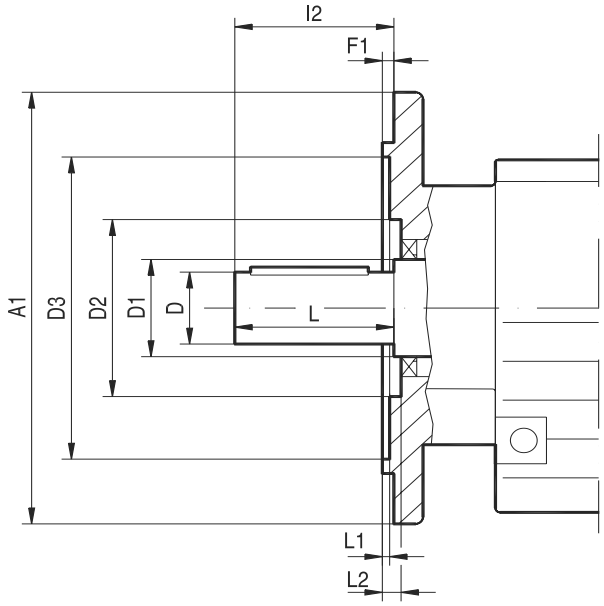

Check dimensions L1 and L2 for selection and installation of output elements.

Type	Dimensions in mm											
	A1	D	D1	D2		D3	F1	I2	L	L1		L2
				RF	R..F					RF	R..F	
RF07, R07F	120	20	22	38	38	72	3	40	40	2	2	6
	140[1)]				-	85	3			2	-	6
	160[1)]				-	100	3.5			2.5	-	6.5
RF17, R17F	120	20	25	46	46	65	3	40	40	1	1	5
	140				-	78	3			1	-	5
	160[1)]				-	95	3.5			1	-	6
RF27, R27F	120	25	30	54	54	66	3	50	50	1	1	6
	140				-	79	3			3	-	7
	160				-	92	3.5			3	-	7
RF37, R37F	120	25	35	60	63	70	3	50	50	5	4	7
	160				-	96	3.5			1	-	7.5
	200[1)]				-	119	3.5			1	-	7.5
RF47, R47F	140	30	35	72	64	82	3	60	60	4	1	6
	160				-	96	3.5			0.5	-	6.5
	200				-	116	3.5			0.5	-	6.5
RF57, R57F	160	35	40	76	75	96	3.5	70	70	4	2.5	5
	200				-	116	3.5			0	-	5
	250[1)]				-	160	4			0.5	-	5.5
RF67, R67F	200	35	50	90	90	118	3.5	70	70	2	4	7
	250				-	160	4			1	-	7.5
RF77, R77F	250	40	52	112	100	160	4	80	80	0.5	2.5	7
	300[1)]				-	210	4			0.5	-	7
RF87, R87F	300	50	62	123	122	210	4	100	100	0	1.5	8
	350				-	226	5			1	-	9
RF97	350	60	72	136		236	5	120	120	0		9
	450					320						
RF107	350	70	82	157		232	5	140	140	0		11
	450			186		316						
RF137	450	90	108	180		316	5	170	170	0		10
	550					416						
RF147	450	110	125	210		316	5	210	210	0		10
	550					416						
RF167	550	120	145	290		416	5	210	210	1		10
	660					517	6			2		11

1) The flange contour protrudes from under the base surface.

10.11 Flange contours of FF.., KF.., SF.. and WF.. gear units

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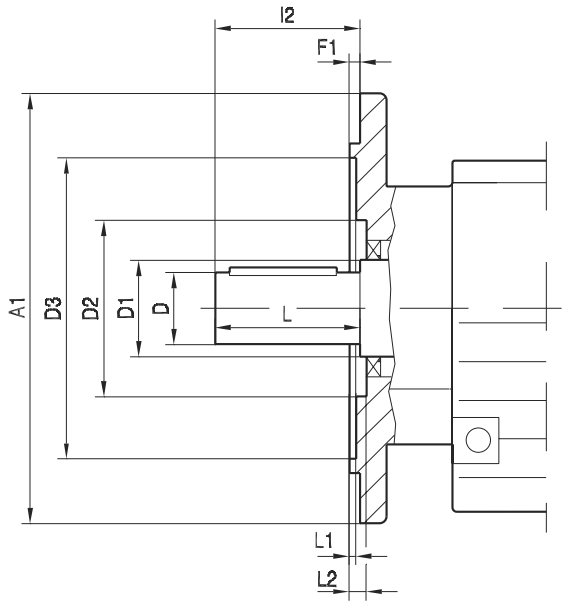

Check dimensions L1 and L2 for selection and installation of output elements.

Type	Dimensions in mm								
	A1	D	D1	D2	D3	F1	l2	L1	L2
FF27	160	25	40	-	96	3.5	20	10.5	18.5
FF37	160	30	45	-	94	3.5	24	2	10
FF47	200	35	50	70	115	3.5	25	8.5	3.5
FF57	250	40	55	76	155	4	23.5	4.5	12
FF67	250	40	55	76	155	4	23	4	4
FF77	300	50	70	95	205	4	37	18	5
FF87	350	60	85	120	220	5	30	9	5
FF97	450	70	95	192	320	5	41.5	15.5	5
FF107	450	90	118	224	320	5	41	29	16
FF127	550	100	135	185	420	5	51	48	6
FF157	660	120	155	200	520	6	60	65	10
KF37	160	30	45	62	94	3.5	24	2	10
KF47	200	35	50	70	115	3.5	25	8.5	3.5
KF57	250	40	55	76	155	4	23.5	4.5	12
KF67	250	40	55	76	155	4	23.5	4.5	12
KF77	300	50	70	95	205	4	37	18	5
KF87	350	60	85	120	220	5	30	9	5
KF97	450	70	95	192	320	5	41.5	15.5	5
KF107	450	90	118	224	320	5	41	29	16
KF127	550	100	135	185	420	5	51	48	6
KF157	660	120	155	200	520	6	60	65	10
SF37	120	20	35	-	68	3	15	6	6
SF37	160	20	35	-	98	3.5	15	6.5	6.5
SF47	160	30	45	-	94	3.5	24	2	10
SF57	200	35	50	75	115	3.5	25	8.5	3.5
SF67	200	40	65	95	115	3.5	42.5	11.5	4
SF77	250	50	80	115	164	4	45.5	21.5	5
SF87	350	60	95	140	220	5	52.5	27.5	6
SF97	450	70	120	175	355	5	60	34	6.5
WF10	80	16	25	40	40	2.5	23	30	30
WF10	120	16	25	49	74	3	23	5	24
WF20	110	18	30	55	104	3	30	23	23
WF20	110	20	30	55	104	4	30	23	23
WF20	120	18	30	46	46	2.5	30	32	32
WF20	120	20	30	46	46	2.5	30	32	32
WF30	120	20	30	64	64	2.5	19.5	14	22
WF30	136	20	30	64	64	2.5	19.5	25.5	31.5

10.12 Flange contours of FAF.., KAF.., SAF.. and WAF.. gear units

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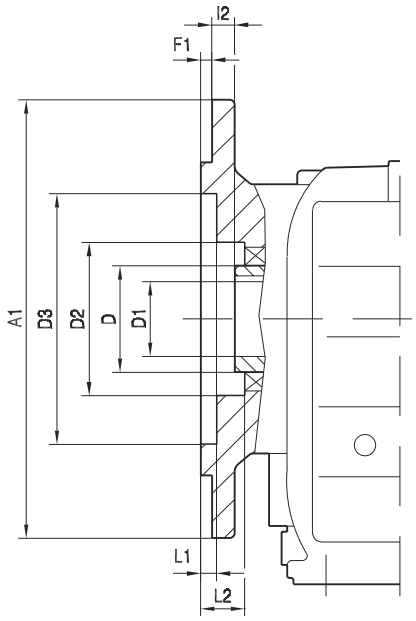

Check dimensions L1 and L2 for selection and installation of output elements.

Type	Dimensions in mm								
	A1	D	D1	D2	D3	F1	l2	L1	L2
FAF27	160	40	25	-	96	3.5	20	10.5	18.5
FAF37	160	45	30	-	94	3.5	24	2	10
FAF47	200	50	35	70	115	3.5	25	8.5	3.5
FAF57	250	55	40	76	155	4	23.5	4.5	12
FAF67	250	55	40	76	155	4	23	4	4
FAF77	300	70	50	95	205	4	37	18	5
FAF87	350	85	60	120	220	5	30	9	5
FAF97	450	95	70	192	320	5	41.5	15.5	5
FAF107	450	118	90	224	320	5	41	29	16
FAF127	550	135	100	185	420	5	51	48	6
FAF157	660	155	120	200	520	6	60	65	10
KAF37	160	45	30	62	94	3.5	24	2	10
KAF47	200	50	35	70	115	3.5	25	8.5	3.5
KAF57	250	55	40	76	155	4	23.5	4.5	12
KAF67	250	55	40	76	155	4	23.5	4.5	12
KAF77	300	70	50	95	205	4	37	18	5
KAF87	350	85	60	120	220	5	30	9	5
KAF97	450	95	70	192	320	5	41.5	15.5	5
KAF107	450	118	90	224	320	5	41	29	16
KAF127	550	135	100	185	420	5	51	48	6
KAF157	660	155	120	200	520	6	60	65	10
SAF37	120	35	20	-	68	3	15	6	6
SAF37	160	35	20	-	98	3.5	15	6.5	6.5
SAF47	160	45	30	-	94	3.5	24	2	10
SAF57	200	50	35	75	115	3.5	25	8.5	3.5
SAF67	200	65	40	95	115	3.5	42.5	11.5	4
SAF77	250	80	50	115	164	4	45.5	21.5	5
SAF87	350	95	60	140	220	5	52.5	27.5	6
SAF97	450	120	70	175	355	5	60	34	6.5
WAF10	80	25	16	40	40	2.5	23	30	30
WAF10	120	25	16	49	74	3	23	5	24
WAF20	110	30	18	55	104	3	30	23	23
WAF20	110	30	20	55	104	4	30	23	23
WAF20	120	30	18	46	46	2.5	30	32	32
WAF20	120	30	20	46	46	2.5	30	32	32
WAF30	120	30	20	64	64	2.5	19.5	14	22
WAF30	136	30	20	64	64	2.5	19.5	25.5	31.5

