SEW EURODRIVE

Catalog

AC Motors

DRN63 – 315, DR2S56 – 80, DR2L71 – 80

Edition 11/2019

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1 Introduction

1.1 The SEW-EURODRIVE group of companies

1.1.1 Global presence

Driving the world – with innovative drive solutions for all industries and for every application. Products and systems from SEW-EURODRIVE are used all over the world. Be it in the automotive, building materials, food and beverage, or metal-processing industry – the decision to use drive technology "made by SEW-EURODRIVE" stands for reliable products in regard of functionality and investment.

Products and services from SEW-EURODRIVE are represented in all important industries of our time. We also show this presence with subsidiaries and production plants all over the world, as well as with our service, which we see as an integrative part of our portfolio that extends SEW-EURODRIVE's high quality standards.

1.1.2 Always the right drive solution

With the broad product portfolio from SEW-EURODRIVE, which also includes mechatronic drive units, frequency inverters, controllers, software and communication in addition to the tried-and-tested modular system for gearmotors, it is possible to implement the perfect drive solution for every application.

Gear units and motors

Thanks to the modular system, gearmotors can be combined individually according to the required speed and torque ranges, the space requirements and the ambient conditions. Gear units and gearmotors offering a unique and fine graduation of power range and the best economic prerequisites to face any drive challenge.

Motors by SEW-EURODRIVE can be mounted directly or via adapter to SEW-EURODRIVE gear units. They meet all worldwide requirements regarding energy efficiency and technical regulations. A wide range of options and accessories ensures high flexibility for adjusting the motor to the requirements of the user and the application.

Inverters

The proven inverter series MOVITRAC®, MOVIDRIVE® and MOVIAXIS® enhance the gearmotors, forming a combination that blends in perfectly with the existing SEW-EURODRIVE systems program.

Modular automation system

With its brand MOVI-C®, SEW-EURODRIVE launches a new generation of drive and automation technology. MOVI-C® is the modular automation system that allows for the highest level of system and machine automation. It comprises drive technology, MotionControl, control technology and visualization.

MOVIDRIVE® modular is the modular application inverter for all types of applications, ranging from simple open-loop speed control to servo drives with kinematic model. MOVIDRIVE® modular can be supplemented by connecting MOVIDRIVE® system single-axis units. These possess functionalities comparable to those of axis modules, but have their own line connection. Especially in the upper power range, MOVIDRIVE® system complements the modular application inverter.

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MOVIDRIVE® modular and system are intended for operation at the MOVI-C® CONTROLLER, the controller from SEW-EURODRIVE. They offer a powerful clock-synchronous connection via the integrated EtherCAT®/SBus^{PLUS} communication interface. Other EtherCAT® stations from SEW-EURODRIVE or other manufacturers can be controlled and diagnosed by the MOVI-C® CONTROLLER.

The MOVISUITE® engineering software, with its unique operating philosophy, prevails over all MOVI-C® hardware and software components. MOVISUITE® was developed with a focus on systematically shortening the startup time and covers the entire engineering process, from planning to diagnostics.

Decentralized drive technology

For economical, decentralized installations, SEW-EURODRIVE offers decentralized drive technology components, 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 the size of the system.

The decentralized drive technology portfolio is complemented by the DRC.. electronic motor, MOVIGEAR® mechatronic drive system, MOVIFIT® decentralized drive controller, MOVIPRO® decentralized drive, positioning, and application controller, as well as MOVITRANS® system components for the contactless energy transfer system.

The smart energy management system MOVI-DPS® enhances the modular product portfolio from SEW-EURODRIVE. With MOVI-DPS®, SEW-EURODRIVE offers the perfect combination: Conserving resources. Reducing costs.

MOVI-DPS® allows for stable power grids, no power failures, and consequently reliable system availability. MOVI-DPS® shows what it can do in both mobile and stationary applications. In addition, MOVI-DPS® can be combined with other systems such as the contactless energy transfer system MOVITRANS®, resulting in further important synergy effects.

Industrial gear units

Power, quality and sturdy design combined in one standard product: With high torque levels, industrial gear units from SEW-EURODRIVE realize major movements. The modular concept will once again provide optimum adaptation of industrial gear units to meet a wide range of different applications.

Individual system solutions with MAXOLUTION®

MAXOLUTION® from SEW-EURODRIVE provides individual system solutions in all areas of system and machine automation. From electromechanical drives, controllers and communication to visualization and the MOVITRANS® contactless energy transfer system to a comprehensive service portfolio, MAXOLUTION® offers all modules required to optimally design customer-specific solutions for machines and systems.

MAXOLUTION® combines individual products of the proven modular system with innovative system components to form individual solutions that perfectly match the requirements of the specific application – "powered by SEW-EURODRIVE".

Safe – flexible – effective: safetyDRIVE

Guaranteeing the safety of all employees and preventing work accidents while ensuring trouble-free production processes are demands placed on all production areas. safetyDRIVE, the comprehensive safety concept, allows you to implement your machines "safely," in accordance with the currently valid guidelines. With controllers that meet the respective requirement of the safety categories or the performance levels and that monitor instead of switch off.

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All of our drive and frequency inverters provide the function that safely stops the electrical power to the motor (STO). The MOVISAFE® components complete the portfolio – integrated into the inverter as option cards DFS..B or DCS..B or modular as safety modules UCS..B. The decentralized MOVIFIT® and MOVIPRO® drive controllers with integrated safety functions are ready for use in decentralized installations.

The functionally safe motor options allow for implementing safety functions in safety-related applications. Safety encoders are used to implement safety functions with respect to speed, direction of rotation, standstill, and relative position. Safety brakes can implement safety functions with respect to decelerating and stopping.

1.1.3 Your ideal partner

Its global presence, extensive product portfolio 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 drive tasks in all industries and applications.

For detailed information on the entire SEW-EURODRIVE product portfolio, refer to our website www.sew-eurodrive.com where you can find out about components, system solutions, services and industries. Via the Online Support, you can access a large selection of documents and tools such as the product configurator and different selection guides as well as all documentation in different languages for download.

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1.2 Product names and trademarks

All product names included in this documentation are trademarks or registered trademarks of the respective titleholders.

1.3 Copyright notice

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2 Product description

2.1 DRN../DR2.. AC Motors

The issues of environmental protection and efficiently conserving valuable resources have increasingly gained importance in recent years. For this reason, numerous industrial nations have and will pass laws and regulations to stipulate binding minimum efficiency values. This especially applies to products with a considerable share in the total energy consumption. The goal is to decrease the consumption of primary energy and simultaneously reduce CO_2 emissions.

The stricter legal requirements also affect AC asynchronous motors. We assume that the use of motors in accordance with the limit values of the international efficiency class IE3 will become mandatory in the largest target markets in the future.

There are no internationally consistent provisions for efficiency regulations with regard to affected products or approved exceptions in single countries or regions.

The high dynamics and the varying international regulations require documentation that can be quickly updated. For this reason, SEW-EURODRIVE provides the latest information on "efficiency regulations" online via "http://www.ie-guide.com" as well as via the Online Support under "Engineering & selection – Energy efficiency tools".

DR.. motors are suited for a variety of drive tasks in industrial environments. They are characterized by the reliability and quality SEW-EURODRIVE is known for and can be used worldwide. Regardless of being used in horizontal materials handling technology, lifting gears or other applications, DR.. motors certainly also meet your requirements even under harsh ambient conditions. In general, DR.. motors are suited for operation at the supply system and in connection with an inverter.

A broad range of approvals and certifications enables you to use DR.. motors all over the world. In this context, the DR.. global motors are particularly noteworthy as they can be used in almost any country in the world in the same design due to the wide voltage range and the numerous approvals. These characteristics reduce the effort regarding material management and storage, thereby saving you a lot of money.

This catalog focuses on DR.. stand-alone motors from SEW-EURODRIVE. Of course, you can also order all DR.. motors as gearmotors from SEW-EURODRIVE. The gear unit can be connected directly to the motor or can be connected using an adapter. You can find more information in the SEW-EURODRIVE gearmotor catalogs.

This catalog describes how the motor can be ideally adapted to your requirements by choosing the required design or by enhancing it with various options.

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2.1.1 Product characteristics

DRN../DR2.. AC motors are AC asynchronous motors with an aluminum squirrel cage. They are designed for continuous duty (S1 duty type). Just as the existing asynchronous motor series from SEW-EURODRIVE, the new DRN..-/DR2S.. motors are suitable for operation at the supply system as well as on an inverter.

The series includes IE1 and IE3 AC motors in 50, 60 and 50/60 Hz that are available for the following power ratings, depending on the number of poles and size:

Series	Number of poles	Sizes	Power range
DR2S..	2	63MS – 80M	0.18 – 1.5 kW
	4	56M to 80M	0.09 – 1.1 kW
	6	63M – 80MK	0.09 – 0.55 kW
DRN..	2	63MS – 132S	0.18 – 7.5 kW
	4	63MS – 315H	0.12 – 225 kW
	6	63M – 160M	0.09 – 7.5 kW
	8	71MS – 80M	0.09 – 0.25 kW

DRN.. motors adhere to the limit values of energy efficiency class IE1/IE3 or NEMA Standard/Premium at 50 Hz and 60 Hz. In regard of the size/power assignment, the series is based on IEC 60072 and/or EN 50347.

2.1.2 Brake

Upon request, SEW-EURODRIVE motors can be supplied with an electromechanical brake. It can be released mechanically if the design with manual brake release is selected accordingly. Up to 4 different brake sizes per power rating can be selected, which allow the user a high degree of flexibility when choosing the right drive due to the possible braking torque configurations. Upon request, BE.. brakes from SEW-EURODRIVE can be ordered in a functionally safe version in accordance with EN ISO 13849.

For continuous monitoring of brake wear and brake function, SEW-EURODRIVE offers the function and wear monitoring (/DUE option). This is a robust measuring system that is completely integrated into the drive. Thanks to the evaluation electronics used, it provides the user with real-time information about the condition of the brake.

For further information, refer to chapter "Brake and backstop" (→ 🗎 286).

2.1.3 Encoder

Along with the motors, SEW-EURODRIVE offers the option to mount incremental encoders and multi-turn absolute encoders without coupling, therefore creating a very compact solution.

Various electrical and mechanical interfaces are available. Up to 8 different encoder mounting adapters are available for mounting customer-specific encoders. If space is limited, built-in encoders /EI.. allow for implementing compact drive solutions. They are entirely integrated into the motor and therefore do not add length to the motor. Both add-on encoders and the EI.. built-in encoder can be ordered in a functionally safe version in accordance with EN ISO 13849.

For further information, refer to chapter "Encoders" (→ 🗎 357).

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2.1.4 Decentralized technology

AC motors from SEW-EURODRIVE with a rated power of up to 4 kW can be delivered with a MOVIMOT® inverter as an option. It is available in 2 variants: One variant is integrated into the terminal box and the other variant is mounted close to the motor and then connected to the motor. MOVIMOT® comes with numerous options as well as an extensive range of accessories. A functionally safe design for MOVIMOT® (according to EN ISO 13849) is also available.

Alternatively, AC motors from SEW-EURODRIVE in the power range between 0.09 and 3.0 kW can be delivered with the MOVI-SWITCH® motor starter with integrated switching and protection functions. The motor starter can either be mounted directly on the motor or close to the motor.

For further information, refer to chapter "AC motors with decentralized technology" (→ 🗎 387).

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2.2 Standards and regulations

SEW-EURODRIVE's AC motors comply with the IEC 60034/EN 60034 international series of product standards and also comply with other standards for special topics.

- **IEC 60034-1, EN 60034-1**

  Rotating electrical machines, rating and performance

- **IEC 60034-2-1, EN 60034-2-1**

  Rotating electrical machines, standard methods for determining losses and efficiency from tests

- **IEC 60034-5, EN 60034-5**

  Rotating electrical machines, degrees of protection provided by integral design of rotating electrical machines (IP code)

- **IEC 60034-7, EN 60034-7**

  Rotating electrical machines: Classification of types of construction, mounting arrangements and terminal box position (IM code)

- **IEC 60034-8, EN 60034-8**

  Rotating electrical machines: Terminal markings and direction of rotation

- **IEC 60034-9, EN 60034-9**

  Rotating electrical machines, noise limits

- **IEC 60034-11, EN 60034-11**

  Rotating electrical machines: Thermal protection

- **IEC 60034-12, EN 60034-12**

  Rotating electrical machines: Starting performance of single-speed three-phase cage induction motors

- **IEC 60034-14, EN 60034-14**

  Rotating electrical machines, mechanical vibrations

- **IEC 60034-18-41, EN 60034-18-41**

  Rotating electrical machines: Partial discharge free electrical insulation systems (Type I) used in rotating electrical machines fed from voltage converters - Qualification and quality control tests

- **IEC 60034-30-1, EN 60034-30-1**

  Rotating electrical machines, efficiency classes of line operated AC motors (IE code)

- **IEC 60072**

  Dimensions and output series for rotating electrical machines

- **EN 50347**

  General purpose three-phase induction motors having standard dimensions and outputs

In connection with terminal box:

- EN 62444:2013

  Cable glands for electrical installations (IEC 62444:2010, modified)

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In connection with functional safety:

- **EN ISO 13849-1**

  Safety of machines – Safety-related parts of control systems – Part 1: General design principles
- **EN ISO 12100**

  Safety of machinery – Basic terminology, general design principles
- **EN 61800-5-2**

  Electrical power drive systems with adjustable speed – Part 5.2: Safety requirements – Functional safety

For international use, further standards are considered as well:

- NEMA MG1

  Motors and generators
- UL 1004-1

  Standard for rotating electrical machines – General requirements
- CSA-C22.2 No. 100

  Motors and generators
- ABNT NBR 17094-1

  Rotating electrical machines – Inductance motors

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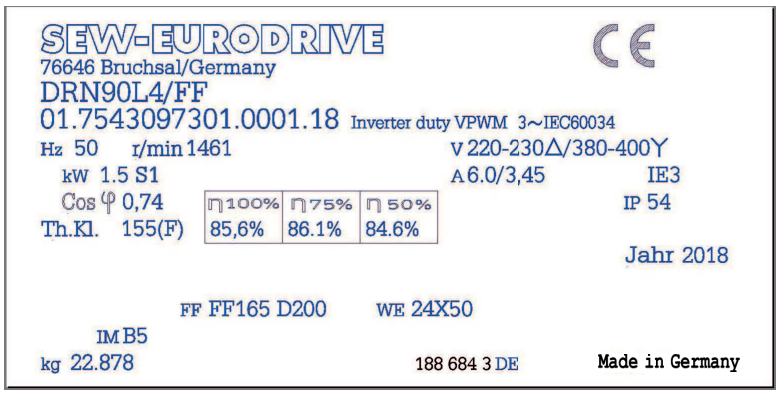
2.3 Rated data

Important data of an AC asynchronous motor:

- Size
- Number of poles
- Rated power
- Cyclic duration factor
- Rated speed
- Rated current
- Nominal voltage
- Rated frequency
- Power factor cosφ
- Degree of protection
- Thermal class
- Efficiency, energy efficiency class

This data is found on the nameplate of the motor, see the figure below. In accordance with IEC 60034-1, the nameplate data applies to a maximum ambient temperature of 40 °C and a maximum installation altitude of 1000 m above sea level.



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2.4 Worldwide usability

The motors can be used in every country in the world.

Market access is contingent to approvals in many countries. Local laws, regulations and other market-specific requirements must be adhered to. SEW-EURODRIVE provides the latest information on efficiency regulations online via "www.ie-guide.com" as well as via the Online Support under "Engineering & selection – Energy efficiency tools" on the website "www.sew-eurodrive.com".

In many cases, an identification on the motor is required along with the certification. This identification is documented with one or several logos on the nameplate or additional labels on the motor.

2.4.1 Approvals and certifications for asynchronous motors

The requirements on the condition of asynchronous motors are different all around the world to guarantee safe and efficient operation. A distinction has to be made between statutory provisions (e.g. efficiency regulations) and voluntary measures (e.g. specific certifications for selected markets).

2.4.2 Approvals

Proof of compliance with normative and statutory requirements is required for evaluation of the conformity. In many countries, adherence to statutory minimum efficiency levels are mandatory.

In some regions, such as Europe, the conformity can be evaluated directly by the manufacturer. It assesses the suitability of the product and confirms compliance with specifications under its own responsibility. In some countries, this assessment has to be performed by an accredited conformity assessment body. The manufacturer has to request the approval from an independent third party.

Independent of the type of conformity assessment, SEW-EURODRIVE fulfills the approval requirements for asynchronous motors worldwide.

In most cases, the product approval or conformity has to be indicated on the product itself. The following chapters provide a selection of frequently used labels on the nameplates.

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Market access

Country	Law/standard/regulation	Description	Identification on the nameplate
Argentina	IRAM 62405	Confirmation of efficiency	Special label
Brazil	ABNT 17094-1	Conformity rrequires, among others: • Number of standard • Starting current ratio • Wiring diagram(s) • Direction(s) of rotation • Bearing sizes	Information on nameplate
China	CCC Certification	CCC Small Devices Directive	CCC mark
Europe (EU)	2014/35/EU	Low Voltage Directive	CE mark
India	BIS	Conformity with check	BIS mark
Canada	CSA	Conformity with check	CSA mark
Russia, Kazakhstan, Belarus and Armenia	Technical Regulation	TR CU 004/2011 Low Voltage Directive	EAC mark
Ukraine	Technical Regulation	CMU No 1067-2015 Low Voltage Directive	UA.TR mark

Local business customs

Country	Law/standard/regulation	Description	Identification on the nameplate
Canada	CSA 22.2	Motor standard requires, among others: • Permitted temperature range • Design letter	Information on nameplate
USA	NEMA MG1 UL 1004-1	Proof of fire endurance based on recognized components	UR mark
		Number of assembly plant	ML + 2 numbers
		Motor standard requires, among others: • KVA letter • Design letter • Overload factor S.F TEFC, TENC or TEBC (similar to IP degree of protection)	e.g. design and ventilation type

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Subsidies

There are various subsidies available in the different markets to promote the use of energy-efficient motors. For more information, contact SEW-EURODRIVE.

Europe, Switzerland, Turkey

CE

By printing the CE marking on the nameplate, the manufacturer declares the conformity of the product with harmonized standards and applicable directives in the EU. Although the countries Switzerland and Turkey are not members of the EU, the EU specifications have been adopted for local laws. This means that the EU regulations are also applicable in these countries.

The declaration of conformity can be obtained from the manufacturer. It does not have to be included with the product upon delivery, i.e., when passing through customs.

Three directives are relevant for the motors:

- Machinery Directive 2006/42/EC
- Low Voltage Directive 2014/35/EU
- Ecodesign Directive 2009/125/EC

Motors whose CE conformity was declared in accordance with the Low Voltage Directive do not have to be declared in accordance with the Machinery Directive as well.

Directive 2009/125/EC

The Ecodesign Directive 2009/125/EC establishes a framework to set mandatory ecological requirements for energy-using and energy-related products. It covers the following topics:

- AC asynchronous motors in Regulation (EC) No. 640/2009 and Regulation (EU) No. 4/2014
- Fans/ventilators in Regulation (EC) No. 327/2011
- Water pumps in Regulation (EC) No. 547/2012
- Wet rotor circulation pumps in Regulation (EC) No. 641/2009

Regulation 640/2009 and 4/2014

This implementation directive (Reg 640/2009) regulates the market introduction of motors within the European Community. A minimum efficiency has been specified since June 16, 2011 that corresponds to IE2 from IEC 60034-30:2008.

As of January 1, 2017, motors in line operation with a power rating ≥ 0.75 kW must meet the higher IE3 level as per IEC 60034-30:2008.

Motors with IE2 as per IEC 60034-30: 2008) that are operated with a frequency inverter are excluded.

The following are exempt from Reg 640/2009 and 4/2014 within the ErP Regulation:

- Brakemotors
- Explosion-proof motors according to Directive 2014/34/EU
- Motors not on continuous duty
- Motors that are exclusively intended for operation under the following conditions:
  - Where ambient temperatures exceed 60 °C
  - Where ambient temperatures are less than -30 °C
  - More than 4000 meters above sea level

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Motors for use in Europe, Switzerland, Turkey

Series	Number of poles	Sizes	Power range
DR2S..	2	63MS – 71M	0.18 – 0.55 kW
	4	56M – 71M	0.09 – 0.55 kW
	6	63M – 80MK	0.09 – 0.55 kW
DRN..	2	63MS – 132S	0.18 – 7.5 kW
	4	63MS – 315H	0.12 – 225 kW
	6	63M – 160M	0.09 – 7.5 kW
	8	71MS – 80M	0.09 – 0.25 kW

Switzerland

Switzerland adopted the Energy-Related Products Directive and its implementation regulations in Energy Ordinance 730.01. This applies for motors since January 2012.

This means that the EU rules must be directly applied in Switzerland.

Turkey

Turkey has released rules pertaining to motors in various communiqués (SMG 2012/2), along with Gazette No. 28197 in February 2012.

This is when the Energy-Related Products Directive and its implementation regulation no. 640/2009 were adopted. Likewise, regulation no. 4/2014 was adopted per SMG 2015/15.

This means that the EU rules must be directly applied in Turkey.

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Australia, New Zealand

The minimum efficiency (MESP or GEMS 2018) stipulated by law both in Australia and New Zealand took effect on April 1, 2006 in Australia and on June 1, 2006 in New Zealand. It regulates numerical values and methods for measuring the efficiency of 2-, 4-, 6- and 8-pole motors from 0.73 kW to 185 kW.

No regulations were made for a power rating of up to 0.55 kW. This means that DRS2.. motors are approved up to this power rating.

At 0.73 kW and higher, the required efficiency corresponds as much as possible with that of the IE2 and IE3 motors specified by IEC 60034-30-1.

The DRN.. motors from SEW-EURODRIVE meet the legal requirements and have been registered by the authorization agency. There are no separate marks and no additional marking requirements.

The regulations exclude the following motors:

- Indivisible gearmotors.

  This means SPIROPLAN® W10/20/30 gearmotors (also WA.., WF.., WAF..) and R17 helical gearmotors (also RF17, RZ17) with motors from 0.75 kW to 1.1 kW in the DR2S.. design can be provided in compliance with regulations.
- Motors only intended for operation on a frequency inverter: DRL.. asynchronous servomotors.
- Motors in S2 short-time duty.
- Motors with integrated MOVIMOT® frequency inverter.
- DRK.. single-phase motors with running capacitor.

The overview of permitted motors can be found online by selecting "SEW-EURODRIVE" under the following link:

"http://reg.energyrating.gov.au/comparator/product_types/54/search/"

Information

In Australia and New Zealand, the IE2 motors are considered the standard design. The advanced IE3 motors (premium efficiency) are just "high-efficiency".

The voltage level 3×415 V, 50 Hz has already been adapted to 3×400 V -6%/+10%, 50 Hz throughout the most parts of these countries.

Applicable motors

Series	Number of poles	Sizes	Power range
DR2S..	2	63MS – 71M	0.18 – 0.55 kW
	4	56M – 71M	0.09 – 0.55 kW
	6	63M – 80MK	0.09 – 0.55 kW
DRN..	2	63MS – 132S	0.18 – 7.5 kW
	4	63MS – 315H	0.12 – 225 kW
	6	63M – 160M	0.09 – 7.5 kW
	8	71MS – 80M	0.09 – 0.25 kW

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USA

Market access in the United States requires three primary features for use or export.

- UL (UR) certificate (UL = Underwriters Laboratories)
- EISA 2007 conformity (EISA = Energy Independence and Security Act)
- Code of Federal Regulations title 10, chapter II, sub-chapter D, part 431 B motors

Registering AC motors with UL (Underwriters Laboratories) offers advantages for US users due to lower fire insurance premiums. The mark includes the registration number.

UL approvals for SEW-EURODRIVE can be accessed under no. E189357. All DRN.. motors can be equipped with the appropriate mark on the nameplate.

SEW-EURODRIVE places the UL mark on these motors that are combined with MOVIMOT®.

EISA compliance

The US legal requirements for minimum efficiency from 1992 were modified and renewed in 2007 and 2014. In a decision by U.S. authorities on May 29, 2014 taking effect on June 1, 2016, the requirements specified for the Premium NEMA energy efficiency class in the United States were extended to cover a larger power range and 8-pole motors, and numerous exceptions were eliminated. The requirements are specified in the Code of Federal Regulations of the Department of Energy (DoE).

EISA applies to the following motors:

- 2-pole and 4-pole motors from 1 hp (0.75 kW) to 200 hp (373 kW). These must meet the Premium Efficiency level.
- 6-pole motors from 1 hp (0.75 kW) to 350 hp (261 kW). These must meet the Premium Efficiency level.
- 8-pole motors from 1 hp (0.75 kW) to 250 hp (186 kW). These must meet the Premium Efficiency level.

Upon registration with the Department of Energy (DoE), the motors are marked with "ee" and the registration number, which is CC056A for SEW-EURODRIVE.

This efficiency requirement does not apply to the following motors:

- Motors that are not designed for continuous duty (e.g. S3/75%).
- Motors only intended for operation on a frequency inverter (asynchronous servomotors – DRL..).
- DRK.. single-phase motors
- Motors operated at idle state (torque motors)

The following motors are not excluded:

- Explosion-protected motors

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Applicable motors

Series	Number of poles	Sizes	Power range
DR2S..	2	63MS – 71M	0.18 – 0.55 kW/0.25 – 0.75 hp
	4	56M – 71M	0.09 – 0.55 kW/0.12 – 0.75 hp
	6	63M – 80MK	0.09 – 0.55 kW0.12 – 0.75 hp
DRN..	2	63MS – 132S	0.18 – 7.5 kW/0.25 – 10 hp
	4	63MS – 315H	0.12 – 225 kW/0.16 – 300 hp
	6	63M – 160M	0.09 – 7.5 kW/0.12 – 10 hp
	8	71MS – 80M	0.09 – 0.25 kW/0.12 – 0.33 hp

Not for use in the USA

One special feature is the requirement for identifying non-usability for the US market. Motors sold in the United States that cannot be used there because they do not comply with EISA 2007 must be labeled accordingly. SEW-EURODRIVE labels motors with the "NOT FOR USE IN THE USA" label.

Canada

Market access in Canada requires two primary features for use or export.

- CSA approval (CSA = Canadian Standard Association)
- EER2016 (EER = Energy Efficiency Regulations)

CSA approval

EnergyVerified

Manufacturers of AC motors must obtain approval and certification from the CSA.

The designs of the motor series can be ordered certified with the CSA mark on the nameplate.

CSA approval for motors is limited to a maximum ambient temperature of 40 °C. Use above 40 °C is only possible with the configured output reduction. However, in these instances, the nameplate only shows the maximum temperature of 40 °C at full power.

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Energy Efficiency Regulations (EER)

The Canadian legal requirements (EER = Energy Efficiency Regulations) for minimum efficiency from 1997 were modified and renewed in 2016. They were published in the Canada Gazette in April 2016.

As of June 2016, the minimum efficiency level for AC motors was increased to premium level (IE3). This applies to the following motors:

- 2-, 4-, 6- and 8-pole motors from 0.75 kW (1 hp) to 375 kW (500 hp)

The motor can only pass through Canadian customs with the CSA or CSA Energy Verified mark on the nameplate.

The CSA or CSA Energy Verified certificate is not included with the drive, since Canadian customs can view the certificate on the CSA website by entering the registration number MC170602. The MC number can be found on the nameplate next to the CSA mark.

The overview of permitted motors can be found online by selecting "SEW-EURODRIVE" under the following link:

"www.csagroup.org/services-industries/product-listing/"

This efficiency requirement does not apply to the following motors:

- Motors not intended for continuous duty (e.g. S3/75%).
- Motors only intended for operation on a frequency inverter (asynchronous servomotors – DRL..).
- DRK.. single-phase motors
- Motors operated at idle state (torque motors).

Not exempt are:

- Explosion-protected motors

Applicable motors

Series	Number of poles	Sizes	Power range
DR2S..	2	63MS – 71M	0.18 – 0.55 kW/0.25 – 0.75 hp
	4	56M – 71M	0.09 – 0.55 kW/0.12 – 0.75 hp
	6	63M – 80MK	0.09 – 0.55 kW0.12 – 0.75 hp
DRN..	2	63MS – 132S	0.18 – 7.5 kW/0.25 – 10 hp
	4	63MS – 315H	0.12 – 225 kW/0.16 – 300 hp
	6	63M – 160M	0.09 – 7.5 kW/0.12 – 10 hp
	8	71MS – 80M	0.09 – 0.25 kW/0.12 – 0.33 hp

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Brazil

Market access in Brazil requires two primary features for use or export.

- ABNT NBR 17094-1

  Associação Brasileira de Normas/Técnicas Máquinas Eléctricas Girantes – Motores de Indução – Parte 1: Trifásicos

- INMETRO certification (Instituto Nacional de Metrologia, Qualidade e Tecnologia)

  With the passing of Law Nº 10.295 in 2001, the Brazilian government established the legal basis for Decree Nº 4.508, Nº 533 and Nº 1.

Decree Nº 1 is an addendum to Decree Nº 4.508 and stipulates that as of July 1, 2019, only motors with efficiency class IR3 Premium may be produced in Brazil or may be imported into Brazil.

Decree Nº 4.508 requires the use of the ENCE label and describes the certification process. ENCE stands for the national energy conservation label (Etiqueta Nacional de Conservação de Energia).

ABNT NBR 17094-1

Brazil's motor standard ABNT NBR 17094-1 requires information on the nameplate in addition to the information required by motor standard IEC 60034:

- Starting current ratio I_a/I_n
- Bearing sizes on drive end and non-drive end.
- Directions of rotation upon delivery with backstop.
- Wiring diagrams

SEW-EURODRIVE may place this information on a second motor nameplate.

Since September 2019, the minimum efficiency for AC motors has been increased to IR3 Premium (nearly IE3, premium efficiency level).

This applies to the following motors:

- 2-, 4-, 6- and 8-pole motors from 0.12 kW (0.15 hp) to 370 kW (500 hp)

The motors are given the ENCE mark together with the INMETRO registration number of the production plant after certification.

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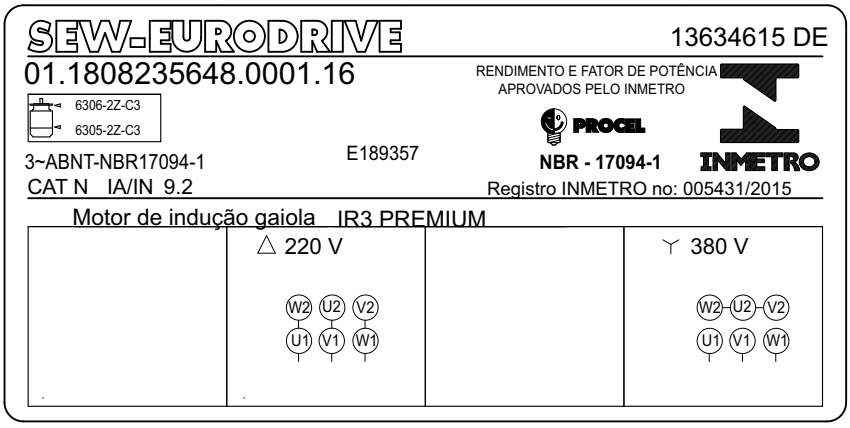
INMETRO certification

Motor certification is carried out by INMETRO. INMETRO (Instituto Nacional de Metrologia, Qualidade e Tecnologia) is the National Institute of Metrology, Quality and Technology of Brazil.

The certification does not issue a certificate. This is only the permission to use the ENCE label and to assign a registration number to each motor series.



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The motor can only pass through Brazilian customs with the ENCE mark on the nameplate.

A number of exceptions allow for the requirements to be reduced. The following motors are exempt from the requirements or have reduced requirements:

- Gearmotors indivisibly mounted directly on the motor without motor flange.
- Motors only intended for operation on a frequency inverter (asynchronous servomotors).
- Motors with integrated MOVIMOT® frequency inverter.
- Motors that are not designed for continuous duty.
- DRK.. single-phase motors with running capacitor.
- Explosion-protected motors with equipment protection level Gb, Gc, Db and Dc.

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Applicable motors

The following table shows the DRN.. motors certified by INMETRO (NBR 17094-1) (IR3):

Series	Number of poles	Sizes	Power range
DR2S..	4	56M	0.09 kW
	6	63M	0.09 kW
DRN..	2	63MS – 132S	0.18 – 7.5 kW
	4	63MS – 315H	0.12 – 225 kW
	6	63M – 160M	0.09 – 7.5 kW
	8	71MS – 80M	0.09 – 0.25 kW

INFORMATION

As of August 2019, only IE3 motor series DRN.. from 0.12 kW can be used without restrictions.

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People's Republic of China

Market access in the People's Republic of China requires two primary features for use or export.

- GB 12350 (2009) – CCC
- GB 18613 (2012) – CEL

GB stands for Gan Biao, a local standard.

GB 12350 (2009) – CCC

Chinese standard GB 12350 (2009) requires small devices to be certified and labeled, and documentation indicating the plant that produced the motor.

This affects motors with the following power ratings:

- 2-pole ≤ 2.2 kW
- 4-pole ≤ 1.1 kW
- 6-pole ≤ 0.75 kW
- 8-pole ≤ 0.55 kW

If one of the rated power values in pole-changing motors exceeds the limits mentioned above, the entire motor is CCC-exempt. The motor only has to be labeled once all power ratings fall within the limits.

If the following conditions are met, the CCC logo must always be present on the motor if it is being imported into China:

- The motor has one of the above number of poles and the specified power ratings.
- The motor is a stand-alone motor or a gearmotor.
- The motor is not built into a machine or system.

SEW-EURODRIVE has one plant in Europe and one in China that certifies and places the CCC logo on the motor nameplate.

The motor can only pass through Chinese customs with the CCC logo on the nameplate.

A copy of the CCC certificate is included by SEW-EURODRIVE with the drive in order to facilitate passage through Chinese customs. This is a voluntary service by SEW-EURODRIVE and is not required by law.

The following list includes the DRN../DR2.. motors that are CCC certified:

Series	Number of poles	Sizes	Power range
DR2S..	2	63MS – 80M	0.18 – 1.5 kW
	4	56M to 80M	0.09 – 1.1 kW
	6	63M – 80MK	0.09 – 0.55 kW
DRN..	2	63MS to 90L	0.18 – 2.2 kW
	4	63MS – 90S	0.12 – 1.1 kW
	6	63M – 90S	0.09 – 0.75 kW
	8	71MS – 80M	0.09 – 0.25 kW

GB 18613 (2012) – CEL

Chinese standard GB 18613 (2012) contains the legal requirements on minimum efficiencies.

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Since July 2007/September 2012, the minimum efficiency for AC motors has been increased to the High Efficiency level, which approximates class IE2 of IEC 60034-30-1.

The motors are labeled by China using a grade system. The following table shows the corresponding international motor standard in February 2013.

IEC 60034-30-1	GB 18613 (2012)
IE1	–
IE2	Grade 1
IE3	Grade 2
IE4	Grade 3

This applies to the following motors:

- 2-, 4- and 6-pole motors from 0.75 kW (1 hp) to 375 kW (500 hp)
- Motors with 9.2 kW
- Explosion-protected motors

A number of exceptions allow for the requirements to be reduced. The following motors are exempt from the requirements or have reduced requirements:

- Pole-changing motors with 2 nominal speeds
- Fully integrated motors that cannot be tested separately, e.g. pumps, fans, compressors and gearmotors
- Motors that are not designed for continuous duty
- Motors only stamped for operation with frequency inverters (asynchronous servomotors)
- DRK.. single-phase motors with running capacitor
- Non-ventilated motors

The design and content of the CEL label were redefined in the implementation regulation CEL 007-2016. By using the QR code, you can access an online website with additional information about the respective motor.

For logistical reasons, SEW-EURODRIVE has added the following information to the Grade label:

- Barcode
- Color ID field corresponding to the CEL color code
- Item number from SEW-EURODRIVE

The motor can only pass through Chinese customs with the CEL label on the product.

The CEL certificate is not included with the drive, since Chinese customs can view the certificate on the CQC website (Chinese approval authority) using the type and catalog designation or the QR code on the motor nameplate.

Since this database only contains Chinese characters, the link is not included here. SEW-EURODRIVE will give interested customers the link to the CQC database upon request.

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Applicable motors

Series	Number of poles	Sizes	Power range
DR2S..	2	63MS – 71M	0.18 – 0.55 kW
	4	56M – 71M	0.09 – 0.55 kW
	6	63M – 80MK	0.09 – 0.55 kW
DRN..	2	63MS – 132S	0.18 – 7.5 kW
	4	63MS – 315H	0.12 – 225 kW
	6	63M – 160M	0.09 – 7.5 kW
	8	71MS – 80M	0.09 – 0.25 kW

South Korea REELS – KEL

In South Korea, AC motors must meet the requirements under REELS (Regulation of Energy Efficiency and Labeling Standard). This applies to the following motors:

- 2-, 4-, 6- and 8-pole motors from 0.75 kW (1 hp) to 375 kW (500 hp)

These motors must be delivered with an efficiency that corresponds to at least energy efficiency class IE2 according to IEC 60034-30:2008 or IE3.

The current version MKE-2015-28 specifies the introduction of the minimum efficiency according to IE3:

- October 1, 2015: ≥ 37 to ≤ 200 kW
- October 1, 2016: > 200 to ≤ 375 kW
- October 1, 2018: ≥ 0.75 to ≤ 37 kW

Each motor is labeled individually with the Korea Energy Label (KEL). The design has been changed as of July 1, 2016. This label contains the following information:

- Type designation
- Number of poles
- Nominal power
- Efficiency
- Conversion into CO_2 g/a
- Monetary equivalent in South Korean won

The motors are not checked for the KEL label or NON-KEL label when passing through South Korean customs. It is only decided at the setup and installation site whether or not the drive is labeled correctly and may be operated.

A number of exceptions allow for the requirements to be reduced. The following motors are exempt from the requirements or have reduced requirements:

- Pole-changing motors with 2 nominal speeds
- Gearmotors directly mounted onto the motor with no coupling between motor and gearmotors in short-time duty S2
- Motors only intended for operation on a frequency inverter (asynchronous servomotors)
- Motors operated on a frequency inverter

  Exception: Drives for fans, ventilators and pumps
- Motors with integrated MOVIMOT® frequency inverter

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- DRK.. single-phase motors with running capacitor
- Non-ventilated motors (TENV, TEAO)

Only motors that normally require KEL but are operated in or under "abnormal" conditions receive the NON-KEL label. This is the case if one of the following conditions is met:

- Operation at ambient temperatures below -15 °C
- Operation at ambient temperature exceeding 50 °C
- Operation at installation altitudes above 1000 m

Example: A DRN90L4 motor with T = -20 °C to 40 °C requires KEL and receives the KEL label, since "... at refrigerant temperature under 50 °C". However, the same motor with a temperate range of T = -20 °C to 60 °C receives the NON-KEL label.

Applicable motors

Series	Number of poles	Sizes	Power range
DR2S..	2	63MS – 71M	0.18 – 0.55 kW
	4	56M – 71M	0.09 – 0.55 kW
	6	63M – 80MK	0.09 – 0.55 kW
DRN..	2	63MS – 132S	0.18 – 7.5 kW
	4	63MS – 315H	0.12 – 225 kW
	6	63M – 160M	0.09 – 7.5 kW
	8	71MS – 80M	0.09 – 0.25 kW

Mexico

In Mexico, the use of IE3 motors for power ratings between 0.746 kW and 373 kW are mandatory (corresponds to NEMA Premium Efficiency Level).