10.13 Fixed covers

Parallel shaft helical gear units, helical-bevel gear units and helical-worm gear units with hollow shafts and shrink discs of size 37 up to size 97 come equipped with a rotating cover as standard. If for safety reasons fixed covers are required for these gear units, you can order them for the respective gear unit types by quoting the part numbers in the following tables. Parallel shaft helical gear units and helical-bevel gear units with hollow shafts and shrink disks of size 107 and higher as well as parallel shaft helical gear units of size 27 come equipped with a fixed cover as standard.

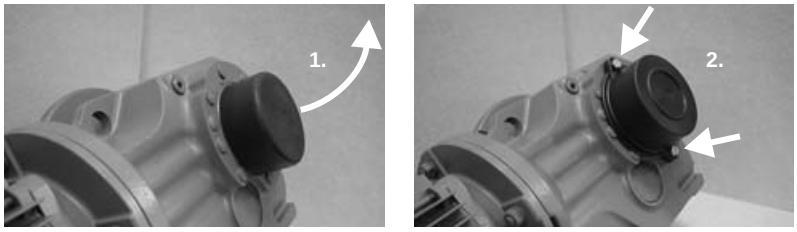

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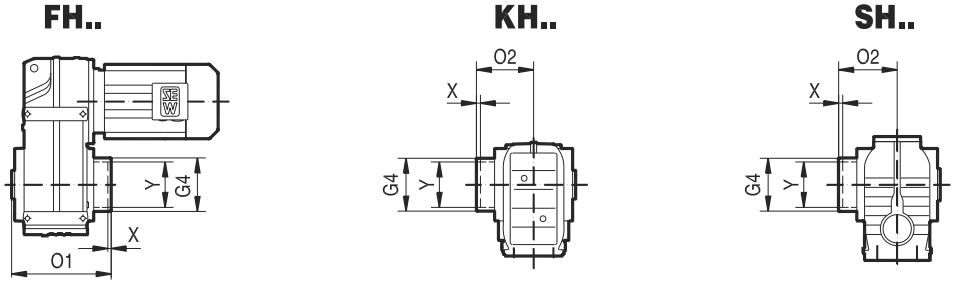
Figure 115: Replacing a rotating cover with a fixed cover

1. Pull off the rotating cover.
2. Install and fasten fixed cover.

Part numbers and dimensions



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Parallel shaft helical gearmotors	FH..37	FH..47	FH..57	FH..67	FH..77	FH..87	FH..97
Part number	643 513 0	643 514 9	643 515 7	643 515 7	643 516 5	643 517 3	643 518 1
Max. size of motor that can be mounted	DT80..	DT80..	DT80..	DV132S	DV160M	DV180..	DV180..
G4 [mm]	78	88	100	100	121	164	185
O1 [mm]	157	188.5	207.5	221.5	255	295	363.5
X [mm]	2	4.5	7.5	6	6	4	6.5
Y [mm]	75	83	83	93	114	159	174

Helical-bevel gearmotors[1)]	KH..37	KH..47	KH..57	KH..67	KH..77	KH..87	KH..97
Part number	643 513 0	643 514 9	643 515 7	643 515 7	643 516 5	643 517 3	643 518 1
G4 [mm]	78	88	100	100	121	164	185
O2 [mm]	95	111.5	122.5	129	147	172	210.5
X [mm]	0	1.5	5.5	3	1	2	4.5
Y [mm]	75	83	83	93	114	159	174

1) Not possible in foot-mounted helical-bevel gear units with hollow shafts and shrink discs (KH..B).

Helical-worm gearmotors	SH..37	SH..47	SH..57	SH..67	SH..77	SH..87	SH..97
Part number	643 512 2	643 513 0	643 514 9	643 515 7	643 516 5	643 517 3	643 518 1
G4 [mm]	59	78	88	100	121	164	185
O2 [mm]	88	95	111.5	123	147	176	204.5
X [mm]	1	0	1.5	3	1	0	0.5
Y [mm]	53	75	83	93	114	159	174

11 Abbreviation Key and Index

11.1 Abbreviation Key

a, b, f	Constants for converting overhung loads	[mm]
c	Constant for converting overhung load	[Nmm]
cosφ	Power factor of the motor	
F_A	Axial load on the output shaft	[N]
f_B	Service factor	
f_{Netz}	Mains frequency	[Hz]
F_R	Overhung load on the output shaft	[N]
f_T, f_H	Power reducing factors of the motor	
f_Z	Transmission element factor for determining the overhung load	
H	Installation altitude	[m ü. NN]
η	Forward efficiency	
η'	Retrodriving efficiency	
$\eta_{75\%}/\eta_{100\%}$	Efficiency of the motor at 75%/100% rated load	
I_A/I_N	Ratio between starting current and rated current of the motor	
I_N	Rated current	[A]
IP..	Degree of protection	
i_{ges}	Total gear reduction ratio	
i_{sch}	Helical-worm stage ratio	
ϑ_{Umg}	Ambient temperature	[°C]
J_{Last}	Mass moment of inertia to be driven	[10^{-4} kgm^2]
J_{Mot}	Mass moment of inertia of the motor	[10^{-4} kgm^2]
J_X	Mass moment of inertia scaled down to the motor shaft	[10^{-4} kgm^2]
J_Z	Mass moment of inertia of the flywheel fan	[10^{-4} kgm^2]
M_a	Output torque	[Nm]
M_B	Braking torque	[Nm]
M_H/M_N	Ratio between acceleration torque and rated torque of the motor	
M_A/M_N	Ratio between run-up torque and rated torque of the motor	
n_a	Output speed	[1/min]
n_e	Input speed	[1/min]
n_M	Motor speed	[1/min]
n_N	Rated speed	[1/min]
P_a	Output power	[kW]
P_e	Calculated drive power of the gear unit	[kW]
P_N	Rated power	[kW]
S.., %ED	Duty type and cyclic duration factor cdf	
T	Duty cycle time	[min]
t1	Brake response time	[10^{-3} s]
t2	Brake application time	[10^{-3} s]
U_{Bremse}	Operating voltage of the brake	[V]
U_{Mot}	Operating voltage of the motor	[V]
Z	Starting frequency	[1/h], [c/h]
Z_0	No-load starting frequency	[1/h], [c/h]

11.2 Index

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Address Directory

Germany			
Headquarters **Production** **Sales**	**Bruchsal**	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 42 D-76646 Bruchsal P.O. Box Postfach 3023 • D-76642 Bruchsal	Tel. +49 7251 75-0 Fax +49 7251 75-1970 http://www.sew-eurodrive.de sew@sew-eurodrive.de
Production	**Graben**	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 1 D-76676 Graben-Neudorf P.O. Box Postfach 1220 • D-76671 Graben-Neudorf	Tel. +49 7251 75-0 Fax +49 7251 75-2970
	Östringen	SEW-EURODRIVE Östringen GmbH Franz-Gurk-Straße 2 D-76684 Östringen P.O. Box Postfach 1174 • D-76677 Östringen	Tel. +49 7253 92540 Fax +49 7253 925490 oestringen@sew-eurodrive.de
Service Competence Center	**Central** Gear units / Motors	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 1 D-76676 Graben-Neudorf	Tel. +49 7251 75-1710 Fax +49 7251 75-1711 sc-mitte-gm@sew-eurodrive.de
	Central Electronics	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 42 D-76646 Bruchsal	Tel. +49 7251 75-1780 Fax +49 7251 75-1769 sc-mitte-e@sew-eurodrive.de
	North	SEW-EURODRIVE GmbH & Co KG Alte Ricklinger Straße 40-42 D-30823 Garbsen (near Hannover)	Tel. +49 5137 8798-30 Fax +49 5137 8798-55 sc-nord@sew-eurodrive.de
	East	SEW-EURODRIVE GmbH & Co KG Dänkritzer Weg 1 D-08393 Meerane (near Zwickau)	Tel. +49 3764 7606-0 Fax +49 3764 7606-30 sc-ost@sew-eurodrive.de
	South	SEW-EURODRIVE GmbH & Co KG Domagkstraße 5 D-85551 Kirchheim (near München)	Tel. +49 89 909552-10 Fax +49 89 909552-50 sc-sued@sew-eurodrive.de
	West	SEW-EURODRIVE GmbH & Co KG Siemensstraße 1 D-40764 Langenfeld (near Düsseldorf)	Tel. +49 2173 8507-30 Fax +49 2173 8507-55 sc-west@sew-eurodrive.de
	Drive Service Hotline / 24 Hour Service		+49 180 5 SEWHELP +49 180 5 7394357
Technical Offices	**Augsburg**	SEW-EURODRIVE GmbH & Co KG August-Wessels-Straße 29 D-86156 Augsburg	Tel. +49 821 22779-10 Fax +49 821 22779-50 tb-augsburg@sew-eurodrive.de
	Berlin	SEW-EURODRIVE GmbH & Co KG Lilienthalstraße 3a D-12529 Schönefeld	Tel. +49 33762 2266-30 Fax +49 33762 2266-36 tb-berlin@sew-eurodrive.de
	Bodensee	SEW-EURODRIVE GmbH & Co KG Burgbergring 91 D-88662 Überlingen	Tel. +49 7551 9226-30 Fax +49 7551 9226-56 tb-bodensee@sew-eurodrive.de
	Bremen	SEW-EURODRIVE GmbH & Co KG Kohlhökerstr.48 D-28203 Bremen	Tel. +49 421 33918-0 Fax +49 421 33918-22 tb-bremen@sew-eurodrive.de
	Dortmund	SEW-EURODRIVE GmbH & Co KG Hildastraße 10 D-44145 Dortmund	Tel. +49 231 912050-10 Fax +49 231 912050-20 tb-dortmund@sew-eurodrive.de
	Dresden	SEW-EURODRIVE GmbH & Co KG Hauptstraße 32 D-01445 Radebeul	Tel. +49 351 26338-0 Fax +49 351 26338-38 tb-dresden@sew-eurodrive.de
	Erfurt	SEW-EURODRIVE GmbH & Co KG Blumenstraße 70 D-99092 Erfurt	Tel. +49 361 21709-70 Fax +49 361 21709-79 tb-erfurt@sew-eurodrive.de
	Güstrow	SEW-EURODRIVE GmbH & Co KG Thünenweg 19 D-18273 Güstrow P.O. Box Postfach 1216 • D-18262 Güstrow	Tel. +49 3843 8557-80 Fax +49 3843 8557-88 tb-guestrow@sew-eurodrive.de