Mexican standard NOM-016-ENER-2010 has been mandatory since December 2010. It applies to motors with the following features:

- AC motors with squirrel-cage motor rotor
- At nominal power from 0.746 kW to 373 kW
- With a nominal voltage of up to 600 V
- For open or enclosed designs
- Single-speed motors
- Mounted horizontally or vertically
- Continuous duty

The nameplate must be in Spanish. Mexico's exemptions are the same as those of the United States. The approved gearmotors are listed in Chapter "USA".

There is no special labeling.

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Japan

The Top Runner program has been the approach to standards on energy efficiency in Japan since 1998. Asynchronous motors were added to the Top Runner program on April 1, 2015. Motors with the following features are affected:

- 2-, 4- and 6-pole three-phase asynchronous motors from 0.75 kW to 375 kW
- Voltages below 1000 V
- Frequencies 50 Hz, 60 Hz and 50/60 Hz
- S1 or S3 duty cycles above 80%

At this point, all motors meeting these conditions will have to operate at the efficiency stated in the Top Runner program. The required efficiencies under Japanese standard JIS C 4034-30:2011 correspond to the efficiencies under IEC 60034-30: 2008 efficiency class IE3.

It does not effect motors for use in potentially explosive areas as well as motors only intended for operation on a frequency inverter (asynchronous servomotors).

The design specification was extended for Japan to include Japanese efficiency requirements and the local power grids. DRN.. motors with Japanese design specification are always motors with 3 voltages and 2 frequencies. The following combinations are available:

- 200 V/50 Hz / 200 V/60 Hz / 220 V/60 Hz
- 400 V/50 Hz / 400 V/60 Hz / 440 V/60 Hz
- The motors are always in a delta connection in the R13 wiring diagram. This also makes star-delta starting possible.

The energy efficiency class corresponds to IE3, although Japanese regulations have reduced the efficiency at 200 V/60 Hz and 400 V/60 Hz, so it is not directly comparable to the international IE3 efficiency requirements. Nevertheless, Japan still uses IE3. The nameplate has been modified to meet Japanese requirements.

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Applicable motors

Series	Number of poles	Sizes	Power range
DR2S..	2	63MS – 71M	0.18 – 0.55 kW
	4	56M – 71M	0.09 – 0.55 kW
	6	63M – 80MK	0.09 – 0.55 kW
DRN..	2	63MS – 132S	0.18 – 7.5 kW
	4	63MS – 315H	0.12 – 225 kW
	6	63M – 160M	0.09 – 7.5 kW
	8	71MS – 80M	0.09 – 0.25 kW

Observe the mean voltage torques when determining the drive.

Russia, Kazakhstan, Belarus, Armenia, Kyrgyzstan

EAC

The following must be observed to access the market in the Eurasian Economic Union, the customs union between Russia, Belarus, Kazakhstan, Armenia, and Kyrgyzstan:

Motors marketed in countries of the Eurasian Economic Union after March 15, 2015 must bear the EAC logo (Eurasian Conformity), similar to the European CE mark.

With the EAC mark, manufacturers and suppliers confirm that a product has undergone a conformity process and meets the specified technical requirements. Conformity is issued by an authorized certifying body.

The requirements for the conformity evaluation procedure are set forth in the technical regulations of the Customs Union (TR CU). These regulations refer to standards that must be applied for a manufacturer to meet the requirements.

All of the motors listed in this catalog meet the technical regulations TR CU 004/2011 of the Customs Union for low-voltage systems.

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Ukraine

Ukraine has its own technical standards, which describe the relevant technical requirements for various products. SEW-EURODRIVE products such as motors, gearmotors, and electronics are subject to the following Ukrainian technical regulations:

Ukrainian technical regulation (TR)	Comparable with the European guideline	Affected products from SEW-EURODRIVE
UA.TR Machines and Equipment Safety According to the Resolution of CMU No. 62-2013	Machinery Directive 2006/42/EC	Motors, gearmotors, frequency inverters
UA.TR Low voltage equipment safety According to the Resolution of CMU No. 1067-2015	Low Voltage Directive 2014/35/EU	Motors, gearmotors
UA.TR Electromagnetic capability (EMC) According to the Resolution of CMU No. 1077-2015	EMC Directive 2014/30/EU	Motors, gearmotors, frequency inverters
UA.TR Equipment and protective systems used in potentially explosive environment According to the Resolution of CMU No. 1055-2016	ATEX Directive 2014/34/EU	All products for use in a potentially explosive environment

Motors marketed in the Ukraine must bear the Ukrainian conformity logo, similar to the European CE mark.

With the mark, manufacturers and suppliers confirm that a product has undergone a conformity process and meets the specified technical requirements. Conformity is issued by an authorized certifying body.

The requirements for the conformity evaluation procedure are set forth in the technical regulations of Ukraine (UA.TR). These regulations refer to standards that must be applied for a manufacturer to meet the requirements.

All of the motors listed in this catalog meet the technical regulations "TR Low voltage equipment safety".

As of July 2018, there are no requirements regarding the efficiency. However, Ukraine has adopted the Ecodesign Directive 2009/125/EG. An implementation date for motors in particular has not yet been specified.

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Saudi Arabia

As of July 2015, the Kingdom of Saudi Arabia (KSA) requires proof of conformity with energy efficiency standards when introducing specific products. This new requirement primarily affects consumer goods (white goods). It also affects all asynchronous motors with squirrel-cage rotors, which must now meet energy efficiency class IE3 as of January 1, 2017, and includes asynchronous motors with squirrel-cage rotors that were introduced as replacement motors.

Conformity with the applicable standard is confirmed by a Certificate of Conformity (CoC).

With regard to the energy regulations for asynchronous motors, energy efficiency class IE3 is required as of January 1, 2017. In turn, the class must be confirmed by the manufacturer through an SASO Energy Efficiency Registration (EER). No CoC is issued for asynchronous motors that do not have an SASO Energy Efficiency Registration.

The exporting company must request the CoC from an authorized conformity assessment body before shipping (the bodies that are currently approved are Bureau Veritas, SGS, DIN Certco, and Intertek).

The requirements in terms of efficiency of asynchronous motors with squirrel-cage rotors are described in SASO IEC 60034-30:2013. This standard is based on IEC 60034-30:2008, which is no longer valid.

The standard relates to single-speed, single-phase and three-phase 50 Hz and 60 Hz asynchronous motors with squirrel-cage rotors with the following features:

- Nominal voltage of up to 1000 V
- Nominal power of 0.75 kW to 375 kW
- 2-, 4- and 6-pole
- Continuous duty with S1 or S3 duty type of 80% and higher
- Line operation
- Ambient conditions in accordance with IEC60034-1 chapter 6 (1000 m installation altitude, ambient temperature of the air -15° C to +40° C)

There are some exceptions:

- Motors that are exclusively intended for operation on a frequency inverter in accordance with IEC 60034-25
- Motors that are fully integrated into a product (e.g. a pump, fan, or compressor) and that cannot be tested independently of this product.

The standard line voltage in Saudi Arabia has also been redefined:

- 1-phase and 3-phase
- Nominal voltage 220 V – 230 V/380 V – 400 V
- Frequency of 60 Hz

Anyone who supplies to Saudi Arabia is responsible for ensuring conformity in accordance with the SASO. Anyone who delivers a product to Saudi Arabia must apply for a Certificate of Conformity that confirms conformity with the various SASO requirements from Bureau Veritas, SGS, DIN Certco, or Intertek.

SEW-EURODRIVE helps you to do so. Upon request, SEW-EURODRIVE takes over the shipping of the gearmotor to Saudi Arabia.

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Applicable motors

Series	Number of poles	Sizes	Power range
DR2S..	2	63MS – 71M	0.18 – 0.55 kW
	4	56M – 71M	0.09 – 0.55 kW
	6	63M – 80MK	0.09 – 0.55 kW
DRN..	2	80MS	0.75 kW
		80M	1.1 kW
		90S	1.5 kW
		90L	2.2 kW
		100LM	3 kW
		132S	5.5 kW
	4	80M	0.75 kW
		90S	1.1 kW
		90L	1.5 kW
		100LM	2.2 kW
		100L	2.2 kW
			3 kW
			3.7 kW
		112M	4 kW
		132S	5.5 kW
		132M	7.5 kW
		132L	9.2 kW
		160M	11 kW
		160L	15 kW
		180M	18.5 kW
		180L	22 kW
		200L	30 kW
	6	132S	3 kW

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India

In January 2017, the Gazette of India made the requirements on the efficiency and quality of motors mandatory with regulation S.O. 178(E).

From January 1, 2018, all motors to which the following conditions apply must meet the requirements of energy efficiency class IE2.

The requirements in terms of efficiency and starting behavior of asynchronous motors with squirrel-cage rotors is described in IS12615:2011. This is based on IEC 60034-30:2008.

It is currently being revised with respect to the current IEC 60034-30-1. The Indian standard IS12615 contains additional requirements regarding the motor. The most important of these relate to starting torque, starting current, speed at 100% load, current at 100% load, size-to-power relationship and greater permitted tolerance in terms of current and frequency.

The standard relates to single-speed, single-phase and three-phase 50 Hz asynchronous motors with squirrel-cage rotors with the following features:

- Nominal voltage of up to 1000 V
- Nominal power of 0.37 kW to 375 kW in sizes 71 to 315L
- 2-, 4- and 6-pole
- Continuous duty with S1 or S3 duty type of 80% and higher
- Line operation

Gearmotors from SEW-EURODRIVE are not affected by the IS 12615:2011 as the flanges and shafts of the integral motors deviate from the measurements described in the Indian standard.

However, with the next version that is expected to become binding in 2018, the gearmotors are affected as well.

Certification

According to the specifications of the BIS (Bureau of Indian Standards), the motors and the manufacturing plants must be certified. The motors must bear the BIS certification logo, the IS standard and the registration number of the manufacturing plant.

Applicable motors

Series	Number of poles	Sizes	Power range
DR2S..	2	63MS	0.18 – 0.25 kW
	4	56M – 63M	0.09 – 0.25 kW
	6	63M – 71MS	0.09 – 0.25 kW
DRN..	2	63MS – 132S	0.18 – 7.5 kW
	4	63MS – 315H	0.12 – 225 kW
	6	63M – 160M	0.09 – 7.5 kW
	8	71MS – 80M	0.09 – 0.25 kW

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2.4.3 Certifications

In addition to mandatory approvals mentioned above, there are numerous optional certifications.

Example

A UL certification is often required for electronic and electromechanical products used in the United States. It includes requirements on the condition of products to minimize risks during operation of electrical systems. In many cases, presentation of an UL approval reduces insurance rates in the USA.

During the conformity assessment, the product characteristics are checked for compliance with the requirements and the certification is issued in case of positive results. Depending on the product category, the proof of conformity is documented with different labels.

For example, "UL-Recognized" label for a motor without integrated inverter.

For example, "UL-Listed" logo for a motor with an integrated MOVIMOT® inverter.

In addition to the shown labels for approvals and certifications, there are also numerous combinations that are not described in the catalog. If you have further questions relating to approvals and certifications, do not hesitate to contact us.

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2.5 Global motors from SEW-EURODRIVE

A global motor has approvals and certifications for several markets and can be used almost anywhere due to its wide voltage range. For this reason, global motors from SEW-EURODRIVE are the ideal solution for supplying as many countries as possible with as little effort as possible.

The motor's part number in the system's parts list does not depend on the country of use which means that only one design is required for the application. When configuring the motor, make sure to observe the dependency of voltage and frequency for different speeds. The required approvals and certifications can be selected for the requested target countries. SEW-EURODRIVE is able to assemble global motors in many countries, which ensures short delivery times.

Depending on the required operating voltages, the voltage range according to the table below can be covered with a motor:

		Voltage range at 50 Hz	Voltage range at 60 Hz
Design 1a	△	220 – 230 V	254 – 266 V
	⅄	380 – 400 V	440 – 460 V
Design 1a for motors ≤ 0.55 kW	△	220 – 240 V	254 – 277 V
	⅄	380 – 415 V	440 – 480 V
Design 1b	△	380 – 400 V	440 – 460 V
	⅄	660 – 690 V	–
Design 2a	△	190 – 200 V	220 – 230 V
	⅄	330 – 346 V	380 – 400 V
Design 2b	△	330 – 346 V	380 – 400 V
	⅄	575 – 600 V	660 – 690 V

Depending on the number of requested approvals and certificates, additional nameplates or small parts for attaching a label to the motor can be added due to the amount of required information.

The example shows global nameplates for a design that can be used in the following markets. Labels that are required additionally are not shown.

- Europe, Switzerland, Turkey
- Russia, Kazakhstan, Belarus
- Ukraine
- South Africa
- Australia, New Zealand
- South Korea
- China
- USA
- Canada
- Mexico
- Brazil

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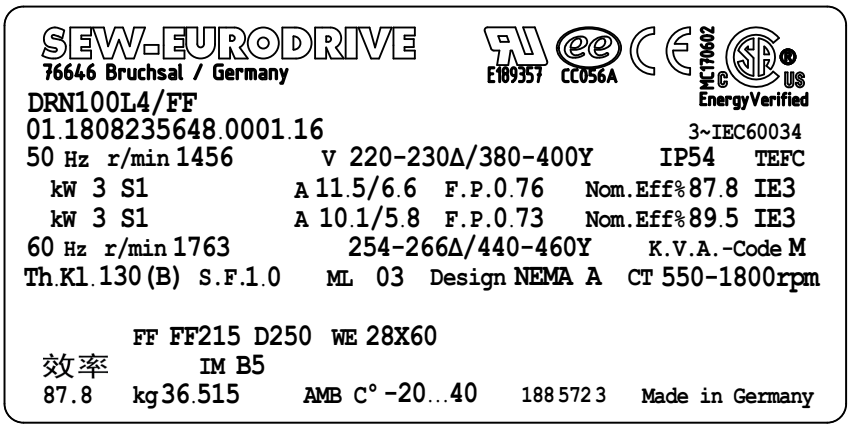
2.5.1 Example of a nameplate for the global motor

The DRN.. motor nameplate serves as an example for the nameplate of the entire global motor.



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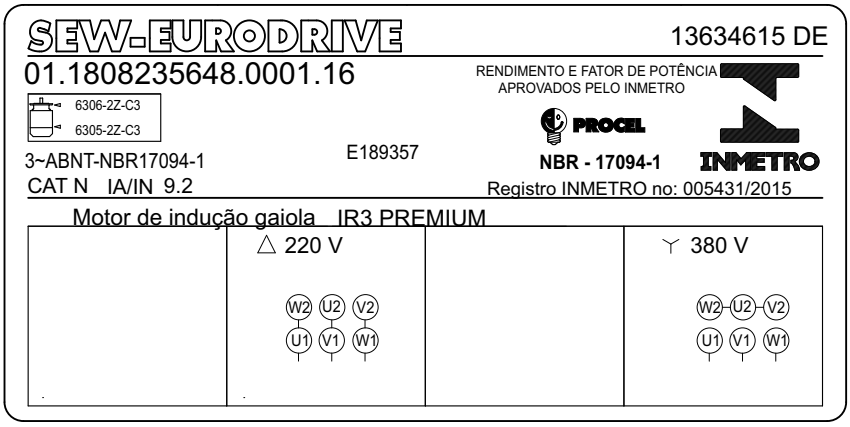

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INFORMATION

The line voltages in Brazil and South Korea can be different for the same frequency of 60 Hz. In addition to a nominal voltage of 3 × 220 V and 3 × 380 V, there are also supply systems with a nominal voltage of 3 × 440 V.

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2.6 DR2L.. series asynchronous servomotors

In addition to the LSPM motors (DR..J), asynchronous servomotors are another link between the conventional AC asynchronous motors for supply system and inverter operation, and the highly dynamic synchronous servomotors with permanent magnets.

2.6.1 Product description of DR2L.. motors

DR2L.. asynchronous servomotors are a drive package made up from the many options of the DR2.. modular motor system.

In its basic variant, the drive package always contains the following:

- A type EI8R encoder with TTL interface and 1024 periods/revolution
- Thermal motor protection in the form of a temperature sensor
- Dynamics package
- Various connection options
- Winding optimized with respect to speed

Alternatives can be selected instead of the elements of the basic design, for example:

- Instead of the high-resolution built-in or add-on encoder: an absolute encoder or only an encoder mounting adapter
- Instead of thermal motor protection in the form of a temperature sensor: temperature sensor in the winding
- Plug connector instead of terminal box
- Instead of entering encoder data manually: electronic nameplate in the encoder to make startup easier

Depending on the application and requirements, you may add the following:

- Brake or backstop
- Forced cooling fan
- Temperature detection (PT1000)
- Canopy
- And many more, see the chapter "Designs, options, and accessories" (→ 🗎 45).

2.6.2 Characteristics of DR2L.. motors: Dynamics

AC motors operated on the supply system usually have an overload capacity of 160% to 200% of the rated torque during startup.

If the motor is operated on an inverter of the same power, the inverter usually provides 150% current, and thus roughly 150% torque, for 60 seconds during startup. If a larger inverter is selected, the inverter can deliver a higher current and, when used together with suitable motors, can consequently deliver a greater torque. The mechanical capacity of the motor defined by the dynamics package must be checked.

As a rule, the synchronous servomotors and the corresponding inverters are designed for a high short-time overload. Here, 400% of the nominal torque and higher is permitted.

The mechanical design of DR2L.. asynchronous servomotors is of such a high quality that dynamic overload values can be reached which exceed the conventional values of an asynchronous motor operated on a supply system or inverter and almost match the values of a synchronous servomotor.

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The motors are available with two dynamics packages. The motors differ in terms of the overload capacity of the nominal motor torque:

Package	Overload capacity in relation to the nominal torque
Dynamics 1 (D1)	190% – 220%
Dynamics 2 (D2)	300% – 350%

The nameplate of the motor specifies the data of the selected dynamics package.

2.6.3 Characteristics of DR2L.. motors: Rotational speeds

In order to optimally adapt motor speed to the required control limits of the applications, SEW-EURODRIVE offers the DR2L.. asynchronous servomotors with the following four rated speeds:

- 1200 min-1
- 1700 min-1
- 2100 min-1
- 3000 min-1

In inverter operation, field weakening of the thermal characteristics begins at rated speed.

The speeds of the transition points of the maximally possible torques in the combination of motor and inverter are smaller than the rated speeds. Refer to the documentation of the inverter for motor and inverter allocations.

2.6.4 Characteristics of DR2L.. motors: Inverter combinations

The motors are optimally adapted for operation on MOVIDRIVE® modular application inverters, MOVIDRIVE® drive inverters, and MOVIAXIS® servo inverters.

Usually, the selection diagrams offer several inverter sizes. The size of the inverter that fits perfectly is based on the application data and project planning.

Example of a selection diagram for the MOVIDRIVE® inverter (dynamic and thermal limit characteristics):

[1]	S1 characteristic curve	[14]	7.5 kW inverter output
[2]	S1 characteristic curve with forced cooling fan	[15]	11 kW inverter power
[3]	Maximum limit torque of dynamics package 1	[16]	15 kW inverter power
[4]	Maximum limit torque of dynamics package 2	[17]	22 kW inverter power

2.6.5 Characteristics of DR2L.. motors: Startup

Encoders with an electronic nameplate make starting up motors of SEW-EURODRIVE especially convenient.

The nameplate of the following encoders contains all drive-relevant data that is uploaded from the encoder to the inverter before startup.

- High-resolution built-in or add-on encoder

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  - EI8 built-in encoders or EK. cone encoders at DR2L71MS4 to DR2L80M4 motors

  The high-resolution built-in or add-on encoders are part of the basic design of DR2L.. motors.

- Absolute encoders
  - AK.. at DR2L71MS4 to DR2L80M4 motors

  Absolute encoders can be used for DR2L.. motors instead of high-resolution encoders.

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2.7 Overview of materials used for the motors

The following table shows an overview of the materials used.

As standard, the motors are painted with "blue/gray"/RAL 7031 machine paint in accordance with DIN 1843. Special coatings and other colors are available on request.

Component	Material	Motor size			
		56 – 132S	132M – 180	200 – 225	250 – 315
Shaft	Steel	Plain steel, quenched and tempered steel			
Bearing	Deep groove ball bearing	60.., 62.. and 63.. series			
	Cylindrical roller bearing	–			NU 3…
Laminated core rotor/stator	Sheet metal	Electrical steel			
Rotor cage	Aluminum	Aluminum die casting (EN-AC)			
Seals	Oil seals	NBR			
		FKM			
A-side end-shield/flange	Gray cast iron	Gray cast iron (EN-GJL)			
	Aluminum	EN-AC alloy (gearmotor sizes 63 to 90)	–		
Stator housing	Aluminum	EN-AC		–	
	Gray cast iron	–		EN-GJL	
Bed plate	Aluminum	EN-AC	–		
Individual feet	Gray cast iron	–	EN-GJL		
Rear endshield	Gray cast iron	EN-AC/(sizes 56 to 80) EN-GJL	EN-GJL		
Terminal boxes	Aluminum	EN-AC			–
	Gray cast iron	EN-GJL			
Insulation	Surfaces	PET/PA/PET composite			
Winding	Copper + paint	Cu-enameled wire			
Terminal board	Base	Polyester resin			
	Terminal stud	Nickel-plated steel/brass			
Plug connector	SEW-EURODRIVE	PO	–		
	Harting	PO			–
Fan	Plastic	PA/PPE			
	Aluminum	EN-AC			
	Gray cast iron	EN-GJL (sizes 63 to 132L)	–		
Fan guard	Steel	Zinc-plated sheet steel/bondal sheet			
	Plastic	Sizes 56 – 90: PC/PET	–		
Fan guard with encoder mount	Aluminum	EN-AC (only with encoder)			–

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3 Overview of types and type designation

3.1 Designs, options, and accessories

3.1.1 Output

Code in the type designation	Description	Size
/FI	IEC foot-mounted motor	63MS – 315H
/F.A, /F.B	Universal foot-mounting (/F.A = motor feet enclosed in delivery, /F.B = motor feet mounted at factory)	71MS – 132S, 225S – 315H
/FF	IEC flange-mounted motor with through bores	63MS – 315H
/FE	IEC flange-mounted motor with through bores and IEC feet	63MS – 315H
/FT	IEC flange-mounted motor with threads	63MS – 100L
/FY	IEC flange-mounted motor with thread and IEC feet	63MS – 100L
/FC	C-face flange-mounted motor, dimensions in inches	63MS – 160L
/FG	Integral motor, as stand-alone motor	56M – 315H
/FM	Integral motor with IEC feet	63MS – 315H
/FL	Flange-mounted motor (deviating from IEC)	63MS – 315H
/FK	Flange-mounted motor (deviating from IEC) with feet	63MS – 280M
/2W	Second shaft end on the motor	63MS – 315H
None	FKM oil seal	56M – 315H

3.1.2 Interfaces

Code in the type designation	Description	Size
/DI	MOVILINK® DDI	71 – 132LS
/KD1	Connection via plug connector	71 – 132LS

3.1.3 Thermal monitoring

Code in the type designation	Description	Size
/TF	Temperature sensor (PTC thermistor or PTC resistor)	56M – 315H
/TH	Thermostat (bimetallic switch)	56M – 315H
/PK	PT1000 sensor	63MS – 315H
/PT	PT100 sensor	63MS – 315H

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3.1.4 Ventilation

Code in the type designation	Description	Size
None	Plastic fan guard	56M – 90L
None	Steel fan guard	63MS – 315H
/LN	Noise-reducing fan guard	100L – 132S
/C	Canopy for fan guard	63MS – 315H
/V	Forced cooling fan	71MS – 315H
/AL	Aluminum fan	63MS – 315H
/Z	Additional inertia mass (flywheel fan)	63MS – 132L
/U	Non-ventilated (without fan)	63MS – 315H
/OL	Non-ventilated (closed B-side)	63MS – 132S

3.1.5 IP degree of protection

Code in the type designation	Description	Size
None	Degree of protection IP44 to IP66 according to EN 60034-5	56M – 315H

3.1.6 Bearings

Code in the type designation	Description	Size
/NIB	Current-insulated rolling bearings B-side	200L – 315H
/ERF	Reinforced bearings on A-side with rolling bearing	250M – 315H
/NS	Relubrication device	225S – 315H
None	Preparation for accommodating SPM measuring nipples	112 – 315H

3.1.7 Winding

Code in the type designation	Description	Size
None	Thermal class B	56M – 315H
None	Thermal class F	56M – 315H
None	Thermal class H	63MS – 315H
/RI	Reinforced winding insulation	63MS – 315H
/RI2	Reinforced winding insulation with increased resistance against partial discharge	112M – 315H
None	Encapsulated stator winding	63MS – 132S
None	Humidity and acid protection	56M – 315H
None	Tropicalized	63MS – 315H

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3.1.8 Terminal box and stator

Code in the type designation	Description	Size
None	Aluminum terminal box	56M – 225M
None	Gray cast iron terminal box	71MS – 315H
None	Gray cast iron terminal box with connection piece	132M – 315H
None	Encapsulated terminal box recess	63MS – 315H
None	Anti-condensation heating	63MS – 315H
/DH	Condensation drain hole	63MS – 315H

3.1.9 Surface and corrosion protection

Code in the type designation	Description	Size
None	Unpainted design	56M – 315H
None	Base coat OSG	56M – 315H
None	Painting OS1 to OS4	56M – 315H
None	Corrosion protection	56M – 315H

3.1.10 Brake and backstop

Code in the type designation	Description	Size
/BE..[1)]	Spring-loaded brake with specification of size	56M – 315H
HR	Manual brake release, re-engaging	56M – 315H
HF	Manual brake release, lockable	63MS – 315H
/RS	Backstop	63MS – 315H

1) Also available in design for functional safety

3.1.11 Condition monitoring

Code in the type designation	Description	Size
/DUE	Diagnostic Unit Eddy Current = function/wear monitoring for BE1 to BE122 brake	80MK – 315H

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3.1.12 Built-in encoders

Code in the type designation	Description	Size
/EI7C[1)]	Built-in incremental encoder with HTL interface, 24 periods	63MS – 132S
/EI76	Built-in incremental encoder with HTL interface and 6/2/1 period(s)	71MS – 132S
/EI72		71MS – 132S
/EI71		71MS – 132S
/EI8R	Built-in incremental encoder with TTL interface and 1024 periods (4096 increments)	71MS – 132S
/EI8C	Built-in incremental encoder with HTL interface and 1024 periods (4096 increments)	71MS – 132S

1) From 71MS to 132S also available in design for functional safety

3.1.13 Add-on encoders

Code in the type designation	Description	Size
/EK8S[1)]	Add-on encoder with sin/cos interface	71MS – 315H
/EV8S		71MS – 280M
/EK8R	Add-on encoder with TTL (RS422) interface	71MS – 315H
/EV8R		71MS – 280M
/EK8C	Add-on encoder with HTL interface	71MS – 315H
/EV8C		71MS – 280M
/AK8W[1)]	Add-on absolute encoder with sin/cos and RS485 interface (multi-turn)	71MS – 315H
/AV8W		71MS – 280M
/AK8Y[1)]	Add-on absolute encoder with sin/cos and SSI interface (multi-turn)	71MS – 315H
/AV8Y		71MS – 280M
/AK8H	Add-on absolute encoder with sin/cos and RS485 interface and HIPERFACE® protocol	71MS – 315H
/AV8H		71MS – 280M

1) Also available for design in functional safety

Code in the type designation	Description	Size
/EG7S[1)]	Add-on encoder with sin/cos interface	132M – 280M
/ES7S[1)]		80MS – 132S
/EV7S		80MS – 280M
/EH7S		315S – 315H
/ES7R	Add-on encoder with TTL (RS422) interface	80MS – 132S
/EG7R		132M – 280M
/EV7R		80MS – 280M
/EH7R		315S – 315H

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Code in the type designation	Description	Size
/AS7W[1)]	Add-on absolute encoder with sin/cos and RS485 interface (multi-turn)	80MS – 132S
/AG7W[1)]		132M – 280M
/AV7W		80MS – 280M
/AS7Y[1)]	Add-on absolute encoder with sin/cos and SSI interface (multi-turn)	80MS – 132S
/AG7Y[1)]		132M – 280M
/AV7Y		80MS – 280M
/AH7Y		315S – 315H
/ES7C	Add-on encoder with HTL interface	80MS – 132S
/EG7C		132M – 280M
/EV7C		80MS – 280M
/EH7C		315S – 315H
/EH7T	Add-on encoder with TTL (RS422) interface	315S – 315H

1) Also available for design in functional safety

3.1.14 Encoder mounting adapters

Code in the type designation	Description	Size
/EG7A	Mounting device for encoders from the SEW-EURODRIVE portfolio	132M – 280M
/EV7A		80MS – 280M
/EH7A		315S – 315H
/EK8A		71MS – 315H
/XV.A	Mounting adapter for third-party encoders	80MS – 280M
/XH1.	Mounted third-party encoder	80MS – 132S
/XV..		80MS – 280M

3.1.15 Decentralized technology

Code in the type designation	Description	Size
/MM03 – MM40	MOVIMOT®	71M – 112M
/MO	MOVIMOT® option(s)	71M – 112M
/MI	Motor identification module for MOVIMOT®	63M – 112M
/MSW	MOVI-SWITCH®	56M – 100L

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3.1.16 Plug connectors

Code in the type designation	Description	Size
/IS	Integrated plug connector with terminal block in upper part of terminal box	63MS – 132S
/ISU	Integrated plug connector without terminal block in upper part of terminal box	63MS – 132S
/ASE.	Mounted Han® 10ES plug connector on terminal box with single locking latch (cage clamp contacts on the motor side)	63MS – 132M
/ASB.	Mounted Han® 10ES plug connector on terminal box with double locking latch (cage clamp contacts on the motor side)	63MS – 132M
/ACE.	Mounted Han® 10E plug connector on terminal box with single locking latch (crimp contacts on the motor side)	63MS – 132S
/ACB.	Han® plug connector mounted on terminal box with double locking latch (crimp contacts on motor end)	63MS – 132S
/AME.	Han® Modular 10B plug connector mounted on terminal box with single locking latch (crimp contacts on motor end)	63MS – 132M
/ABE.		71MS – 225M
/ADE.		71MS – 225M
/AKE.		132M – 225M
/AMB.	Han® Modular 10B plug connector mounted on terminal box with double locking latch (crimp contacts on motor end)	63MS – 132M
/ABB.		71MS – 225M
/ADB.		71MS – 225M
/AKB.		132M – 225M
/AND.	Harting Han® Q8/0, single locking latch	56M – 132M
/IV	Other industrial plug connectors according to customer specifications	56M – 225M

3.1.17 Cage clamp terminals

DRN.. motors

Code in the type designation	Description	Size
/KCC	6-pole terminal strip with cage clamp contacts	71MS – 132S
/KC1	C1 profile compliant connection of the electrified monorail drive (according to VDI guideline 3643)	71MS – 132S

DR2S.. motors

Code in the type designation	Description	Size
/KCC	6-pole terminal strip with cage clamp contacts	71MS – 80M
/KC1	C1 profile compliant connection of the electrified monorail drive (according to VDI guideline 3643)	71MS – 80M

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3.1.18 Other motor designs

Code in the type designation	Description	Size
None	Motor design according to VE01 recommendation of the VIK (Verband der Industriellen Energie- und Kraftwirtschaft e.V. – Association of Energy and Power Generation Industry)	63MS – 315H

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3.2 Type designation of AC motors

The following table shows an example structure of a type designation:

DRN71MSR8/BE03HR/FI/TF	
DR	Product family
N	Labeling of the product line
71MS	Size
R	Power designation
8	Number of poles
/BE03	Brake
HR	Manual brake release
/FI	Output option
/TF	Thermal motor protection

3.2.1 Designation of the motors

Designation	
DR2S..	Standard motor, standard efficiency IE1 (2nd generation)
DRN..	Energy-efficient motor, Premium Efficiency IE3
DR2L..	Asynchronous servomotor (2nd generation)
56 – 315	Nominal sizes: 63, 71, 80, 90, 100, 112, 132, 160, 180, 200, 225, 250, 280, 315
K, S, MK, MS, M, MC, ME, LS, LM, L, LC, H	Lengths
R, Q P, I B	Power designation (identification of motors with the same size but with different power)
2, 4, 6, 8	Number of poles

3.3 Serial number

The following table lists the structure of a serial number:

Example: 01. 12212343 01. 0001. 18	
01.	Sales organization
12212343	Order number (8 digits)
01.	Order item (2 digits)
0001	Quantity (4 digits)
18	End digits of the year of manufacture (2 digits)

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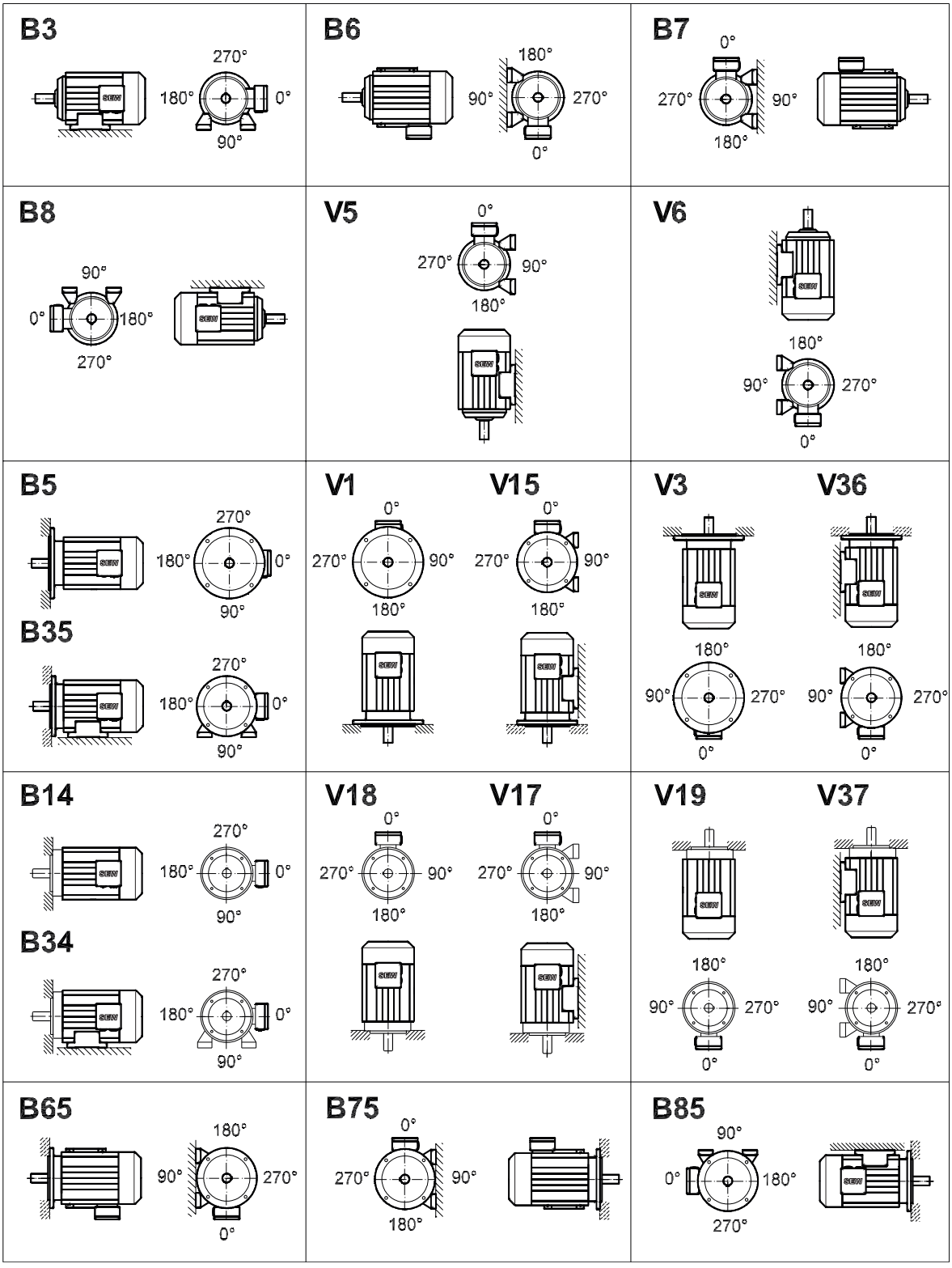
3.4 Mounting position designation of motors

3.4.1 Designs of AC motors according to DIN EN 60034-7



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3.4.2 Assignment of sizes and power rating according to EN 50347

In countries that accept the requirements of the IEC, AC motors with squirrel-cage rotor are usually classified according to the European standard EN 50347. This standard defines a unique size assignment depending on the shaft height between 63 mm and 315 mm for motors with the following data:

- Rated power between 0.09 kW and 132 kW
- Number of poles 2, 4, 6, 8

Furthermore, EN 50347 defines standard dimensions for feet, flanges and shaft ends among others. The standard only applies to motors with a rated frequency of 50 Hz, as it is a European standard. For motors with a rated frequency of 60 Hz, deviations from the standard may occur in the size/power assignment.

For 2- and 4-pole motors, the size/power assignment is always adhered to for 50 Hz and 60 Hz motors. For 6-pole variants, this also applies to a performance of 50 Hz. For motors with 60 Hz and 50/60 Hz as well as for DR2S.. motors, the normatively prescribed dimensions are not adhered to for all sizes.

INFORMATION

The standard EN 50347 does not contain specifications on the geometrical length of a motor, which means that motors from different manufacturers but with the same designated size can have varying lengths. For a definite statement on the adherence of the normative specifications, the geometrical dimensions of foot or flange must be compared to the relevant rated power.

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3.4.3 Position of motor terminal box and cable entry

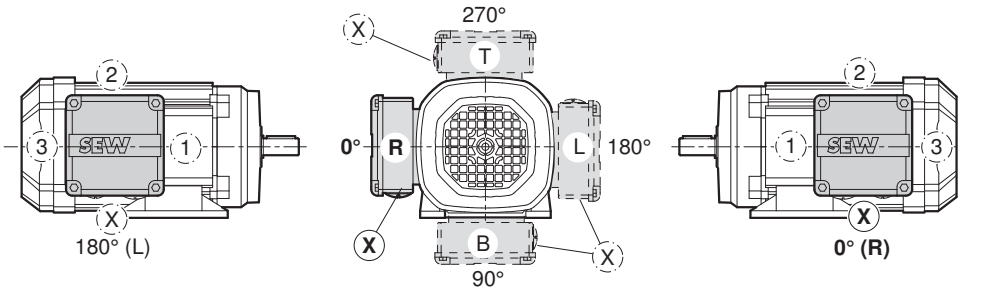
The standard EN 60034 specifies the following designations for motor terminal box positions:

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

Deviating from this standard, the position of the motor terminal box is specified with 0°, 90°, 180° or 270° for gearmotors, as viewed on the fan guard = B-side.

The following figure shows both designations. Where the mounting position of the motor changes, R, B, L and T are rotated accordingly.

The cable entry position is specified with x, 1, 2, 3.



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INFORMATION

Without specific information regarding the terminal box, the design 0° with cable entry "x" (designation "normal" in quotation and order confirmation) is delivered.

For motor sizes 56 and 63, the terminal box is cast onto the stator. The cable entry is thus fixed at position "X" and "2".

INFORMATION

The position of the terminal box is not specified on the nameplate.

4 Technical data of the motors

4.1 Operating temperatures

The motors are designed for use in a temperature range between -20 °C and +40 °C in the standard version. According to IEC 60034, the standard temperature range is lower with -15 °C to +40 °C.

If the motors are operated outside of the standard temperature range, modifications may be necessary. Contact SEW-EURODRIVE in such a case.

4.2 Key to the data tables

The following table lists the short symbols used in the "Technical data" tables.

P_N	Rated power
M_N	Rated torque
n_N	Rated speed
I_N	Rated current
cosφ	Power factor
$\eta_{50\%}$	Efficiency at 50% of the rated power
$\eta_{75\%}$	Efficiency at 75% of the rated power
$\eta_{100\%}$	Efficiency at 100% of the rated power
I_A/I_N	Starting current ratio
M_A/M_N	Starting torque ratio
M_H/M_N	Ramp-up torque ratio
M_K/M_N	Breakdown torque ratio
m_{Mot}	Mass of the motor
J_{Mot}	Mass moment of inertia of the motor
BE..	Brake used
Z_0 BG	Switching frequency for operation with BG brake controller
Z_0 BGE	Switching frequency for operation with BGE brake controller
M_B	Braking torque
m_{BMot}	Mass of the brakemotor
J_{BMot}	Mass moment of inertia of the brakemotor

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4.3 IE3 DRN.. motors, 380 V, 50 Hz, 2-pole

4.3.1 Information on motors

Motor	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN80MS2	0.75	2.5	2855	1.66	0.84	80.2	82.0	81.4	5.9	2.8 2.5	2.9
DRN80M2	1.1	3.65	2860	2.35	0.85	83.1	84.1	83.0	6.6	3.0 2.5	2.9
DRN90S2	1.5	4.95	2886	3.25	0.83	83.7	85.0	84.2	6.6	2.7 2.5	2.9
DRN90L2	2.2	7.2	2905	4.55	0.85	86.1	86.7	85.9	7.4	2.5 2.1	3.0
DRN100LM2	3	9.9	2894	6.1	0.85	88.9	88.7	87.2	7.7	3.3 2.6	3.5
DRN112M2	4	13	2948	7.9	0.86	88.1	88.7	88.1	10.6	2.9 1.3	3.3
DRN132S2	5.5	17.9	2935	9.9	0.92	90.3	90.2	89.2	10.0	3.0 2.1	3.7
DRN132S2	7.5	24.5	2936	14.8	0.85	90.6	90.8	90.1	9.6	3.3 2.0	3.4

4.3.2 Further information on motors and brakemotors

Motor	P_N kW	M_N Nm	n_N min^{-1}	m_{Mot} kg	J_{Mot} 10^{-4} kgm^2	BE..	Z_0 BG BGE 1/h	M_B Nm	m_{BMot} kg	J_{BMot} 10^{-4} kgm^2
DRN80MS2	0.75	2.5	2855	11	18.5	BE05	1200 3400	5	15	20
DRN80M2	1.1	3.65	2860	14	24.1	BE1	1000 2600	7	18	25.6
DRN90S2	1.5	4.95	2886	20	53.1	BE1	600 1300	10	22	54.7
DRN90L2	2.2	7.2	2905	23	66.3	BE2	- 1000	14	27	71
DRN100LM2	3	9.9	2894	33	89.7	BE2	- 750	20	37	94.4
DRN112M2	4	13	2948	45	178	BE5	- 400	28	52	183
DRN132S2	5.5	17.9	2935	56	241	BE5	- 300	40	64	246
DRN132S2	7.5	24.5	2936	56	241	BE5	- 300	55	64	246

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4.4 IE3 DRN.. motors, 380 V, 50 Hz, 4-pole

4.4.1 Information on motors

Motor	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN80M4	0.75	4.95	1440	1.85	0.74	80.7	82.9	82.9	6.7	3.1 2.7	3.4
DRN90S4	1.1	7.2	1455	2.7	0.73	83.5	85.0	84.5	6.9	2.7 2.1	3.3
DRN90L4	1.5	9.8	1461	3.55	0.74	84.6	86.1	85.6	7.5	2.7 2.0	3.3
DRN100LS4	2.2	14.5	1450	5	0.76	86.4	87.5	86.9	7.1	2.9 2.2	3.3
DRN100L4	3	19.7	1456	6.8	0.76	87.3	88.3	87.8	8.2	3.4 2.3	3.7
DRN112M4	4	26	1464	8.4	0.81	88.6	89.4	88.7	8.2	2.4 1.6	3.6
DRN132S4	5.5	36	1461	11	0.84	90.6	90.6	89.6	8.3	2.8 2.2	3.5
DRN132M4	7.5	49	1468	16	0.78	90.8	91.1	90.4	7.8	3.1 2.4	3.3
DRN132L4	9.2	60	1470	19.7	0.77	90.8	91.6	91.0	8.4	3.7 1.8	3.7
DRN160M4	11	71	1473	22	0.81	91.1	91.7	91.4	7.3	2.6 2.2	3.0
DRN160L4	15	97	1474	30.5	0.80	91.9	92.5	92.1	8.0	3.0 2.0	3.4
DRN180M4	18.5	120	1478	35	0.85	92.8	93.1	92.6	9.5	3.6 2.9	3.6
DRN180L4	22	142	1477	40.5	0.87	93.4	93.6	93.0	9.6	3.5 2.1	3.4
DRN200L4	30	194	1480	59	0.82	93.3	93.9	93.6	8.2	2.9 2.5	3.3
DRN225S4	37	240	1482	67	0.88	94.3	94.4	93.9	8.4	3.0 2.3	2.7
DRN225M4	45	290	1482	85	0.85	94.1	94.5	94.2	8.8	3.0 2.2	2.7
DRN250M4	55	355	1482	110	0.80	94.4	94.8	94.6	8.2	4.0 2.5	2.9
DRN280S4	75	485	1482	151	0.79	94.9	95.3	95.0	7.6	3.7 2.6	2.9
DRN280M4	90	580	1481	169	0.84	95.4	95.6	95.2	7.7	3.6 2.0	2.7
DRN315S4	110	710	1486	198	0.88	95.7	95.8	95.5	6.2	2.6 1.9	2.8
DRN315M4	132	850	1485	240	0.87	95.8	95.9	95.6	6.0	2.4 1.8	2.6
DRN315L4	160	1030	1484	290	0.88	96.1	96.3	95.9	5.9	2.4 1.8	2.5
DRN315H4	200	1280	1488	370	0.86	95.7	96.1	96.0	7.4	3.3 2.5	3.4

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4.4.2 Further information on motors and brakemotors

Motor	P_N	M_N	n_N	m_{Mot}	J_{Mot}	BE..	Z_0 BG BGE	M_B	m_{BMot}	J_{BMot}
	kW	Nm	min-1	kg	10^{-4} kgm^2		1/h	Nm	kg	10^{-4} kgm^2
DRN80M4	0.75	4.95	1440	14	24.7	BE1	3200 8200	10	18	26.2
DRN90S4	1.1	7.2	1455	20	54	BE2	2300 6000	14	24	58.7
DRN90L4	1.5	9.8	1461	23	67.2	BE2	2200 5800	20	27	71.9
DRN100LS4	2.2	14.5	1450	27	81.4	BE5	- 6100	28	33	87.4
DRN100L4	3	19.7	1456	34	112	BE5	- 3700	40	40	118
DRN112M4	4	26	1464	45	178	BE5	- 2900	55	52	183
DRN132S4	5.5	36	1461	56	241	BE11	- 2100	80	71	251
DRN132M4	7.5	49	1468	73	381	BE11	- 1100	110	91	403
DRN132L4	9.2	60	1470	81	439	BE20	- 980	150	110	490
DRN160M4	11	71	1473	115	817	BE20	- 900	150	145	877
DRN160L4	15	97	1474	130	1040	BE20	- 800	200	165	1100
DRN180M4	18.5	120	1478	155	1630	BE30	- 510	300	195	1770
DRN180L4	22	142	1477	170	1950	BE30	- 470	300	210	2090
DRN200L4	30	194	1480	280	2660	BE32	- 500	400	335	2890
DRN225S4	37	240	1482	310	4350	BE32	- 230	500	365	4580
DRN225M4	45	290	1482	310	4350	BE32	- 200	600	365	4580
DRN250M4	55	355	1482	460	7360	BE62	- 180	800	550	7960
DRN280S4	75	485	1482	520	8940	BE62	- 150	1000	600	9530
DRN280M4	90	580	1481	630	12000	BE62	- 79	1200	720	12600
DRN315S4	110	710	1486	870	23400	BE122	- 53	1600	1000	24400
DRN315M4	132	850	1485	890	24800	BE122	- 46	2000	1020	25800
DRN315L4	160	1030	1484	1020	28600	BE122	- 34	2000	1150	29600
DRN315H4	200	1280	1488	1140	35200	BE122	- 23	2000	1270	36200

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4.5 IE3 DRN.. motors, 380 V, 50 Hz, 6-pole

4.5.1 Information on motors

Motor	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN90S6	0.75	7.5	957	2.1	0.68	77.4	79.8	78.9	4.8	2.0 2.0	2.4
DRN90L6	1.1	11	957	3.1	0.67	78.8	81.3	81.0	5.0	2.4 2.3	2.8
DRN100L6	1.5	14.9	961	4.3	0.63	80.7	82.8	82.5	4.7	2.2 2.2	2.9
DRN112M6	2.2	21.5	973	5.7	0.66	83.6	85.0	84.3	6.5	2.4 1.9	3.2
DRN132S6	3	29.5	974	7.8	0.66	84.8	86.0	85.6	6.2	2.6 2.5	3.4
DRN132S6	4	39.5	968	10.2	0.68	86.4	87.5	86.8	5.5	2.5 2.5	3.2
DRN132L6	5.5	54	975	14.5	0.64	86.9	88.3	88.0	5.6	2.7 2.5	2.8
DRN160M6	7.5	73	979	16.6	0.74	88.4	89.4	89.1	8.2	2.7 1.6	4.0

4.5.2 Further information on motors and brakemotors

Motor	P_N kW	M_N Nm	n_N min^{-1}	m_{Mot} kg	J_{Mot} 10^{-4} kgm^2	BE..	Z_0 BG BGE 1/h	M_B Nm	m_{BMot} kg	J_{BMot} 10^{-4} kgm^2
DRN90S6	0.75	7.5	957	20	54	BE2	2400 5000	20	24	58.7
DRN90L6	1.1	11	957	23	67.4	BE5	2200 4400	28	29	73.4
DRN100L6	1.5	14.9	961	34	112	BE5	- 3400	40	40	118
DRN112M6	2.2	21.5	973	45	178	BE5	- 2500	55	52	183
DRN132S6	3	29.5	974	56	245	BE11	- 2300	80	71	256
DRN132S6	4	39.5	968	56	245	BE11	- 2100	80	71	256
DRN132L6	5.5	54	975	81	439	BE11	- 1700	110	100	461
DRN160M6	7.5	73	979	115	1290	BE20	- 1200	150	145	1350

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4.6 IE3 DRN.. motors, 400 V, 50 Hz, 2-pole

4.6.1 AuInformation on motors

Motor	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN63MS2	0.18	0.63	2725	0.465	0.78	62.7	66.2	65.9	4.2	2.6 2.6	2.6
DRN63M2	0.25	0.87	2755	0.57	0.81	69.2	70.9	69.7	4.9	2.7 2.6	2.7
DRN71MS2	0.37	1.26	2810	0.87	0.78	70.7	73.8	73.8	5.4	3.1 2.7	3.1
DRN71M2	0.55	1.86	2825	1.24	0.81	75.7	78.0	77.8	5.9	3.2 3.0	3.2
DRN80MS2	0.75	2.5	2855	1.58	0.84	80.2	82.0	81.4	5.9	2.8 2.5	2.9
DRN80M2	1.1	3.65	2860	2.2	0.85	83.1	84.1	83.0	6.6	3.0 2.5	2.9
DRN90S2	1.5	4.95	2886	3.1	0.83	83.7	85.0	84.2	6.6	2.7 2.5	2.9
DRN90L2	2.2	7.2	2905	4.3	0.85	86.1	86.7	85.9	7.4	2.5 2.1	3.0
DRN100LM2	3	9.9	2894	5.8	0.85	88.9	88.7	87.2	7.7	3.3 2.6	3.5
DRN112M2	4	13	2948	7.5	0.86	88.1	88.7	88.1	10.6	2.9 1.3	3.3
DRN132S2	5.5	17.9	2935	9.4	0.92	90.3	90.2	89.2	10.0	3.0 2.1	3.7
DRN132S2	7.5	24.5	2936	14.1	0.85	90.6	90.8	90.1	9.6	3.3 2.0	3.4

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4.6.2 Further information on motors and brakemotors

Motor	P_N	M_N	n_N	m_{Mot}	J_{Mot}	BE..	Z_0 BG BGE	M_B	m_{BMot}	J_{BMot}
	kW	Nm	min^{-1}	kg	10^{-4} kgm^2		h^{-1}	Nm	kg	10^{-4} kgm^2
DRN63MS2	0.18	0.63	2725	4.9	2.95	BE03	5000 6000	1.3	6.8	3.63
DRN63M2	0.25	0.87	2755	5.8	3.76	BE03	4500 6000	1.7	7.6	4.44
DRN71MS2	0.37	1.26	2810	6.8	2.93	BE03	6000 3600	2.7	8.6	3.61
DRN71M2	0.55	1.86	2825	8	3.71	BE05	2600 5500	5	10	5.01
DRN80MS2	0.75	2.5	2855	11	18.5	BE05	1200 3400	5	15	20
DRN80M2	1.1	3.65	2860	14	24.1	BE1	1000 2600	7	18	25.6
DRN90S2	1.5	4.95	2886	20	53.1	BE1	600 1300	10	22	54.7
DRN90L2	2.2	7.2	2905	23	66.3	BE2	- 1000	14	27	71
DRN100LM2	3	9.9	2894	33	89.7	BE2	- 750	20	37	94.4
DRN112M2	4	13	2948	45	178	BE5	- 400	28	52	183
DRN132S2	5.5	17.9	2935	56	241	BE5	- 300	40	64	246
DRN132S2	7.5	24.5	2936	56	241	BE5	- 300	55	64	246

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4.7 IE3 DRN.. motors, 400 V, 50 Hz, 4-pole

4.7.1 Information on motors

Motor	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN63MS4	0.12	0.83	1380	0.4	0.64	58.3	63.9	64.8	3.6	2.7 2.6	2.7
DRN63M4	0.18	1.25	1375	0.57	0.65	65.1	69.4	69.9	3.7	2.6 2.6	2.6
DRN71MS4	0.25	1.7	1405	0.72	0.66	70.1	73.5	73.5	4.3	2.5 2.3	2.5
DRN71M4	0.37	2.5	1415	1.02	0.66	74.3	77.3	77.3	4.8	2.8 2.4	2.8
DRN80MK4	0.55	3.65	1435	1.29	0.75	78.6	81.0	80.8	6.1	2.7 2.1	3.1
DRN80M4	0.75	4.95	1440	1.75	0.74	80.7	82.9	82.9	6.7	3.1 2.7	3.4
DRN90S4	1.1	7.2	1455	2.55	0.73	83.5	85.0	84.5	6.9	2.7 2.1	3.3
DRN90L4	1.5	9.8	1461	3.4	0.74	84.6	86.1	85.6	7.5	2.7 2.0	3.3
DRN100LS4	2.2	14.5	1450	4.75	0.76	86.4	87.5	86.9	7.1	2.9 2.2	3.3
DRN100L4	3	19.7	1456	6.4	0.76	87.3	88.3	87.8	8.2	3.4 2.3	3.7
DRN112M4	4	26	1464	7.9	0.81	88.6	89.4	88.7	8.2	2.4 1.6	3.6
DRN132S4	5.5	36	1461	10.5	0.84	90.6	90.6	89.6	8.3	2.8 2.2	3.5
DRN132M4	7.5	49	1468	15.2	0.78	90.8	91.1	90.4	7.8	3.1 2.4	3.3
DRN132L4	9.2	60	1470	18.7	0.77	90.8	91.6	91.0	8.4	3.7 1.8	3.7
DRN160M4	11	71	1473	21	0.81	91.1	91.7	91.4	7.3	2.6 2.2	3.0
DRN160L4	15	97	1474	29	0.80	91.9	92.5	92.1	8.0	3.0 2.0	3.4
DRN180M4	18.5	120	1478	33.5	0.85	92.8	93.1	92.6	9.5	3.6 2.9	3.6
DRN180L4	22	142	1477	38.5	0.87	93.4	93.6	93.0	9.6	3.5 2.1	3.4
DRN200L4	30	194	1480	56	0.82	93.3	93.9	93.6	8.2	2.9 2.5	3.3
DRN225S4	37	240	1482	64	0.88	94.3	94.4	93.9	8.4	3.0 2.3	2.7
DRN225M4	45	290	1482	81	0.85	94.1	94.5	94.2	8.8	3.0 2.2	2.7
DRN250M4	55	355	1482	104	0.80	94.4	94.8	94.6	8.2	4.0 2.5	2.9
DRN280S4	75	485	1482	143	0.79	94.9	95.3	95.0	7.6	3.7 2.6	2.9
DRN280M4	90	580	1481	161	0.84	95.4	95.6	95.2	7.7	3.6 2.0	2.7
DRN315S4	110	710	1488	189	0.87	95.4	95.7	95.5	6.7	2.9 2.1	3.1
DRN315M4	132	850	1487	230	0.87	95.6	95.9	95.6	6.5	2.7 2.0	2.9
DRN315L4	160	1030	1486	275	0.87	95.9	96.1	95.9	6.5	2.7 2.0	2.8
DRN315H4	200	1280	1489	355	0.84	95.4	96.0	96.0	8.1	3.7 2.8	3.8

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4.7.2 Further information on motors and brakemotors

Motor	P_N	M_N	n_N	m_{Mot}	J_{Mot}	BE..	Z_0 BG BGE	M_B	m_{BMot}	J_{BMot}
	kW	Nm	min-1	kg	10^{-4} kgm^2		h-1	Nm	kg	10^{-4} kgm^2
DRN63MS4	0.12	0.83	1380	4.9	2.95	BE03	1000 1000	1.7	6.8	3.63
DRN63M4	0.18	1.25	1375	5.8	3.76	BE03	1000 1000	2.7	7.6	4.44
DRN71MS4	0.25	1.7	1405	6.8	5.42	BE03	6200 9700	3.4	8.6	6.11
DRN71M4	0.37	2.5	1415	8	7.14	BE05	5000 9000	5	10	8.44
DRN80MK4	0.55	3.65	1435	11	17.1	BE1	3500 8500	7	14	18.6
DRN80M4	0.75	4.95	1440	14	24.7	BE1	3200 8200	10	18	26.2
DRN90S4	1.1	7.2	1455	20	54	BE2	2300 6000	14	24	58.7
DRN90L4	1.5	9.8	1461	23	67.2	BE2	2200 5800	20	27	71.9
DRN100LS4	2.2	14.5	1450	27	81.4	BE5	– 6100	28	33	87.4
DRN100L4	3	19.7	1456	34	112	BE5	– 3700	40	40	118
DRN112M4	4	26	1464	45	178	BE5	– 2900	55	52	183
DRN132S4	5.5	36	1461	56	241	BE11	– 2100	80	71	251
DRN132M4	7.5	49	1468	73	381	BE11	– 1100	110	91	403
DRN132L4	9.2	60	1470	81	439	BE20	– 980	150	110	490
DRN160M4	11	71	1473	115	817	BE20	– 900	150	145	877
DRN160L4	15	97	1474	130	1040	BE20	– 800	200	165	1100
DRN180M4	18.5	120	1478	155	1630	BE30	– 510	300	195	1770
DRN180L4	22	142	1477	170	1950	BE30	– 470	300	210	2090
DRN200L4	30	194	1480	280	2660	BE32	– 500	400	335	2890
DRN225S4	37	240	1482	310	4350	BE32	– 230	500	365	4580
DRN225M4	45	290	1482	310	4350	BE32	– 200	600	365	4580
DRN250M4	55	355	1482	460	7360	BE62	– 180	800	550	7960
DRN280S4	75	485	1482	520	8940	BE62	– 150	1000	600	9530
DRN280M4	90	580	1481	630	12000	BE62	– 79	1200	720	12600
DRN315S4	110	710	1488	870	23400	BE122	– 53	1600	1000	24400
DRN315M4	132	850	1487	890	24800	BE122	– 46	2000	1020	25800
DRN315L4	160	1030	1486	1020	28600	BE122	– 34	2000	1150	29600
DRN315H4	200	1280	1489	1140	35200	BE122	– 23	2000	1270	36200

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4.8 IE3 DRN.. motors, 400 V, 50 Hz, 6-pole

4.8.1 Information on motors

Motor	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN63MR6	0.09	0.93	920	0.36	0.58	44.3	51.7	55.0	2.9	2.7 2.6	2.8
DRN63M6	0.12	1.32	870	0.4	0.71	51.9	57.5	57.7	2.6	1.9 1.8	1.9
DRN71MS6	0.18	1.88	915	0.55	0.69	59.4	63.7	63.9	3.4	1.9 1.9	2.2
DRN71M6	0.25	2.6	915	0.76	0.68	63.5	68.2	68.6	3.4	2.0 1.9	2.3
DRN80MK6	0.37	3.8	935	1.05	0.68	70.8	73.8	73.5	4.1	2.1 2.1	2.4
DRN90SR6	0.55	5.4	966	1.52	0.65	73.5	76.7	77.2	5.2	2.3 2.2	2.8
DRN90S6	0.75	7.5	957	2	0.68	77.4	79.8	78.9	4.8	2.0 2.0	2.4
DRN90L6	1.1	11	957	2.95	0.67	78.8	81.3	81.0	5.0	2.4 2.3	2.8
DRN100L6	1.5	14.9	961	4.1	0.63	80.7	82.8	82.5	4.7	2.2 2.2	2.9
DRN112M6	2.2	21.5	973	5.5	0.66	83.6	85.0	84.3	6.5	2.4 1.9	3.2
DRN132S6	3	29.5	974	7.4	0.66	84.8	86.0	85.6	6.2	2.6 2.5	3.4
DRN132S6	4	39.5	968	9.7	0.68	86.4	87.5	86.8	5.5	2.5 2.5	3.2
DRN132L6	5.5	54	975	13.8	0.64	86.9	88.3	88.0	5.6	2.7 2.5	2.8
DRN160M6	7.5	73	979	15.8	0.74	88.4	89.4	89.1	8.2	2.7 1.6	4.0

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4.8.2 Further information on motors and brakemotors

Motor	P_N	M_N	n_N	m_{Mot}	J_{Mot}	BE..	Z_0 BG BGE	M_B	m_{BMot}	J_{BMot}
	kW	Nm	min^{-1}	kg	10^{-4} kgm^2		h^{-1}	Nm	kg	10^{-4} kgm^2
DRN63MR6	0.09	0.93	920	5.8	6.47	BE03	12000 12000	2.1	7.6	7.16
DRN63M6	0.12	1.32	870	5.8	6.47	BE03	12000 12000	2.7	7.6	7.16
DRN71MS6	0.18	1.88	915	6.8	8.29	BE05	7000 12000	5	9.2	9.59
DRN71M6	0.25	2.6	915	8	10.4	BE05	5200 12000	5	10	11.7
DRN80MK6	0.37	3.8	935	11	17.1	BE1	3000 9000	10	14	18.6
DRN90SR6	0.55	5.4	966	20	54	BE2	2400 5000	14	24	58.7
DRN90S6	0.75	7.5	957	20	54	BE2	2400 5000	20	24	58.7
DRN90L6	1.1	11	957	23	67.4	BE5	2200 4400	28	29	73.4
DRN100L6	1.5	14.9	961	34	112	BE5	- 3400	40	40	118
DRN112M6	2.2	21.5	973	45	178	BE5	- 2500	55	52	183
DRN132S6	3	29.5	974	56	245	BE11	- 2300	80	71	256
DRN132S6	4	39.5	968	56	245	BE11	- 2100	80	71	256
DRN132L6	5.5	54	975	81	439	BE11	- 1700	110	100	461
DRN160M6	7.5	73	979	115	1290	BE20	- 1200	150	145	1350

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4.9 IE3 DRN.. motors, 400 V, 50 Hz, 8-pole

4.9.1 Information on motors

DRN.. motor type	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN71MSR8	0.09	1.24	695	0.435	0.53	39.0	46.7	50.7	2.4	2.3 2.3	2.6
DRN71MS8	0.12	1.72	665	0.47	0.64	46.2	52.4	53.5	2.3	1.6 1.6	1.8
DRN80MK8	0.18	2.45	705	0.76	0.54	49.4	56.1	58.7	3.0	1.8 1.8	2.4
DRN80M8	0.25	3.4	702	1.02	0.53	55.8	62.0	64.1	3.1	2.0 1.9	2.3

4.9.2 Further information on motors and brakemotors

DRN.. motor type	P_N kW	M_N Nm	n_N min^{-1}	m_{Mot} kg	J_{Mot} 10^{-4} kgm²	BE..	Z_0 BG BGE h^{-1}	M_B Nm	m_{BMot} kg	J_{BMot} 10^{-4} kgm²
DRN71MSR8	0.09	1.24	695	6.8	8.29	BE03	6000 16000	2.7	8.6	8.98
DRN71MS8	0.12	1.72	665	6.8	8.29	BE03	6000 16000	3.4	8.6	8.98
DRN80MK8	0.18	2.45	705	11	17.1	BE05	5000 11500	5	14	18.6
DRN80M8	0.25	3.4	702	14	24.7	BE1	3700 10500	7	18	26.2

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4.10 IE3 DRN.. motors, 380 V, 60 Hz, 2-pole

4.10.1 Information on motors

Motor	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN63MS2	0.18	0.51	3370	0.495	0.74	60.9	65.1	66.0	5.3	3.3 3.1	3.3
DRN63M2	0.25	0.7	3395	0.61	0.79	67.0	69.8	70.0	6.2	3.4 3.1	3.4
DRN71MS2	0.37	1.03	3440	0.92	0.76	69.4	73.1	74.0	6.8	3.8 3.2	3.8
DRN71M2	0.55	1.52	3455	1.3	0.78	73.3	76.4	77.0	7.4	3.9 3.5	3.9
DRN80MS2	0.75	2.05	3476	1.68	0.82	79.7	84.8	82.5	7.4	3.2 2.9	3.4
DRN80M2	1.1	3	3485	2.35	0.83	82.3	84.1	84.0	8.2	3.7 3.0	3.6
DRN90S2	1.5	4.1	3505	3.2	0.81	83.7	85.6	85.5	8.3	3.3 2.7	3.5
DRN90L2	2.2	6	3525	4.5	0.85	84.7	86.4	86.5	9.8	3.1 2.1	3.5
DRN100LM2	3	8.1	3517	6.2	0.83	88.0	89.1	88.5	10.2	3.8 2.8	4.2
DRN100L2	3.7	10.1	3508	7	0.88	88.6	89.1	88.5	11.0	4.2 3.4	4.1
DRN112M2	4	10.8	3552	7.8	0.86	87.4	88.6	88.5	10.1	3.1 1.4	4.1
DRN132S2	5.5	14.8	3544	9.9	0.92	89.0	89.7	89.5	11.0	3.3 2.1	4.2
DRN132S2	7.5	20	3545	14.7	0.85	89.6	90.4	90.2	9.3	3.6 2.4	4.6

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4.10.2 Further information on motors and brakemotors

Motor	P_N	M_N	n_N	m_{Mot}	J_{Mot}	BE..	Z_0 BG BGE	M_B	m_{BMot}	J_{BMot}
	kW	Nm	min^{-1}	kg	10^{-4} kgm^2		1/h	Nm	kg	10^{-4} kgm^2
DRN63MS2	0.18	0.51	3370	4.9	2.95	BE03	4000 4800	1.3	6.8	3.63
DRN63M2	0.25	0.7	3395	5.8	3.76	BE03	4800 3600	1.7	7.6	4.44
DRN71MS2	0.37	1.03	3440	6.8	2.93	BE03	2900 4800	2.1	8.6	3.61
DRN71M2	0.55	1.52	3455	8	3.71	BE03	2100 4400	3.4	9.9	4.39
DRN80MS2	0.75	2.05	3476	11	18.5	BE05	960 2720	5	15	20
DRN80M2	1.1	3	3485	14	24.1	BE1	800 2080	7	18	25.6
DRN90S2	1.5	4.1	3505	20	53.1	BE1	480 1040	10	22	54.7
DRN90L2	2.2	6	3525	23	66.3	BE2	- 800	14	27	71
DRN100LM2	3	8.1	3517	33	89.7	BE2	- 600	20	37	94.4
DRN100L2	3.7	10.1	3508	34	111	BE2	- 600	20	39	115
DRN112M2	4	10.8	3552	45	178	BE5	- 320	28	52	183
DRN132S2	5.5	14.8	3544	56	241	BE5	- 240	40	64	246
DRN132S2	7.5	20	3545	56	241	BE5	- 240	55	64	246

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4.11 IE3 DRN.. motors, 380 V, 60 Hz, 4-pole

4.11.1 Information on motors

Motor	P_N kW	M_N Nm	n_N 1/min	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN63MS4	0.12	0.67	1700	0.45	0.58	57.7	63.7	66.0	4.3	3.3 3.2	3.4
DRN63M4	0.18	1.01	1695	0.63	0.59	63.5	68.5	70.0	4.5	3.3 3.2	3.3
DRN71MS4	0.25	1.39	1720	0.78	0.62	69.2	73.1	74.0	5.1	3.0 2.6	3.0
DRN71M4	0.37	2.05	1730	1.11	0.62	74.3	77.7	78.5	5.7	3.4 2.8	3.4
DRN80MK4	0.55	3	1745	1.4	0.71	78.1	81.0	81.5	7.4	3.2 2.5	3.6
DRN80M4	0.75	4.1	1751	1.89	0.70	82.0	84.9	85.5	8.1	3.7 3.0	4.2
DRN90S4	1.1	6	1762	2.8	0.69	83.5	86.1	86.5	8.2	3.3 2.3	4.0
DRN90L4	1.5	8.1	1767	3.65	0.70	83.8	86.1	86.5	9.1	3.3 1.9	4.0
DRN100LM4	2.2	11.9	1762	5.1	0.73	88.1	89.5	89.5	9.1	3.4 2.4	4.2
DRN100L4	3	16.2	1763	7	0.73	87.6	89.3	89.5	9.2	3.9 2.3	4.4
DRN100L4	3.7	20	1758	8.7	0.72	87.8	89.4	89.5	9.1	4.1 2.0	4.4
DRN112M4	4	21.5	1769	8.5	0.79	88.5	89.6	89.5	9.8	2.8 1.4	4.0
DRN132S4	5.5	29.5	1768	11.1	0.82	90.9	91.8	91.7	9.8	3.5 2.8	4.3
DRN132M4	7.5	40.5	1774	16.1	0.77	91.1	91.9	91.7	8.5	3.7 2.6	3.7
DRN132L4	9.2	49.5	1775	20	0.76	91.0	91.9	91.7	8.4	4.3 1.7	4.1
DRN160M4	11	59	1776	22.5	0.80	91.2	92.3	92.4	7.0	2.6 2.1	3.1
DRN160L4	15	81	1777	30.5	0.80	92.3	93.3	93.0	9.0	3.4 2.1	3.8
DRN180M4	18.5	99	1781	35.5	0.84	92.7	93.6	93.6	9.5	4.1 3.4	4.0
DRN180L4	22	118	1781	41.5	0.86	93.2	93.8	93.6	9.8	4.2 2.7	3.9
DRN200L4	30	161	1783	59	0.82	93.0	94.0	94.1	8.5	3.5 2.5	3.3
DRN225S4	37	198	1785	67	0.88	94.2	94.7	94.5	9.2	3.4 2.6	3.0
DRN225M4	45	240	1785	85	0.85	94.5	95.1	95.0	8.9	3.6 2.2	2.7
DRN250ME4	55	295	1785	107	0.82	94.3	95.2	95.4	8.6	4.6 2.4	2.7
DRN280S4	75	400	1785	151	0.79	94.6	95.3	95.4	9.1	4.8 2.7	3.1
DRN280M4	90	480	1784	171	0.83	94.8	95.4	95.4	8.0	4.8 2.5	2.9
DRN315S4	110	590	1788	199	0.88	95.3	95.8	95.8	6.6	2.8 2.1	3.0
DRN315ME4	132	700	1790	240	0.87	95.3	96.0	96.2	7.8	3.5 2.9	4.0
DRN315L4	160	860	1787	285	0.88	95.8	96.3	96.2	6.9	2.9 2.4	3.3
DRN315H4	200	1070	1791	390	0.83	95.0	96.0	96.2	8.3	4.6 3.4	4.7

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4.11.2 Further information on motors and brakemotors

Motor	P_N	M_N	n_N	m_{Mot}	J_{Mot}	BE..	Z_0 BG BGE	M_B	m_{BMot}	J_{BMot}
	kW	Nm	1/min	kg	10^{-4} kgm^2		1/h	Nm	kg	10^{-4} kgm^2
DRN63MS4	0.12	0.67	1700	4.9	2.95	BE03	8000 8000	1.3	6.8	3.63
DRN63M4	0.18	1.01	1695	5.8	3.76	BE03	8000 8000	2.1	7.6	4.44
DRN71MS4	0.25	1.39	1720	6.8	5.42	BE03	4950 -7800	2.7	8.6	6.11
DRN71M4	0.37	2.05	1730	8	7.14	BE05	4000 7200	5	10	8.44
DRN80MK4	0.55	3	1745	11	17.1	BE1	2800 6800	7	14	18.6
DRN80M4	0.75	4.1	1751	14	24.7	BE1	2600 6600	10	18	26.2
DRN90S4	1.1	6	1762	20	54	BE2	1800 4800	14	24	58.7
DRN90L4	1.5	8.1	1767	23	67.2	BE2	1800 4700	20	27	71.9
DRN100LM4	2.2	11.9	1762	33	90.7	BE5	- 3700	28	38	96.7
DRN100L4	3	16.2	1763	34	112	BE5	- 2900	40	40	118
DRN100L4	3.7	20	1758	34	112	BE5	- 2900	40	40	118
DRN112M4	4	21.5	1769	45	178	BE5	- 2300	55	52	183
DRN132S4	5.5	29.5	1768	56	241	BE11	- 1700	80	71	251
DRN132M4	7.5	40.5	1774	73	381	BE11	- 900	110	91	403
DRN132L4	9.2	49.5	1775	81	439	BE11	- 780	110	100	461
DRN160M4	11	59	1776	115	817	BE20	- 720	150	145	877
DRN160L4	15	81	1777	130	1040	BE20	- 640	200	165	1100
DRN180M4	18.5	99	1781	155	1630	BE20	- 400	200	190	1690
DRN180L4	22	118	1781	170	1950	BE30	- 380	300	210	2090
DRN200L4	30	161	1783	280	2660	BE32	- 400	400	335	2890
DRN225S4	37	198	1785	310	4350	BE32	- 180	400	365	4580
DRN225M4	45	240	1785	310	4350	BE32	- 160	500	365	4580
DRN250ME4	55	295	1785	510	8940	BE60	- 120	600	590	9280
DRN280S4	75	400	1785	520	8940	BE62	- 120	1000	600	9530
DRN280M4	90	480	1784	630	12000	BE62	- 63	1000	720	12600
DRN315S4	110	590	1788	870	23400	BE122	- 42	1200	1000	24400
DRN315ME4	132	700	1790	990	28300	BE122	- 33	1600	1130	29400
DRN315L4	160	860	1787	1020	28600	BE122	- 27	2000	1150	29600
DRN315H4	200	1070	1791	1150	35200	BE122	- 18	2000	1280	36200

4.12 IE3 DRN.. motors, 380 V, 60 Hz, 6-pole

4.12.1 Information on motors

Motor	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN63MR6	0.09	0.76	1135	0.41	0.52	49.2	57.3	61.5	3.5	3.4 3.4	3.6
DRN63M6	0.12	1.04	1105	0.45	0.63	54.9	61.6	64.0	3.3	2.4 2.5	2.5
DRN71MS6	0.18	1.52	1130	0.61	0.63	61.7	66.6	68.0	3.9	2.3 2.1	2.6
DRN71M6	0.25	2.1	1135	0.84	0.62	64.8	70.3	72.0	4.2	2.5 2.3	2.8
DRN80MK6	0.37	3.05	1150	1.14	0.63	71.2	74.8	75.5	4.9	2.5 2.4	3.0
DRN90SR6	0.55	4.5	1172	1.66	0.60	76.6	80.5	81.7	6.0	2.7 2.4	3.4
DRN90S6	0.75	6.1	1165	2.2	0.63	79.1	82.6	82.5	5.6	2.4 2.3	3.0
DRN112M6	1.1	8.9	1183	3.1	0.61	84.6	86.9	87.5	7.9	2.5 1.8	3.9
DRN112M6	1.5	12.1	1181	4.05	0.63	86.1	88.2	88.5	7.7	2.5 1.9	3.8
DRN132S6	2.2	17.8	1179	5.9	0.63	87.2	89.2	89.5	6.7	2.7 2.4	3.9
DRN132S6	3	24.5	1178	8.1	0.63	87.6	89.4	89.5	6.9	2.7 2.5	4.0
DRN132M6	3.7	30	1182	10.7	0.59	86.8	89.0	89.5	6.7	3.4 2.8	3.3
DRN132M6	4	32.5	1181	11.1	0.61	87.4	89.2	89.5	6.4	3.2 2.6	3.1
DRN160M6	5.5	44.5	1185	12.6	0.72	88.4	90.4	91.0	8.6	2.9 1.3	4.4
DRN160M6	7.5	61	1182	17.2	0.73	89.2	90.8	91.0	8.0	2.9 1.3	4.2

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4.12.2 Further information on motors and brakemotors

Motor	P_N	M_N	n_N	m_{Mot}	J_{Mot}	BE..	Z_0 BG BGE	M_B	m_{BMot}	J_{BMot}
	kW	Nm	min^{-1}	kg	10^{-4} kgm²		1/h	Nm	kg	10^{-4} kgm²
DRN63MR6	0.09	0.76	1135	5.8	6.47	BE03	9600 9600	1.7	7.6	7.16
DRN63M6	0.12	1.04	1105	5.8	6.47	BE03	9600 9600	2.1	7.6	7.16
DRN71MS6	0.18	1.52	1130	6.8	8.29	BE03	5600 9600	3.4	8.6	8.98
DRN71M6	0.25	2.1	1135	8	10.4	BE05	4150 9600	5	10	11.7
DRN80MK6	0.37	3.05	1150	11	17.1	BE1	2400 7200	7	14	18.6
DRN90SR6	0.55	4.5	1172	20	54	BE1	1920 4000	10	23	55.6
DRN90S6	0.75	6.1	1165	20	54	BE2	1920 4000	14	24	58.7
DRN112M6	1.1	8.9	1183	45	178	BE5	- 2080	20	52	183
DRN112M6	1.5	12.1	1181	45	178	BE5	- 2080	28	52	183
DRN132S6	2.2	17.8	1179	56	245	BE5	- 1840	40	64	250
DRN132S6	3	24.5	1178	56	245	BE5	- 1840	55	64	250
DRN132M6	3.7	30	1182	73	381	BE11	- 1440	80	91	403
DRN132M6	4	32.5	1181	73	381	BE11	- 1440	80	91	403
DRN160M6	5.5	44.5	1185	115	1290	BE20	- 960	110	145	1350
DRN160M6	7.5	61	1182	115	1290	BE20	- 960	150	145	1350