Germany			
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	Hannover/ Garbsen	SEW-EURODRIVE GmbH & Co KG Alte Ricklinger Str.40-42 D-30823 Garbsen P.O. Box Postfach 1104 53 • D-30804 Garbsen	Tel. +49 5137 8798-10 Fax +49 5137 8798-50 tb-hannover@sew-eurodrive.de
	Heilbronn	SEW-EURODRIVE GmbH & Co KG Zeppelinstraße 7 D-74357 Bönnigheim P.O. Box Postfach 68 • D-74355 Bönnigheim	Tel. +49 7143 8738-0 Fax +49 7143 8738-25 tb-heilbronn@sew-eurodrive.de
	Herford	SEW-EURODRIVE GmbH & Co KG Radewiger Straße 21 D-32052 Herford P.O. Box Postfach 4108 • D-32025 Herford	Tel. +49 5221 9141-0 Fax +49 5221 9141-20 tb-herford@sew-eurodrive.de
	Karlsruhe	SEW-EURODRIVE GmbH & Co KG Ettlinger Weg 2 D-76467 Bietigheim P.O. Box Postfach 43 • D-76463 Bietigheim	Tel. +49 7245 9190-10 Fax +49 7245 9190-20 tb-karlsruhe@sew-eurodrive.de
	Kassel	SEW-EURODRIVE GmbH & Co KG Lange Straße 14 D-34253 Lohfelden	Tel. +49 561 95144-80 Fax +49 561 95144-90 tb-kassel@sew-eurodrive.de
	Koblenz	SEW-EURODRIVE GmbH & Co KG Bahnstraße 17a D-56743 Mendig	Tel. +49 2652 9713-30 Fax +49 2652 9713-40 tb-koblenz@sew-eurodrive.de
	Lahr	SEW-EURODRIVE GmbH & Co KG Europastraße 3 D-77933 Lahr / Schwarzwald	Tel. +49 7821 90999-60 Fax +49 7821 90999-79 tb-lahr@sew-eurodrive.de
	Langenfeld	SEW-EURODRIVE GmbH & Co KG Siemensstraße 1 D-40764 Langenfeld	Tel. +49 2173 8507-10 Fax +49 2173 8507-50 tb-langenfeld@sew-eurodrive.de
	Magdeburg	SEW-EURODRIVE GmbH & Co KG Burgstraße 7 D-39326 Wolmirstedt	Tel. +49 39201 7004-1 Fax +49 39201 7004-9 tb-magdeburg@sew-eurodrive.de
	Mannheim	SEW-EURODRIVE GmbH & Co KG Radeberger Straße 2 D-68309 Mannheim	Tel. +49 621 71683-10 Fax +49 621 71683-22 tb-mannheim@sew-eurodrive.de
	München	SEW-EURODRIVE GmbH & Co KG Domagkstraße 5 D-85551 Kirchheim	Tel. +49 89 909551-10 Fax +49 89 909551-50 tb-muenchen@sew-eurodrive.de
	Münster	SEW-EURODRIVE GmbH & Co KG Von-Vincke-Straße 14 D-48143 Münster	Tel. +49 251 41475-11 Fax +49 251 41475-50 tb-muenster@sew-eurodrive.de
	Nürnberg	SEW-EURODRIVE GmbH & Co KG Plattenäckerweg 6 D-90455 Nürnberg	Tel. +49 911 98884-50 Fax +49 911 98884-60 tb-nuernberg@sew-eurodrive.de
	Regensburg	SEW-EURODRIVE GmbH & Co KG Im Gewerbepark A15 D-93059 Regensburg	Tel. +49 941 46668-68 Fax +49 941 46668-66 tb-regensburg@sew-eurodrive.de
	Rhein-Main	SEW-EURODRIVE GmbH & Co KG Niederstedter Weg 5 D-61348 Bad Homburg	Tel. +49 6172 9617-0 Fax +49 6172 9617-50 tb-rheinmain@sew-eurodrive.de
	Stuttgart	SEW-EURODRIVE GmbH & Co KG Friedrich-List-Straße 46 D-70771 Leinfelden-Echterdingen	Tel. +49 711 16072-0 Fax +49 711 16072-72 tb-stuttgart@sew-eurodrive.de
	Ulm	SEW-EURODRIVE GmbH & Co KG Dieselstraße 14 D-89160 Dornstadt	Tel. +49 7348 9885-0 Fax +49 7348 9885-90 tb-ulm@sew-eurodrive.de

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	Zwickau / Meerane	SEW-EURODRIVE GmbH & Co KG Dänkritzer Weg1 D-08393 Meerane	Tel. +49 3764 7606-0 Fax +49 3764 7606-20 tb-zwickau@sew-eurodrive.de

France			
Production Sales Service	**Haguenau**	SEW-USOCOME 48-54, route de Soufflenheim B. P. 20185 F-67506 Haguenau Cedex	Tel. +33 3 88 73 67 00 Fax +33 3 88 73 66 00 http://www.usocome.com sew@usocome.com
Assembly Sales Service	**Bordeaux**	SEW-USOCOME Parc d'activités de Magellan 62, avenue de Magellan - B. P. 182 F-33607 Pessac Cedex	Tel. +33 5 57 26 39 00 Fax +33 5 57 26 39 09
	Lyon	SEW-USOCOME Parc d'Affaires Roosevelt Rue Jacques Tati F-69120 Vaulx en Velin	Tel. +33 4 72 15 37 00 Fax +33 4 72 15 37 15
	Paris	SEW-USOCOME Zone industrielle 2, rue Denis Papin F-77390 Verneuil l'Etang	Tel. +33 1 64 42 40 80 Fax +33 1 64 42 40 88
Technical Offices	**Alsace Franche-Comté**	SEW-USOCOME 1, rue Auguste Gasser F-68360 Soultz	Tel. +33 3 89 74 51 62 Fax +33 3 89 76 58 71
	Alsace Nord	SEW-USOCOME 15, rue Mambourg F-68240 Sigolsheim	Tel. +33 3 89 78 45 11 Fax +33 3 89 78 45 12
	Aquitaine	SEW-USOCOME Parc d'activités de Magellan 62, avenue de Magellan B.P.182 F-33607 Pessac Cedex	Tel. +33 5 57 26 39 00 Fax +33 5 57 26 39 09
	Ardennes Lorraine	SEW-USOCOME 7, rue de Prény F-54000 Nancy	Tel. +33 3 83 96 28 04 Fax +33 3 83 96 28 07
	Bourgogne	SEW-USOCOME 10, rue de la Poste F-71350 Saint Loup Géanges	Tel. +33 3 85 49 92 18 Fax +33 3 85 49 92 19
	Bretagne Ouest	SEW-USOCOME 4, rue des Châtaigniers F-44830 Brains	Tel. +33 2 51 70 54 04 Fax +33 2 51 70 54 05
	Centre Auvergne	SEW-USOCOME 27, avenue du Colombier F-19150 Laguenne	Tel. +33 5 55 20 12 10 Fax +33 5 55 20 12 11
	Centre Pays de Loire	SEW-USOCOME 9, rue des Erables F-37540 Saint Cyr sur Loire	Tel. +33 2 47 41 33 23 Fax +33 2 47 41 34 03
	Champagne	SEW-USOCOME 2, chemin des Suivots F-10120 Saint André les Vergers	Tel. +33 3 25 79 63 24 Fax +33 3 25 79 63 25
	Lyon Nord-Est	SEW-USOCOME Parc d'Affaires Roosevelt Rue Jacques Tati F-69120 Vaulx en Velin	Tel. +33 4 72 15 37 03 Fax +33 4 72 15 37 15
	Lyon Ouest	SEW-USOCOME Parc d'Affaires Roosevelt Rue Jacques Tati F-69120 Vaulx en Velin	Tel. +33 4 72 15 37 04 Fax +33 4 72 15 37 15
	Lyon Sud-Est	SEW-USOCOME Montée de la Garenne F-26750 Génissieux	Tel. +33 4 75 05 65 95 Fax +33 4 75 05 65 96