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4.13 IE3 DRN.. motors, 380 V, 60 Hz, 8-pole

4.13.1 Information on motors

DRN.. motor type	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN71MSR8	0.09	1	856	0.495	0.46	43.9	52.6	57.5	2.7	2.6 2.6	3.1
DRN71MS8	0.12	1.37	835	0.53	0.56	49.3	56.5	59.5	2.7	1.9 1.9	2.3
DRN80MK8	0.18	2	863	0.85	0.48	53.3	60.5	64.0	3.5	2.2 2.2	2.9
DRN80M8	0.25	2.75	861	1.14	0.48	58.2	65.0	68.0	3.5	2.3 2.2	2.9

4.13.2 Further information on motors and brakemotors

DRN.. motor type	P_N kW	M_N Nm	n_N min^{-1}	m_{Mot} kg	J_{Mot} 10^{-4} kgm^2	BE..	Z_0 BG BGE h^{-1}	M_B Nm	m_{BMot} kg	J_{BMot} 10^{-4} kgm^2
DRN71MSR8	0.09	1	856	6.8	8.29	BE03	4800 12800	2.1	8.6	8.98
DRN71MS8	0.12	1.37	835	6.8	8.29	BE03	4800 12800	2.7	8.6	8.98
DRN80MK8	0.18	2	863	11	17.1	BE05	4000 9200	5	14	18.6
DRN80M8	0.25	2.75	861	14	24.7	BE1	2950 8400	7	18	26.2

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4.14 IE3 DRN.. motors, 440 V, 60 Hz, 2-pole

4.14.1 Information on motors

Motor	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN63MS2	0.18	0.51	3370	0.43	0.74	60.9	65.1	66.0	5.3	3.3 3.1	3.3
DRN63M2	0.25	0.7	3395	0.53	0.79	67.0	69.8	70.0	6.2	3.4 3.1	3.4
DRN71MS2	0.37	1.03	3440	0.8	0.76	69.4	73.1	74.0	6.8	3.8 3.2	3.8
DRN71M2	0.55	1.52	3455	1.12	0.78	73.3	76.4	77.0	7.4	3.9 3.5	3.9
DRN80MS2	0.75	2.05	3476	1.45	0.82	79.7	84.8	82.5	7.4	3.2 2.9	3.4
DRN80M2	1.1	3	3485	2.05	0.83	82.3	84.1	84.0	8.2	3.7 3.0	3.6
DRN90S2	1.5	4.1	3505	2.8	0.81	83.7	85.6	85.5	8.3	3.3 2.7	3.5
DRN90L2	2.2	6	3525	3.85	0.85	84.7	86.4	86.5	9.8	3.1 2.1	3.5
DRN100LM2	3	8.1	3517	5.3	0.83	88.0	89.1	88.5	10.2	3.8 2.8	4.2
DRN100L2	3.7	10.1	3508	6.1	0.88	88.6	89.1	88.5	11.0	4.2 3.4	4.1
DRN112M2	4	10.8	3552	6.8	0.86	87.4	88.6	88.5	10.1	3.1 1.4	4.1
DRN132S2	5.5	14.8	3544	8.6	0.92	89.0	89.7	89.5	11.0	3.3 2.1	4.2
DRN132S2	7.5	20	3545	12.7	0.85	89.6	90.4	90.2	9.3	3.6 2.4	4.6

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4.14.2 Further information on motors and brakemotors

Motor	P_N	M_N	n_N	m_{Mot}	J_{Mot}	BE..	Z_0 BG BGE	M_B	m_{BMot}	J_{BMot}
	kW	Nm	min^{-1}	kg	10^{-4} kgm^2		1/h	Nm	kg	10^{-4} kgm^2
DRN63MS2	0.18	0.51	3370	4.9	2.95	BE03	4000 4800	1.3	6.8	3.63
DRN63M2	0.25	0.7	3395	5.8	3.76	BE03	4800 3600	1.7	7.6	4.44
DRN71MS2	0.37	1.03	3440	6.8	2.93	BE03	2900 4800	2.1	8.6	3.61
DRN71M2	0.55	1.52	3455	8	3.71	BE03	2100 4400	3.4	9.9	4.39
DRN80MS2	0.75	2.05	3476	11	18.5	BE05	960 2720	5	15	20
DRN80M2	1.1	3	3485	14	24.1	BE1	800 2080	7	18	25.6
DRN90S2	1.5	4.1	3505	20	53.1	BE1	480 1040	10	22	54.7
DRN90L2	2.2	6	3525	23	66.3	BE2	- 800	14	27	71
DRN100LM2	3	8.1	3517	33	89.7	BE2	- 600	20	37	94.4
DRN100L2	3.7	10.1	3508	34	111	BE2	- 600	20	39	115
DRN112M2	4	10.8	3552	45	178	BE5	- 320	28	52	183
DRN132S2	5.5	14.8	3544	56	241	BE5	- 240	40	64	246
DRN132S2	7.5	20	3545	56	241	BE5	- 240	55	64	246

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4.15 IE3 DRN.. motors, 440 V, 60 Hz, 4-pole

4.15.1 Information on motors

Motor	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN63MS4	0.12	0.67	1700	0.385	0.58	57.7	63.7	66.0	4.3	3.3 3.2	3.4
DRN63M4	0.18	1.01	1695	0.54	0.59	63.5	68.5	70.0	4.5	3.3 3.2	3.3
DRN71MS4	0.25	1.39	1720	0.68	0.62	69.2	73.1	74.0	5.1	3.0 2.6	3.0
DRN71M4	0.37	2.05	1730	0.96	0.62	74.3	77.7	78.5	5.7	3.4 2.8	3.4
DRN80MK4	0.55	3	1745	1.21	0.71	78.1	81.0	81.5	7.4	3.2 2.5	3.6
DRN80M4	0.75	4.1	1751	1.63	0.70	82.0	84.9	85.5	8.1	3.7 3.0	4.2
DRN90S4	1.1	6	1762	2.4	0.69	83.5	86.1	86.5	8.2	3.3 2.3	4.0
DRN90L4	1.5	8.1	1767	3.15	0.70	83.8	86.1	86.5	9.1	3.3 1.9	4.0
DRN100LM4	2.2	11.9	1762	4.4	0.73	88.1	89.5	89.5	9.1	3.4 2.4	4.2
DRN100L4	3	16.2	1763	6	0.73	87.6	89.3	89.5	9.2	3.9 2.3	4.4
DRN100L4	3.7	20	1758	7.5	0.72	87.8	89.4	89.5	9.1	4.1 2.0	4.4
DRN112M4	4	21.5	1769	7.4	0.79	88.5	89.6	89.5	9.8	2.8 1.4	4.0
DRN132S4	5.5	29.5	1768	9.6	0.82	90.9	91.8	91.7	9.8	3.5 2.8	4.3
DRN132M4	7.5	40.5	1774	13.9	0.77	91.1	91.9	91.7	8.5	3.7 2.6	3.7
DRN132L4	9.2	49.5	1775	17.2	0.76	91.0	91.9	91.7	8.4	4.3 1.7	4.1
DRN160M4	11	59	1776	19.3	0.80	91.2	92.3	92.4	7.0	2.6 2.1	3.1
DRN160L4	15	81	1777	26.5	0.80	92.3	93.3	93.0	9.0	3.4 2.1	3.8
DRN180M4	18.5	99	1781	31	0.84	92.7	93.6	93.6	9.5	4.1 3.4	4.0
DRN180L4	22	118	1781	35.5	0.86	93.2	93.8	93.6	9.8	4.2 2.7	3.9
DRN200L4	30	161	1783	51	0.82	93.0	94.0	94.1	8.5	3.5 2.5	3.3
DRN225S4	37	198	1785	58	0.88	94.2	94.7	94.5	9.2	3.4 2.6	3.0
DRN225M4	45	240	1785	73	0.85	94.5	95.1	95.0	8.9	3.6 2.2	2.7
DRN250ME4	55	295	1785	92	0.82	94.3	95.2	95.4	8.6	4.6 2.4	2.7
DRN280S4	75	400	1785	131	0.79	94.6	95.3	95.4	9.1	4.8 2.7	3.1
DRN280M4	90	480	1784	147	0.83	94.8	95.4	95.4	8.0	4.8 2.5	2.9
DRN315S4	110	590	1788	171	0.88	95.1	95.7	95.8	6.9	3.0 2.2	3.2
DRN315ME4	132	700	1790	205	0.87	95.8	96.4	96.2	7.7	3.5 2.8	3.9
DRN315L4	160	860	1787	245	0.89	95.9	96.3	96.2	6.8	2.9 2.3	3.2
DRN315H4	200	1070	1790	320	0.85	95.2	96.0	96.2	8.4	3.8 2.8	3.9

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4.15.2 Further information on motors and brakemotors

Motor	P_N	M_N	n_N	m_{Mot}	J_{Mot}	BE..	Z_0 BG BGE	M_B	m_{BMot}	J_{BMot}
	kW	Nm	min^{-1}	kg	10^{-4} kgm²		1/h	Nm	kg	10^{-4} kgm²
DRN63MS4	0.12	0.67	1700	4.9	2.95	BE03	8000 8000	1.3	6.8	3.63
DRN63M4	0.18	1.01	1695	5.8	3.76	BE03	8000 8000	2.1	7.6	4.44
DRN71MS4	0.25	1.39	1720	6.8	5.42	BE03	4950 7800	2.7	8.6	6.11
DRN71M4	0.37	2.05	1730	8	7.14	BE05	4000 7200	5	10	8.44
DRN80MK4	0.55	3	1745	11	17.1	BE1	2800 6800	7	14	18.6
DRN80M4	0.75	4.1	1751	14	24.7	BE1	2600 6600	10	18	26.2
DRN90S4	1.1	6	1762	20	54	BE2	1800 4800	14	24	58.7
DRN90L4	1.5	8.1	1767	23	67.2	BE2	1800 4700	20	27	71.9
DRN100LM4	2.2	11.9	1762	33	90.7	BE5	- 3700	28	38	96.7
DRN100L4	3	16.2	1763	34	112	BE5	- 2900	40	40	118
DRN100L4	3.7	20	1758	34	112	BE5	- 2900	40	40	118
DRN112M4	4	21.5	1769	45	178	BE5	- 2300	55	52	183
DRN132S4	5.5	29.5	1768	56	241	BE11	- 1700	80	71	251
DRN132M4	7.5	40.5	1774	73	381	BE11	- 900	110	91	403
DRN132L4	9.2	49.5	1775	81	439	BE11	- 780	110	100	461
DRN160M4	11	59	1776	115	817	BE20	- 720	150	145	877
DRN160L4	15	81	1777	130	1040	BE20	- 640	200	165	1100
DRN180M4	18.5	99	1781	155	1630	BE20	- 400	200	190	1690
DRN180L4	22	118	1781	170	1950	BE30	- 380	300	210	2090
DRN200L4	30	161	1783	280	2660	BE32	- 400	400	335	2890
DRN225S4	37	198	1785	310	4350	BE32	- 180	400	365	4580
DRN225M4	45	240	1785	310	4350	BE32	- 160	500	365	4580
DRN250ME4	55	295	1785	510	8940	BE60	- 120	600	590	9280
DRN280S4	75	400	1785	520	8940	BE62	- 120	1000	600	9530
DRN280M4	90	480	1784	630	12000	BE62	- 63	1000	720	12600
DRN315S4	110	590	1788	870	23400	BE122	- 42	1200	1000	24400
DRN315ME4	132	700	1790	990	28300	BE122	- 33	1600	1130	29400
DRN315L4	160	860	1787	1020	28600	BE122	- 27	2000	1150	29600
DRN315H4	200	1070	1790	1140	35200	BE122	- 18	2000	1270	36200

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4.16 IE3 DRN.. motors, 440 V, 60 Hz, 6-pole

4.16.1 Information on motors

Motor	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN63MR6	0.09	0.76	1135	0.355	0.52	49.2	57.3	61.5	3.5	3.4 3.4	3.6
DRN63M6	0.12	1.04	1105	0.385	0.63	54.9	61.6	64.0	3.3	2.4 2.5	2.5
DRN71MS6	0.18	1.52	1130	0.53	0.63	61.7	66.6	68.0	3.9	2.3 2.1	2.6
DRN71M6	0.25	2.1	1135	0.73	0.62	64.8	70.3	72.0	4.2	2.5 2.3	2.8
DRN80MK6	0.37	3.05	1150	0.99	0.63	71.2	74.8	75.5	4.9	2.5 2.4	3.0
DRN90S6	0.55	4.5	1172	1.44	0.60	76.6	80.5	81.7	6.0	2.7 2.4	3.4
DRN90S6	0.75	6.1	1165	1.88	0.63	79.1	82.6	82.5	5.6	2.4 2.3	3.0
DRN112M6	1.1	8.9	1183	2.65	0.61	84.6	86.9	87.5	7.9	2.5 1.8	3.9
DRN112M6	1.5	12.1	1181	3.5	0.63	86.1	88.2	88.5	7.7	2.5 1.9	3.8
DRN132S6	2.2	17.8	1179	5.1	0.63	87.2	89.2	89.5	6.7	2.7 2.4	3.9
DRN132S6	3	24.5	1178	7	0.63	87.6	89.4	89.5	6.9	2.7 2.5	4.0
DRN132M6	3.7	30	1182	9.2	0.59	86.8	89.0	89.5	6.7	3.4 2.8	3.3
DRN132M6	4	32.5	1181	9.6	0.61	87.4	89.2	89.5	6.4	3.2 2.6	3.1
DRN160M6	5.5	44.5	1185	10.9	0.72	88.4	90.4	91.0	8.6	2.9 1.3	4.4
DRN160M6	7.5	61	1182	14.8	0.73	89.2	90.8	91.0	8.0	2.9 1.3	4.2

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4.16.2 Further information on motors and brakemotors

Motor	P_N	M_N	n_N	m_{Mot}	J_{Mot}	BE..	Z_0 BG BGE	M_B	m_{BMot}	J_{BMot}
	kW	Nm	min^{-1}	kg	10^{-4} kgm^2		1/h	Nm	kg	10^{-4} kgm^2
DRN63MR6	0.09	0.76	1135	5.8	6.47	BE03	9600 9600	1.7	7.6	7.16
DRN63M6	0.12	1.04	1105	5.8	6.47	BE03	9600 9600	2.1	7.6	7.16
DRN71MS6	0.18	1.52	1130	6.8	8.29	BE03	5600 9600	3.4	8.6	8.98
DRN71M6	0.25	2.1	1135	8	10.4	BE05	4150 9600	5	10	11.7
DRN80MK6	0.37	3.05	1150	11	17.1	BE1	2400 7200	7	14	18.6
DRN90S6	0.55	4.5	1172	20	54	BE1	1920 4000	10	23	55.6
DRN90S6	0.75	6.1	1165	20	54	BE2	1920 4000	14	24	58.7
DRN112M6	1.1	8.9	1183	45	178	BE5	- 2080	20	52	183
DRN112M6	1.5	12.1	1181	45	178	BE5	- 2080	28	52	183
DRN132S6	2.2	17.8	1179	56	245	BE5	- 1840	40	64	250
DRN132S6	3	24.5	1178	56	245	BE5	- 1840	55	64	250
DRN132M6	3.7	30	1182	73	381	BE11	- 1440	80	91	403
DRN132M6	4	32.5	1181	73	381	BE11	- 1440	80	91	403
DRN160M6	5.5	44.5	1185	115	1290	BE20	- 960	110	145	1350
DRN160M6	7.5	61	1182	115	1290	BE20	- 960	150	145	1350

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4.17 IE3 DRN.. motors, 440 V, 60 Hz, 8-pole

4.17.1 Information on motors

DRN.. motor type	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN71MSR8	0.09	1	856	0.43	0.46	43.9	52.6	57.5	2.7	2.6 2.6	3.1
DRN71MS8	0.12	1.37	835	0.455	0.56	49.3	56.5	59.5	2.7	1.9 1.9	2.3
DRN80MK8	0.18	2	863	0.74	0.48	53.3	60.5	64.0	3.5	2.2 2.2	2.9
DRN80M8	0.25	2.75	861	0.99	0.48	58.2	65.0	68.0	3.5	2.3 2.2	2.9

4.17.2 Further information on motors and brakemotors

DRN.. motor type	P_N kW	M_N Nm	n_N min^{-1}	m_{Mot} kg	J_{Mot} 10^{-4} kgm^2	BE..	Z_0 BG BGE h^{-1}	M_B Nm	m_{BMot} kg	J_{BMot} 10^{-4} kgm^2
DRN71MSR8	0.09	1	856	6.8	8.29	BE03	4800 12800	2.1	8.6	8.98
DRN71MS8	0.12	1.37	835	6.8	8.29	BE03	4800 12800	2.7	8.6	8.98
DRN80MK8	0.18	2	863	11	17.1	BE05	4000 9200	5	14	18.6
DRN80M8	0.25	2.75	861	14	24.7	BE1	2950 8400	7	18	26.2

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4.18 IE3 DRN.. motors, 460 V, 60 Hz, 2-pole

4.18.1 Information on motors

DRN.. motor type	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN63MS2	0.18	0.51	3370	0.41	0.74	60.9	65.1	66.0	5.3	3.3 3.1	3.3
DRN63M2	0.25	0.7	3395	0.5	0.79	67.0	69.8	70.0	6.2	3.4 3.1	3.4
DRN71MS2	0.37	1.03	3440	0.76	0.76	69.4	73.1	74.0	6.8	3.8 3.2	3.8
DRN71M2	0.55	1.52	3455	1.07	0.78	73.3	76.4	77.0	7.4	3.9 3.5	3.9
DRN80MS2	0.75	2.05	3476	1.39	0.82	79.7	84.8	82.5	7.4	3.2 2.9	3.4
DRN80M2	1.1	3	3485	1.94	0.83	82.3	84.1	84.0	8.2	3.7 3.0	3.6
DRN90S2	1.5	4.1	3505	2.65	0.81	83.7	85.6	85.5	8.3	3.3 2.7	3.5
DRN90L2	2.2	6	3525	3.7	0.85	84.7	86.4	86.5	9.8	3.1 2.1	3.5
DRN100LM2	3	8.1	3517	5.1	0.83	88.0	89.1	88.5	10.2	3.8 2.8	4.2
DRN100L2	3.7	10.1	3508	5.8	0.88	88.6	89.1	88.5	11.0	4.2 3.4	4.1
DRN112M2	4	10.8	3552	6.5	0.86	87.4	88.6	88.5	10.1	3.1 1.4	4.1
DRN132S2	5.5	14.8	3544	8.2	0.92	89.0	89.7	89.5	11.0	3.3 2.1	4.2
DRN132S2	7.5	20	3545	12.2	0.85	89.6	90.4	90.2	9.3	3.6 2.4	4.6

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4.18.2 Further information on motors and brakemotors

DRN.. motor type	P_N	M_N	n_N	m_{Mot}	J_{Mot}	BE..	Z_0 BG BGE	M_B	m_{BMot}	J_{BMot}
	kW	Nm	min^{-1}	kg	10^{-4} kgm^2		h^{-1}	Nm	kg	10^{-4} kgm^2
DRN63MS2	0.18	0.51	3370	4.9	2.95	BE03	4000 4800	1.3	6.8	3.63
DRN63M2	0.25	0.7	3395	5.8	3.76	BE03	4800 3600	1.7	7.6	4.44
DRN71MS2	0.37	1.03	3440	6.8	2.93	BE03	2900 4800	2.1	8.6	3.61
DRN71M2	0.55	1.52	3455	8	3.71	BE03	2100 4400	3.4	9.9	4.39
DRN80MS2	0.75	2.05	3476	11	18.5	BE05	960 2720	5	15	20
DRN80M2	1.1	3	3485	14	24.1	BE1	800 2080	7	18	25.6
DRN90S2	1.5	4.1	3505	20	53.1	BE1	480 1040	10	22	54.7
DRN90L2	2.2	6	3525	23	66.3	BE2	- 800	14	27	71
DRN100LM2	3	8.1	3517	33	89.7	BE2	- 600	20	37	94.4
DRN100L2	3.7	10.1	3508	34	111	BE2	- 600	20	39	115
DRN112M2	4	10.8	3552	45	178	BE5	- 320	28	52	183
DRN132S2	5.5	14.8	3544	56	241	BE5	- 240	40	64	246
DRN132S2	7.5	20	3545	56	241	BE5	- 240	55	64	246

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4.19 IE3 DRN.. motors, 460 V, 60 Hz, 4-pole

4.19.1 Information on motors

DRN.. motor type	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN63MS4	0.12	0.67	1700	0.37	0.58	57.7	63.7	66.0	4.3	3.3 3.2	3.4
DRN63M4	0.18	1.01	1695	0.52	0.59	63.5	68.5	70.0	4.5	3.3 3.2	3.3
DRN71MS4	0.25	1.39	1720	0.65	0.62	69.2	73.1	74.0	5.1	3.0 2.6	3.0
DRN71M4	0.37	2.05	1730	0.92	0.62	74.3	77.7	78.5	5.7	3.4 2.8	3.4
DRN80MK4	0.55	3	1745	1.16	0.71	78.1	81.0	81.5	7.4	3.2 2.5	3.6
DRN80M4	0.75	4.1	1751	1.56	0.70	82.0	84.9	85.5	8.1	3.7 3.0	4.2
DRN90S4	1.1	6	1762	2.3	0.69	83.5	86.1	86.5	8.2	3.3 2.3	4.0
DRN90L4	1.5	8.1	1767	3	0.70	83.8	86.1	86.5	9.1	3.3 1.9	4.0
DRN100LM4	2.2	11.9	1762	4.2	0.73	88.1	89.5	89.5	9.1	3.4 2.4	4.2
DRN100L4	2.2	11.9	1765	4.15	0.74	87.5	89.2	89.5	9.4	3.7 2.2	4.2
DRN100L4	3	16.2	1763	5.8	0.73	87.6	89.3	89.5	9.2	3.9 2.3	4.4
DRN100L4	3.7	20	1758	7.2	0.72	87.8	89.4	89.5	9.1	4.1 2.0	4.4
DRN112M4	4	21.5	1769	7.1	0.79	88.5	89.6	89.5	9.8	2.8 1.4	4.0
DRN132S4	5.5	29.5	1768	9.2	0.82	90.9	91.8	91.7	9.8	3.5 2.8	4.3
DRN132M4	7.5	40.5	1774	13.3	0.77	91.1	91.9	91.7	8.5	3.7 2.6	3.7
DRN132L4	9.2	49.5	1775	16.5	0.76	91.0	91.9	91.7	8.4	4.3 1.7	4.1
DRN160M4	11	59	1776	18.5	0.80	91.2	92.3	92.4	7.0	2.6 2.1	3.1
DRN160L4	15	81	1777	25	0.80	92.3	93.3	93.0	9.0	3.4 2.1	3.8
DRN180M4	18.5	99	1781	29.5	0.84	92.7	93.6	93.6	9.5	4.1 3.4	4.0
DRN180L4	22	118	1781	34	0.86	93.2	93.8	93.6	9.8	4.2 2.7	3.9
DRN200L4	30	161	1783	48.5	0.82	93.0	94.0	94.1	8.5	3.5 2.5	3.3
DRN225S4	37	198	1785	56	0.88	94.2	94.7	94.5	9.2	3.4 2.6	3.0
DRN225M4	45	240	1785	70	0.85	94.5	95.1	95.0	8.9	3.6 2.2	2.7
DRN250ME4	55	295	1785	88	0.82	94.3	95.2	95.4	8.6	4.6 2.4	2.7
DRN280S4	75	400	1785	125	0.79	94.6	95.3	95.4	9.1	4.8 2.7	3.1
DRN280M4	90	480	1784	141	0.83	94.8	95.4	95.4	8.0	4.8 2.5	2.9
DRN315S4	110	590	1790	165	0.87	95.0	95.7	95.8	7.6	3.3 2.5	3.5
DRN315ME4	132	700	1791	200	0.86	95.4	96.0	96.2	8.3	3.8 3.1	4.3

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DRN.. motor type	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN315L4	150	800	1788	225	0.87	95.5	96.1	96.2	7.8	3.4 2.7	3.8
DRN315L4	160	850	1788	235	0.88	95.6	96.2	96.2	7.4	3.2 2.6	3.6
DRN315H4	185	990	1792	290	0.83	94.8	95.9	96.2	8.6	4.6 3.4	4.6
DRN315H4	200	1070	1791	310	0.84	95.0	96.0	96.2	8.1	4.2 3.1	4.3
DRN315H4	225	1200	1790	345	0.85	95.4	96.1	96.2	7.3	3.7 2.8	3.8

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4.19.2 Further information on motors and brakemotors

DRN.. motor type	P_N	M_N	n_N	m_{Mot}	J_{Mot}	BE..	Z_0 BG BGE	M_B	m_{BMot}	J_{BMot}
	kW	Nm	min^{-1}	kg	10^{-4} kgm^2		h^{-1}	Nm	kg	10^{-4} kgm^2
DRN63MS4	0.12	0.67	1700	4.9	2.95	BE03	8000 8000	1.3	6.8	3.63
DRN63M4	0.18	1.01	1695	5.8	3.76	BE03	8000 8000	2.1	7.6	4.44
DRN71MS4	0.25	1.39	1720	6.8	5.42	BE03	4950 7800	2.7	8.6	6.11
DRN71M4	0.37	2.05	1730	8	7.14	BE05	4000 7200	5	10	8.44
DRN80MK4	0.55	3	1745	11	17.1	BE1	2800 6800	7	14	18.6
DRN80M4	0.75	4.1	1751	14	24.7	BE1	2600 6600	10	18	26.2
DRN90S4	1.1	6	1762	20	54	BE2	1800 4800	14	24	58.7
DRN90L4	1.5	8.1	1767	23	67.2	BE2	1800 4700	20	27	71.9
DRN100LM4	2.2	11.9	1762	33	90.7	BE5	- 3700	28	38	96.7
DRN100L4	2.2	11.9	1765	34	112	BE5	1400 3700	28	40	118
DRN100L4	3	16.2	1763	34	112	BE5	- 2900	40	40	118
DRN100L4	3.7	20	1758	34	112	BE5	- 2900	40	40	118
DRN112M4	4	21.5	1769	45	178	BE5	- 2300	55	52	183
DRN132S4	5.5	29.5	1768	56	241	BE11	- 1700	80	71	251
DRN132M4	7.5	40.5	1774	73	381	BE11	- 900	110	91	403
DRN132L4	9.2	49.5	1775	81	439	BE11	- 780	110	100	461
DRN160M4	11	59	1776	115	817	BE20	- 720	150	145	877
DRN160L4	15	81	1777	130	1040	BE20	- 640	200	165	1100
DRN180M4	18.5	99	1781	155	1630	BE20	- 400	200	190	1690
DRN180L4	22	118	1781	170	1950	BE30	- 380	300	210	2090
DRN200L4	30	161	1783	280	2660	BE32	- 400	400	335	2890
DRN225S4	37	198	1785	310	4350	BE32	- 180	400	365	4580
DRN225M4	45	240	1785	310	4350	BE32	- 160	500	365	4580
DRN250ME4	55	295	1785	510	8940	BE60	- 120	600	590	9280
DRN280S4	75	400	1785	520	8940	BE62	- 120	1000	600	9530
DRN280M4	90	480	1784	630	12000	BE62	- 63	1000	720	12600
DRN315S4	110	590	1790	870	23400	BE122	- 42	1200	1000	24400
DRN315ME4	132	700	1791	990	28300	BE122	- 33	1600	1130	29400
DRN315L4	150	800	1788	1020	28600	BE122	- 27	2000	1150	29600

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DRN.. motor type	P_N kW	M_N Nm	n_N min^{-1}	m_{Mot} kg	J_{Mot} 10^{-4} kgm^2	BE..	Z_0 BG BGE h^{-1}	M_B Nm	m_{BMot} kg	J_{BMot} 10^{-4} kgm^2
DRN315L4	160	850	1788	1020	28600	BE122	- 27	2000	1150	29600
DRN315H4	185	990	1792	1130	35200	BE122	- 18	2000	1270	36200
DRN315H4	200	1070	1791	1130	35200	BE122	- 18	2000	1270	36200
DRN315H4	225	1200	1790	1130	35200	BE122	- 18	2000	1270	36200

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4.20 IE3 DRN.. motors, 460 V, 60 Hz, 6-pole

4.20.1 Information on motors

DRN.. motor type	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN63MR6	0.09	0.76	1135	0.34	0.52	49.2	57.3	59.5	3.5	3.4 3.4	3.6
DRN63M6	0.12	1.04	1105	0.37	0.63	54.9	61.6	64.0	3.3	2.5 2.5	2.5
DRN71MS6	0.18	1.52	1130	0.5	0.63	61.7	66.6	68.0	3.9	2.3 2.1	2.6
DRN71M6	0.25	2.1	1135	0.69	0.62	64.8	70.3	72.0	4.2	2.5 2.3	2.8
DRN80MK6	0.37	3.05	1150	0.94	0.63	71.2	74.8	75.5	4.9	2.5 2.4	3.0
DRN90SR6	0.55	4.5	1172	1.37	0.60	76.6	80.5	81.5	6.0	2.7 2.4	3.4
DRN90S6	0.75	6.1	1165	1.8	0.63	79.1	82.6	82.5	5.6	2.4 2.3	3.0
DRN112M6	1.1	8.9	1183	2.55	0.61	84.6	86.9	87.5	7.9	2.5 1.8	3.9
DRN112M6	1.5	12.1	1181	3.35	0.63	86.1	88.2	88.5	7.7	2.5 1.9	3.8
DRN132S6	2.2	17.8	1179	4.9	0.63	87.2	89.2	89.5	6.7	2.7 2.4	3.9
DRN132S6	3	24.5	1178	6.7	0.63	87.6	89.4	89.5	6.9	2.7 2.5	4.0
DRN132M6	3.7	30	1182	8.8	0.59	86.8	89.0	89.5	6.7	3.4 2.8	3.3
DRN132M6	4	32.5	1181	9.2	0.61	87.4	89.2	89.5	6.4	3.2 2.6	3.1
DRN160M6	5.5	44.5	1185	10.4	0.72	88.4	90.4	91.0	8.6	2.9 1.3	4.4
DRN160M6	7.5	61	1182	14.2	0.73	89.2	90.8	91.0	8.0	2.9 1.3	4.2

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4.20.2 Further information on motors and brakemotors

DRN.. motor type	P_N	M_N	n_N	m_{Mot}	J_{Mot}	BE..	Z_0 BG BGE	M_B	m_{BMot}	J_{BMot}
	kW	Nm	min^{-1}	kg	10^{-4} kgm^2		h^{-1}	Nm	kg	10^{-4} kgm^2
DRN63MR6	0.09	0.76	1135	5.8	6.47	BE03	9600 9600	1.7	7.6	7.16
DRN63M6	0.12	1.04	1105	5.8	6.47	BE03	9600 9600	2.1	7.6	7.16
DRN71MS6	0.18	1.52	1130	6.8	8.29	BE03	5600 9600	3.4	8.6	8.98
DRN71M6	0.25	2.1	1135	8	10.4	BE05	4150 9600	5	10	11.7
DRN80MK6	0.37	3.05	1150	11	17.1	BE1	2400 7200	7	14	18.6
DRN90SR6	0.55	4.5	1172	20	54	BE1	1920 4000	10	23	55.6
DRN90S6	0.75	6.1	1165	20	54	BE2	1920 4000	14	24	58.7
DRN112M6	1.1	8.9	1183	45	178	BE5	- 2080	20	52	183
DRN112M6	1.5	12.1	1181	45	178	BE5	- 2080	28	52	183
DRN132S6	2.2	17.8	1179	56	245	BE5	- 1840	40	64	250
DRN132S6	3	24.5	1178	56	245	BE5	- 1840	55	64	250
DRN132M6	3.7	30	1182	73	381	BE11	- 1440	80	91	403
DRN132M6	4	32.5	1181	73	381	BE11	- 1440	80	91	403
DRN160M6	5.5	44.5	1185	115	1290	BE20	- 960	110	145	1350
DRN160M6	7.5	61	1182	115	1290	BE20	- 960	150	145	1350

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4.21 IE3 DRN.. motors, 575 V, 60 Hz, 2-pole

4.21.1 Information on motors

DRN.. motor type	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN63MS2	0.18	0.51	3370	0.33	0.74	60.9	65.1	66.0	5.3	3.3 3.1	3.3
DRN63M2	0.25	0.7	3395	0.4	0.79	67.0	69.8	70.0	6.2	3.4 3.1	3.4
DRN71MS2	0.37	1.03	3440	0.61	0.76	69.4	73.1	74.0	6.8	3.8 3.2	3.8
DRN71M2	0.55	1.52	3455	0.86	0.78	73.3	76.4	77.0	7.4	3.9 3.5	3.9
DRN80MS2	0.75	2.05	3476	1.11	0.82	79.7	84.8	82.5	7.4	3.2 2.9	3.4
DRN80M2	1.1	3	3485	1.55	0.83	82.3	84.1	84.0	8.2	3.7 3.0	3.6
DRN90S2	1.5	4.1	3505	2.15	0.81	83.7	85.6	85.5	8.3	3.3 2.7	3.5
DRN90L2	2.2	6	3525	2.95	0.85	84.7	86.4	86.5	9.8	3.1 2.1	3.5
DRN100LM2	3	8.1	3517	4.05	0.83	88.0	89.1	88.5	10.2	3.8 2.8	4.2
DRN100L2	3.7	10.1	3508	4.65	0.88	88.6	89.1	88.5	11.0	4.2 3.4	4.1
DRN112M2	4	10.8	3552	5.2	0.86	87.4	88.6	88.5	10.1	3.1 1.4	4.1
DRN132S2	5.5	14.8	3544	6.6	0.92	89.0	89.7	89.5	11.0	3.3 2.1	4.2
DRN132S2	7.5	20	3545	9.7	0.85	89.6	90.4	90.2	9.3	3.6 2.4	4.6

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4.21.2 Further information on motors and brakemotors

DRN.. motor type	P_N	M_N	n_N	m_{Mot}	J_{Mot}	BE..	Z_0 BG BGE	M_B	m_{BMot}	J_{BMot}
	kW	Nm	min^{-1}	kg	10^{-4} kgm^2		h^{-1}	Nm	kg	10^{-4} kgm^2
DRN63MS2	0.18	0.51	3370	4.9	2.95	BE03	4000 4800	1.3	6.8	3.63
DRN63M2	0.25	0.7	3395	5.8	3.76	BE03	4800 3600	1.7	7.6	4.44
DRN71MS2	0.37	1.03	3440	6.8	2.93	BE03	2900 4800	2.1	8.6	3.61
DRN71M2	0.55	1.52	3455	8	3.71	BE03	2100 4400	3.4	9.9	4.39
DRN80MS2	0.75	2.05	3476	11	18.5	BE05	960 2720	5	15	20
DRN80M2	1.1	3	3485	14	24.1	BE1	800 2080	7	18	25.6
DRN90S2	1.5	4.1	3505	20	53.1	BE1	480 1040	10	22	54.7
DRN90L2	2.2	6	3525	23	66.3	BE2	- 800	14	27	71
DRN100LM2	3	8.1	3517	33	89.7	BE2	- 600	20	37	94.4
DRN100L2	3.7	10.1	3508	34	111	BE2	- 600	20	39	115
DRN112M2	4	10.8	3552	45	178	BE5	- 320	28	52	183
DRN132S2	5.5	14.8	3544	56	241	BE5	- 240	40	64	246
DRN132S2	7.5	20	3545	56	241	BE5	- 240	55	64	246

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4.22 IE3 DRN.. motors, 575 V, 60 Hz, 4-pole

4.22.1 Information on motors

DRN.. motor type	P_N	M_N	n_N	I_N	cosφ	$\eta_{50\%}$	$\eta_{75\%}$	$\eta_{100\%}$	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
	kW	Nm	min^{-1}	A		%	%	%			
DRN63MS4	0.12	0.67	1700	0.295	0.58	57.7	63.7	66.0	4.3	3.3 3.2	3.4
DRN63M4	0.18	1.01	1695	0.415	0.59	63.5	68.5	70.0	4.5	3.3 3.2	3.3
DRN71MS4	0.25	1.39	1720	0.52	0.62	69.2	73.1	74.0	5.1	3.0 2.6	3.0
DRN71M4	0.37	2.05	1730	0.74	0.62	74.3	77.7	78.5	5.7	3.4 2.8	3.4
DRN80MK4	0.55	3	1745	0.93	0.71	78.1	81.0	81.5	7.4	3.2 2.5	3.6
DRN80M4	0.75	4.1	1751	1.25	0.70	82.0	84.9	85.5	8.1	3.7 3.0	4.2
DRN90S4	1.1	6	1762	1.85	0.69	83.5	86.1	86.5	8.2	3.3 2.3	4.0
DRN90L4	1.5	8.1	1767	2.4	0.70	83.8	86.1	86.5	9.1	3.3 1.9	4.0
DRN100LM4	2.2	11.9	1762	3.4	0.73	88.1	89.5	89.5	9.1	3.4 2.4	4.2
DRN100L4	2.2	11.9	1765	3.35	0.74	87.5	89.2	89.5	9.4	3.7 2.2	4.2
DRN100L4	3	16.2	1763	4.65	0.73	87.6	89.3	89.5	9.2	3.9 2.3	4.4
DRN100L4	3.7	20	1758	5.7	0.72	87.8	89.4	89.5	9.1	4.1 2.0	4.4
DRN112M4	4	21.5	1769	5.6	0.79	88.5	89.6	89.5	9.8	2.8 1.4	4.0
DRN132S4	5.5	29.5	1768	7.4	0.82	90.9	91.8	91.7	9.8	3.5 2.8	4.3
DRN132M4	7.5	40.5	1774	10.6	0.77	91.1	91.9	91.7	8.5	3.7 2.6	3.7
DRN132L4	9.2	49.5	1775	13.2	0.76	91.0	91.9	91.7	8.4	4.3 1.7	4.1
DRN160M4	11	59	1776	14.8	0.80	91.2	92.3	92.4	7.0	2.6 2.1	3.1
DRN160L4	15	81	1777	20	0.80	92.3	93.3	93.0	9.0	3.4 2.1	3.8
DRN180M4	18.5	99	1781	23.5	0.84	92.7	93.6	93.6	9.5	4.1 3.4	4.0
DRN180L4	22	118	1781	27.5	0.86	93.2	93.8	93.6	9.8	4.2 2.7	3.9
DRN200L4	30	161	1783	39	0.82	93.0	94.0	94.1	8.5	3.5 2.5	3.3
DRN225S4	37	198	1785	44.5	0.88	94.2	94.7	94.5	9.2	3.4 2.6	3.0
DRN225M4	45	240	1785	56	0.85	94.5	95.1	95.0	8.9	3.6 2.2	2.7
DRN250ME4	55	295	1785	70	0.82	94.3	95.2	95.4	8.6	4.6 2.4	2.7
DRN280S4	75	400	1785	100	0.79	94.6	95.3	95.4	9.1	4.8 2.7	3.1
DRN280M4	90	480	1784	113	0.83	94.8	95.4	95.4	8.0	4.8 2.5	2.9
DRN315L4	150	800	1788	180	0.88	95.4	96.1	96.2	7.3	3.1 2.5	3.5
DRN315H4	200	1070	1788	240	0.87	95.9	96.3	96.2	6.7	3.3 2.5	3.3