France			
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	Normandie	SEW-USOCOME 5 rue de la Limare F-14250 Brouay	Tel. +33 2 31 37 92 86 Fax +33 2 31 74 68 15
	Paris Est	SEW-USOCOME Résidence Le Bois de Grâce 2, allée des Souches Vertes F-77420 Champs sur Marne	Tel. +33 1 64 68 40 50 Fax +33 1 64 68 45 00
	Paris Ouest	SEW-USOCOME 42 avenue Jean Jaurès F-78580 Maule	Tel. +33 1 30 90 89 86 Fax +33 1 30 90 93 15
	Paris Picardie	SEW-USOCOME 25 bis, rue Kléber F-92300 Levallois Perret	Tel. +33 1 41 05 92 74 Fax +33 1 41 05 92 75
	Paris Sud	SEW-USOCOME 6. chemin des Bergers Lieu-dit Marchais F-91410 Roinville sous Dourdan	Tel. +33 1 60 81 10 56 Fax +33 1 60 81 10 57
	Provence	SEW-USOCOME Résidence Les Hespérides Bât. B2 67, boulevard des Alpes F-13012 Marseille	Tel. +33 4 91 18 00 11 Fax +33 4 91 18 00 12
	Pyrénées	SEW-USOCOME 271, Lieu-dit Ninaut F-31190 Caujac	Tel. +33 5 61 08 15 85 Fax +33 5 61 08 16 44
	Sud-Atlantique	SEW-USOCOME 12, rue des Pinsons F-44120 Vertou	Tel. +33 2 40 80 32 23 Fax +33 2 40 80 32 13

Algeria			
Sales	**Alger**	Réducom 16, rue des Frères Zaghnoun Bellevue El-Harrach 16200 Alger	Tel. +213 21 8222-84 Fax +213 21 8222-84

Argentina			
Assembly **Sales** **Service**	**Buenos Aires**	SEW EURODRIVE ARGENTINA S.A. Centro Industrial Garin, Lote 35 Ruta Panamericana Km 37,5 1619 Garin	Tel. +54 3327 4572-84 Fax +54 3327 4572-21 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
	Perth	SEW-EURODRIVE PTY. LTD. 105 Robinson Avenue Belmont, W.A. 6104	Tel. +61 8 9478-2688 Fax +61 8 9277-7572 enquires@sew-eurodrive.com.au
	Brisbane	SEW-EURODRIVE PTY.LTD. 1 /34 Collinsvale St Rocklea, Queensland, 4106	Tel. +61 7 3272-7900 Fax +61 7 3272-7901 enquires@sew-eurodrive.com.au
Technical Offices	**Adelaide**	SEW-EURODRIVE PTY. LTD. Unit 1/601 Anzac Highway Glenelg, S.A. 5045	Tel. +61 8 8294-8277 Fax +61 8 8294-2893 enquires@sew-eurodrive.com.au
	Townsville	SEW-EURODRIVE PTY. LTD. 12 Leyland Street Garbutt, QLD 4814	Tel. +61 7 4779 4333 Fax +61 7 4779 5333 enquires@sew-eurodrive.com.au

Austria			
Assembly **Sales** **Service**	**Wien**	SEW-EURODRIVE Ges.m.b.H. Richard-Strauss-Strasse 24 A-1230 Wien	Tel. +43 1 617 55 00-0 Fax +43 1 617 55 00-30 http://sew-eurodrive.at sew@sew-eurodrive.at
Technical Offices	**Linz**	SEW-EURODRIVE Ges.m.b.H. Reuchlinstr. 6/3 A-4020 Linz	Tel. +43 732 655 109-0 Fax +43 732 655 109-20 tb-linz@sew-eurodrive.at
	Graz	SEW-EURODRIVE Ges.m.b.H. Grabenstraße 231 A-8045 Graz	Tel. +43 316 685 756-0 Fax +43 316 685 755 tb-graz@sew-eurodrive.at
	Dornbirn	SEW-EURODRIVE Ges.m.b.H. Lustenauerstraße 27/1 A-6850 Dornbirn	Tel. +43 5572 3725 99-0 Fax +43 5572 3725 99-20 tb-dornbirn@sew-eurodrive.at

Bangladesh			
Sales	**Dhaka**	Triangle Trade International Bldg-5, Road-2, Sec-3, Uttara Model Town Dhaka-1230 Bangladesh	Tel. +880 2 8912246 Fax +880 2 8913344

Belgium			
Assembly **Sales** **Service**	**Brüssel**	SEW Caron-Vector S.A. Avenue Eiffel 5 B-1300 Wavre	Tel. +32 10 231-311 Fax +32 10 231-336 http://www.caron-vector.be info@caron-vector.be
Technical Office	**Vlaanderen**	SEW Caron-Vector S.A. Industrieweg 112-114 B-9032 Gent (Wondelgem)	Tel. +32 92 273-452 Fax +32 92 274-155

Bolivia			
Sales	**La Paz**	GRUPO LARCOS LTDA. Av. Jose Carrasco Not. 1398 Entre Hugo Estrada Y Av. Busch La Paz	Tel. +591 2 221808 Fax +591 2 220085 larcos@ceibo.entelnet.bo

Brazil			
Production **Sales** **Service**	**Sao Paulo**	SEW-EURODRIVE Brasil Ltda. Avenida Amâncio Gaiolli, 50 Caixa Postal: 201-07111-970 Guarulhos/SP - Cep.: 07251-250	Tel. +55 11 6489-9133 Fax +55 11 6480-3328 http://www.sew.com.br sew@sew.com.br
	Additional addresses for service in Brazil provided on request!		

Bulgaria			
Sales	**Sofia**	BEVER-DRIVE GmbH Bogdanovetz Str.1 BG-1606 Sofia	Tel. +359 2 9151160 Fax +359 2 9151166 bever@fastbg.net

Cameroon			
Sales	**Douala**	Electro-Services Rue Drouot Akwa B.P. 2024 Douala	Tel. +237 4322-99 Fax +237 4277-03

Canada			
Assembly **Sales** **Service**	**Toronto**	SEW-EURODRIVE CO. OF CANADA LTD. 210 Walker Drive Bramalea, Ontario L6T3W1	Tel. +1 905 791-1553 Fax +1 905 791-2999 http://www.sew-eurodrive.ca l.reynolds@sew-eurodrive.ca
	Vancouver	SEW-EURODRIVE CO. OF CANADA LTD. 7188 Honeyman Street Delta. B.C. V4G 1 E2	Tel. +1 604 946-5535 Fax +1 604 946-2513 b.wake@sew-eurodrive.ca
	Montreal	SEW-EURODRIVE CO. OF CANADA LTD. 2555 Rue Leger Street LaSalle, Quebec H8N 2V9	Tel. +1 514 367-1124 Fax +1 514 367-3677 a.peluso@sew-eurodrive.ca

Canada			
	Additional addresses for service in Canada provided on request!		

Chile			
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China			
Production **Assembly** **Sales** **Service**	**Tianjin**	SEW-EURODRIVE (Tianjin) Co., Ltd. No. 46, 7th Avenue, TEDA Tianjin 300457	Tel. +86 22 25322612 Fax +86 22 25322611 gm-tianjin@sew-eurodrive.cn http://www.sew-eurodrive.com.cn
Assembly **Sales** **Service**	**Suzhou**	SEW-EURODRIVE (Suzhou) Co., Ltd. 333, Suhong Middle Road Suzhou Industrial Park Jiangsu Province, 215021 P. R. China	Tel. +86 512 62581781 Fax +86 512 62581783 suzhou@sew.com.cn
	Guangzhou	SEW-EURODRIVE (Guangzhou) Co., Ltd. No. 9, JunDa Road East Section of GETDD Guangzhou 510530 P. R. China	Tel. +86 20 82267890 Fax +86 20 82267891 sewguangzhou@sew.com.cn
	Shenyang	SEW-EURODRIVE (Shenyang) Co., Ltd. 10A-2, 6th Road Shenyang Economic Technological ¬Development Area Shenyang, 110141 P. R. China	Tel. +86 24 22521596 Fax +86 24 22521579 shenyang@sew.com.cn

Colombia			
Assembly **Sales** **Service**	**Bogotá**	SEW-EURODRIVE COLOMBIA LTDA. Calle 22 No. 132-60 Bodega 6, Manzana B Santafé de Bogotá	Tel. +57 1 54750-50 Fax +57 1 54750-44 http://www.sew-eurodrive.com.co sewcol@sew-eurodrive.com.co

Croatia			
Sales **Service**	**Zagreb**	KOMPEKS d. o. o. PIT Erdödy 4 II HR 10 000 Zagreb	Tel. +385 1 4613-158 Fax +385 1 4613-158 kompeks@net.hr