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DRN.. motor type	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN315H4	225	1200	1786	265	0.87	96.2	96.5	96.2	6.0	3.0 2.2	3.0

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4.22.2 Further information on motors and brakemotors

DRN.. motor type	P_N	M_N	n_N	m_{Mot}	J_{Mot}	BE..	Z_0 BG BGE	M_B	m_{BMot}	J_{BMot}
	kW	Nm	min^{-1}	kg	10^{-4} kgm²		h^{-1}	Nm	kg	10^{-4} kgm²
DRN63MS4	0.12	0.67	1700	4.9	2.95	BE03	8000 8000	1.3	6.8	3.63
DRN63M4	0.18	1.01	1695	5.8	3.76	BE03	8000 8000	2.1	7.6	4.44
DRN71MS4	0.25	1.39	1720	6.8	5.42	BE03	4950 7800	2.7	8.6	6.11
DRN71M4	0.37	2.05	1730	8	7.14	BE05	4000 7200	5	10	8.44
DRN80MK4	0.55	3	1745	11	17.1	BE1	2800 6800	7	14	18.6
DRN80M4	0.75	4.1	1751	14	24.7	BE1	2600 6600	10	18	26.2
DRN90S4	1.1	6	1762	20	54	BE2	1800 4800	14	24	58.7
DRN90L4	1.5	8.1	1767	23	67.2	BE2	1800 4700	20	27	71.9
DRN100LM4	2.2	11.9	1762	33	90.7	BE5	- 3700	28	38	96.7
DRN100L4	2.2	11.9	1765	34	112	BE5	1400 3700	28	40	118
DRN100L4	3	16.2	1763	34	112	BE5	- 2900	40	40	118
DRN100L4	3.7	20	1758	34	112	BE5	- 2900	40	40	118
DRN112M4	4	21.5	1769	45	178	BE5	- 2300	55	52	183
DRN132S4	5.5	29.5	1768	56	241	BE11	- 1700	80	71	251
DRN132M4	7.5	40.5	1774	73	381	BE11	- 900	110	91	403
DRN132L4	9.2	49.5	1775	81	439	BE11	- 780	110	100	461
DRN160M4	11	59	1776	115	817	BE20	- 720	150	145	877
DRN160L4	15	81	1777	130	1040	BE20	- 640	200	165	1100
DRN180M4	18.5	99	1781	155	1630	BE20	- 400	200	190	1690
DRN180L4	22	118	1781	170	1950	BE30	- 380	300	210	2090
DRN200L4	30	161	1783	280	2660	BE32	- 400	400	335	2890
DRN225S4	37	198	1785	310	4350	BE32	- 180	400	365	4580
DRN225M4	45	240	1785	310	4350	BE32	- 160	500	365	4580
DRN250ME4	55	295	1785	510	8940	BE60	- 120	600	590	9280
DRN280S4	75	400	1785	520	8940	BE62	- 120	1000	600	9530
DRN280M4	90	480	1784	630	12000	BE62	- 63	1000	720	12600
DRN315L4	150	800	1788	1020	28600	BE122	- 27	2000	1150	29600
DRN315H4	200	1070	1788	1130	35200	BE122	- 18	2000	1270	36200
DRN315H4	225	1200	1786	1130	35200	BE122	- 18	2000	1270	36200

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4.23 IE3 DRN.. motors, 575 V, 60 Hz, 6-pole

4.23.1 Information on motors

DRN.. motor type	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN63MR6	0.09	0.76	1135	0.27	0.52	49.2	57.3	59.5	3.5	3.4 3.4	3.6
DRN63M6	0.12	1.04	1105	0.295	0.63	54.9	61.6	64.0	3.3	2.5 2.5	2.5
DRN71MS6	0.18	1.52	1130	0.4	0.63	61.7	66.6	68.0	3.9	2.3 2.1	2.6
DRN71M6	0.25	2.1	1135	0.56	0.62	64.8	70.3	72.0	4.2	2.5 2.3	2.8
DRN80MK6	0.37	3.05	1150	0.75	0.63	71.2	74.8	75.5	4.9	2.5 2.4	3.0
DRN90SR6	0.55	4.5	1172	1.1	0.60	76.6	80.5	81.5	6.0	2.7 2.4	3.4
DRN90S6	0.75	6.1	1165	1.44	0.63	79.1	82.6	82.5	5.6	2.4 2.3	3.0
DRN112M6	1.1	8.9	1183	2.05	0.61	84.6	86.9	87.5	7.9	2.5 1.8	3.9
DRN112M6	1.5	12.1	1181	2.7	0.63	86.1	88.2	88.5	7.7	2.5 1.9	3.8
DRN132S6	2.2	17.8	1179	3.95	0.63	87.2	89.2	89.5	6.7	2.7 2.4	3.9
DRN132S6	3	24.5	1178	5.3	0.63	87.6	89.4	89.5	6.9	2.7 2.5	4.0
DRN132M6	3.7	30	1182	7.1	0.59	86.8	89.0	89.5	6.7	3.4 2.8	3.3
DRN132M6	4	32.5	1181	7.4	0.61	87.4	89.2	89.5	6.4	3.2 2.6	3.1
DRN160M6	5.5	44.5	1185	8.3	0.72	88.4	90.4	91.0	8.6	2.9 1.3	4.4
DRN160M6	7.5	61	1182	11.3	0.73	89.2	90.8	91.0	8.0	2.9 1.3	4.2

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4.23.2 Further information on motors and brakemotors

DRN.. motor type	P_N	M_N	n_N	m_{Mot}	J_{Mot}	BE..	Z_0 BG BGE	M_B	m_{BMot}	J_{BMot}
	kW	Nm	min^{-1}	kg	10^{-4} kgm^2		h^{-1}	Nm	kg	10^{-4} kgm^2
DRN63MR6	0.09	0.76	1135	5.8	6.47	BE03	9600 9600	1.7	7.6	7.16
DRN63M6	0.12	1.04	1105	5.8	6.47	BE03	9600 9600	2.1	7.6	7.16
DRN71MS6	0.18	1.52	1130	6.8	8.29	BE03	5600 9600	3.4	8.6	8.98
DRN71M6	0.25	2.1	1135	8	10.4	BE05	4150 9600	5	10	11.7
DRN80MK6	0.37	3.05	1150	11	17.1	BE1	2400 7200	7	14	18.6
DRN90SR6	0.55	4.5	1172	20	54	BE1	1920 4000	10	23	55.6
DRN90S6	0.75	6.1	1165	20	54	BE2	1920 4000	14	24	58.7
DRN112M6	1.1	8.9	1183	45	178	BE5	- 2080	20	52	183
DRN112M6	1.5	12.1	1181	45	178	BE5	- 2080	28	52	183
DRN132S6	2.2	17.8	1179	56	245	BE5	- 1840	40	64	250
DRN132S6	3	24.5	1178	56	245	BE5	- 1840	55	64	250
DRN132M6	3.7	30	1182	73	381	BE11	- 1440	80	91	403
DRN132M6	4	32.5	1181	73	381	BE11	- 1440	80	91	403
DRN160M6	5.5	44.5	1185	115	1290	BE20	- 960	110	145	1350
DRN160M6	7.5	61	1182	115	1290	BE20	- 960	150	145	1350

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4.24 IE3 global DRN.. motors, 50 Hz/60 Hz, 2-pole

50 Hz (voltage range 380 – 400 V), 60 Hz (voltage range 440 – 460 V)

4.24.1 Information on motors

Motor	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N	M_H/M_N	M_K/M_N
DRN63MS2	0.18	0.63 0.51	2725 3370	0.475 0.43	0.78 0.74	62.7 60.9	66.2 65.1	65.9 66.0	4.2 5.3	2.6 3.3	2.6 3.1	2.6 3.3
DRN63M2	0.25	0.87 0.7	2755 3395	0.58 0.52	0.81 0.79	69.2 67.0	70.9 69.8	69.7 70.0	4.9 6.2	2.7 3.4	2.6 3.1	2.7 3.4
DRN71MS2	0.37	1.26 1.03	2810 3440	0.89 0.79	0.78 0.76	70.7 69.4	73.8 73.1	73.8 74.0	5.4 6.8	3.1 3.8	2.7 3.2	3.1 3.8
DRN71M2	0.55	1.86 1.52	2825 3455	1.26 1.1	0.81 0.78	75.7 73.3	78.0 76.4	77.8 77.0	5.9 7.4	3.2 3.9	3.0 3.5	3.2 3.9
DRN80MS2	0.75	2.5 2.05	2855 3476	1.58 1.42	0.84 0.82	80.2 79.7	82.0 84.8	81.4 82.5	5.9 7.4	2.8 3.2	2.5 2.9	2.9 3.4
DRN80M2	1.1	3.65 3	2860 3485	2.2 1.94	0.85 0.83	83.1 82.3	84.1 84.1	83.0 84.0	6.6 8.2	3.0 3.7	2.5 3.0	2.9 3.6
DRN90S2	1.5	4.95 4.1	2886 3505	3.1 2.65	0.83 0.81	83.7 83.7	85.0 85.6	84.2 85.5	6.6 8.3	2.7 3.3	2.5 2.7	2.9 3.5
DRN90L2	2.2	7.2 6	2905 3525	4.35 3.75	0.85 0.85	86.1 84.7	86.7 86.4	85.9 86.5	7.4 9.8	2.5 3.1	2.1 2.1	3.0 3.5
DRN100LM2	3	9.9 8.1	2894 3517	5.8 5.2	0.85 0.83	88.9 88.0	88.7 89.1	87.2 88.5	7.7 10.2	3.3 3.8	2.6 2.8	3.5 4.2
DRN112M2	4	13 10.8	2948 3552	7.6 6.5	0.86 0.86	88.1 87.6	88.7 88.8	88.1 88.7	10.6 10.1	2.9 3.1	1.3 1.4	3.3 4.1
DRN132S2	5.5	17.9 14.8	2935 3544	9.9 8.5	0.92 0.92	90.3 89.0	90.2 89.7	89.2 89.5	10.0 11.0	3.0 3.3	2.1 2.1	3.7 4.2
DRN132S2	7.5	24.5 20	2936 3545	14.4 12.2	0.85 0.85	90.6 89.6	90.8 90.4	90.1 90.2	9.6 9.3	3.3 3.6	2.0 2.4	3.4 4.6

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4.24.2 Further information on motors and brakemotors

Motor	P_N	M_N	n_N	m_{Mot}	J_{Mot}	BE..	Z_0 BG BGE	m_{BMot}	m_{BMot}	J_{BMot}
	kW	Nm	min^{-1}	kg	10^{-4} kgm^2		1/h	Nm	kg	$10^{-4}kgm^2$
DRN63MS2	0.18	0.63 0.51	2725 3370	4.9	2.95	BE03	5000 6000	1.3	6.8	3.63
DRN63M2	0.25	0.87 0.7	2755 3395	5.8	3.76	BE03	4500 6000	1.7	7.6	4.44
DRN71MS2	0.37	1.26 1.03	2810 3440	6.8	2.93	BE03	6000 3600	2.7	8.6	3.61
DRN71M2	0.55	1.86 1.52	2825 3455	8	3.71	BE05	2600 5500	5	10	5.01
DRN80MS2	0.75	2.5 2.05	2855 3476	11	18.5	BE05	1200 3400	5	15	20
DRN80M2	1.1	3.65 3	2860 3485	14	24.1	BE1	1000 2600	7	18	25.6
DRN90S2	1.5	4.95 4.1	2886 3505	20	53.1	BE1	600 1300	10	22	54.7
DRN90L2	2.2	7.2 6	2905 3525	23	66.3	BE2	- 1000	14	27	71
DRN100LM2	3	9.9 8.1	2894 3517	33	89.7	BE2	- 750	20	37	94.4
DRN112M2	4	13 10.8	2948 3552	45	178	BE5	- 400	28	52	183
DRN132S2	5.5	17.9 14.8	2935 3544	56	241	BE5	- 300	40	64	246
DRN132S2	7.5	24.5 20	2936 3545	56	241	BE5	- 300	55	64	246

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4.25 IE3 global DRN.. motors, 50 Hz/60 Hz, 4-pole

50 Hz (voltage range 380 – 400 V), 60 Hz (voltage range 440 – 460 V)

4.25.1 Information on motors

Motor	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N	M_H/M_N	M_K/M_N
DRN63MS4	0.12	0.83 0.67	1380 1700	0.41 0.38	0.64 0.58	58.3 57.7	63.9 63.7	64.8 66.0	3.6 4.3	2.7 3.3	2.6 3.2	2.7 3.4
DRN63M4	0.18	1.25 1.01	1375 1695	0.58 0.54	0.65 0.59	65.1 63.5	69.4 68.5	69.9 70.0	3.7 4.5	2.6 3.3	2.6 3.2	2.6 3.3
DRN71MS4	0.25	1.7 1.39	1405 1720	0.74 0.67	0.66 0.62	70.1 69.2	73.5 73.1	73.5 74.0	4.3 5.1	2.5 3.0	2.3 2.6	2.5 3.0
DRN71M4	0.37	2.5 2.05	1415 1730	1.05 0.95	0.66 0.62	74.3 74.3	77.3 77.7	77.3 78.5	4.8 5.7	2.8 3.4	2.4 2.8	2.8 3.4
DRN80MK4	0.55	3.65 3	1435 1745	1.32 1.2	0.75 0.71	78.6 78.1	81.0 81.0	80.8 81.5	6.1 7.4	2.7 3.2	2.1 2.5	3.1 3.6
DRN80M4	0.75	4.95 4.1	1440 1751	1.75 1.56	0.74 0.70	80.7 82.0	82.9 84.9	82.9 85.5	6.7 8.1	3.1 3.7	2.7 3.0	3.4 4.2
DRN90S4	1.1	7.2 6	1455 1762	2.55 2.3	0.73 0.69	83.5 83.5	85.0 85.8	84.5 86.5	6.9 8.2	2.7 3.3	2.1 2.3	3.3 4.0
DRN90L4	1.5	9.8 8.1	1461 1767	3.45 3	0.74 0.70	84.6 83.5	86.1 85.9	85.6 86.5	7.5 9.1	2.7 3.3	2.0 1.9	3.3 4.0
DRN100LM4	2.2	14.4 11.9	1456 1762	4.85 4.3	0.76 0.73	86.4 88.1	87.3 89.5	86.7 89.5	7.6 9.1	2.9 3.4	2.4 2.4	3.5 4.2
DRN100L4	3	19.7 16.2	1456 1763	6.6 5.8	0.76 0.73	87.3 87.6	88.3 89.3	87.8 89.5	8.2 9.2	3.4 3.9	2.3 1.2	3.7 4.4
DRN112M4	4	26 21.5	1464 1769	8.1 7.2	0.81 0.79	88.6 88.5	89.4 89.6	88.7 89.5	8.2 9.8	2.4 2.8	1.6 1.4	3.6 4.0
DRN132S4	5.5	36 29.5	1464 1768	11 9.5	0.84 0.82	90.1 90.9	90.4 91.8	89.6 91.7	9.0 9.8	3.0 3.5	2.4 2.8	3.7 4.3
DRN132M4	7.5	49 40.5	1468 1774	15.5 13.6	0.78 0.77	90.8 91.1	91.1 91.9	90.4 91.7	7.8 8.5	3.1 3.7	2.4 2.6	3.3 3.7
DRN132L4	9.2	60 49.5	1470 1775	19.1 16.8	0.77 0.76	90.8 91.0	91.6 91.9	91.0 91.7	8.4 8.4	3.7 4.3	1.8 1.7	3.7 4.1
DRN160M4	11	71 59	1473 1776	22 19.1	0.81 0.80	91.1 91.2	91.7 92.3	91.4 92.4	7.3 7.0	2.6 2.6	2.2 2.1	3.0 3.1
DRN160L4	15	97 81	1474 1777	30 25.5	0.80 0.80	91.9 92.3	92.5 93.3	92.1 93.0	8.0 9.0	3.0 3.4	2.0 2.1	3.4 3.8
DRN180M4	18.5	120 99	1478 1781	34.5 30	0.85 0.84	92.8 92.7	93.1 93.6	92.6 93.6	9.5 9.5	3.6 4.1	2.9 3.4	3.6 4.0
DRN180L4	22	142 118	1477 1781	40 35.5	0.87 0.86	93.4 93.2	93.6 93.8	93.0 93.6	9.6 9.8	3.5 4.2	2.1 2.7	3.4 3.9
DRN200L4	30	194 161	1480 1783	57 50	0.82 0.82	93.3 93.0	93.9 94.0	93.6 94.1	8.2 8.5	2.9 3.5	2.5 2.5	3.3 3.3
DRN225S4	37	240 198	1482 1785	67 58	0.88 0.88	94.3 94.2	94.4 94.7	93.9 94.5	8.4 9.2	3.0 3.4	2.3 1.8	2.7 2.4
DRN225M4	45	290 240	1482 1785	83 72	0.85 0.85	94.1 94.5	94.5 95.1	94.2 95.0	8.8 8.9	3.0 4.0	2.2 2.2	2.7 2.7
DRN250ME4	55	355 295	1483 1785	104 91	0.83 0.82	94.3 94.3	94.8 95.2	94.6 95.4	7.9 8.6	3.4 4.6	2.4 2.4	2.9 2.7
DRN280S4	75	485 400	1482 1785	145 126	0.79 0.79	94.9 94.6	95.3 95.3	95.0 95.4	7.6 9.1	3.7 4.8	2.6 2.7	2.9 3.1
DRN280M4	90	580 480	1481 1784	168 146	0.84 0.83	95.4 94.8	95.6 95.4	95.2 95.4	7.7 8.0	3.6 4.8	2.0 2.5	2.7 2.9
DRN315S4	110	710 590	1488 1790	198 165	0.87 0.87	95.4 95.0	95.7 95.0	95.5 95.8	6.7 7.6	2.9 3.3	2.1 2.5	3.1 3.5
DRN315ME4	132	850 700	1489 1791	240 205	0.86 0.86	95.3 95.4	95.7 95.4	95.6 96.2	7.8 8.3	3.3 3.8	2.4 3.1	3.4 4.3
DRN315L4	160	1030 850	1486 1788	290 240	0.87 0.88	95.9 95.7	96.1 95.7	95.9 96.2	6.5 7.4	2.7 3.2	2.0 2.6	2.8 3.6

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Motor	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N	M_H/M_N	M_K/M_N
DRN315H4	200	1280 1070	1489 1791	370 310	0.84 0.84	95.4 95.1	96.0 95.1	96.0 96.2	8.1 8.1	3.7 4.2	2.8 3.1	3.8 4.3

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4.25.2 Further information on motors and brakemotors

Motor	P_N	M_N	n_N	m_{Mot}	J_{Mot}	BE..	Z_0 BG BGE	M_{BMot}	m_{BMot}	J_{BMot}
	kW	Nm	min^{-1}	kg	$10^{-4}kgm^2$		1/h	Nm	kg	$10^{-4}kgm^2$
DRN63MS4	0.12	0.83 0.67	1380 1700	4.9	2.95	BE03	10000 10000	1.7	6.8	3.63
DRN63M4	0.18	1.25 1.01	1375 1695	5.8	3.76	BE03	10000 10000	2.7	7.6	4.44
DRN71MS4	0.25	1.7 1.39	1405 1720	6.8	5.42	BE03	6200 9700	3.4	8.6	6.11
DRN71M4	0.37	2.5 2.05	1415 1730	8	7.14	BE05	5000 9000	5	10	8.44
DRN80MK4	0.55	3.65 3	1435 1745	11	17.1	BE1	3500 8500	7	14	18.6
DRN80M4	0.75	4.95 4.1	1440 1751	14	24.7	BE1	3200 8200	10	18	26.2
DRN90S4	1.1	7.2 6	1455 1762	20	54	BE2	2300 6000	14	24	58.7
DRN90L4	1.5	9.8 8.1	1461 1767	23	67.2	BE2	2200 5800	20	27	71.9
DRN100LM4	2.2	14.4 11.9	1456 1762	33	90.7	BE5	- 4700	28	38	96.7
DRN100L4	3	19.7 16.2	1456 1763	34	112	BE5	- 3700	40	40	118
DRN112M4	4	26 21.5	1464 1769	45	178	BE5	- 2900	55	52	183
DRN132S4	5.5	36 29.5	1464 1768	56	241	BE11	- 420	80	71	251
DRN132M4	7.5	49 40.5	1468 1774	73	381	BE11	- 1100	110	91	403
DRN132L4	9.2	60 49.5	1470 1775	81	439	BE20	- 980	150	110	490
DRN160M4	11	71 59	1473 1776	115	817	BE20	- 900	150	145	877
DRN160L4	15	97 81	1474 1777	130	1040	BE20	- 800	200	165	1100
DRN180M4	18.5	120 99	1478 1781	155	1630	BE30	- 510	300	195	1770
DRN180L4	22	142 118	1477 1781	170	1950	BE30	- 470	300	210	2090
DRN200L4	30	194 161	1480 1783	280	2660	BE32	- 500	400	335	2890
DRN225S4	37	240 198	1482 1785	310	4350	BE32	- 230	500	365	4580
DRN225M4	45	290 240	1482 1785	310	4350	BE32	- 200	600	365	4580
DRN250ME4	55	355 295	1483 1785	510	8940	BE62	- 150	800	600	9530
DRN280S4	75	485 400	1482 1785	520	8940	BE62	- 150	1000	600	9530
DRN280M4	90	580 480	1481 1784	630	12000	BE62	- 79	1200	720	12600
DRN315S4	110	710 590	1488 1790	870	23400	BE122	- 53	1600	1000	24400
DRN315ME4	132	850 700	1489 1791	990	28300	BE122	- 41	2000	1130	29400
DRN315L4	160	1030 850	1486 1788	1020	28600	BE122	- 34	2000	1150	29600
DRN315H4	200	1280 1070	1489 1791	1140	35200	BE122	- 23	2000	1270	36200

4.26 IE3 global DRN.. motors, 50 Hz/60 Hz, 6-pole

50 Hz (voltage range 380 – 400 V), 60 Hz (voltage range 440 – 460 V)

4.26.1 Information on motors

Motor	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N	M_H/M_N	M_K/M_N
DRN63MR6	0.09	0.93 0.76	920 1135	0.38 0.355	0.58 0.52	44.3 49.2	51.7 57.3	55.0 61.5	2.9 3.5	2.7 3.4	2.6 3.4	2.8 3.6
DRN63M6	0.12	1.32 1.04	870 1105	0.405 0.38	0.71 0.63	51.9 54.9	57.5 61.6	57.7 64.0	2.6 3.3	1.9 2.4	1.8 2.5	1.9 2.5
DRN71MS6	0.18	1.88 1.52	915 1130	0.55 0.52	0.69 0.63	59.4 61.7	63.7 66.6	63.9 68.0	3.4 3.9	1.9 2.3	1.9 2.1	2.2 2.6
DRN80MK6	0.37	3.8 3.05	935 1150	1.07 0.97	0.68 0.63	70.8 71.2	73.8 74.8	73.5 75.5	4.1 4.9	2.1 2.5	2.1 2.4	2.4 3.0
DRN90S6	0.55	5.4 4.5	966 1172	1.54 1.41	0.65 0.60	73.5 76.6	76.7 80.5	77.2 81.7	5.2 6.0	2.3 2.7	2.2 2.4	2.8 3.4
DRN90S6	0.75	7.5 6.1	957 1165	2.05 1.82	0.68 0.63	77.4 79.1	79.8 82.6	78.9 82.5	4.8 5.6	2.0 2.4	2.0 2.3	2.4 3.0
DRN112M6	1.1	10.7 8.9	981 1183	2.85 2.55	0.64 0.61	83.9 84.6	85.9 86.9	86.0 87.5	7.1 7.9	2.3 2.5	1.8 1.8	3.3 3.9
DRN112M6	1.5	14.7 12.1	977 1181	3.75 3.35	0.66 0.63	83.9 86.1	85.6 88.2	85.5 88.5	6.8 7.7	2.3 2.5	1.9 1.9	3.2 3.8
DRN132S6	2.2	21.5 17.8	976 1179	5.4 4.9	0.66 0.63	83.3 87.2	84.6 89.2	84.3 89.5	6.1 6.7	2.6 2.7	2.4 2.4	3.4 3.9
DRN132S6	3	29.5 24.5	974 1178	7.4 6.7	0.66 0.63	84.8 87.6	86.0 89.4	85.6 89.5	6.2 7.0	2.6 2.7	2.5 2.5	3.4 4.0
DRN132M6	4	39 32.5	977 1181	10.2 9.2	0.64 0.61	85.4 87.4	86.9 89.2	86.8 89.5	5.6 6.4	2.7 3.2	2.4 2.6	2.8 3.1
DRN160M6	5.5	53 44.5	982 1185	12.1 10.4	0.74 0.72	86.7 88.4	88.0 90.4	88.0 91.0	8.6 8.6	2.8 2.9	1.6 1.3	4.3 4.4
DRN160M6	7.5	73 61	979 1182	16.1 14.5	0.74 0.73	88.4 89.2	89.4 90.8	89.1 91.0	8.2 8.0	2.7 2.9	1.6 1.3	4.0 4.2

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4.26.2 Further information on motors and brakemotors

Motor	P_N	M_N	n_N	m_{Mot}	J_{Mot}	BE..	Z_0 BG BGE	M_{BMot}	m_{BMot}	J_{BMot}
	kW	Nm	min^{-1}	kg	$10^{-4}kgm^2$		1/h	Nm	kg	$10^{-4}kgm^2$
DRN63MR6	0.09	0.93 0.76	920 1135	5.8	6.47	BE03	12000 12000	2.1	7.6	7.16
DRN63M6	0.12	1.32 1.04	870 1105	5.8	6.47	BE03	12000 12000	2.7	7.6	7.16
DRN71MS6	0.18	1.88 1.52	915 1130	6.8	8.29	BE05	7000 12000	5	9.2	9.59
DRN80MK6	0.37	3.8 3.05	935 1150	11	17.1	BE1	5200 12000	10	14	18.6
DRN90S6	0.55	5.4 4.5	966 1172	20	54	BE2	3000 9000	14	24	58.7
DRN90S6	0.75	7.5 6.1	957 1165	20	54	BE2	2400 5000	20	24	58.7
DRN112M6	1.1	10.7 8.9	981 1183	45	178	BE5	- 2600	28	52	183
DRN112M6	1.5	14.7 12.1	977 1181	45	178	BE5	- 2600	40	52	183
DRN132S6	2.2	21.5 17.8	976 1179	56	245	BE5	- 2300	55	64	250
DRN132S6	3	29.5 24.5	974 1178	56	245	BE11	- 2300	80	71	256
DRN132M6	4	39 32.5	977 1181	73	381	BE11	- 1800	80	91	403
DRN160M6	5.5	53 44.5	982 1185	115	1290	BE20	- 1200	110	145	1350
DRN160M6	7.5	73 61	979 1182	115	1290	BE20	- 1200	150	145	1350

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4.27 IE1 DR2S.. motors, 400 V, 50 Hz, 2-pole

4.27.1 Information on motors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DR2S63MSR2	0.18	0.63	2725	0.465	0.78	57.8	61.0	60.7	4.2	2.6 2.6	2.6
DR2S63MS2	0.25	0.91	2610	0.67	0.80	62.1	64.7	62.3	3.3	2.1 2.1	2.1
DR2S71MS2	0.37	1.26	2810	0.87	0.78	66.6	69.5	69.5	5.4	3.1 2.7	3.1
DR2S71MR2	0.55	1.86	2825	1.24	0.81	72.4	74.6	74.4	5.9	3.2 3.0	3.2
DR2S71M2	0.75	2.6	2760	1.78	0.80	71.3	73.7	72.9	4.7	2.8 2.7	2.8
DR2S80MS2	1.1	3.75	2800	2.45	0.84	74.2	76.4	75.0	4.6	2.3 2.0	2.4
DR2S80M2	1.5	5.1	2820	3.3	0.84	77.2	78.5	77.2	5.1	2.6 2.3	2.6

4.27.2 Further information on motors and brakemotors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	m_{Mot} kg	J_{Mot} 10^{-4} kgm^2	BE..	Z_0 BG BGE h^{-1}	M_B Nm	m_{BMot} kg	J_{BMot} 10^{-4} kgm^2
DR2S63MSR2	0.18	0.63	2725	4.9	2.95	BE03	5000 6000	1.3	6.8	3.63
DR2S63MS2	0.25	0.91	2610	4.9	2.95	BE03	5000 6000	2.1	6.8	3.63
DR2S71MS2	0.37	1.26	2810	6.8	2.93	BE03	6000 3600	2.7	8.6	3.61
DR2S71MR2	0.55	1.86	2825	8	3.71	BE05	2600 5500	5	10	5.01
DR2S71M2	0.75	2.6	2760	8	3.83	BE05	2600 5500	5	10	5.13
DR2S80MS2	1.1	3.75	2800	11	19.1	BE1	1200 3400	10	15	20.6
DR2S80M2	1.5	5.1	2820	14	24.7	BE1	1000 2600	10	18	26.2

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4.28 IE1 DR2S.. motors, 400 V, 50 Hz, 4-pole

4.28.1 Information on motors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	I_N 400 V A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DR2S56MR4	0.09	0.62	1380	0.35	0.61	43.9	51.4	54.8	3.0	2.8 2.8	2.9
DR2S56M4	0.12	0.89	1290	0.39	0.74	48.8	53.8	53.3	2.7	2.0 2.0	2.0
DR2S63MSR4	0.12	0.83	1380	0,405	0.64	55.6	61.0	61.9	3.6	2.7 2.6	2.7
DR2S63MS4	0.18	1.29	1330	0.59	0.71	52.1	57.1	57.0	2.9	2.0 2.0	2.1
DR2S63M4	0.25	1.79	1330	0.78	0.70	59.0	62.5	61.5	3.4	2.3 2.3	2.3
DR2S71MS4	0.37	2.6	1350	1.05	0.73	66.0	68.0	66.0	3.6	2.0 1.8	2.0
DR2S71M4	0.55	3.85	1360	1.52	0.72	69.6	71.7	70.0	4.1	2.4 2.2	2.4
DR2S80MK4	0.75	5.1	1410	1.81	0.76	73.6	75.9	75.3	5.2	2.4 2.0	2.6
DR2S80M4	1.1	7.4	1415	2.45	0.80	79.5	80.3	78.9	5.5	2.5 2.1	2.7

4.28.2 Further information on motors and brakemotors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	m_{Mot} kg	J_{Mot} 10^{-4} kgm^2	BE..	Z_0 BG BGE h^{-1}	M_B Nm	m_{BMot} kg	J_{BMot} 10^{-4} kgm^2
DR2S56MR4	0.09	0.62	1380	3.1	1.21	BE02	10000 10000	1.2	3.9	1.31
DR2S56M4	0.12	0.89	1290	3.1	1.21	BE02	10000 10000	1.2	3.9	1.31
DR2S63MSR4	0.12	0.83	1380	4.9	2.95	BE03	10000 10000	1.7	6.8	3.64
DR2S63MS4	0.18	1.29	1330	4.9	2.95	BE03	10000 10000	2.7	6.8	3.64
DR2S63M4	0.25	1.79	1330	5.8	3.76	BE03	10000 10000	3.4	7.7	4.45
DR2S71MS4	0.37	2.6	1350	6.8	5.42	BE05	6200 9700	5	9.2	6.72
DR2S71M4	0.55	3.85	1360	8	7.14	BE1	5000 9000	10	11	8.44
DR2S80MK4	0.75	5.1	1410	11	17.1	BE1	3500 8500	10	14	18.6
DR2S80M4	1.1	7.4	1415	14	24.7	BE2	3200 8200	20	18	29.2

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4.29 IE1 DR2S.. motors, 400 V, 50 Hz, 6-pole

4.29.1 Information on motors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DR2S63MQ6	0.09	0.93	920	0.36	0.58	37.5	43.7	46.5	2.9	2.7 2.6	2.8
DR2S63MR6	0.12	1.32	870	0.4	0.71	48.7	53.9	54.1	2.6	1.9 1.8	1.9
DR2S63M6	0.18	2	855	0.66	0.71	41.5	48.0	49.1	2.5	1.9 1.9	1.9
DR2S71MS6	0.25	2.65	895	0.78	0.71	60.2	65.1	64.9	3.0	1.7 1.7	2.0
DR2S71M6	0.37	4	885	1.18	0.69	55.1	60.1	60.0	2.9	1.9 1.9	2.0
DR2S80MK6	0.55	5.8	910	1.58	0.72	64.5	67.2	65.9	3.5	1.8 1.8	2.1

4.29.2 Further information on motors and brakemotors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	m_{Mot} kg	J_{Mot} 10^{-4} kgm^2	BE..	Z_0 BG BGE h^{-1}	M_B Nm	m_{BMot} kg	J_{BMot} 10^{-4} kgm^2
DR2S63MQ6	0.09	0.93	920	5.8	6.47	BE03	12000 12000	2.1	7.6	7.16
DR2S63MR6	0.12	1.32	870	5.8	6.47	BE03	12000 12000	2.7	7.6	7.16
DR2S63M6	0.18	2	855	5.8	6.57	BE03	12000 12000	3.4	7.6	7.26
DR2S71MS6	0.25	2.65	895	6.8	8.29	BE1	7000 12000	7	9.4	9.59
DR2S71M6	0.37	4	885	8	10.4	BE1	5200 12000	10	11	11.7
DR2S80MK6	0.55	5.8	910	11	17.1	BE2	3000 9000	14	15	21.6

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4.30 DR2S.. motors, 400 V, 50 Hz, 2-pole, S3/75%

4.30.1 Information on motors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DR2S63MS2	0.28	1.06	2520	0.74	0.84	62.6	63.6	59.0	3.0	1.9 1.8	1.8
DR2S71MS2	0.4	1.37	2790	0.92	0.81	67.7	70.1	69.5	5.1	2.9 2.5	2.9
DR2S71M2	0.8	2.8	2740	1.87	0.82	71.9	73.7	72.3	4.4	2.6 2.5	2.6
DR2S80MS2	1.2	4.15	2770	2.65	0.86	72.4	73.6	71.4	4.3	2.1 1.8	2.2
DR2S80M2	1.6	5.4	2805	3.45	0.85	77.2	77.9	76.1	4.9	2.5 2.2	2.4

4.30.2 Further information on motors and brakemotors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	m_{Mot} kg	J_{Mot} 10^{-4} kgm^2	BE..	Z_0 BG BGE h^{-1}	M_B Nm	m_{BMot} kg	J_{BMot} 10^{-4} kgm^2
DR2S63MS2	0.28	1.06	2520	4.9	2.95	BE03	5000 6000	2.1	6.8	3.63
DR2S71MS2	0.4	1.37	2790	6.8	3.05	BE03	6000 3600	2.7	8.6	3.73
DR2S71M2	0.8	2.8	2740	8	3.83	BE1	2600 5500	7	11	5.13
DR2S80MS2	1.2	4.15	2770	11	19.1	BE1	1200 3400	10	15	20.6
DR2S80M2	1.6	5.4	2805	14	24.7	BE2	1000 2600	14	18	29.2

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4.31 DR2S.. motors, 400 V, 50 Hz, 4-pole, S3/75%

4.31.1 Information on motors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DR2S63MS4	0.2	1.47	1295	0.63	0.75	52.8	56.5	54.6	2.7	1.7 1.8	1.9
DR2S63M4	0.28	2.05	1295	0.85	0.74	59.6	61.8	59.1	3.1	2.0 2.0	2.0
DR2S71MS4	0.4	2.85	1330	1.11	0.76	70.6	71.7	63.7	3.3	1.8 1.6	1.8
DR2S71M4	0.6	4.25	1345	1.61	0.74	68.8	69.9	67.2	3.8	2.1 2.0	2.2
DR2S80MK4	0.8	5.4	1405	1.9	0.78	74.1	75.9	74.7	4.9	2.2 1.9	2.5
DR2S80M4	1.2	8.2	1405	2.6	0.82	79.7	79.8	77.8	5.1	2.3 1.9	2.5

4.31.2 Further information on motors and brakemotors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	m_{Mot} kg	J_{Mot} 10^{-4} kgm^2	BE..	Z_0 BG BGE h^{-1}	M_B Nm	m_{BMot} kg	J_{BMot} 10^{-4} kgm^2
DR2S63MS4	0.2	1.47	1295	4.9	2.95	BE03	10000 10000	3.4	6.8	3.63
DR2S63M4	0.28	2.05	1295	5.8	3.76	BE03	10000 10000	3.4	7.6	4.44
DR2S71MS4	0.4	2.85	1330	6.8	5.42	BE1	6200 9700	7	9.4	6.72
DR2S71M4	0.6	4.25	1345	8	7.14	BE1	5000 9000	10	11	8.44
DR2S80MK4	0.8	5.4	1405	11	17.1	BE2	3500 8500	14	15	21.6
DR2S80M4	1.2	8.2	1405	14	24.7	BE2	3200 8200	20	18	29.2

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4.32 DR2S.. motors, 400 V, 50 Hz, 6-pole, S3/75%

4.32.1 Information on motors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DR2S71MS6	0.28	3.05	875	0.84	0.75	57.2	60.5	58.4	2.8	1.5 1.5	1.7
DR2S71M6	0.4	4.4	870	1.24	0.73	56.2	60.2	58.8	2.8	1.7 1.7	1.8
DR2S80MK6	0.6	6.4	900	1.67	0.75	65.2	66.9	64.4	3.3	1.6 1.7	1.9

4.32.2 Further information on motors and brakemotors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	m_{Mot} kg	J_{Mot} 10^{-4} kgm^2	BE..	Z_0 BG BGE h^{-1}	M_B Nm	m_{BMot} kg	J_{BMot} 10^{-4} kgm^2
DR2S71MS6	0.28	3.05	875	6.8	8.29	BE1	7000 12000	7	9.4	9.59
DR2S71M6	0.4	4.4	870	8	10.4	BE1	5200 12000	10	11	11.7
DR2S80MK6	0.6	6.4	900	11	17.1	BE2	3000 9000	14	15	21.6

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4.33 IE1 DR2S.. motors, 380 V, 60 Hz, 2-pole

4.33.1 Information on motors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DR2S63MSR2	0.18	0.51	3370	0.495	0.74	59.0	63.1	64.0	5.3	3.3 3.1	3.3
DR2S63MS2	0.25	0.72	3310	0.69	0.74	64.5	68.1	68.0	4.3	2.7 2.6	2.7
DR2S71MS2	0.37	1.03	3440	0.92	0.76	67.5	71.1	72.0	6.8	3.8 3.2	3.8
DR2S71MR2	0.55	1.52	3455	1.3	0.78	68.5	71.4	72.0	7.4	3.9 3.5	3.9
DR2S71M2	0.75	2.1	3410	1.86	0.77	70.4	73.6	74.0	6.0	3.4 3.1	3.4
DR2S80MS2	1.1	3.05	3445	2.6	0.81	75.5	78.5	78.5	6.0	2.9 2.4	2.9
DR2S80M2	1.5	4.15	3460	3.4	0.81	79.4	81.6	81.5	6.8	3.3 2.7	3.3

4.33.2 Further information on motors and brakemotors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	m_{Mot} kg	J_{Mot} 10^{-4} kgm^2	BE..	Z_0 BG BGE h^{-1}	M_B Nm	m_{BMot} kg	J_{BMot} 10^{-4} kgm^2
DR2S63MSR2	0.18	0.51	3370	4.9	2.95	BE03	4000 4800	1.3	6.8	3.63
DR2S63MS2	0.25	0.72	3310	4.9	2.95	BE03	4000 4800	1.7	6.8	3.63
DR2S71MS2	0.37	1.03	3440	6.8	2.93	BE03	2900 4800	2.1	8.6	3.61
DR2S71MR2	0.55	1.52	3455	8	3.71	BE03	2100 4400	3.4	9.9	4.39
DR2S71M2	0.75	2.1	3410	8	3.83	BE05	2100 4400	5	10	5.13
DR2S80MS2	1.1	3.05	3445	11	19.1	BE1	960 2720	7	15	20.6
DR2S80M2	1.5	4.15	3460	14	24.7	BE1	800 2080	10	18	26.2

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4.34 IE1 DR2S.. motors, 380 V, 60 Hz, 4-pole

4.34.1 Information on motors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	I_N 400 V A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DR2S56MR4	0.09	0.51	1700	0.4	0.55	45.4	53.3	57.5	3.6	3.6 3.5	3.6
DR2S56M4	0.12	0.69	1650	0,425	0.66	53.3	59.9	62.0	3.4	2.6 2.6	2.7
DR2S63MSR4	0.12	0.67	1700	0.45	0.58	56.0	61.8	64.0	4.3	3.3 3.2	3.4
DR2S63MS4	0.18	1.03	1675	0.65	0.62	58.3	64.2	66.0	3.7	2.6 2.6	2.8
DR2S63M4	0.25	1.43	1675	0.85	0.62	62.8	67.2	68.0	4.2	3.0 2.9	3.0
DR2S71MS4	0.37	2.1	1685	1.11	0.67	67.5	70.2	70.0	4.4	2.4 2.2	2.5
DR2S71M4	0.55	3.1	1695	1.61	0.66	71.5	74.2	74.0	5.0	2.8 2.5	2.8
DR2S80MK4	0.75	4.15	1730	1.94	0.72	75.7	78.3	78.5	6.5	2.9 2.3	3.3
DR2S80M4	1.1	6.1	1730	2.6	0.76	80.3	81.9	81.5	6.9	3.1 2.6	3.4

4.34.2 Further information on motors and brakemotors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	m_{Mot} kg	J_{Mot} 10^{-4} kgm^2	BE..	Z_0 BG BGE h^{-1}	M_B Nm	m_{BMot} kg	J_{BMot} 10^{-4} kgm^2
DR2S56MR4	0.09	0.51	1700	3.1	1.21	BE02	8000 8000	1.2	3.9	1.31
DR2S56M4	0.12	0.69	1650	3.1	1.21	BE02	8000 8000	1.2	3.9	1.31
DR2S63MSR4	0.12	0.67	1700	4.9	2.95	BE03	8000 8000	1.3	6.8	3.64
DR2S63MS4	0.18	1.03	1675	4.9	2.95	BE03	8000 8000	2.1	6.8	3.64
DR2S63M4	0.25	1.43	1675	5.8	3.76	BE03	8000 8000	3.4	7.7	4.45
DR2S71MS4	0.37	2.1	1685	6.8	5.42	BE05	4950 7800	5	9.2	6.72
DR2S71M4	0.55	3.1	1695	8	7.14	BE1	4000 7200	7	11	8.44
DR2S80MK4	0.75	4.15	1730	11	17.1	BE1	2800 6800	10	14	18.6
DR2S80M4	1.1	6.1	1730	14	24.7	BE2	2600 6600	14	18	29.2

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4.35 IE1 DR2S.. motors, 380 V, 60 Hz, 6-pole

4.35.1 Information on motors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DR2S63MQ6	0.09	0.76	1135	0.41	0.52	46.0	53.6	57.5	3.5	3.4 3.4	3.6
DR2S63MR6	0.12	1.04	1105	0.45	0.63	51.1	57.3	59.5	3.3	2.4 2.5	2.5
DR2S63M6	0.18	1.57	1095	0.75	0.60	44.4	51.9	55.0	3.1	2.5 2.4	2.6
DR2S71MS6	0.25	2.15	1120	0.84	0.63	61.2	66.6	68.0	3.6	2.1 2.0	2.5
DR2S71M6	0.37	3.15	1115	1.28	0.62	58.9	64.5	66.0	3.6	2.4 2.3	2.5
DR2S80MK6	0.55	4.65	1135	1.66	0.65	68.2	71.7	72.0	4.3	2.2 2.2	2.6

4.35.2 Further information on motors and brakemotors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	m_{Mot} kg	J_{Mot} 10^{-4} kgm^2	BE..	Z_0 BG BGE h^{-1}	M_B Nm	m_{BMot} kg	J_{BMot} 10^{-4} kgm^2
DR2S63MQ6	0.09	0.76	1135	5.8	6.47	BE03	9600 9600	1.7	7.6	7.16
DR2S63MR6	0.12	1.04	1105	5.8	6.47	BE03	9600 9600	2.1	7.6	7.16
DR2S63M6	0.18	1.57	1095	5.8	6.57	BE03	9600 9600	3.4	7.6	7.26
DR2S71MS6	0.25	2.15	1120	6.8	8.29	BE05	5600 9600	5	9.2	9.59
DR2S71M6	0.37	3.15	1115	8	10.4	BE1	4150 9600	7	11	11.7
DR2S80MK6	0.55	4.65	1135	11	17.1	BE1	2400 7200	10	14	18.6

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4.36 IE1 DR2S.. motors, 440 V, 60 Hz, 2-pole

4.36.1 Information on motors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DR2S63MSR2	0.18	0.51	3370	0.43	0.74	59.0	63.1	64.0	5.3	3.3 3.1	3.3
DR2S63MS2	0.25	0.72	3310	0.6	0.74	64.5	68.1	68.0	4.3	2.7 2.6	2.7
DR2S71MS2	0.37	1.03	3440	0.8	0.76	67.5	71.1	72.0	6.8	3.8 3.2	3.8
DR2S71MR2	0.55	1.52	3455	1.12	0.78	68.5	71.4	72.0	7.4	3.9 3.5	3.9
DR2S71M2	0.75	2.1	3410	1.6	0.77	70.4	73.6	74.0	6.0	3.4 3.1	3.4
DR2S80MS2	1.1	3.05	3445	2.25	0.81	75.5	78.5	78.5	6.0	2.9 2.4	2.9
DR2S80M2	1.5	4.15	3460	2.95	0.81	79.4	81.6	81.5	6.8	3.3 2.7	3.3

4.36.2 Further information on motors and brakemotors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	m_{Mot} kg	J_{Mot} 10^{-4} kgm^2	BE..	Z_0 BG BGE h^{-1}	M_B Nm	m_{BMot} kg	J_{BMot} 10^{-4} kgm^2
DR2S63MSR2	0.18	0.51	3370	4.9	2.95	BE03	4000 4800	1.3	6.8	3.63
DR2S63MS2	0.25	0.72	3310	4.9	2.95	BE03	4000 4800	1.7	6.8	3.63
DR2S71MS2	0.37	1.03	3440	6.8	2.93	BE03	2900 4800	2.1	8.6	3.61
DR2S71MR2	0.55	1.52	3455	8	3.71	BE03	2100 4400	3.4	9.9	4.39
DR2S71M2	0.75	2.1	3410	8	3.83	BE05	2100 4400	5	10	5.13
DR2S80MS2	1.1	3.05	3445	11	19.1	BE1	960 2720	7	15	20.6
DR2S80M2	1.5	4.15	3460	14	24.7	BE1	800 2080	10	18	26.2

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4.37 IE1 DR2S.. motors, 440 V, 60 Hz, 4-pole

4.37.1 Information on motors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	I_N 400 V A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DR2S56MR4	0.09	0.51	1700	0,345	0.55	45.4	53.3	57.5	3.6	3.6 3.5	3.6
DR2S56M4	0.12	0.69	1650	0,365	0.66	53.3	59.9	62.0	3.4	2.6 2.6	2.7
DR2S63MSR4	0.12	0.67	1700	0,385	0.58	56.0	61.8	64.0	4.3	3.3 3.2	3.4
DR2S63MS4	0.18	1.03	1675	0.56	0.62	58.3	64.2	66.0	3.7	2.6 2.6	2.8
DR2S63M4	0.25	1.43	1675	0.73	0.62	62.8	67.2	68.0	4.2	3.0 2.9	3.0
DR2S71MS4	0.37	2.1	1685	0.96	0.67	67.5	70.2	70.0	4.4	2.4 2.2	2.5
DR2S71M4	0.55	3.1	1695	1.39	0.66	71.5	74.2	74.0	5.0	2.8 2.5	2.8
DR2S80MK4	0.75	4.15	1730	1.67	0.72	75.7	78.3	78.5	6.5	2.9 2.3	3.3
DR2S80M4	1.1	6.1	1730	2.25	0.76	80.3	81.9	81.5	6.9	3.1 2.6	3.4

4.37.2 Further information on motors and brakemotors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	m_{Mot} kg	J_{Mot} 10^{-4} kgm^2	BE..	Z_0 BG BGE h^{-1}	M_B Nm	m_{BMot} kg	J_{BMot} 10^{-4} kgm^2
DR2S56MR4	0.09	0.51	1700	3.1	1.21	BE02	8000 8000	1.2	3.9	1.31
DR2S56M4	0.12	0.69	1650	3.1	1.21	BE02	8000 8000	1.2	3.9	1.31
DR2S63MSR4	0.12	0.67	1700	4.9	2.95	BE03	8000 8000	1.3	6.8	3.64
DR2S63MS4	0.18	1.03	1675	4.9	2.95	BE03	8000 8000	2.1	6.8	3.64
DR2S63M4	0.25	1.43	1675	5.8	3.76	BE03	8000 8000	3.4	7.7	4.45
DR2S71MS4	0.37	2.1	1685	6.8	5.42	BE05	4950 7800	5	9.2	6.72
DR2S71M4	0.55	3.1	1695	8	7.14	BE1	4000 7200	7	11	8.44
DR2S80MK4	0.75	4.15	1730	11	17.1	BE1	2800 6800	10	14	18.6
DR2S80M4	1.1	6.1	1730	14	24.7	BE2	2600 6600	14	18	29.2

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4.38 IE1 DR2S.. motors, 440 V, 60 Hz, 6-pole

4.38.1 Information on motors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DR2S63MQ6	0.09	0.76	1135	0.355	0.52	46.0	53.6	57.5	3.5	3.4 3.4	3.6
DR2S63MR6	0.12	1.04	1105	0.385	0.63	51.1	57.3	59.5	3.3	2.4 2.5	2.5
DR2S63M6	0.18	1.57	1095	0.65	0.60	44.4	51.9	55.0	3.1	2.5 2.4	2.6
DR2S71MS6	0.25	2.15	1120	0.73	0.63	61.2	66.6	68.0	3.6	2.1 2.0	2.5
DR2S71M6	0.37	3.15	1115	1.1	0.62	58.9	64.5	66.0	3.6	2.4 2.3	2.5
DR2S80MK6	0.55	4.65	1135	1.43	0.65	68.2	71.7	72.0	4.3	2.2 2.2	2.6

4.38.2 Further information on motors and brakemotors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	m_{Mot} kg	J_{Mot} 10^{-4} kgm^2	BE..	Z_0 BG BGE h^{-1}	M_B Nm	m_{BMot} kg	J_{BMot} 10^{-4} kgm^2
DR2S63MQ6	0.09	0.76	1135	5.8	6.47	BE03	9600 9600	1.7	7.6	7.16
DR2S63MR6	0.12	1.04	1105	5.8	6.47	BE03	9600 9600	2.1	7.6	7.16
DR2S63M6	0.18	1.57	1095	5.8	6.57	BE03	9600 9600	3.4	7.6	7.26
DR2S71MS6	0.25	2.15	1120	6.8	8.29	BE05	5600 9600	5	9.2	9.59
DR2S71M6	0.37	3.15	1115	8	10.4	BE1	4150 9600	7	11	11.7
DR2S80MK6	0.55	4.65	1135	11	17.1	BE1	2400 7200	10	14	18.6

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4.39 IE1 DR2S.. global motors, 50 Hz/60 Hz, 2-pole

4.39.1 Information on motors

DR2S.. motor type	P_N kW	M_N Nm	n_N min-1	I_N A	cosφ	IE	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N %	M_A/M_N	M_H/M_N	M_K/M_N
DR2S63MSR4	0.12	0.83 0.67	1380 1700	0.41 0.38	0.64 0.58	IE1	55.6 56.0	61.0 61.8	61.9 64.0	3.6 4.3	2.7 3.3	2.6 3.2	2.7 3.4
DR2S63MS4	0.18	1.29 1.03	1330 1675	0.61 0.56	0.71 0.62	IE1	52.1 58.3	57.1 64.2	57.0 66.0	2.9 3.7	2.0 2.6	2.0 2.6	2.1 2.8
DR2S63M4	0.25	1.79 1.43	1330 1675	0.79 0.72	0.70 0.62	IE1	59.0 62.8	62.5 67.2	61.5 68.0	3.4 4.2	2.3 3.0	2.3 2.9	2.3 3.0
DR2S71MS4	0.37	2.6 2.1	1350 1685	1.06 0.97	0.73 0.67	IE1	66.0 67.5	68.0 70.2	66.0 70.0	3.6 4.4	2.0 2.4	1.8 2.2	2.0 2.5
DR2S71M4	0.55	3.85 3.1	1360 1695	1.58 1.39	0.72 0.66	IE1	69.6 71.5	71.7 74.2	70.0 74.0	4.1 5.0	2.4 2.8	2.2 2.5	2.4 2.8
DR2S80MK4	0.75	5.1 4.15	1410 1730	1.88 1.67	0.76 0.72	IE1	73.6 75.7	75.9 78.3	75.3 78.5	5.2 6.1	2.4 2.9	2.0 2.3	2.6 3.3
DR2S80M4	1.1	7.4 6.1	1415 1730	2.5 2.2	0.80 0.76	IE1	79.5 80.3	80.3 81.9	78.9 81.5	5.5 6.9	2.5 3.1	2.1 2.6	2.7 3.4

4.39.2 Further information on motors and brakemotors

DR2S.. motor type	P_N kW	M_N Nm	n_N min^{-1}	m kg	J_{Mot} 10^{-4} kgm^2	BE..	Z_0 BG BGE 1/h	M_B Nm	m_B kg	J_{Mot_BE} 10^{-4} kgm^2
DR2S63MSR4	0.12	0.83 0.67	1380 1700	4.9	2.95	BE03	10000 10000	1.7	6.8	3.63
DR2S63MS4	0.18	1.29 1.03	1330 1675	4.9	2.95	BE03	10000 10000	2.7	6.8	3.63
DR2S63M4	0.25	1.79 1.43	1330 1675	5.8	3.76	BE03	10000 10000	3.4	7.6	4.44
DR2S71MS4	0.37	2.6 2.1	1350 1685	6.8	5.42	BE05	6200 9700	5	9.2	6.72
DR2S71M4	0.55	3.85 3.1	1360 1695	8	7.14	BE1	5000 9000	10	11	8.44
DR2S80MK4	0.75	5.1 4.15	1410 1730	11	17.1	BE1	3500 8500	10	14	18.6
DR2S80M4	1.1	7.4 6.1	1415 1730	14	24.7	BE2	3200 8200	20	18	29.2

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4.40 IE1 DR2S.. global motors, 50 Hz/60 Hz, 4-pole

4.40.1 Information on motors

DR2S.. motor type	P_N kW	M_N Nm	n_N min-1	I_N A	cosφ	IE	$\eta_{50\%}$	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N %	M_A/M_N	M_H/M_N	M_K/M_N
DR2S 56MR 4	0.09	0.62 0.51	1380 1700	0.38 0.36	0.61 0.55	-	43.9 45.4	51.4 53.3	54.8 57.5	3.0 3.6	2.8 3.6	2.8 3.5	2.9 3.6
DR2S 63MSR 4	0.12	0.83 0.67	1380 1700	0.41 0.38	0.64 0.58	IE1	55.6 56.0	61.0 61.8	61.9 64.0	3.6 4.3	2.7 3.3	2.6 3.2	2.7 3.4
DR2S 63MS 4	0.18	1.29 1.03	1330 1675	0.61 0.56	0.71 0.62	IE1	52.1 58.3	57.1 64.2	57.0 66.0	2.9 3.7	2.0 2.6	2.0 2.6	2.1 2.8
DR2S 63M 4	0.25	1.79 1.43	1330 1675	0.79 0.72	0.70 0.62	IE1	59.0 62.8	62.5 67.2	61.5 68.0	3.4 4.2	2.3 3.0	2.3 2.9	2.3 3.0
DR2S 71MS 4	0.37	2.6 2.1	1350 1685	1.06 0.97	0.73 0.67	IE1	66.0 67.5	68.0 70.2	66.0 70.0	3.6 4.4	2.0 2.4	1.8 2.2	2.0 2.5
DR2S 71M 4	0.55	3.85 3.1	1360 1695	1.58 1.39	0.72 0.66	IE1	69.6 71.5	71.7 74.2	70.0 74.0	4.1 5.0	2.4 2.8	2.2 2.5	2.4 2.8
DR2S 80MK 4	0.75	5.1 4.15	1410 1730	1.88 1.67	0.76 0.72	IE1	73.6 75.7	75.9 78.3	75.3 78.5	5.2 6.1	2.4 2.9	2.0 2.3	2.6 3.3
DR2S 80M 4	1.1	7.4 6.1	1415 1730	2.5 2.2	0.80 0.76	IE1	79.5 80.3	80.3 81.9	78.9 81.5	5.5 6.9	2.5 3.1	2.1 2.6	2.7 3.4

4.40.2 Further information on motors and brakemotors

DR2S.. motor type	P_N kW	M_N Nm	n_N min-1	m kg	J_{Mot} 10^{-4} kgm²	BE..	Z_0 BG BGE 1/h	M_B Nm	m_B kg	J_{Mot_BE} 10^{-4} kgm²
DR2S 56MR 4	0.09	0.62 0.51	1380 1700	3.1	1.21	BE02	10000 10000	1.2	3.9	1.31
DR2S 63MSR 4	0.12	0.83 0.67	1380 1700	4.9	2.95	BE03	10000 10000	1.7	6.8	3.64
DR2S 63MS 4	0.18	1.29 1.03	1330 1675	4.9	2.95	BE03	10000 10000	2.7	6.8	3.64
DR2S 63M 4	0.25	1.79 1.43	1330 1675	5.8	3.76	BE03	10000 10000	3.4	7.7	4.45
DR2S 71MS 4	0.37	2.6 2.1	1350 1685	6.8	5.42	BE05	6200 9700	5	9.2	6.72
DR2S 71M 4	0.55	3.85 3.1	1360 1695	8	7.14	BE1	5000 9000	10	11	8.44
DR2S 80MK 4	0.75	5.1 4.15	1410 1730	11	17.1	BE1	3500 8500	10	14	18.6
DR2S 80M 4	1.1	7.4 6.1	1415 1730	14	24.7	BE2	3200 8200	20	18	29.2

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4.41 Key to the data tables of DR2L.. asynchronous servomotors

The following table lists the short symbols used in the "Technical data" tables.

n_N	Rated speed
M_N	Rated torque
I_N	Rated current
J_{Mot}	Mass moment of inertia of the motor
M_{pk} D1	Maximum limit torque (dynamics package 1)
M_{pk} D2	Maximum limit torque (dynamics package 2)
m	Mass of the motor
BE..	Brake used
m_B	Mass of the brake motor
J_{MOT_BE}	Mass moment of inertia of the brakemotor
M_B D1	Braking torque (dynamics package 1)
M_B D2	Braking torque (dynamics package 2)

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4.42 DR2L.. motors, 400 V, 50 Hz, 4-pole

4.42.1 Information on motors

n_N	Motor type	M_N	I_N	M_{pk} D1	M_{pk} D2	m	J_{Mot}
		Nm	A	Nm	Nm	kg	10^{-4} kgm^2
1200	DR2L71MS4	2.5	1.12	5	8.5	6.8	5.42
	DR2L71M4	3.8	1.71	7	14	8	7.14
	DR280MK4	6	2.3	14	25	10.7	17.1
	DR2L80M4	8	3.15	14	30	14.1	24.7
1700	DR2L71MS4	2.7	1.64	5	8.5	6.8	5.42
	DR2L71M4	4.2	2.32	7	14	8	7.14
	DR280MK4	6.2	3.14	14	25	10.7	17.1
	DR2L80M4	9.6	4.32	14	30	14.1	24.7
2100	DR2L71MS4	2.7	1.9	5	8.5	6.8	5.42
	DR2L71M4	4	2.66	7	14	8	7.14
	DR280MK4	6.5	3.77	14	25	10.7	17.1
	DR2L80M4	9.6	5.25	14	30	14.1	24.7
3000	DR2L71MS4	2.6	2.46	5	8.5	6.8	5.42
	DR2L71M4	3.8	3.49	7	14	8	7.14
	DR280MK4	6.3	4.89	14	25	10.7	17.1
	DR2L80M4	9.2	6.81	14	30	14.1	24.7

4.42.2 Further information on motors and brakemotors

n_N	Motor type	M_N	I_N	BE..	M_B D1	M_B D2	m_B	J_{Mot_BE}
		Nm	A		Nm	Nm	kg[1)]	10^{-4} kgm^2
1200	DR2L71MS4	2.5	1.12	BE05	5	5	9.2	6.72
	DR2L71M4	3.8	1.71	BE1	7	10	10.6	8.44
	DR280MK4	6	2.3	BE2	14	20	14.9	21.6
	DR2L80M4	8	3.15	BE2	14	20	18.3	29.2
1700	DR2L71MS4	2.7	1.64	BE05	5	5	9.2	6.72
	DR2L71M4	4.2	2.32	BE1	7	10	10.6	8.44
	DR280MK4	6.2	3.14	BE2	14	20	14.9	21.6
	DR2L80M4	9.6	4.32	BE2	14	20	18.3	29.2
2100	DR2L71MS4	2.7	1.9	BE05	5	5	9.2	6.72
	DR2L71M4	4	2.66	BE1	7	10	10.6	8.44
	DR280MK4	6.5	3.77	BE2	14	20	14.9	21.6
	DR2L80M4	9.6	5.25	BE2	14	20	18.3	29.2
3000	DR2L71MS4	2.6	2.46	BE05	5	5	9.2	6.72
	DR2L71M4	3.8	3.49	BE1	7	10	10.6	8.44
	DR280MK4	6.3	4.89	BE2	14	20	14.9	21.6
	DR2L80M4	9.2	6.81	BE2	14	20	18.3	29.2

1) Applies for foot-mounted motor with brake (DR2L...BE../FI..)

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5 Drive selection

Observe the explanations and notes in this chapter during drive selection.

5.1 Notes on electromagnetic compatibility – EMC

5.1.1 EMC Directive 2014/30/EU

AC motors are designed for use as components for installation in machinery and systems. The manufacturer of the machine or system is responsible for complying with the EMC Directive 2014/30/EU.

5.1.2 EMC measures

The motor can be equipped with grounding terminals, depending on size and design.

- External grounding terminals **LF** (low frequency grounding)
- External grounding terminals **HF** (high frequency grounding)

Metallic cable glands and shielded cables increase the electromagnetic compatibility.

5.1.3 Line operation

AC (brake) motors by SEW-EURODRIVE adhere to the EMC requirements of EN 60034-1 when used in accordance with their designated use in continuous duty. No interference prevention measures are required.

5.1.4 Switching operation

Switching operation of the motor requires suitable measures for interference suppression from the switching device.

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5.1.5 Safe switching of motor and brakes

Note the information in the following sections for switching of inductances.

Switching of motor windings

Switching of motor windings can create voltage peaks. Voltage peaks can damage windings and contacts. To avoid this, install the incoming cables with varistors.

Switching of brake coils

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

All brake control systems from SEW-EURODRIVE are equipped with varistors as standard.

Observe the dimensioning specifications for switch contacts, voltage supply cables, and fusing in chapter "Dimensioning the periphery" (→ 🗎 324).

Suppressor circuit on the switching devices

According to standard 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.

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5.2 Drive selection – non-controlled motor

5.2.1 Flow diagram

The following flow diagram shows the project planning procedure for a non-controlled motor without gear unit that is operated on the grid.

For the flow diagram for configuring gearmotors, refer to the gearmotor catalogs.

Necessary information regarding the machine to be driven

- Technical data
- Required duty type
- Travel cycle and switching frequency
- Other specifications (such as minimum and maximum acceleration, run-up time, etc.)
- Ambient conditions
- Country of use, voltage and frequency
- Required approvals and certifications
- Installation situation, available space

↓

Calculation of the relevant application data

- Travel diagram (acceleration, maximum speed, deceleration, pauses)
- Speeds on 50 Hz or 60 Hz supply system
- Static and dynamic torques
- Static and dynamic overhung loads
- Static and dynamic power requirements

↓

Motor selection

- Specify motor voltage and motor frequency
- Identify the efficiency class demanded in the country of use, and required approvals and certifications
- Static and maximum torque
- Consider derating due to installation altitude or ambient temperature
- Permitted overhung loads
- Permitted switching frequency
- Maximum speed
- Number of poles
- Operating mode
- Mounting position selection
- Motor options (brake, ventilation, plug connectors, motor protection, degree of protection, painting, etc.)

↓

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Optional: Brake selection

- Determine brake size and braking torque
- Brake control
- Braking work
- Number of braking operations per hour
- Braking distance
- Braking time

↓

Make sure that all requirements have been met.

Also refer to chapter "Nominal data of a 50 Hz motor when operated on a 60 Hz supply system" (→ 🗎 148).

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5.3 Drive selection – controlled motor

5.3.1 Inverter operation

Suitability for operating with an inverter

AC motors by SEW-EURODRIVE can be operated with inverters.

SEW-EURODRIVE recommends the use of oil seals made of FKM (fluorocarbon rubber) on the A- and B-sides of the motor if the motors on the frequency inverter are operated at more than 1800 min^{-1}.

Installation note

For operating AC motors with an inverter, refer to the installation and EMC instructions provided by the inverter manufacturer.

Brakemotor operation with inverter

Install the brake cables of brakemotors 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.

Connecting an encoder to the inverter

Observe the following instructions when connecting an encoder:

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

Connection of a PTC thermistor /TF to the inverter

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

INFORMATION

Motor protection device at ambient temperatures of < 0 °C

Operating motors in CFC and VFC mode at ambient temperatures of less than 0 °C makes using a Pt1000 temperature sensor mandatory to reach the optimum motor torque.

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5.3.2 Flow diagram

The following flow diagram shows how to determine a controlled drive. The drive consists of a motor that is powered by an inverter.

For the flow diagram on project planning for a gearmotor, refer to the gearmotor catalogs.

Necessary information regarding the machine to be driven

- Technical data
- Travel cycle
- Speed setting range
- Positioning accuracy
- Ambient conditions
- Country of use, voltage and frequency
- Required approvals and certifications
- Installation condition

↓

Calculation of the relevant application data

- Travel diagram (acceleration, maximum speed, deceleration, pauses)
- Rotational speeds
- Static and dynamic torques
- Static and dynamic overhung loads
- Static and dynamic power requirements
- Regenerative power and cyclic duration factor
- Thermal rms torque
- Thermal rms power

↓

Motor selection

- Specify motor voltage and motor frequency
- Identify the efficiency class demanded in the country of use, required approvals and certifications
- Static and maximum torque
- Consider derating due to installation altitude or ambient temperature
- Observe dynamic and thermal torque curves
- Permitted overhung loads
- Maximum speed
- Number of poles
- Operating mode
- Mounting position selection
- Encoder selection based on requirements
- Motor options (brake, ventilation, plug connectors, thermal motor protection, degree of protection, painting, oil seal, etc.)

↓

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Optional: Brake selection
- Determine brake size and braking torque
- Brake control
- Braking work
- Number of braking operations per hour
- Braking distance
- Braking time

↓

Selecting the inverter
- Motor/inverter assignment
- Continuous current and peak current for current-controlled inverters/axes
- Selection of additional inverter options according to functional requirements

↓

Selecting the braking resistor
- Based on the calculated regenerative power
- Based on the cyclic duration factor and peak braking power

↓

Inverter options
- EMC measures
- Operation/communication
- Additional functions
- Functional safety technology, if required

↓

Ensure that all requirements have been met.

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5.3.3 Product range of inverters by SEW-EURODRIVE

The extensive product range of SEW-EURODRIVE inverters is available for designing electronically controlled drives.

A distinction is made for inverters between decentralized installation (mounting close to the motor in high degree of protection) and installation in the control cabinet or close to the control cabinet. The following section lists the inverters for installation in the control cabinet or installation near the control cabinet.

Decentralized installation

- MOVI4RU®

  The decentralized inverter MOVI4R-U® in degree of protection IP54 and a power range of 0.25 to 4.0 kW is designed for open-loop speed control of asynchronous motors without encoder. Installation and startup procedure are optimized for simple applications.

- MOVIFIT® compact

  The decentralized inverter MOVIFIT® compact in degree of protection IP55 and a power range of 0.37 to 1.5 kW is designed for open-loop speed control of asynchronous motors without encoder. The inverter does not require space in the central control cabinet as it is installed close to the motor. Installation and startup procedure are optimized for simple intralogistics applications.

- MOVIFIT® FC

  The decentralized inverter MOVIFIT® FC in degree of protection IP65 and a power range of 0.25 to 4 kW is designed for speed control of asynchronous motors without encoder. The inverter does not require space in the central control cabinet as it is installed close to the motor. The robust housing technology of MOVIFIT® is available in various hygienic surface designs that reliably protect the inverter - even in demanding environments - such as in the beverage industry where the devices are subject to humidity and cleaning agents.

- MOVIPRO®

  The decentralized application controller MOVIPRO® in IP54 degree of protection and a power range of 2.2 to 15 kW is designed for torque control, speed control, and positioning control of asynchronous motors and synchronous motors. MOVIPRO® is not only an inverter but also includes the following functions: Controller, inverter, energy management, brake management, communication, functional safety, and connection technology. With these functions, MOVIPRO® combines all functions of decentralized system installations without control cabinet, and thus ensures that systems are flexible, modular, and standardized.

Control cabinet installation

- MOVITRAC® LTE-B

  The simple inverter MOVITRAC® LTE-B in degree of protection IP20 and a power range of 0.37 to 11 kW, and in degree of protection IP66 and a power range of 0.37 to 7.5 kW is designed for open-loop speed control of asynchronous motors without encoder. The inverter is defined by a compact design and especially easy handling in conveyor systems, pumps, and fans. The design variant in high degree of protection can be mounted outside of the control cabinet and includes the required equipment such as EMC measures.

- MOVITRAC® LTP-B

  The standard inverter MOVITRAC® LTP-B in degree of protection IP20 and a power range of 0.37 to 11 kW, IP66 and a power range of 0.37 to 7.5 kW, and IP55 and a power range of 11 to 160 kW is designed for speed control of asynchronous motors and synchronous motors without encoder. The design variants in

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high degree of protection can be mounted outside of the control cabinet and includes the required equipment such as EMC measures or the safety function STO. MOVITRAC® LTP-B is defined by convenient startup in conveyor systems, hoists, pumps, and fans.

- MOVITRAC® B

  The standard inverter MOVITRAC® B in degree of protection IP10/IP20 and a power range of 0.25 to 75 kW is designed for speed control of asynchronous motors without encoder. The universal inverter is suitable for versatile applications in conveying and materials handling technology due to the VFC vector control mode, the integrated safety function STO, extensive accessories, and a modular structure.

- MOVIDRIVE® B

  The application inverter MOVIDRIVE® B in degree of protection IP10/IP20 and a power range of 0.55 to 315 kW is designed for torque control, speed control, and positioning control of asynchronous motors and synchronous motors. The large number of basic functionalities, the broad spectrum of options, and the excessive accessories make MOVIDRIVE® B a universal application inverter for all types of applications. In combination with control technology of SEW-EURODRIVE, it is the ideal device, both technically and economically, for demanding tasks in conveying, handling technology, processing technology, and kinematics applications.

- MOVIDRIVE® system

  The application inverter MOVIDRIVE® system in degree of protection IP20 and a power range of 2 to 588 A is designed for torque control, speed control, and positioning control of asynchronous motors and synchronous motors. In combination with MOVI-C® CONTROLLER, MOVIDRIVE® system performs tasks with high requirements on dynamics, functional safety, and kinematics. MOVIDRIVE® system is the optimal inverter when the focus lies on high functionality, large power ranges, long motor cables, and high availability.

- MOVIDRIVE® modular

  The application inverter MOVIDRIVE® modular in degree of protection IP20 consists of a power supply module with 10 to 110 kW and connected axis modules with 2 to 180 A. The focus of this modular design lies on a compact design and energy exchange between drives via a DC link connection. MOVDIRVE® modular meets the most demanding requirements on dynamics, energy management, functional safety, and kinematics. In combination with the MOVI-C® CONTROLLER, all applications ranging from materials handling technology to machine automation with predefined, parameterizable function units, to free programming in IEC 61131, can be implemented quickly and flexibly in a cost-efficient manner.

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Product characteristics of inverters

The following table lists the most important product characteristics for the various inverter series. You can choose the inverter series matching your application based on these product characteristics.

Decentralized installation

MOVI4R-U®, MOVIFIT® compact, MOVIFIT® FC, MOVIPRO®

Product features	MOVI4R-U®	MOVIFIT® compact	MOVIFIT® FC	MOVIPRO®
Voltage range	1 × AC 200 – 240 V (0.25 – 0.55 kW)	3 × AC 380 – 500 V	3 × AC 380 – 500 V	3 × AC 380 – 500 V
	3 × AC 200 – 240 V (0.25 – 0.55 kW)	–	–	–
	3 × AC 380 – 480 V (0.25 – 4 kW)	–	–	–
Power range	0.25 – 4 kW	0.25 – 4 kW	0.25 – 4 kW	2.2 – 22 kW
Overload capacity	150% I_N for 60 seconds			
	100% I_N continuously in operation without overload			
4Q capable	No	No	Yes, with integrated brake chopper as standard	
Control mode	V/f	V/f	V/f	V/f
		LVFC voltage-controlled vector control	VFC voltage-controlled vector control	
	–	–	–	CFC/Servo current-controlled vector control
Encoder input	No	No	No	Option
Torque control	No	No	No	Yes
Speed control	Yes	Yes	Yes	Yes
Position control	No	No	No	Yes
Serial interfaces	No	No	System bus (SBus) and RS485	–
Fieldbus interfaces	No	AS-Interface SBus[1)]	PROFIBUS, PROFINET IO, PROFINET POF, DeviceNet™, Ethernet/IP™, Modbus TCP	
Maximum output frequency	599 Hz	599 Hz	599 Hz	599 Hz
STO – Safe Torque Off	No	No	Yes	Yes
Approvals and certifications	CE, UL, cUL, RCM, EAC	CE, UL[1)], cUL[1)], RCM, EAC	CE, UL, cUL, RCM, EAC	

1) In preparation for MOVIFIT® compact

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Control cabinet installation

MOVITRAC® LTE-B, MOVITRAC® LTP-B, MOVITRAC® B

Product features	MOVITRAC® LTE-B	MOVITRAC® LTP-B	MOVITRAC® B
Voltage range	1 × AC 110 – 120 V (0.37 – 1.1 kW)	1 × AC 200 – 240 V (0.75 – 2.2 kW)	1 × AC 200 – 240 V (0.25 – 2.2 kW)
	1 × AC 200 – 240 V (0.75 – 4.0 kW)	3 × AC 200 – 240 V (0.75 – 75 kW)	3 × AC 200 – 240 V (0.25 – 30 kW)
	3 × AC 200 – 240 V (0.37 – 4.0 kW)	3 × AC 380 – 480 V (0.75 – 160 kW)	3 × AC 380 – 500 V (0.25 – 75 kW)
	3 × AC 380 – 480 V (0.75 – 11 kW)	3 × AC 500 – 600 V (0.75 – 110 kW)	–
Power range	0.37 – 11 kW (IP20)	0.75 – 15 kW (IP20)	0.25 – 75 kW
	0.37 – 7.5 kW (IP66)	0.75 – 160 kW (IP55)	
Overload capacity	150% I_N for 60 seconds	150% I_N for 60 seconds	150% I_N for 60 seconds
	175% I_N for 2 seconds	175% I_N for 2 seconds	125% I_N continuously in operation without overload
4Q capable	Size 1 without brake chopper, sizes 2 and 3 as standard	Yes, with integrated brake chopper as standard	
Control mode	V/f	V/f	V/f
	VFC voltage-controlled vector control	VFC voltage-controlled vector control	VFC voltage-controlled vector control
Encoder input	No	No	No
Torque control	No	Yes	No
Speed control	Yes	Yes	Yes
Position control	No	No	No
Serial interfaces	System bus (SBus) and RS485		
Fieldbus interfaces	Optionally via gateway PROFIBUS, EtherCAT®, PROFINET, DeviceNet™, Ethernet/IP™	Optionally via gateway PROFIBUS, EtherCAT®, PROFINET, DeviceNet™, Ethernet/IP™	Optionally via gateway PROFIBUS, CANopen, DeviceNet™, PROFINET IO, EtherNet/IP™, EtherCAT®
Maximum output frequency	500 Hz	500 Hz	599 Hz
STO – Safe Torque Off	No	Yes	Yes (3-phase devices)
Approvals and certifications	CE, UL, cUL, RCM, EAC		

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MOVIDRIVE® B, MOVIDRIVE® system, MOVIDRIVE® modular

Product features	MOVIDRIVE® B	MOVIDRIVE® system	MOVIDRIVE® modular
Voltage range	3 × AC 200 – 240 V (1.5 – 30 kW)	3 × AC 200 – 240 V (7 –108 A)	3 × AC 380 – 500 V
	3 × AC 380 – 500 V (0.55 – 315 kW)	3 × AC 380 – 500 V (2 – 588 A)	–
Performance/current range	0.55 – 250 kW	–	10 – 110 kW (power supply modules)
			2 – 180 A (axis modules)
Overload capacity	150% I_N for 60 seconds	200% I_N for 3 seconds	250% I_N for 1 second
	125% I_N continuously in operation without overload	125% I_N continuously in operation without overload	100% I_N continuously in operation without overload
4Q capable	Yes, with integrated brake chopper as standard		
Control mode	V/f	V/f	V/f
	VFC voltage-controlled vector control	VFC^{PLUS} voltage-controlled vector control	VFC^{PLUS} voltage-controlled vector control
	CFC current-controlled vector control	CFC current-controlled vector control	CFC current-controlled vector control
	–	ELSM® for synchronous motors without encoders	ELSM® for synchronous motors without encoders
Encoder input	Option	Yes	Yes
Torque control	Yes	Yes	Yes
Speed control	Yes	Yes	Yes
Position control	Yes	Yes	Yes
Serial interfaces	System bus (SBus) and RS485	EtherCAT®/SBus^{PLUS}	
Fieldbus interfaces	Optionally PROFIBUS DP, CANopen, DeviceNet™, PROFINET IO, EtherNet/IP™, EtherCAT®	PROFIBUS, PROFINET, PROFISAFE, EtherNet/IP™, Modbus TCP/IP	
Maximum output frequency	599 Hz	599 Hz	599 Hz
STO – Safe Torque Off	Yes	Yes	Yes
Approvals and certifications	CE, UL, cUL, RCM, EAC		

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5.3.4 Non-SEW inverters

The motors can be operated with third-party inverters. Observe the information on use with third-party inverters, see chapter "AC motors on third-party inverters" (→ 🗎 133).