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Technical Offices	**Brno**	SEW-EURODRIVE CZ S.R.O. Krenova 52 CZ -60200 Brno	Tel. +420 543256151 + 543256163 Fax +420 543256845
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Denmark			
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Denmark			
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	Helsingør	SEW-EURODRIVEA/S Rømøvej 2 DK-3140 Ålsgårde	Tel. +45 49 7557-00 Fax +45 49 7558-00
	Odense	SEW-EURODRIVEA/S Lindelyvei 29, Nr. Søby DK-5792 Arslev	Tel. +45 65 9020-70 Fax +45 65 9023-09

Egypt			
Sales **Service**	**Cairo**	Copam Egypt for Engineering & Agencies 33 El Hegaz ST, Heliopolis, Cairo	Tel. +20 2 2566-299 + 1 23143088 Fax +20 2 2594-757 http://www.copam-egypt.com/ copam@datum.com.eg

Estonia			
Sales	**Tallin**	ALAS-KUUL AS Mustamäe tee 24 EE-10620Tallin	Tel. +372 6593230 Fax +372 6593231 veiko.soots@alas-kuul.ee

Finland			
Assembly **Sales** **Service**	**Lahti**	SEW-EURODRIVE OY Vesimäentie 4 FIN-15860 Hollola 2	Tel. +358 201 589-300 Fax +358 3 780-6211 sew@sew.fi http://www.sew-eurodrive.fi
Technical Offices	**Helsinki**	SEW-EURODRIVE OY Luutnantinaukio 5C LT2 FIN-00410 Helsinki	Tel. +358 201 589-300 Fax + 358 9 5666-311 sew@sew.fi
	Vaasa	SEW-EURODRIVE OY Kauppapuistikko 11 E FIN-65100 Vaasa	Tel. +358 3 589-300 Fax +358 6 3127-470

Gabon			
Sales	**Libreville**	Electro-Services B.P. 1889 Libreville	Tel. +241 7340-11 Fax +241 7340-12

Great Britain			
Assembly **Sales** **Service**	**Normanton**	SEW-EURODRIVE Ltd. Beckbridge Industrial Estate P.O. Box No.1 GB-Normanton, West- Yorkshire WF6 1QR	Tel. +44 1924 893-855 Fax +44 1924 893-702 http://www.sew-eurodrive.co.uk info@sew-eurodrive.co.uk
Technical Offices	**London**	SEW-EURODRIVE Ltd. 764 Finchely Road, Temple Fortune GB-London N.W.11 7TH	Tel. +44 20 8458-8949 Fax +44 20 8458-7417
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	Scotland	SEW-EURODRIVE Ltd. Scottish Office No 37 Enterprise House Springkerse Business Park GB-Stirling FK7 7UF Scotland	Tel. +44 17 8647-8730 Fax +44 17 8645-0223

Greece			
Sales **Service**	**Athen**	Christ. Boznos & Son S.A. 12, Mavromichali Street P.O. Box 80136, GR-18545 Piraeus	Tel. +30 2 1042 251-34 Fax +30 2 1042 251-59 http://www.boznos.gr info@boznos.gr

Greece			
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Hong Kong			
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Hungary			
Sales **Service**	**Budapest**	SEW-EURODRIVE Kft. H-1037 Budapest Kunigunda u. 18	Tel. +36 1 437 06-58 Fax +36 1 437 06-50 office@sew-eurodrive.hu

Iceland			
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India			
Assembly **Sales** **Service**	**Baroda**	SEW-EURODRIVE India Pvt. Ltd. Plot No. 4, Gidc Por Ramangamdi • Baroda - 391 243 Gujarat	Tel. +91 265 2831086 Fax +91 265 2831087 http://www.seweurodriveindia.com mdoffice@seweurodriveindia.com
Technical Offices	**Bangalore**	SEW-EURODRIVE India Private Limited 308, Prestige Centre Point 7, Edward Road Bangalore	Tel. +91 80 22266565 Fax +91 80 22266569 salesbang@seweurodriveinindia.com
	Calcutta	SEW EURODRIVE INDIA PVT. LTD. Juthika Apartment, Flat No. B1 11/1, Sunny Park Calcutta - 700 019	Tel. +91 33 24615820 Fax +91 33 24615826 sewcal@cal.vsnl.net.in
	Chennai	SEW-EURODRIVE India Private Limited F2, 1st Floor, Sarvamangala Indira New No. 67, Bazullah Road Chennai - 600 017	Tel. +91 44 28144461 Fax +91 44 28144463 saleschen@seweurodriveindia.com
	Hyderabad	SEW-EURODRIVE India Pvt. Limited 408, 4th Floor, Meridian Place Green Park Road Amerpeet Hyderabad	Tel. +91 40 23414698 Fax +91 40 23413884 saleshyd@seweurodriveindia.com
	Mumbai	SEW-EURODRIVE India Private Limited 312 A, 3rd Floor, Acme Plaza Andheri Kurla Road, Andheri (E) Mumbai	Tel. +91 22 28348440 Fax +91 22 28217858 salesmumbai@seweurodriveindia.com
	New Delhi	SEW-EURODRIVE India Private Limited 303 Kirti Deep, 2-Nangal Raya Business Centre New Delhi 110 046	Tel. +91 11 28521566 Fax +91 11 28521577 salesdelhi@seweurodriveindia.com
	Pune	SEW-EURODRIVE India Private Limited 206, Metro House 7 Mangaldas Road Pune 411001, Maharashtra	Tel. +91 20 26111054 Fax +91 20 26132337 salespune@seweurodriveindia.com

Indonesia			
Technical Office	**Jakarta**	SEW-EURODRIVE Pte Ltd. Jakarta Liaison Office, Menara Graha Kencana Jl. Perjuangan No. 88, LT 3 B, Kebun Jeruk, Jakarta 11530	Tel. +62 21 5359066 Fax +62 21 5363686

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

Israel			
Sales	**Tel-Aviv**	Liraz Handasa Ltd. Ahofer Str 34B / 228 58858 Holon	Tel. +972 3 5599511 Fax +972 3 5599512 lirazhandasa@barak-online.net

Italy			
Assembly **Sales** **Service**	**Milano**	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Via Bernini,14 I-20020 Solaro (Milano)	Tel. +39 02 96 9801 Fax +39 02 96 799781 http://www.sew-eurodrive.it sewit@sew-eurodrive.it
Technical Offices	**Bologna**	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Via Emilia,172 I-40064 Ozzano dell'Emilia (Bo)	Tel. +39 051 796-660 Fax +39 051 796-595
	Caserta	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Viale Carlo III Km. 23,300 I-81020 S. Nicola la Strada (Caserta)	Tel. +39 0823 450611 Fax +39 0823 421414
	Firenze	RIMA Via Einstein, 14 I-50013 Campi Bisenzio (Firenze)	Tel. +39 055 898 58-21 Fax +39 055 898 58-30
	Pescara	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Via Emilia,172 I-40064 Ozzano dell'Emilia (Bo)	Tel. +39 051 796-660 Fax +39 051 796-595
	Torino	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Filiale Torino c.so Unione Sovietica 612/15 - int. C I-11035 Torino	Tel. +39 011 3473780 Fax +39 011 3473783
	Verona	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Via P. Sgulmero, 27/A I-37132 Verona	Tel. +39 045 97-7722 Fax +39 045 97-6079

Ivory Coast			
Sales	**Abidjan**	SICA Ste industrielle et commerciale pour l'Afrique 165, Bld de Marseille B.P. 2323, Abidjan 08	Tel. +225 2579-44 Fax +225 2584-36

Japan			
Assembly **Sales** **Service**	**Toyoda-cho**	SEW-EURODRIVE JAPAN CO., LTD 250-1, Shimoman-no, Iwata Shizuoka 438-0818	Tel. +81 538 373811 Fax +81 538 373814 sewjapan@sew-eurodrive.co.jp
Technical Offices	**Fukuoka**	SEW-EURODRIVE JAPAN CO., LTD. C-go, 5th-floor, Yakuin-Hiruzu-Bldg. 1-5-11, Yakuin, Chuo-ku Fukuoka, 810-0022	Tel. +81 92 713-6955 Fax +81 92 713-6860 sewkyushu@jasmine.ocn.ne.jp
	Osaka	SEW-EURODRIVE JAPAN CO., LTD. B-Space EIRAI Bldg., 3rd Floor 1-6-9 Kyoumachibori, Nishi-ku, Osaka, 550-0003	Tel. +81 6 6444--8330 Fax +81 6 6444--8338 sewosaka@crocus.ocn.ne.jp
	Tokyo	SEW-EURODRIVE JAPAN CO., LTD. Izumi-Bldg. 5 F 3-2-15 Misaki-cho Chiyoda-ku, Tokyo 101-0061	Tel. +81 3 3239-0469 Fax +81 3 3239-0943 sewtokyo@basil.ocn.ne.jp

Korea			
Assembly **Sales** **Service**	**Ansan-City**	SEW-EURODRIVE KOREA CO., LTD. B 601-4, Banweol Industrial Estate Unit 1048-4, Shingil-Dong Ansan 425-120	Tel. +82 31 492-8051 Fax +82 31 492-8056 http://www.sew-korea.co.kr master@sew-korea.co.kr

Korea			
	Busan	SEW-EURODRIVE KOREA Co., Ltd. No. 1720 - 11, Songjeong - dong Gangseo-ku Busan 618-270	Tel. +82 51 832-0204 Fax +82 51 832-0230 master@sew-korea.co.kr
Technical Offices	**Daegu**	SEW-EURODRIVE KOREA Co., Ltd. No.1108 Sungan officete l 87-36, Duryu 2-dong, Dalseo-ku Daegu 704-712	Tel. +82 53 650-7111 Fax +82 53 650-7112 sewdaegu@netsgo.com
	DaeJeon	SEW-EURODRIVE KOREA Co., Ltd. No. 2017, Hongin offictel 536-9, Bongmyung-dong, Yusung-ku Daejeon 305-301	Tel. +82 42 828-6461 Fax +82 42 828-6463 sewdaejeon@netsgo.com
	Kwangju	SEW-EURODRIVE KOREA Co., Ltd. 4fl., Shinhyun B/D 96-16 Unam-dong, Buk-ku Kwangju 500-170	Tel. +82 62 511-9172 Fax +82 62 511-9174 sewkwangju@netsgo.com
	Seoul	SEW-EURODRIVE KOREA Co., Ltd. No.1104 Sunkyung officetel 106-4 Kuro 6-dong, Kuro-ku Seoul 152-054	Tel. +82 2 862-8051 Fax +82 2 862-8199 sewseoul@netsgo.com

Latvia			
Sales	**Riga**	SIA Alas-Kuul Katlakalna 11C LV-1073 Riga	Tel. +371 7139253 Fax +371 7139386 http://www.alas-kuul.com info@alas-kuul.com

Lebanon			
Sales	**Beirut**	Gabriel Acar & Fils sarl B. P. 80484 Bourj Hammoud, Beirut	Tel. +961 1 4947-86 +961 1 4982-72 +961 3 2745-39 Fax +961 1 4949-71 gacar@beirut.com

Lithuania			
Sales	**Alytus**	UAB Irseva Naujoji 19 LT-62175 Alytus	Tel. +370 315 79204 Fax +370 315 56175 info@irseva.lt http://www.sew-eurodrive.lt

Luxembourg			
Assembly **Sales** **Service**	**Brüssel**	CARON-VECTOR S.A. Avenue Eiffel 5 B-1300 Wavre	Tel. +32 10 231-311 Fax +32 10 231-336 http://www.caron-vector.be info@caron-vector.be

Malaysia			
Assembly **Sales** **Service**	**Johore**	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
Technical Offices	**Kota Kinabalu**	SEW-EURODRIVE Sdn Bhd (Kota Kinabalu Branch) Lot No. 2,1st Floor, Inanam Baru Phase III, Miles 5.1 /2, Jalan Tuaran, Inanam 89350 Kota Kinabalu Sabah, Malaysia	Tel. +60 88 424792 Fax +60 88 424807
	Kuala Lumpur	SEW-EURODRIVE Sdn. Bhd. No. 2, Jalan Anggerik Mokara 31/46 Kota Kemuning Seksyen 31 40460 Shah Alam Selangor Darul Ehsan	Tel. +60 3 5229633 Fax +60 3 5229622 sewpjy@po.jaring.my

Malaysia			
	Kuching	SEW-EURODRIVE Sdn. Bhd. Lot 268, Section 9 KTLD Lorong 9, Jalan Satok 93400 Kuching, Sarawak East Malaysia	Tel. +60 82 232380 Fax +60 82 242380
	Penang	SEW-EURODRIVE Sdn. Bhd. No. 38, Jalan Bawal Kimsar Garden 13700 Prai, Penang	Tel. +60 4 3999349 Fax +60 4 3999348 seweurodrive@po.jaring.my

Mexico			
Assembly **Sales** **Service**	**Queretaro**	SEW-EURODRIVE MEXIKO SA DE CV SEM-981118-M93 Tequisquiapan No. 102 Parque Industrail Queretaro C.P. 76220 Queretaro, Mexico	Tel. +52 442 1030-300 Fax +52 442 1030-301 http://www.sew-eurodrive.com.mx scmexico@seweurodrive.com.mx

Morocco			
Sales	**Casablanca**	Afit 5, rue Emir Abdelkader MA 20300 Casablanca	Tel. +212 22618372 Fax +212 22618351 richard.miekisiak@premium.net.ma

Netherlands			
Assembly **Sales** **Service**	**Rotterdam**	VECTOR Aandrijftechniek B.V. Industrieweg 175 NL-3044 AS Rotterdam Postbus 10085 NL-3004 AB Rotterdam	Tel. +31 10 4463-700 Fax +31 10 4155-552 http://www.vector.nu info@vector.nu

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. 10 Settlers Crescent, Ferrymead Christchurch	Tel. +64 3 384-6251 Fax +64 3 384-6455 sales@sew-eurodrive.co.nz
Technical Office	**Palmerston North**	SEW-EURODRIVE NEW ZEALAND LTD. C/-Grant Shearman, RD 5, Aronui Road Palmerston North	Tel. +64 6 355-2165 Fax +64 6 355-2316 sales@sew-eurodrive.co.nz

Norway			
Assembly **Sales** **Service**	**Moss**	SEW-EURODRIVE A/S Solgaard skog 71 N-1599 Moss	Tel. +47 69 241-020 Fax +47 69 241-040 http://www.sew-eurodrive.no sew@sew-eurodrive.no

Pakistan			
Technical Office	**Karachi**	SEW-EURODRIVE Pte. Ltd. Karachi Liaison Office A/3, 1st Floor, Central Commercial Area Sultan Ahmed Shah Road Block 7/8, K.C.H.S. Union Ltd., Karachi	Tel. +92 21 4529369 Fax +92 21 4547365 seweurodrive@cyber.net.pk

Peru			
Assembly **Sales** **Service**	**Lima**	SEW DEL PERU MOTORES REDUCTORES 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			
Technical Office	**Manila**	SEW-EURODRIVE Pte Ltd Manila Liaison Office Suite 110, Ground Floor Comfoods Building Senator Gil Puyat Avenue 1200 Makati City	Tel. +63 2 894275254 Fax +63 2 8942744 sewmla@i-next.net

Poland			
Assembly **Sales** **Service**	**Lodz**	SEW-EURODRIVE Polska Sp.z.o.o. ul. Techniczna 5 PL-92-518 Lodz	Tel. +48 42 67710-90 Fax +48 42 67710-99 http://www.sew-eurodrive.pl sew@sew-eurodrive.pl
Technical Office	**Katowice**	SEW-EURODRIVE Polska Sp.z.o.o. ul. Nad Jeziorem 87 PL-43-100 Tychy	Tel. +48 32 2175026 + 32 2175027 Fax +48 32 2277910
	Bydgoszcz	SEW-EURODRIVE Polska Sp.z.o.o. ul. Fordonska 246 PL-85-959 Bydgoszcz	Tel. +48 52 3606590 Fax +48 52 3606591
	Szczecinek	SEW-EURODRIVE Polska Sp.z.o.o. ul. Mickiewicza 2 pok. 36 PL-78-400 Szczecinek	Tel. +48 94 3728820 Fax +48 94 3728821

Portugal			
Assembly **Sales** **Service**	**Coimbra**	SEW-EURODRIVE, LDA. Apartado 15 P-3050-901 Mealhada	Tel. +351 231 20 9670 Fax +351 231 20 3685 http://www.sew-eurodrive.pt infosew@sew-eurodrive.pt
Technical Offices	**Lisboa**	Tertir Edifício Lisboa Gabinete 119 P-2615 Alverca do Ribatejo	Tel. +351 21 958-0198 Fax +351 21 958-0245 esc.lisboa@sew-eurodrive.pt
	Porto	Av. D. Afonso Henriques, 1196 - 1° - sala 102 Edifício ACIA P- 4450-016 Matosinhos	Tel. +351 229 350 383 Fax +351 229 350 384 MobilTel. +351 9 332559110 esc.porto@sew-eurodrive.pt

Romania			
Sales **Service**	**Bucuresti**	Sialco Trading SRL str. Madrid nr.4 011785 Bucuresti	Tel. +40 21 230-1328 Fax +40 21 230-7170 sialco@sialco.ro

Russia			
Assembly **Sales** **Service**	**St. Petersburg**	ZAO SEW-EURODRIVE P.O. Box 36 195220 St. Petersburg Russia	Tel. +7 812 3332522 +7 812 5357142 Fax +7 812 3332523 http://www.sew-eurodrive.ru sew@sew-eurodrive.ru
Technical Office	**Moskau**	ZAO SEW-EURODRIVE RUS-107023 Moskau	Tel. +7 495 9337090 Fax +7 495 9337094 mso@sew-eurodrive.ru
	Novosibirsk	ZAO SEW-EURODRIVE pr. K Marksa, d.30 RUS-630087 Novosibirsk	Tel. +7 383 3350200 Fax +7 383 3462544 nso@sew-eurodrive.ru

Senegal			
Sales	**Dakar**	SENEMECA Mécanique Générale Km 8, Route de Rufisque B.P. 3251, Dakar	Tel. +221 849 47-70 Fax +221 849 47-71 senemeca@sentoo.sn

Serbia and Montenegro			
Sales	**Beograd**	DIPAR d.o.o. Ustanicka 128a PC Košum, IV floor SCG-11000 Beograd	Tel. +381 11 347 3244 / +381 11 288 0393 Fax +381 11 347 1337 dipar@yubc.net