5.3.5 Reinforced insulation for inverter operation

When asynchronous motors are operated at an inverter, the winding is subject to higher loads than would be the case in line operation without inverter.

An inverter pulses the DC voltage of the DC link (U_z) to the supply cables to the motor. This pulsing takes place in the kHz range, which means several thousand ON and OFF switchings per second – at SEW-EURODRIVE usually with 4, 8, or 16 kHz.

The standard winding can resist voltage peaks up to:

- Line-to-line voltages U_{LL} = 1560 V
- Line-to-ground voltages U_{LG} = 1100 V

As a result, using SEW-EURODRIVE AC motors with standard winding at an inverter is permitted up to 500 V.

If a motor is operated at an inverter under the following conditions, the double voltage pulse can exceed the maximum permissible value of the standard winding of 1560 V:

- The inverter supplies the motor with a voltage of 600 V or higher.
- The DC link voltage is increased to DC 742.5 V.

Additional measures are required to protect the motor winding. The options reinforced winding insulation /RI (chapter "Reinforced winding insulation" (→ 🗎 487)) and reinforced winding insulation with increased resistance against partial discharge /RI2, see chapter "Reinforced winding insulation with increased resistance against partial discharge" (→ 🗎 487) are available.

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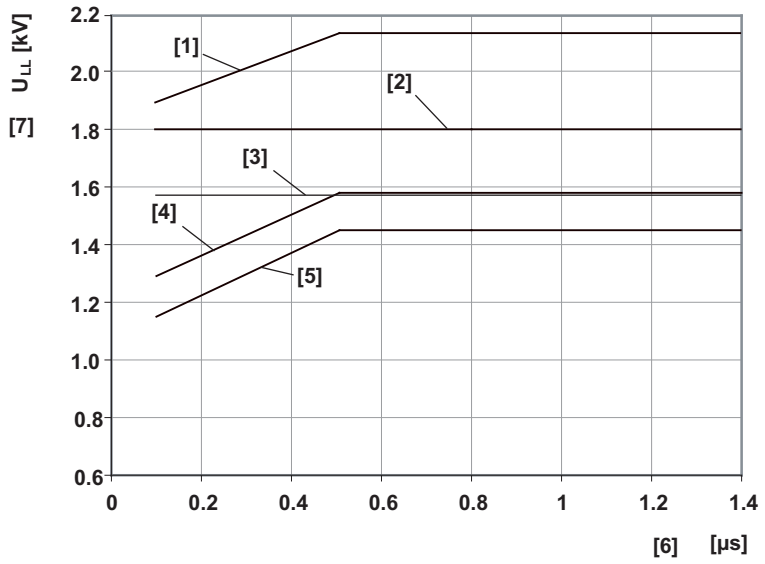
5.3.6 AC motors on third-party inverters

When motors are powered from inverters, observe the wiring instructions issued by the inverter manufacturer. It is essential that you observe the operating instructions for the inverter.

Operating the motors on third-party inverters is permitted if the pulse voltages at the motor terminals indicated in the following figure are not exceeded.



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[1] Permitted pulse voltage for motors with reinforced insulation and increased resistance against partial discharge (/RI2)
[2] Permitted pulse voltage for motors with reinforced insulation (/RI)
[3] Permitted pulse voltage according to NEMA MG1 part 31, $V_N \leq 500$ V
[4] Permitted pulse voltage for nominal voltages $V_N \leq 500$ V, star connection
[5] Permitted pulse voltage for nominal voltages $V_N \leq 500$ V, delta connection
[6] Duration of voltage increase
[7] Permitted pulse voltage

INFORMATION

Compliance with the limit values must be checked and taken into account as follows:

- The supply voltage level at the third-party inverter
- The threshold of the brake chopper voltage
- The operating mode of the motor (motor mode/generator mode)

→ If the permitted pulse voltage is exceeded, you must install limiting measures, such as filters, chokes or special motor cables. Consult the manufacturer of the inverter.

5.3.7 IVIC Class for Motors

The standard IEC 60034-18-41:2014 defines the stress categories for motors with the following characteristics:

- Nominal voltages over 300 V
- With electrical insulation system that is free of partial discharge
- Operation at a frequency inverter with intermediate voltage circuit

The stress categories, or impulse voltage insulation classes (IVIC), are divided into classes A to D.

Technical details

The table shows the normative limit values for the most important nominal voltages for the motors.

IVIC class		Nominal voltage		
		400 V	500 V	575 V
B (medium)	Phase-to-earth $U_{pk/pk}$	1240 V	1550 V	1783 V
	Phase-to-phase $U_{pk/pk}$	1800 V	2250 V	2588 V
C (high)	Phase-to-earth $U_{pk/pk}$	1680 V	2100 V	2415 V
	Phase-to-phase $U_{pk/pk}$	2360 V	2950 V	3393 V

The rise time of the voltage is defined as follows: Ta > 0.3 ±0.2 µs

Information about drive selection

The DRN../DR2S.. motors are optimally adapted for operation with all SEW-EURODRIVE frequency inverters.

Motors with standard insulating systems for nominal voltages > 300 V

For operation on frequency inverters with intermediate voltage circuit, and with line voltages up to and including 400 V (including tolerances), the motors fulfill the specifications of IEC 60034-18-41:2014 in impulse voltage insulation class C (high). For line voltages up to and including 500 V (including tolerances), they fulfill impulse voltage insulation class B (medium).

Motors with /RI reinforced winding insulation for nominal voltages > 300 V

For operation on voltage source converters with line voltages up to and including 500 V (including tolerances), the motors fulfill the specifications of IEC 60034-18-41:2014 in impulse voltage insulation class C (high). For line voltages up to and including 600 V (including tolerances), they fulfill impulse voltage insulation class B (medium).

SEW-EURODRIVE motors with /RI reinforced winding insulation surpass the normative specifications and achieve the limit values for phase-to-earth $U_{pk/pk}$ of 2200 V and phase-to-phase $U_{pk/pk}$ of 3000 V.

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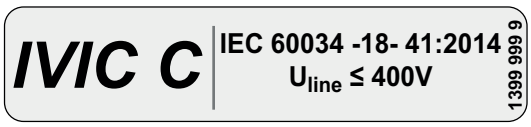
Order information

Upon request, the permissible IVIC class can be displayed on the motor in the form of an additional label.

The permissible IVIC class is then also specified for SEW-EURODRIVE motors in the order confirmation.

The following illustration depicts an example of a motor label with standard insulation system:



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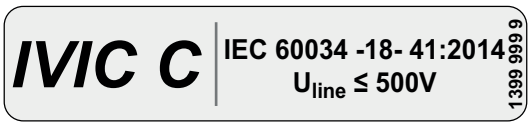
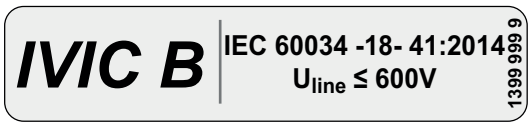
The following illustration depicts an example of a motor label with the option reinforced winding insulation /RI, depending on the nominal voltage:



20562391947



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5.3.8 Limit characteristic curves of the motors in inverter operation

If the motors are operated with inverter, the thermally permitted torque must be observed during drive project planning. The thermally permitted torque depends on the following factors:

- Motor size
- Operating mode
- Type of cooling: Self-cooling or forced cooling fan
- Base frequency
  - f_{base} = 50 Hz (400 V ⅄)
  - f_{base} = 87 Hz (230 V △)
  - f_{base} = 60 Hz (460 V ⅄)
  - f_{base} = 104 Hz (266/460 V △)
  - f_{base} = 120 Hz (230/460 V ⅄⅄)

The effective operating point derived from the travel cycle must be below the limit curve. It comprises the effective torque and the mean speed.

The following conditions apply to the shown limit curves:

- Motor in duty type S1 on 50 Hz supply system
- Motor 230 V△/400 V⅄ or relevant voltage range
- Motor in thermal class 155 (F)

INFORMATION

Observe the maximum limit speeds in chapter Limit speeds as well as the project planning notes for motors and mounted options.

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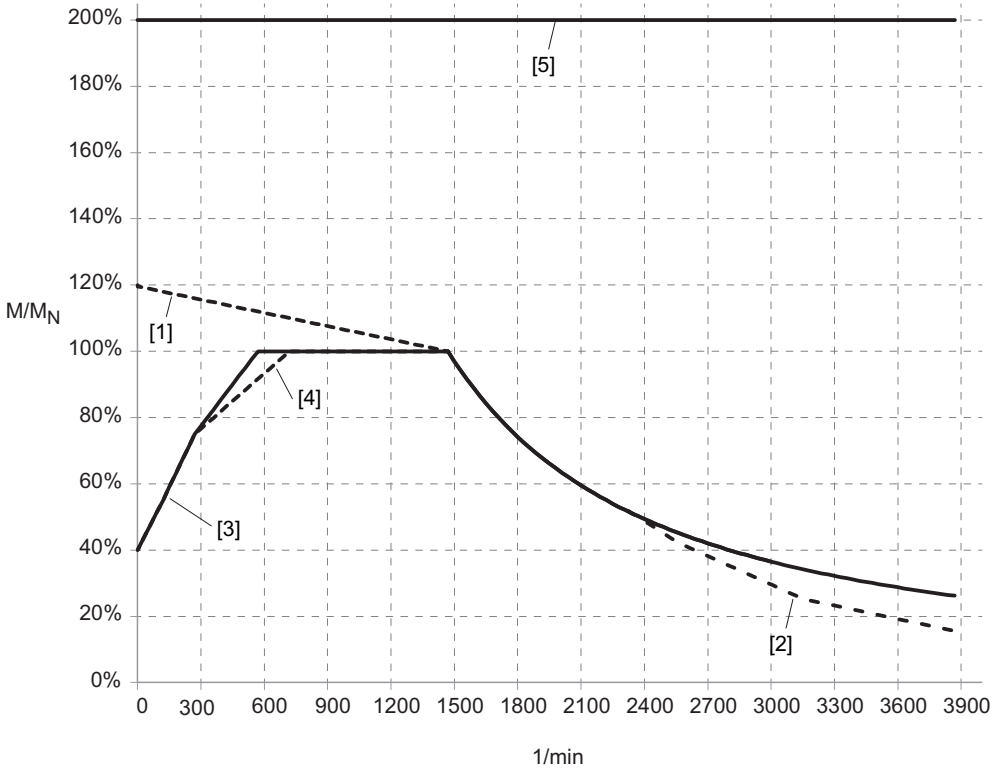
f_{base} = 50 Hz (400 V ⅄, 50 Hz) DRN.. motor, 4-pole (self-cooling and forced air cooling)

The following figure shows the thermal limit characteristic curve of a DRN.. motor at a base frequency f_{base} of 50 Hz. A distinction is made between motors with self-cooling and forced air cooling (option forced cooling fan /V).

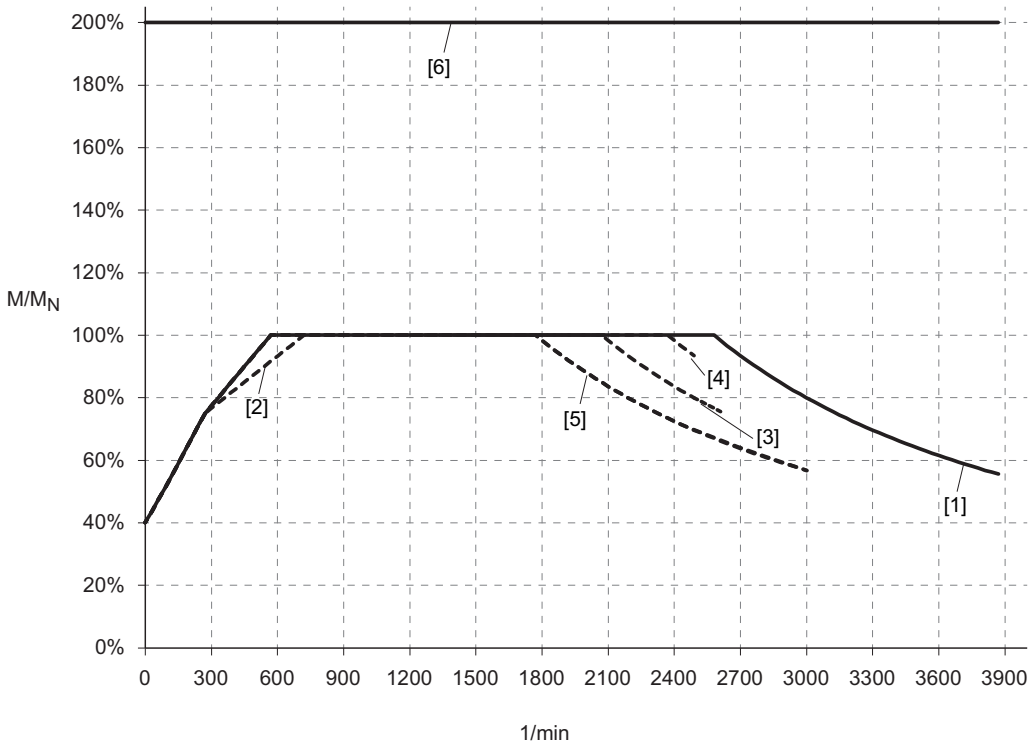


9007217748520075

[1] S1 duty cycle with forced air cooling DRN63MS – 315H
[2] S1 duty dycle with self-cooling DRN63MS – 80MK
[3] S1 duty cycle with self-cooling DRN80M – 225S, 250M, 315S – 315H
[4] S1 duty cycle with self-cooling DRN225M, DRN280S, DRN280M
[5] Mechanical limit for gearmotors

f_{base} = 87 Hz (230 V △, 50 Hz) DRN.. motor, 4-pole (self-cooling)

The following figure shows the thermal limit characteristic curve of a DRN.. motor at a base frequency f_{base} of 87 Hz, delta connection △ at 400 V and self-cooling.



9007217748522507

[1] S1 duty cycle with self-cooling for DRN63MS – 225S, DRN250M, DRN250ME
[2] S1 duty cycle with self-cooling for DRN225M
[3] S1 duty cycle with self-cooling for DRN280S and DRN280M
[4] S1 duty cycle with self-cooling for DRN315S and DRN315ME
[5] S1 duty cycle with self-cooling for DRN225M, DRN315M and DRN315L
[6] Mechanical limit for gearmotors

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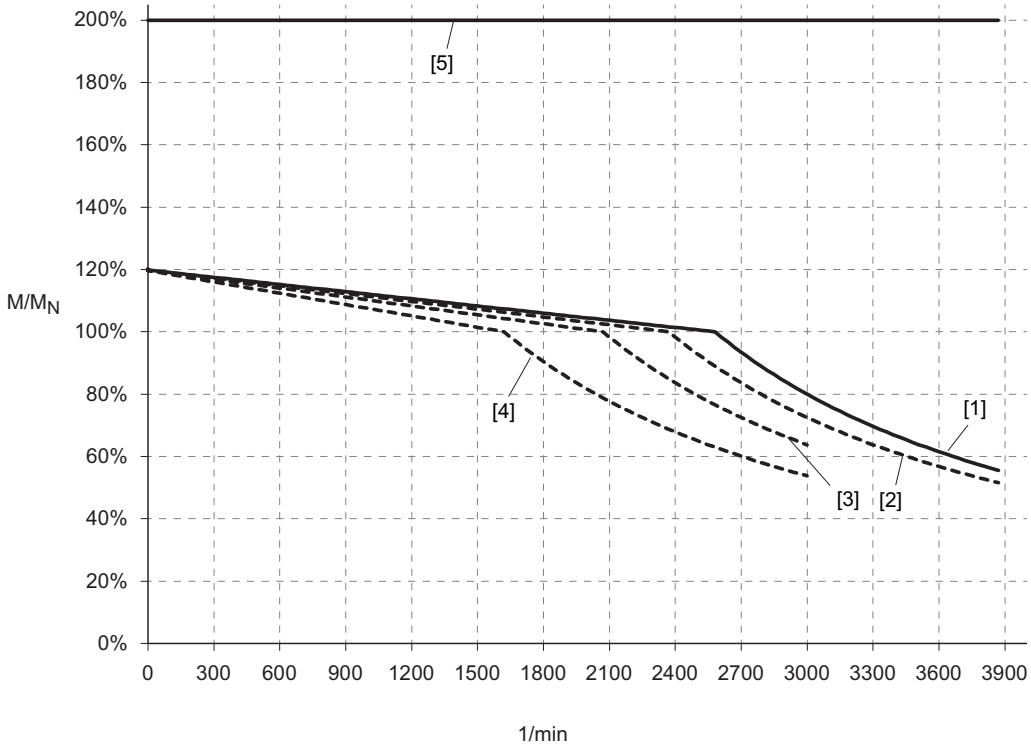
f_{base} = 87 Hz (230 V △, 50 Hz) DRN.. motor, 4-pole (forced air cooling)

The following figure shows the thermal limit characteristic curve of a DRN.. motor at a base frequency f_{base} of 87 Hz, delta connection △ at 230 V and forced air cooling (option forced cooling fan /V).



9007217748524939

[1] S1 duty cycle with forced air cooling DRN63MS – 132S
[2] S1 duty cycle with forced air cooling for DRN132M – 200L
[3] S1 duty cycle with forced air cooling for DRN225S, DRN250ME, DRN250M, DRN315S, DRN315ME
[4] S1 duty cycle with forced air cooling for DRN225M, DRN280S, DRN280M, DRN315M, DRN315L
[5] Mechanical limit for gearmotors

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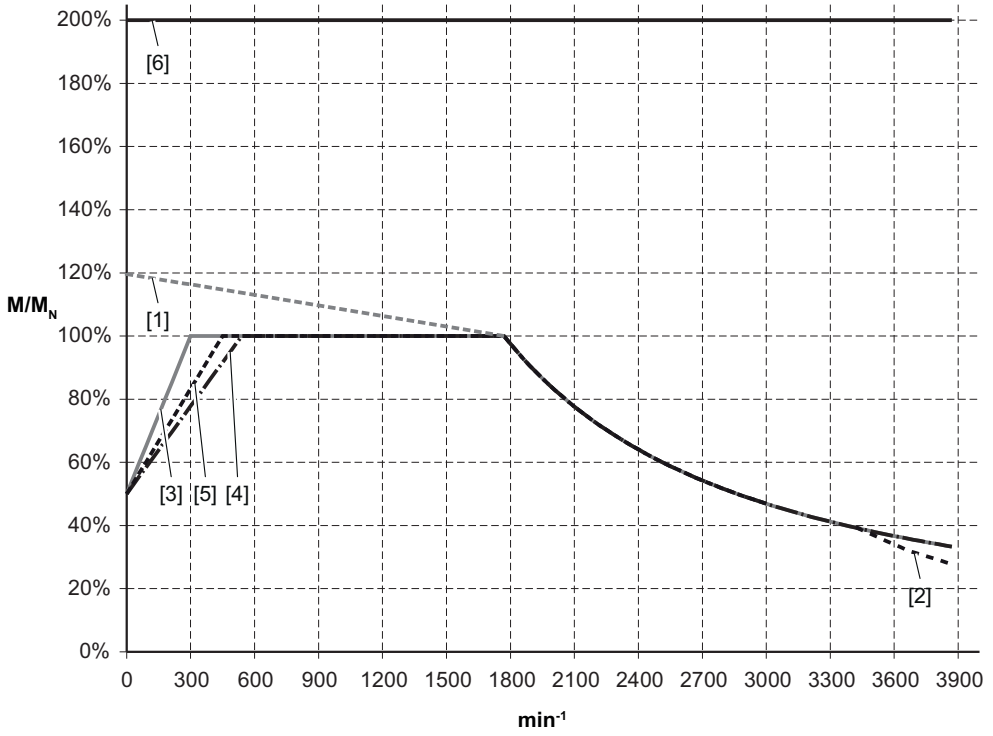
f_{base} = 60 Hz (460 V ⅄, 60 Hz) DRN.. motor 4-pole (self-cooling and forced air cooling)

The following figure shows the thermal limit characteristic curve of a DRN.. motor at a base frequency f_{base} of 60 Hz, delta connection ⅄ at 460 V, forced air cooling and self-cooling.



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[1] S1 duty cycle with forced air cooling DRN63MS – 315H
[2] S1 duty cycle for DRN63MS – 80MK
[3] S1 duty cycle for DRN80M – 315H
[4] S1 duty cycle DRN100L (3.7 kW)
[5] S1 duty cycle for DRN315H (225 kW)
[6] Mechanical limit for gearmotors

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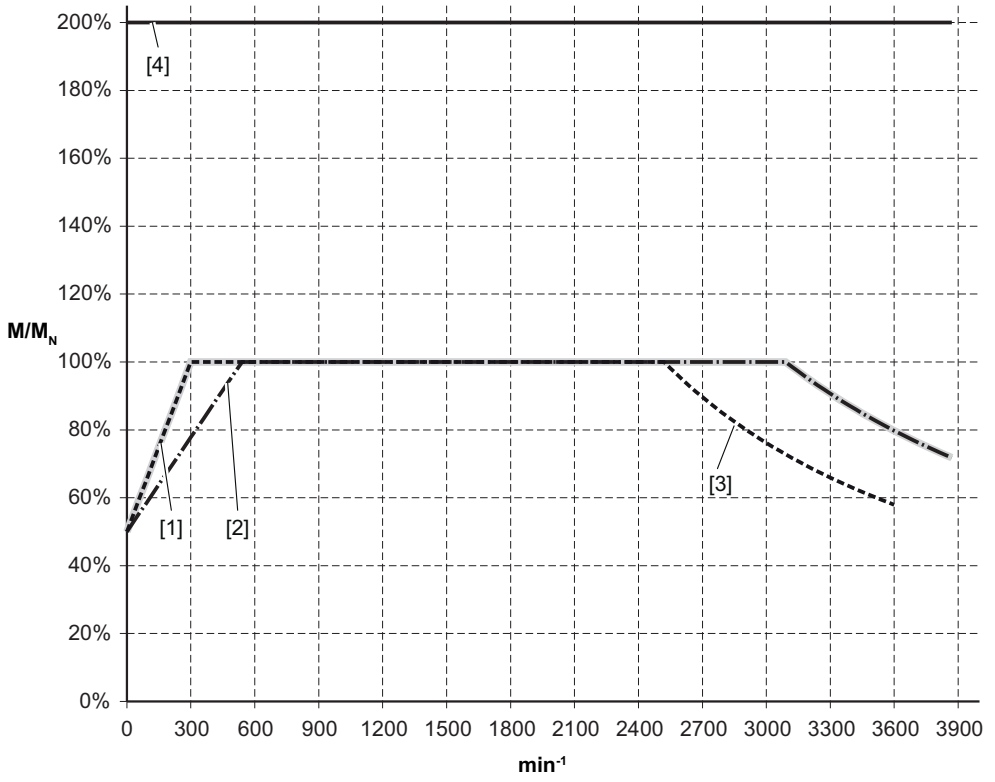
f_{base} = 104 Hz (266 V/46 V △, 60 Hz) DRN.. motor 4-pole (self-cooling)

The following figure shows the thermal limit characteristic curve of a DRN.. motor at a base frequency f_{base} of 104 Hz, delta connection △ at 266/460 V and self-cooling.

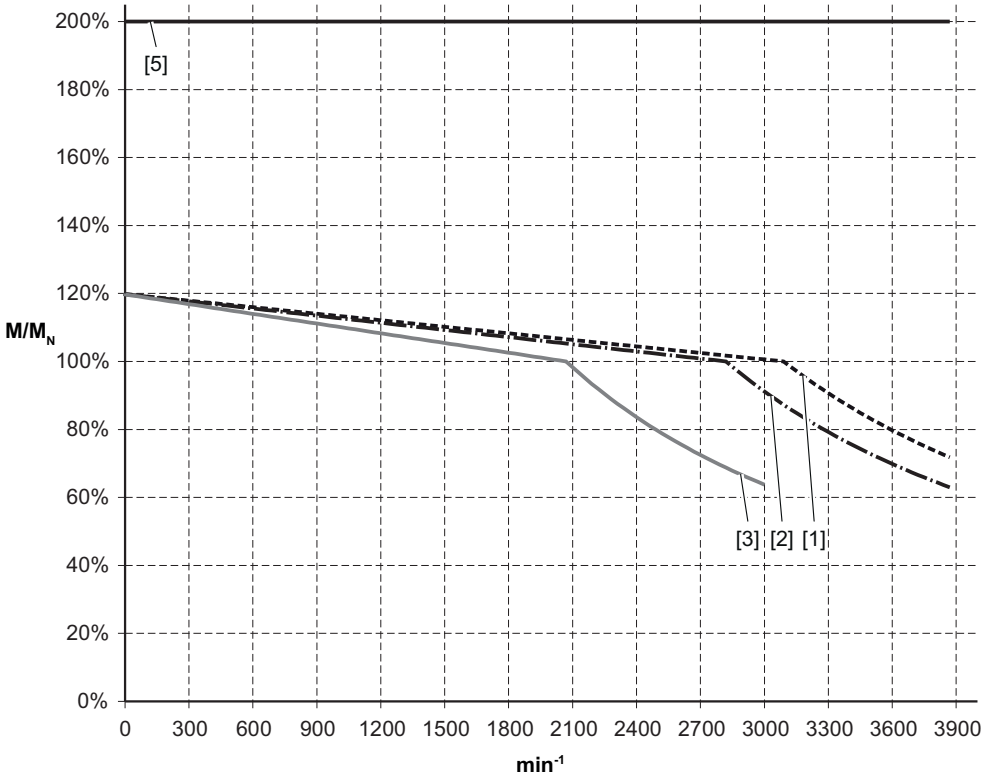


24418405899

[1] S1 duty cycle with self-cooling for DRN63MS – 225S
[2] S1 duty cycle with self-cooling for DRN100L (3.7 kW)
[3] S1 duty cycle with self-cooling for DRN225M – 315L
[4] Mechanical limit for gearmotors

f_{base} = 104 Hz (266 V/46 V △, 60 Hz) DRN.. motor 4-pole (forced air cooling)

The following figure shows the thermal limit characteristic curve of a DRN.. motor at a base frequency f_{base} of 104 Hz, delta connection △ at 266/460 V and forced air cooling.



24418408331

[1] S1 duty cycle with forced air cooling DRN63MS – 112M
[2] S1 duty cycle with forced air cooling for DRN132M – 200L
[3] S1 duty cycle with forced air cooling for DRN225S – 315L
[4] Mechanical limit for gearmotors

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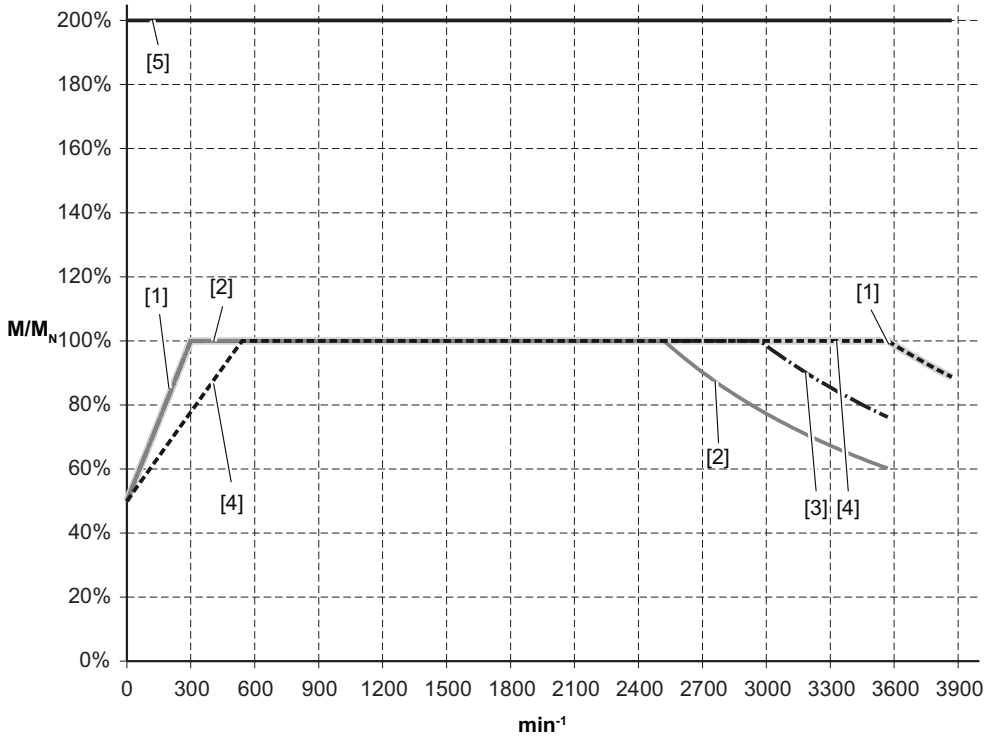
f_{base} = 120 Hz (230 V/460 V ⅄⅄, 60 Hz) DRN.. motor 4-pole (self-cooling)

The following figure shows the thermal limit characteristic curve of a DRN.. motor at a base frequency f_{base} of 120 Hz, double star connection ⅄⅄ at 230/460 V and self-cooling.



24418410763

[1] S1 duty cycle with self-cooling for DRN63MS – 180L
[2] S1 duty cycle with self-cooling for DRN225M – 280M
[3] S1 duty cycle with self-cooling for DRN200L – 225S
[4] S1 duty cycle with self-cooling for DRN100L (3.7 kW)
[5] Mechanical limit for gearmotors

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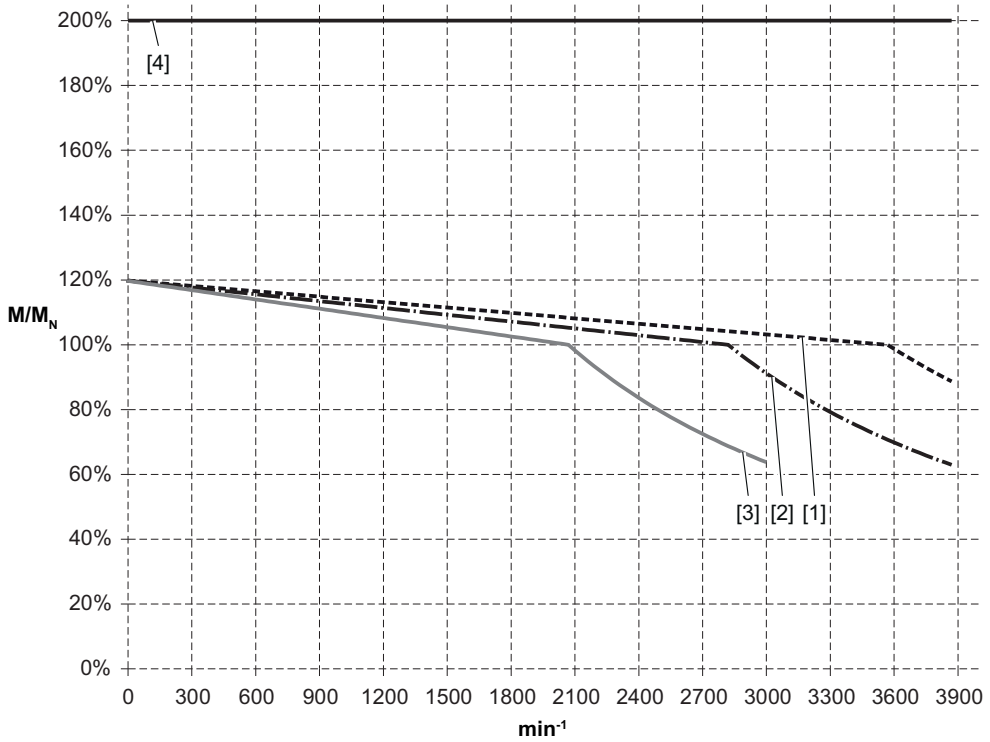
f_{base} = 120 Hz (230 V/460 V ⅄, 60 Hz) DRN.. motor 4-pole (forced air cooling)

The following figure shows the thermal limit characteristic curve of a DRN.. motor at a base frequency f_{base} of 120 Hz, double star connection ⅄⅄ at 230/460 V and forced-air cooling.



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[1] S1 duty cycle with forced air cooling DRN63MS – 100L (3 kW)
[2] S1 duty cycle with forced air cooling for DRN100L (3.7 kW) – 200L
[3] S1 duty cycle with forced air cooling for DRN225S – 280M
[4] Mechanical limit for gearmotors

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5.4 Project planning of the drive – DR2L.. motors

Tapping the full potential of an asynchronous servomotor requires the selection of an appropriate drive.

The schematic procedure is detailed in the chapter "Drive selection – controlled motor".

5.4.1 Dynamics package D1 or D2

During the drive selection, you must decide which dynamics package is required and will be implemented.

This will affect the dimensioning, especially the size of the inverter.

The higher inertia levels of the DR2L.. motor when compared to synchronous servomotors – roughly a factor of 10 or more – are of great benefit when controlling loads with a high inherent inertia, even when taking gear unit reduction ratios into account.

For detailed information, refer to the chapter "Product description – asynchronous servomotors of the DR2L.. series".

The technical data for the DR2L.. motors and the limit values of the D1 or D2 dynamics packages are provided in the chapter "Technical data – DR2L.. asynchronous servomotors".

5.4.2 Sine encoder

The standard drive package of DR2L.. motors includes the following incremental encoders:

- EI8R built-in encoder
- EK8S add-on cone encoder

This sine encoder has a resolution of 1024 sine cycles.

The interpolation of the sin/cos signals in the inverter greatly increases the available speed information, resulting in a usable speed setting range of 1:5000 and highly accurate operation at speeds below 1 rpm.

Startup is simplified by the electronic nameplate included in the encoder.

Detailed information can be found in the chapter "Encoders".

5.4.3 Multi-turn absolute encoder

Instead of the incremental encoder, a multi-turn absolute encoder can be installed at the same location as the incremental encoder.

- AK8W, AK8Y or AK8H add-on cone encoders

The SSI encoder (A.8**Y**) establishes the connection to the functional safety elements in the control cabinet.

Startup is simplified by the electronic nameplate included in the encoder.

Detailed information can be found in the chapter "Encoders".

5.4.4 Forced cooling fan

The use of a /V forced cooling fan prevents the reduction in permissible load torque at speeds below 900 rpm.

In fact, the relationship is reversed, meaning that the permitted torque at speed "0" is approx. 10 – 15% higher than the nominal torque when a forced cooling fan is used.

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Detailed information can be found in the chapter "Forced cooling fans".

5.4.5 Inverter utilization

When selecting the drive for an asynchronous servomotor, the following variables apply:

- The mean (effective) speed
- The mean (effective) torque
- The maximum speed
- The maximum dynamic torque

To select a suitable inverter, you must check the thermally decisive elements in the limit characteristic curves with 100% I_N and the peak values in the diagrams with 150%/200% I_N.

For technical data for the DR2L.. motors, refer to the chapter "Technical data – asynchronous DRL.. servomotors".

The combinations and limit characteristic curves of the DR2L.. motors with MOVIDRIVE® and MOVIAXIS® are covered in full in the manual "AC motors – Inverter Assignments and Characteristic Curves".

The maximum speeds of the motors are specified in the chapter "Maximum speeds".

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5.5 Electrical properties

5.5.1 Frequencies and voltages

Frequencies

The AC motors from SEW-EURODRIVE are delivered suitable for line frequency operation of 50 Hz or 60 Hz, depending on the configuration. The nameplates of the relevant motors list data referring to the configuration, see chapter "Type designation of AC motors" (→ 🗎 52).

The global motor design is an exception to that. The global motor is designed both for operation on a 50 Hz and on a 60 Hz supply system. The nameplates of global motors list information for operation on a 50 Hz supply system, as well as information for operation on a 60 Hz supply system.

Unless specified otherwise, the technical specifications in this catalog refer to motors operated at a line frequency of 50 Hz.

Voltages

Depending on the configuration, AC motors from SEW-EURODRIVE are designed for operation at a fixed voltage (e.g. 230 V △/400 V 人) or for operation in a voltage range (e.g. 220 V – 230 V △/380 V – 400 V 人), see chapter "Type designation of AC motors" (→ 🗎 52).

The following combinations of rated frequency and rated voltage are possible:

- 50 Hz fixed voltage
- 60 Hz fixed voltage
- 50 Hz voltage range
- 50/60 Hz voltage range

The tolerances A and B as specified in standard IEC 60034 apply to rated frequencies as well as to nominal voltages, see chapter "Tolerances according to IEC 60034-1" (→ 🗎 149).

The AC motors from SEW-EURODRIVE are available in a variety of nominal voltages. Should you require a nominal voltage deviating from the local standard, please contact SEW-EURODRIVE.

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5.5.2 Standard nominal voltages at 50 Hz or 50/60 Hz, depending on the motor size

As standard, motors in the variants 50 Hz or 50/60 Hz are operated in the wiring diagram R13, i.e. in star or delta connection.

The nominal voltage assigned to the motors by SEW-EURODRIVE as standard varies depending on the motor size and motor power.

The following table lists the nominal voltages for motors designed for operation at a 50 Hz or 50/60 Hz supply system depending on the rated power.

Motor	Power	50 Hz fixed voltage	50 Hz voltage range	50/60 Hz voltage range
	kW	V	V	V
DRN63MS – DRN80MK DR2S63 – DR2S80	0.09 – 0.55	230△/400人	220 – 230△/380 – 400人	220 – 240△/380 – 415人
				254 – 277△/440 – 480人, 60 Hz
DRN80MS – DRN132S	0.75 – 5.5	230△/400人	220 – 230△/380 – 400人	220 – 230△/380 – 400人, 50 Hz
				254 – 266△/440 – 460人, 60 Hz
DRN132M – DRN315H	7.5 – 200	400△/690人	380 – 400△/660 – 690人	380 – 400△/660 – 690人, 50 Hz
				440 – 460△/ – , 60 Hz

Due to the tolerances A and B as specified in standard IEC 60034, motors and brakes for AC 230/400 V and motors for AC 400/690 V can also be operated at AC 220/380 V or AC 380/660 V supply systems.

5.5.3 Nominal data of a 50 Hz motor when operated on a 60 Hz supply system

Observe the following table when motors designed for 50 Hz supply system are operated on 60 Hz supply systems:

Nominal voltage at 50 Hz	Connection	Motor voltage at 60 Hz	Deviating data			
			Rotational speed	Power rating	Rated torque	Starting torque ratio
AC 230 △/400 V 人	△	230	+20%	0%	-17%	-17%
AC 230 △/400 V 人	人	460	+20%	+20%	0%	0%
AC 400 △/690 V 人	△					

If you want to operate motors designed for 50 Hz supply systems on a 60 Hz supply system, consult SEW-EURODRIVE. In some countries and regions regulations apply regarding efficiency values that must be adhered for 60 Hz operation.