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. Rybnicna 40 SK-83107 Bratislava	Tel. +421 2 49595201 Fax +421 2 49595200 http://www.sew.sk sew@sew-eurodrive.sk
	Zilina	SEW-Eurodrive SK s.r.o. ul. Vojtecha Spanyola 33 SK-010 01 Zilina	Tel. +421 41 700 2513 Fax +421 41 700 2514 sew@sew-eurodrive.sk
	Banská Bystrica	SEW-Eurodrive SK s.r.o. Rudlovská cesta 85 SK-97411 Banská Bystrica	Tel. +421 48 414 6564 Fax +421 48 414 6566 sew@sew-eurodrive.sk

Slovenia			
Sales **Service**	**Celje**	Pakman - Pogonska Tehnika d.o.o. UI. XIV. divizije 14 SLO - 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 11 494-3104 http://www.sew.co.za dross@sew.co.za
	Capetown	SEW-EURODRIVE (PROPRIETARY) LIMITED Rainbow Park Cnr. Racecourse & Omuramba Road Montague Gardens Cape Town P.O.Box 36556 Chempet 7442 Cape Town	Tel. +27 21 552-9820 Fax +27 21 552-9830 Telex 576 062 dswanepoel@sew.co.za
	Durban	SEW-EURODRIVE (PROPRIETARY) LIMITED 2 Monaceo Place Pinetown Durban P.O. Box 10433, Ashwood 3605	Tel. +27 31 700-3451 Fax +27 31 700-3847 dtait@sew.co.za
	Nelspruit	SEW-EURODRIVE (PTY) LTD. 7 Christie Crescent Vintonia P.O.Box 1942 Nelspruit 1200	Tel. +27 13 752-8007 Fax +27 13 752-8008 robermeyer@sew.co.za
Technical Offices	**Port Elizabeth**	SEW-EURODRIVE PTY LTD. 5 b Linsay Road Neave Township 6000 Port Elizabeth	Tel. +27 41 453-0303 Fax +27 41 453-0305 dswanepoel@sew.co.za
	Richards Bay	SEW-EURODRIVE PTY LTD. 25 Eagle Industrial Park Alton Richards Bay P.O. Box 458 Richards Bay 3900	Tel. +27 35 797-3805 Fax +27 35 797-3819 dtait@sew.co.za

Spain			
Assembly **Sales** **Service**	**Bilbao**	SEW-EURODRIVE ESPAÑA, S.L. Parque Tecnológico, Edificio, 302 E-48170 Zamudio (Vizcaya)	Tel. +34 9 4431 84-70 Fax +34 9 4431 84-71 http://www.sew-eurodrive.es sew.spain@sew-eurodrive.es
Technical Offices	**Barcelona**	Delegación Barcelona Avenida Francesc Maciá 40-44 Oficina 3.1 E-08206 Sabadell (Barcelona)	Tel. +34 9 37 162200 Fax +34 9 37 233007

Spain			
	Lugo	Delegación Noroeste Apartado, 1003 E-27080 Lugo	Tel. +34 6 3940 3348 Fax +34 9 8220 2934
	Madrid	Delegación Madrid Gran Via. 48-2° A-D E-28220 Majadahonda (Madrid)	Tel. +34 9 1634 2250 Fax +34 9 1634 0899

Sri Lanka			
Sales	**Colombo**	SM International (Pte) Ltd 254, Galle Raod Colombo 4, Sri Lanka	Tel. +94 1 2584887 Fax +94 1 2582981

Sweden			
Assembly **Sales** **Service**	**Jönköping**	SEW-EURODRIVE AB Gnejsvägen 6-8 S-55303 Jönköping Box 3100 S-55003 Jönköping	Tel. +46 36 3442-00 Fax +46 36 3442-80 http://www.sew-eurodrive.se info@sew-eurodrive.se
Technical Offices	**Göteborg**	SEW-EURODRIVE AB Gustaf Werners gata 8 S-42131 Västra Frölunda	Tel. +46 31 70968-80 Fax +46 31 70968-93
	Malmö	SEW-EURODRIVE AB Borrgatan 5 S-21124 Malmö	Tel. +46 40 68064-80 Fax +46 40 68064-93
	Stockholm	SEW-EURODRIVE AB Björkholmsvägen 10 S-14125 Huddinge	Tel. +46 8 44986-80 Fax +46 8 44986-93
	Skellefteå	SEW-EURODRIVE AB Trädgårdsgatan 8 S-93131 Skellefteå	Tel. +46 910 7153-80 Fax +46 910 7153-93

Switzerland			
Assembly **Sales** **Service**	**Basel**	Alfred Imhof A.G. Jurastrasse 10 CH-4142 Münchenstein bei Basel	Tel. +41 61 417 1717 Fax +41 61 417 1700 http://www.imhof-sew.ch info@imhof-sew.ch
Technical Offices	**Rhaetian Switzerland**	André Gerber Es Perreyres CH-1436 Chamblon	Tel. +41 24 445 3850 Fax +41 24 445 4887
	Bern / Solothurn	Rudolf Bühler Muntersweg 5 CH-2540 Grenchen	Tel. +41 32 652 2339 Fax +41 32 652 2331
	Central Switzerland and Ticino	Beat Lütolf Baumacher 11 CH-6244 Nebikon	Tel. +41 62 756 4780 Fax +41 62 756 4786
	Zürich	René Rothenbühler Nörgelbach 7 CH-8493 Saland	Tel. +41 52 386 3150 Fax +41 52 386 3213
	Bodensee and East Switzerland	Markus Künzle Eichweg 4 CH-9403 Goldbach	Tel. +41 71 845 2808 Fax +41 71 845 2809

Taiwan (R.O.C.)			
Sales	**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
	Taipei	Ting Shou Trading Co., Ltd. 6F-3, No. 267, Sec. 2 Tung Hwa South Road, Taipei	Tel. +886 2 27383535 Fax +886 2 27368268 Telex 27 245 sewtwn@ms63.hinet.net

Thailand			
Assembly **Sales** **Service**	**Chon Buri**	SEW-EURODRIVE (Thailand) Ltd. Bangpakong Industrial Park 2 700/456, Moo.7, Tambol Donhuaroh Muang District Chon Buri 20000	Tel. +66 38 454281 Fax +66 38 454288 sewthailand@sew-eurodrive.com
Technical Offices	**Bangkok**	SEW-EURODRIVE PTE LTD Bangkok Liaison Office 6th floor, TPS Building 1023, Phattanakarn Road Klongtan, Phrakanong, Bangkok,10110	Tel. +66 2 7178149 Fax +66 2 7178152 sewthailand@sew-eurodrive.com
	Hadyai	SEW-EURODRIVE (Thailand) Ltd. Hadyai Country Home Condominium 59/101 Soi.17/1 Rachas-Utid Road. Hadyai, Songkhla 90110	Tel. +66 74 359441 Fax +66 74 359442 sewhdy@ksc.th.com
	Khonkaen	SEW-EURODRIVE (Thailand) Ltd. 4th Floor, Kaow-U-HA MOTOR Bldg, 359/2, Mitraphab Road. Muang District Khonkaen 40000	Tel. +66 43 225745 Fax +66 43 324871 sewkk@cscoms.com
	Lampang	SEW-EURODRIVE (Thailand) Ltd. 264 Chatchai Road, sob-tuy, Muang, Lampang 52100	Tel. +66 54 310241 Fax +66 54 310242 sewthailand@sew-eurodrive.com

Tunisia			
Sales	**Tunis**	T. M.S. Technic Marketing Service 7, rue Ibn El Heithem Z.I. SMMT 2014 Mégrine Erriadh	Tel. +216 1 4340-64 + 1 4320-29 Fax +216 1 4329-76 tms@tms.com.tn

Turkey			
Assembly **Sales** **Service**	**Istanbul**	SEW-EURODRIVE Hareket Sistemleri San. ve Tic. Ltd. Sti. Bagdat Cad. Koruma Cikmazi No. 3 TR-34846 Maltepe ISTANBUL	Tel. +90 216 4419163 / 164 3838014/15 Fax +90 216 3055867 sew@sew-eurodrive.com.tr
Technical Offices	**Ankara**	SEW-EURODRIVE Hareket Sistemleri San. ve Tic. Ltd. Sti. Özcelik Is Merkezi, 14. Sok, No. 4/42 TR-06370 Ostim/Ankara	Tel. +90 312 3853390 Fax +90 312 3853258
	Bursa	SEW-EURODRIVE Hareket Sistemleri San. ve Tic. Ltd. Sti. Besevler Küçük Sanayi Parkoop Parçacilar Sitesi 48. Sokak No. 47 TR Nilüfer/Bursa	Tel. +90 224 443 4556 Fax +90 224 443 4558
	Izmir	SEW-EURODRIVE Hareket Sistemleri San. ve Tic. Ltd. Sti. 1203/11 Sok. No. 4/613 Hasan Atli Is Merkezi TR-35110 Yenisehir-Izmir	Tel. +90 232 4696264 Fax +90 232 4336105

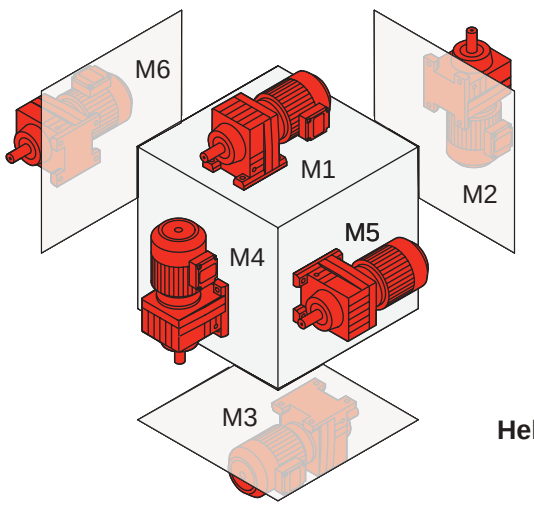
Ukraine			
Sales **Service**	**Dnepropetrovsk**	SEW-EURODRIVE Str. Rabochaja 23-B, Office 409 49008 Dnepropetrovsk	Tel. +380 56 370 3211 Fax +380 56 372 2078 http://www.sew-eurodrive.ua sew@sew-eurodrive.ua

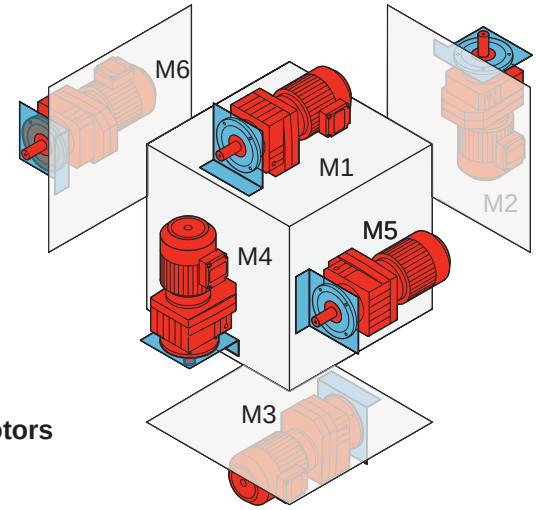
Uruguay			
Sales	**Montevideo**	SEW-EURODRIVE Argentina S. A. Sucursal Uruguay German Barbato 1526 CP 11200 Montevideo	Tel. +598 2 90181-89 Fax +598 2 90181-88 sewuy@sew-eurodrive.com.uy

USA			
Production **Assembly** **Sales** **Service**	**Greenville**	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 Manuf. +1 864 439-9948 Fax Ass. +1 864 439-0566 Telex 805 550 http://www.seweurodrive.com cslyman@seweurodrive.com
Assembly **Sales** **Service**	**San Francisco**	SEW-EURODRIVE INC. 30599 San Antonio St. Hayward, California 94544-7101	Tel. +1 510 487-3560 Fax +1 510 487-6381 cshayward@seweurodrive.com
	Philadelphia/PA	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
	Dayton	SEW-EURODRIVE INC. 2001 West Main Street Troy, Ohio 45373	Tel. +1 937 335-0036 Fax +1 937 440-3799 cstroy@seweurodrive.com
	Dallas	SEW-EURODRIVE INC. 3950 Platinum Way Dallas, Texas 75237	Tel. +1 214 330-4824 Fax +1 214 330-4724 csdallas@seweurodrive.com
	Additional addresses for service in the USA provided on request!		

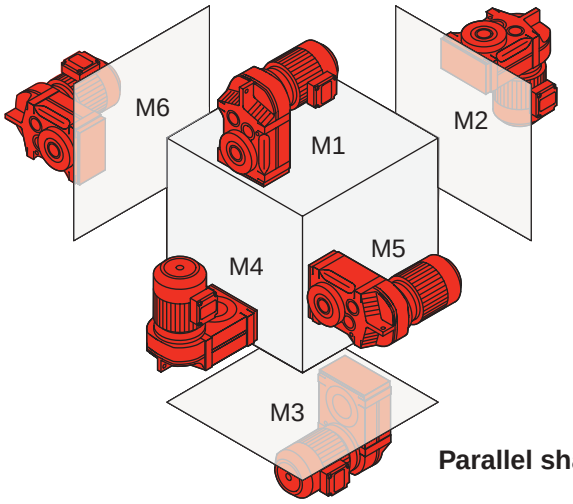
Venezuela			
Assembly **Sales** **Service**	**Valencia**	SEW-EURODRIVE Venezuela S.A. Av. Norte Sur No. 3, Galpon 84-319 Zona Industrial Municipal Norte Valencia, Estado Carabobo	Tel. +58 241 832-9804 Fax +58 241 838-6275 http://www.sew-eurodrive.com.ve sewventas@cantv.net sewfinanzas@cantv.net

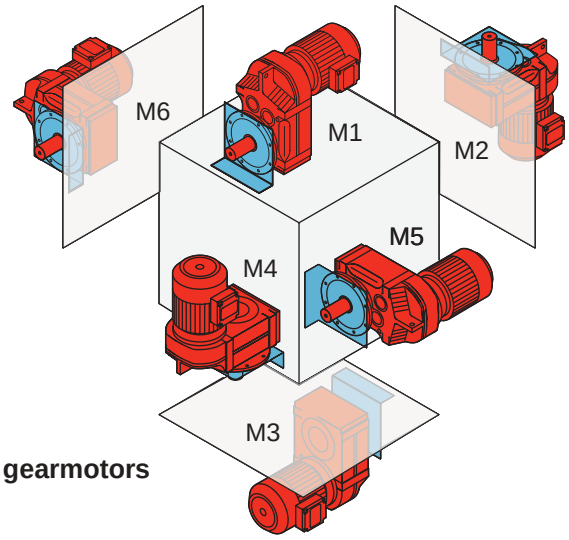
Overview of Mounting Positions*



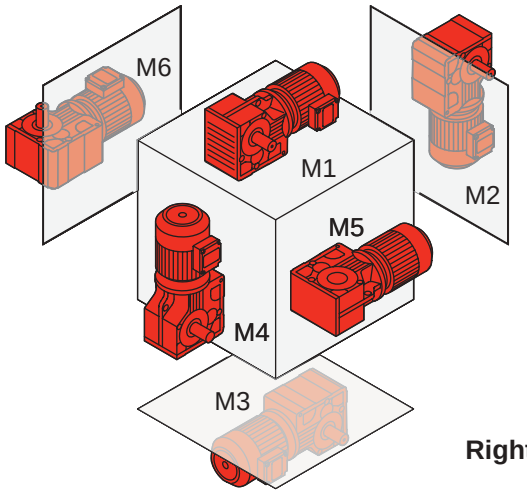


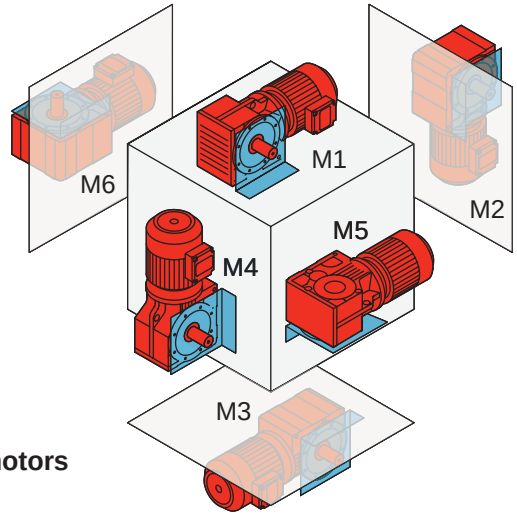
Helical gearmotors





Parallel shaft helical gearmotors





Right-angle gearmotors

03343AEN

* Refer to the main document for detailed information on mounting positions for SEW gearmotors.

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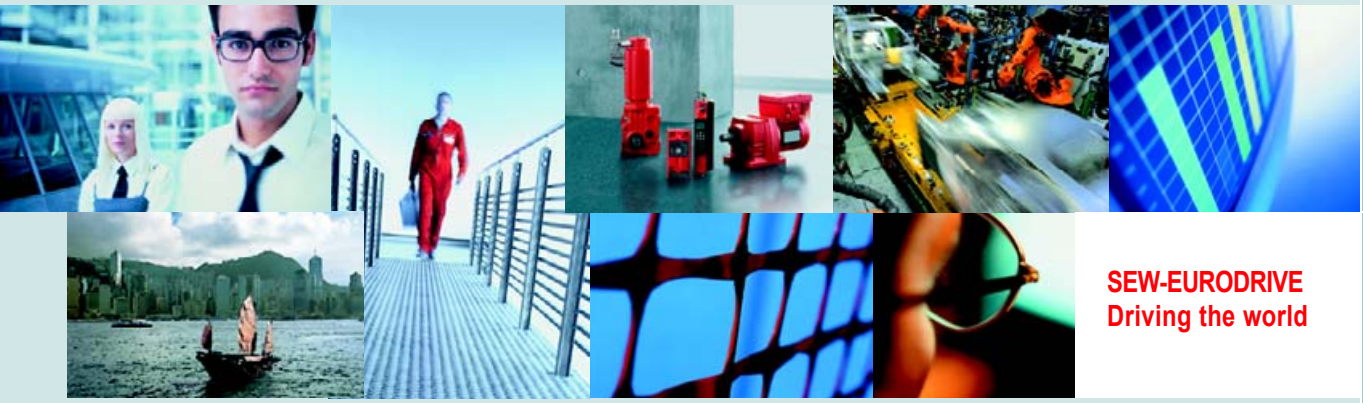

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