5.5.4 Motor properties for operation on a 60 Hz or 50/60 Hz supply system

The motors are also available for operation at a line frequency of 60 Hz.

In such cases, the length (and consequently the geometric dimensions) may vary between the 50 Hz and 60 Hz or 50/60 Hz design at the same rated power. Especially adhere to this aspect when selecting global motors, see chapter "Technical data of the motors" (→ 🗎 56).

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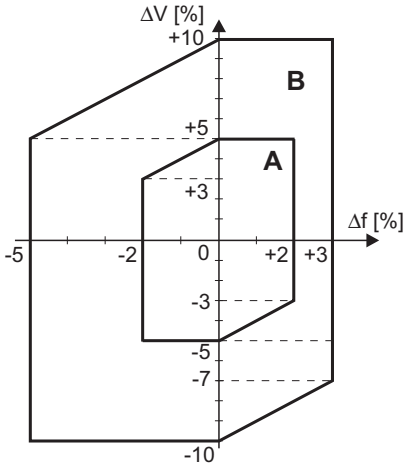
5.6 Tolerances according to IEC 60034-1

In accordance with IEC 60034-1, the following tolerances are permitted for electric motors with rated voltage (also applies to the rated voltage range):

Voltage and frequency	Tolerance A and tolerance B
Efficiency η P_N ≤ 150 kW P_N > 150 kW	-0.15 × (1-η) -0.1 × (1-η)
Power factor cosφ	$-\frac{1 - \cos\varphi}{6}$
Slip P_N < 1 kW P_N ≥ 1 kW	± 30% ± 20%
Starting current	+ 20%
Tightening torque	-15% to +25%
Breakdown torque	-10%
Pull-up torque	-15%
Mass moment of inertia	±10%

5.6.1 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 marked "0" in the following figure identifies the respective ratings for frequency as well as voltage.



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In the tolerance range A, the motor must be able to deliver the rated torque in continuous duty (S1). The other characteristic values and heating may deviate slightly from the 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 outer limits of tolerance range B.

5.6.2 Undervoltage

It is not possible to achieve the rated value such as power, torque and speed in the event of undervoltage e.g. due to weak supply systems or an insufficiently large motor cable. This is particularly true for motor startup where the starting current amounts to a multiple of the rated current.

5.6.3 Overvoltage

Overvoltage results in a higher torque development, but also in more intense heating of the motor winding.

Overvoltages exceeding the tolerances permitted in the standards may cause damage at the motor winding.

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5.7 Thermal classes according to IEC 60034-1

The motor standards of the IEC 60034-1 series describe the designs and identification of thermal classes. This defines the limit overtemperatures for the winding subject to the rated torque at a maximum ambient temperature of +40 °C. A thermal reserve of 10 – 15 Kelvin for eventual voltage tolerances is also provided.

SEW-EURODRIVE indicated the thermal class of the motor with the numerical value as required in the standards and with a letter.

As standard, asynchronous motors from SEW-EURODRIVE are designed in thermal class 130 (B). Higher thermal classes (155 (F) and 180 (H)) are available upon request.

Thermal classification/ thermal class	Maximum winding temperature
130 (B)	130 °C
155 (F)	155 °C
180 (H)	180 °C

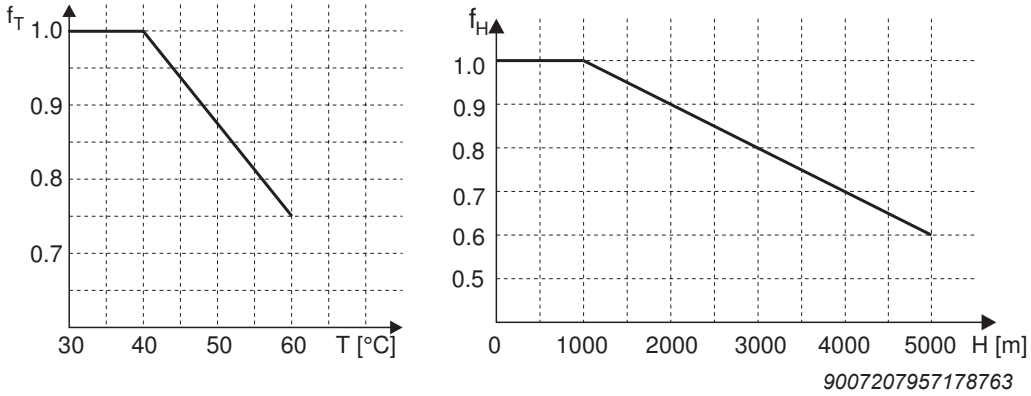
5.7.1 Power reduction

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 installation altitude of 1000 m above sea level. The power must be reduced according to the following formula in the case of higher ambient temperatures or altitudes:

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

The following diagrams show the power reduction depending on the ambient temperature and installation altitude.

The factors f_T and f_H apply to the motors:



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T Ambient temperature
H Installation altitude above sea level

Contact SEW-EURODRIVE for ambient temperatures over 60 °C or installation altitudes above 5000 m.

5.7.2 Starting frequency

At the supply system, a motor is rated according to its thermal capacity utilization in continuous duty (S1 = continuous duty = 100% cyclic duration factor).

Definition

The switching frequency indicates the number of times the motor can accelerate the mass moment of inertia of its rotor and the mass moment of inertia of the external load up to the static load speed without thermal overloading.

The power demand calculated from the load torque of the application must not exceed the rated power of the motor. This mechanical power must be output continuously by the motor within the permitted thermal limits without overheating.

High switching frequency

In practice, drives can be loaded in such a way that the motor can often be switched on and off at low load torque relative to the motor's rated torque, such as for a travel drive. In this case, it is not the power demand of the drive train that is the decisive factor in determining the size of the motor, but rather the number of times the motor has to start up per time interval.

In comparison to motor operation at the rating point, a higher current flows at the start-up of an asynchronous motor. This starting current is specified in the starting current ratio. The motor heats up more during startup due to the higher current than in permanent operation at the rating point. This means each startup leads to disproportionate heating of the motor.

If the resulting heat is higher than the heat that is dissipated by the cooling system, the windings can excessively overheat. This must be taken into account when configuring the overall drive and is determined by means of the permitted switching frequency. The thermal load capacity of the motor can additionally be increased by selecting a suitable thermal class or by using forced air cooling.

No-load starting frequency Z_0

For line-powered drives, the thermal limit limits the permitted switching frequency of the motors. The basis for calculating the permitted switching frequency is the so-called no-load starting frequency Z_0 of the motors with the switch-ons per hour as the unit.

SEW-EURODRIVE specifies the permitted switching frequency of a load-free motor as the no-load starting frequency Z_0 at 50% cyclic duration factor. This value indicates the number of times per hour that the motor can accelerate the mass moment of inertia of its rotor up to the rated speed without external load at 50% cyclic duration factor within its thermal configuration.

The calculation of the permitted switching frequency is based on the no-load starting frequency, taking several influence factors into account. The following factors influence the value of the no-load starting frequency:

- K_J: The factor K_J is determined according to the mass moments of inertia to be accelerated of the application and the motor options in relation to the inertia of the motor. The higher the additional mass moment of inertia to be accelerated, the smaller the value K_J.
- K_M: Depending on the external load during run-up, i.e. the higher the static load torque, the smaller the factor K_M.
- K_P: Depending on the static power and the relative cyclic duration factor cdf, i.e. the static capacity utilization and the percentage of the cyclic duration factor influence the factor K_P.

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Permitted switching frequency of motors

If a load with increased mass moment of inertia has to be accelerated or an increased load torque has to be overcome, the motor's run-up time increases. As a higher current flows during this run-up time, the motor is thermally more loaded and the permitted switching frequency decreases.

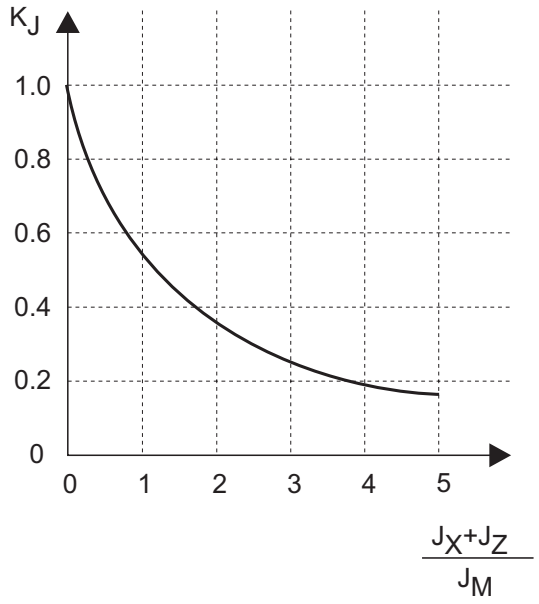
You can determine the permitted switching frequency Z of the motor in cycles/hour using the following formula:

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

The factors K_J, K_M and K_P influence the value of the no-load starting frequency in such a way that the actual permitted switching frequency Z on the basis of the conditions of the application is determined.

You can determine the factors K_J, K_M and K_P using the following diagrams according to different parameters.

Factor K_J depending on the additional mass moment of inertia



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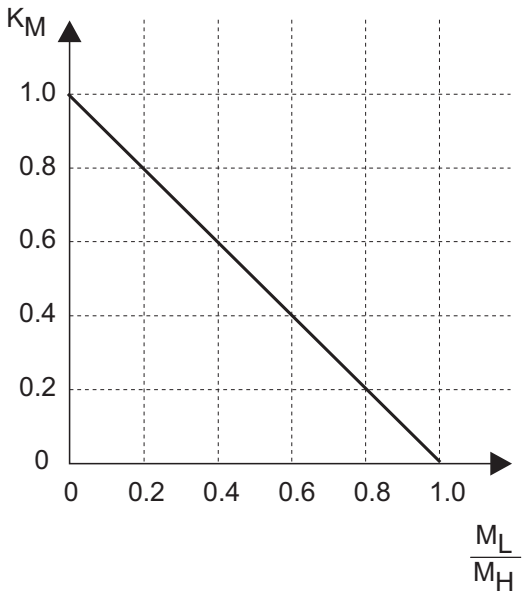
Factor K_M depending on the external load during run-up



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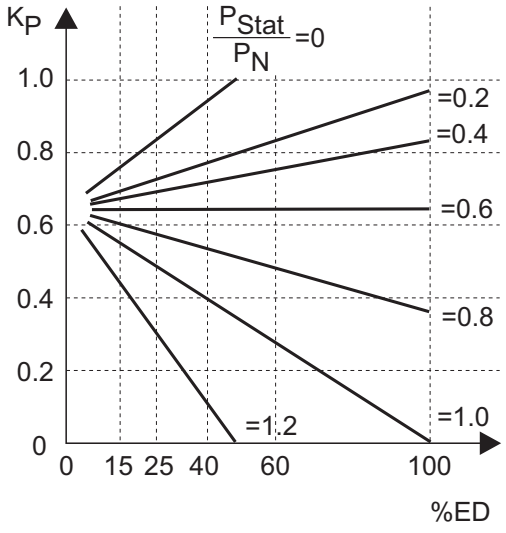
Factor K_P depending on the static power and the relative cyclic duration factor CDF



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Key

J_X	Total of all external mass moments of inertia in relation to the motor axis	M_H	Acceleration torque of the motor
J_Z	Mass moment of inertia flywheel fan	P_{Stat}	Power demand after run-up (static power)
J_M	Motor's mass moment of inertia	P_N	Rated motor power
M_L	External load during run-up	% cdf	Relative cyclic duration factor

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Example: Calculating the permitted switching frequency

Brakemotor: DRN80M4 with BE1 brake as line-powered drive

No-load starting frequency Z_0 with BGE brake rectifier = 8200 h^{-1}

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

$Z = Z_0 \times K_J \times K_M \times K_P = 8200\ h^{-1} \times 0.2 \times 0.4 \times 0.65 = 426\ h^{-1}$

The cycle duration is 8.45 s.

The switch-on time amounts to 5.07 s.

In addition, it must be checked if the brake is permitted for the required operating conditions. Observe the information in the manual "Project Planning for BE.. Brakes – DR.., DRN.., EDR.., and EDRN.. AC Motors – Standard Brake/Safety Brake".

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5.8 Thermal monitoring

In accordance with the standard IEC 60034-11, two fundamental states are taken into account when monitoring a motor against thermal overload:

- Thermal overload with gradual temperature change
- Thermal overload with rapid temperature change

5.8.1 Thermal overload with gradual temperature change

If the motor is subject to thermal overload with a gradual temperature rise, the thermal protection system must limit the winding temperature from critical rising.

Possible causes for heating:

- Failure of the cooling system, e.g. due to residue in the cooling channels or at the cooling fins on the motor housing.
- Reduced flow of cooling air, e.g. due to completely or partially covered fan grille.
- Renewed drawing in of already heated cooling air.
- Excessive rise in the ambient temperature or the coolant temperature.
- Rising mechanical overload.
- Voltage drop, overvoltage or asymmetry in the motor supply over an extended period.
- A cyclic duration factor deviating from the initial specifications at a motor dimensioned for intermittent duty.
- Deviations from the rated frequency.

5.8.2 Thermal overload with rapid temperature change

If the motor is subject to thermal overload with a rapid temperature rise, then the thermal protection system must limit the winding temperature from rising further.

Possible causes for rapid heating:

- Rotor blockage.
- Phase failure.
- Start-up under special, non-designated conditions, e.g. with excess mass moment of inertia, insufficient voltage, or extremely high load torque.
- Rapid load increase.
- Repeated start-up over short time intervals.

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5.8.3 Selecting the correct motor protection device

Selecting the correct motor protection device significantly influences the operational safety of the motor. There are 2 kinds of protection devices: current-controlled and motor temperature-dependent.

Current-controlled protection devices are usually installed in the control cabinet.

Examples of current-controlled protection devices:

- Fuses
- Motor circuit breaker

Temperature-dependent protection devices are usually installed directly in the motor winding.

PTC thermistors, bimetallic switches, or temperature sensors respond when the maximum permitted winding temperature is reached. The advantage is that temperatures are detected where they actually occur and where they reach the highest values.

SEW-EURODRIVE provides 4 fundamental types of thermal motor protection for the motors:

- PTC thermistor /TF, chapter "PTC thermistor /TF (PTC)" (→ 🗎 469)
- Bimetallic temperature switch /TH, chapter "Temperature switch /TH" (→ 🗎 471)
- Temperature sensor /PT, chapter "Temperature sensor /PT" (→ 🗎 473)
- Temperature sensor /PK, chapter "Temperature sensor /PK" (→ 🗎 474)

INFORMATION

Motor protection device at ambient temperatures of < 0 °C

Operating motors in CFC and VFC mode at ambient temperatures of less than 0 °C makes using a Pt1000 temperature sensor mandatory to reach the optimum motor torque.

Fuses

Fuses do not protect the motor from overload, but are used to protect supply cables. They are exclusively used as short-circuit protection and may detect a rotor blockage, as this condition is similar to a short-circuit on the terminals.

Motor circuit breakers

Motor circuit breakers offer adequate protection against overload in operation with low switching frequencies and brief start-ups. The motor circuit breaker is set to the rated motor current. In combination with DRN.. motors, ensure that the motor circuit breakers used are suitable for IE3 motors.

Motor circuit breakers are not adequate as the sole means of protection given switching operation with a high switching frequency (> 60 per h) and for high inertia starting. In these cases, we recommend using PTC thermistors in addition, see chapter "PTC thermistor /TF (PTC)" (→ 🗎 469).

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PTC thermistors

Three PTC thermistors (PTC, characteristic curve according to DIN 44082) are integrated into the winding overhang of the motor and connected in series. The terminals are in the terminal box.

Evaluation takes place at a respective input of the inverter or at a trip switch in the control cabinet.

Motor protection with PTC thermistor /TF (see chapter "PTC thermistor /TF (PTC)" (→ 🗎 469)) provides comprehensive protection against thermal overload. Motors protected in this way can be used for heavy starting, switching and braking operation and in case of unstable supply systems. A motor circuit breaker is usually installed as well.

SEW-EURODRIVE recommends using motors equipped with PTC thermistor for inverter operation.

Bimetallic switches

In contrast to the PTC thermistors, bimetallic switches do not require specific evaluation electronics. They can be directly included into the monitoring circuit of the motor.

Three bimetallic switches are integrated into the winding overhang of the motor and connected in series, see chapter "Temperature switch /TH" (→ 🗎 471). The terminals are located in the terminal box.

To achieve maximum motor protection, the trigger temperature is slightly lower than the limit value of the thermal class selected for the motor.

Temperature sensor

A temperature sensor is integrated into the winding of the motor. The winding temperature of the motor can be constantly determined with an evaluation unit by means of the characteristic curve of the sensor.

The sensor has a nearly linear characteristic curve and a high level of accuracy.

The sensors do not bear any relation to the selected thermal class of the motor and can be integrated into the winding in addition to a PTC thermistor or a bimetallic switch.

For detailed information, refer to chapters "Temperature sensor /PT" (→ 🗎 473) and "Temperature sensor /PK" (→ 🗎 474).

MOVIMOT® protection devices

Motors driven by MOVIMOT® contain integrated protection devices to prevent thermal damage. No other devices are required for motor protection.

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5.8.4 Comparison of the safety mechanisms

The following table shows the suitability of the various protection devices and temperature sensors for different causes of tripping.

Cause of the increased thermal load	Current-dependent protection device		Temperature-dependent protection device			
	Fuse	Motor circuit breaker	PTC thermistor /TF	Bimetallic switch /TH	Temperature sensor /PT[1)]	Temperature sensor /PK[1)]
Overcurrents up to 200% I_N	–	x	x	x	x	x
Heavy start	–	•	x	•	•	•
Direct switching of the direction of rotation	–	•	x	•	–	–
Switching operation up to Z = 30 1/h	–	•	x	x	–	–
Stalling	•	•	•	•	•	•
Phase failure	–	•	x	x	–	–
Voltage deviation (> tolerance B)	–	x	x	x	x	x
Frequency deviation (> tolerance B)	–	x	x	x	x	x
Insufficient motor cooling	–	–	x	x	x	x

1) With adapted evaluation unit

x Comprehensive protection
• Limited protection
– No protection

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5.9 Output designs

Asynchronous motors from SEW-EURODRIVE are available in different flange- and foot-mounted designs. This chapter provides a list of the available designs.

In the standard version, the output shaft is designed as IEC shaft end with full key or half key.

AC motors from SEW-EURODRIVE are equipped with a pinion shaft end for direct mounting to gear units.

5.9.1 /FI – IEC foot-mounted motor

The /FI foot-mounted motor is a motor design with drive-end endshield (closed flange), shaft end and feet pursuant to IEC 60072-1/EN 50347 (comparable to IEC basic mounting position IM B3). The dimension of the feet and the shaft end are shown on the nameplate. This ensures a reference to the geometrical dimensions given in EN 50347.

5.9.2 /F.A, /F.B – Universal foot-mounted motor

These designs describe the SEW-EURODRIVE motor in the universal foot version. This means that variable mounting of the feet to the stator is possible, thus allowing a foot-mounted motor with individual terminal box position (0°, 180°, 270°) to be implemented, e.g. /FIA or /FYB. The option /F.A means that the motor feet are enclosed in the delivery, option /F.B means that the motor feet are mounted at the factory.

5.9.3 /FF – IEC flange-mounted motor with through bores

Flanges of design /FF have through bores according to IEC 60072-1/EN 50347 (comparable to IEC basic mounting position IM B5). Both the flange diameter and the diameter at which the bores are arranged as well as the shaft end comply with the specifications of the standard.

5.9.4 /FT – IEC flange-mounted motor with threads

Flanges of design /FT have threaded holes according to IEC 60072-1/EN 50347 (comparable to IEC basic mounting position IM B14). Both the flange diameter and the diameter at which the threads are arranged as well as the shaft end comply with the specifications of the standard.

5.9.5 /FL – Flange-mounted motor (deviating from IEC)

The flange design /FL has through bores or tapped holes according to the standard (comparable to IEC basic mounting position IM B14 or IM B5) according to IEC 60072-1/EN 50347. One or several geometrical designs deviate from the standard. This may include: Other connection dimensions as defined in the size-to-power relationship, deviating flange heights or deviating alignment of the connection bore pattern.

5.9.6 /FE – IEC flange-mounted motor with through bores and IEC feet

Combination of /FI and /FF (comparable with IEC basic mounting position IM B35).

5.9.7 /FY – IEC flange-mounted motor with threaded holes and IEC feet

Combination of /FI and /FT (comparable with IEC basic mounting position IM B34).

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5.9.8 /FK – Flange-mounted motor (deviating from IEC) with IEC feet

Combination of /FI and /FL.

5.9.9 /FC – C-face flange-mounted motor; dimensions in inches according to NEMA MG1

Shaft end and flanges in /FC design are designed according to NEMA MG 1 (comparable to IEC basic mounting position IM B14) and the dimensions are based on the Anglo-American system of measurement (inches).

5.9.10 /FG – Integral motor as stand-alone motor

Flanges in /FG design are intended for connecting motors and gear units from SEW-EURODRIVE. The designation /FG is only part of the type designation if the motors are delivered without gear unit.

5.9.11 /FM – Integral motor as stand-alone motor with IEC feet

Combination of /FI and /FG (not comparable with an existing IEC basic mounting position).

5.9.12 Overview

The table below gives an overview of the possible flange and feet designs.

Option	IEC flange	IEC flange	Non-IEC flange	C-Face flange	IEC foot	Gear unit flange
	With through bore	With tapped hole				
/FI						
/FF						
/FE						
/FT						
/FY						
/FC						
/FG						
/FM						
/FL						
/FK						

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5.10 Input side shaft end

In the standard design, the shaft end on the input end (A-side) of an AC motor from SEW-EURODRIVE is designed with a keyway according to EN 50347 and full key according to DIN 6885. On request, the shaft ends can also be delivered as smooth shaft ends and without a key and keyway.

A special form of the shaft end on the input end for direct mounting to gear units from SEW-EURODRIVE is the pinion shaft end that constitutes the input element for the gear unit.

Rotors are balanced with a half key as standard; see also the chapter "Vibration class and increased vibration stress" (→ 🗎 178).

Contact SEW-EURODRIVE if you need the motors to be delivered with rotors with full-key balancing (deviating from the standard). Rotors balanced in this manner are labeled with a "V" on the front shaft end face in line with the standard regulations.

5.10.1 Standard shaft ends

DRN.. motors

The following table lists the standard shaft ends for DRN.. motors. Deviating geometries of the shaft ends are available on request.

Size	Shaft end
63	11 × 23
71	14 × 30
80	19 × 40
90	24 × 50
100	28 × 60
112	28 × 60
132	38 × 80
160	42 × 110
180	48 × 110
200	55 × 110
225	60 × 140
250	65 × 140
280	75 × 140
315	80 × 170

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DR2S.. motors

The following table lists the standard shaft ends for DR2S.. motors. Deviating geometries of the shaft ends are available on request.

Size	Shaft end
63MS	11 × 23
63M	14 × 30
71MS	14 × 30
71M	19 × 40
80MK	19 × 40
80M	24 × 50

5.10.2 Center of gravity of motors

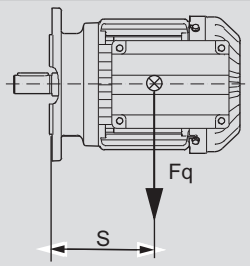
The center of gravity of a motor is a theoretical variable. This theoretical value is determined under the assumption that the entire mass of the motor is concentrated in one point and acts on this point with the weight F_q. The mass of the motor can be found in the chapter "Technical data of the motors" (→ 🗎 56).

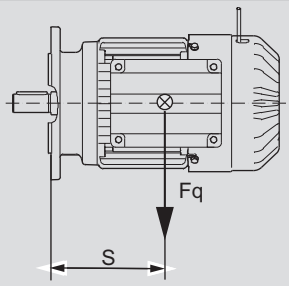
The center of gravity is relative to the flange position and stated with regard to the standard IEC flange (B5). For brakemotors, it additionally considers the characteristics of the BE.. brake assigned as standard.

Also consider the center of gravity for the combination of motors that are mounted to a gear unit with an adapter.

Changed designs or additional options influence the center of gravity. Consult SEW-EURODRIVE in case of deviating motor designs or changed options.

DRN.. motors





Motor	Center of gravity S	Brakemotor	Brake	Center of gravity S
	mm			mm
DRN63MS	71[1)]	DRN63MS	BE03	98[1)]
DRN63M	78[1)]	DRN63M	BE03	104[1)]
DRN71MS	73[1)]	DRN71MS	BE03	94[1)]
DRN71M	84[1)]	DRN71M	BE05	111[1)]
DRN80MK	90[1)]	DRN80MK	BE1	121[1)]
DRN80MS	98[1)]	DRN80MS	BE05	128[1)]
DRN80M	115[1)]	DRN80M	BE1	144[1)]
DRN90S	119[1)]	DRN90S	BE2	147[1)]

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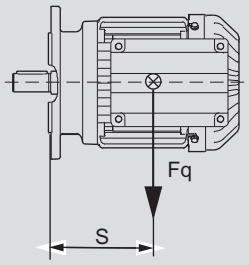

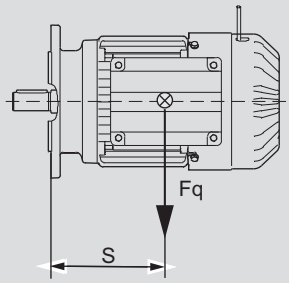

Motor	Center of gravity S	Brakemotor	Brake	Center of gravity S
	mm			mm
DRN90L	133[1)]	DRN90L	BE2	161[1)]
DRN100LS	127	DRN100LS	BE5	156
DRN100L	152	DRN100L	BE5	180
DRN100LM	148	DRN100LM	BE2	171
DRN112M	161	DRN112M	BE5	188
DRN132S	180	DRN132S	BE11	226
DRN132M	187	DRN132M	BE11	234
DRN132L	199	DRN132L	BE20	261
DRN160M	218	DRN160M	BE20	283
DRN160L	233	DRN160L	BE20	289
DRN180M	232	DRN180M	BE30	298
DRN180L	244	DRN180L	BE30	303
DRN200L	294	DRN200L	BE32	348
DRN225S	262	DRN225S	BE32	312
DRN225M	262	DRN225M	BE32	312
DRN250M	325	DRN250M	BE62	388
DRN280S	337	DRN280S	BE62	393
DRN280M	377	DRN280M	BE62	431
DRN315S	408	DRN315S	BE122	475
DRN315M	414	DRN315M	BE122	478
DRN315L	464	DRN315L	BE122	535
DRN315H	488	DRN315H	BE122	550

1) Plastic fan guard

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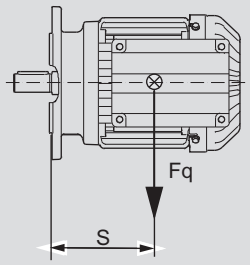
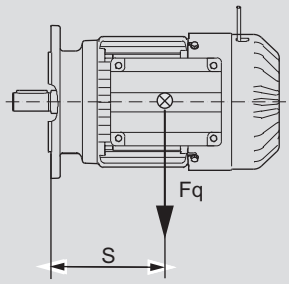
DR2S.. motors





Motor	Center of gravity S	Brakemotor	Brake	Center of gravity S
	mm			mm
DR2S63MS	71[1)]	DR2S63MS	BE03	98[1)]
DR2S63M	75[1)]	DR2S63M	BE03	101[1)]
DR2S71MS	73[1)]	DR2S71MS	BE05	101[1)]
DR2S71M	84[1)]	DR2S71M	BE1	113[1)]
DR2S80MK	90[1)]	DR2S80MK	BE1	121[1)]
DR2S80MS	98[1)]	DR2S80MS	BE1	130[1)]
DR2S80M	115[1)]	DR2S80M	BE2	148[1)]

1) Plastic fan guard

5.10.3 Special shaft ends

SEW-EURODRIVE can also deliver shaft ends of the solo foot-mounted motors and/or solo flange-mounted motors that differ from the series design. Contact SEW-EURODRIVE, if required.

The permitted overhung and axial loads and the dimensions of the special shaft end are documented separately. For the standard IEC shaft ends and bearings, please refer to the chapter "Overhung and axial loads for motor shaft ends" (→ 🗎 166).

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5.10.4 Overhung and axial loads for motor shaft ends

Permitted axial load

The maximum permitted axial load F_A is determined by multiplying the maximum permitted overhung load F_{RX} with the factor 0.2.

$F_A = 0.2 \times F_{Rx}$

Permitted overhung load of DR2L.. motors

The determined F_{Rx} value for the 4-pole DR.. motors of the same size is multiplied by a factor of 0.8 in order to define the permitted overhung load F_{RxDRL} for the 4-pole DR2L.. motors.

$F_{RxDRL} = 0.8 \times F_{Rx}$

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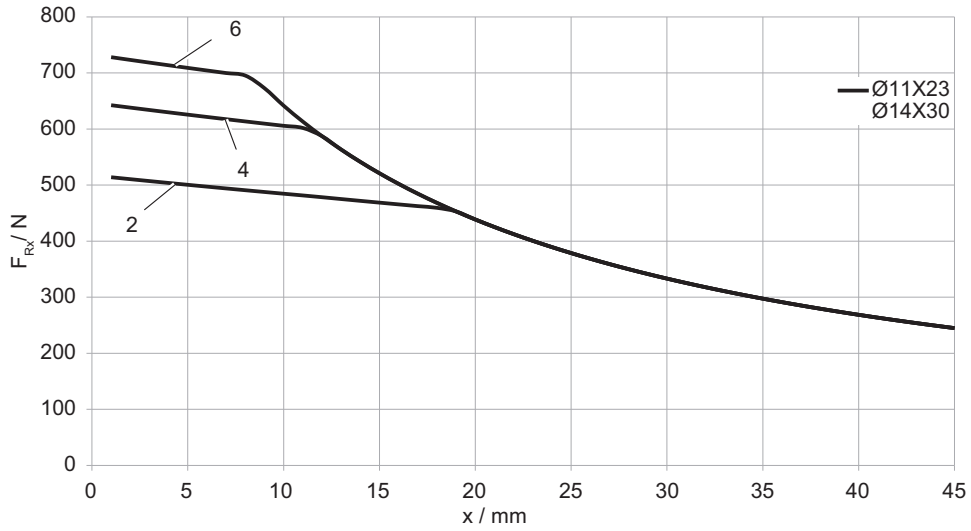
Overhung load diagrams

Key

2, 4, 6	Number of poles
Ø19x40	Shaft end

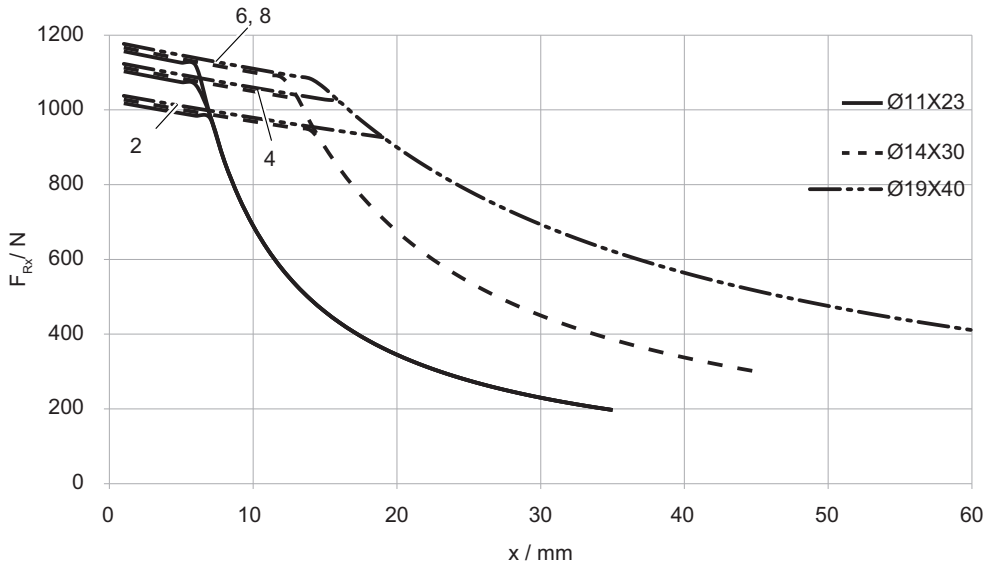
For overhung load diagrams of the second shaft end, refer to chapter "Output" (→ 🗎 459).

Overhung load diagram DRN63, DR2S63



9007223611899659

Overhung load diagram DRN71, DR2S71



9007223611904523

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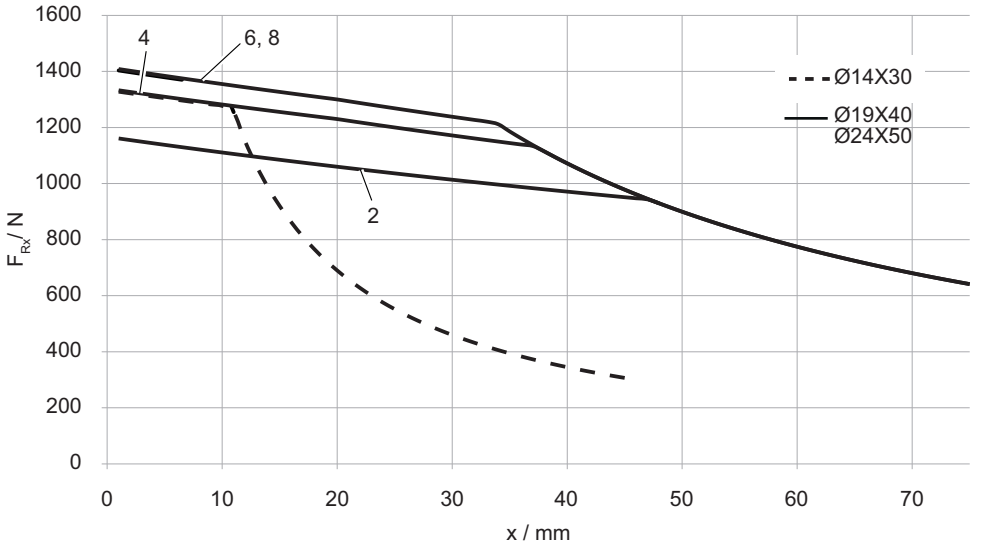
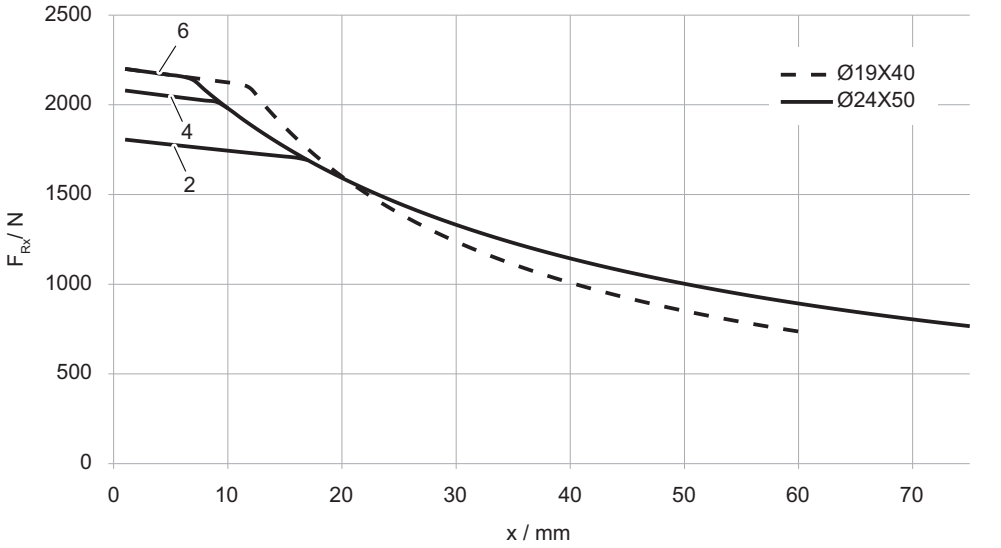
Overhung load diagram DRN80, DR2S80



9007223671326987

Overhung load diagram DRN90



9007223671329419

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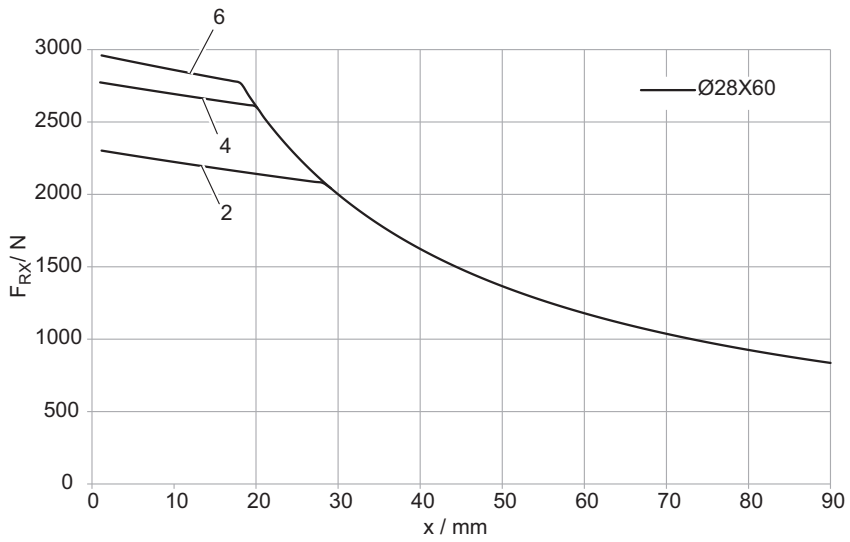
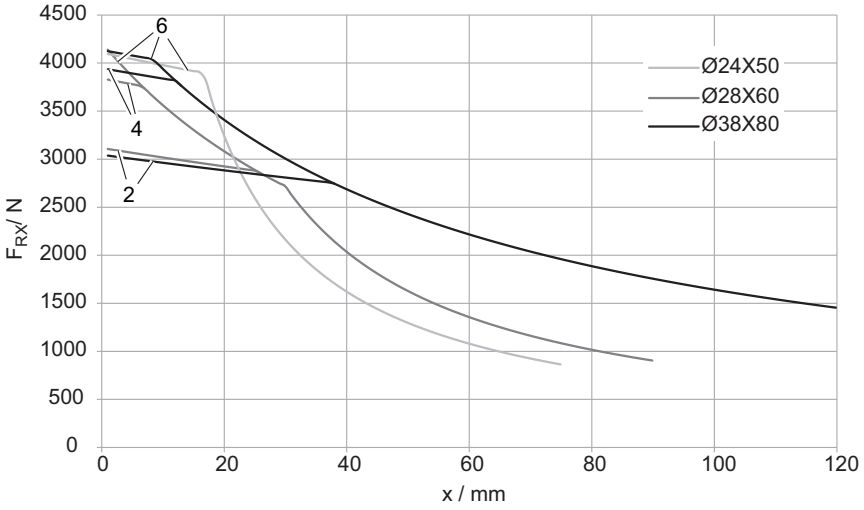
Overhung load diagram DRN100



27021611226631947

Overhung load diagram DRN112M – DRN132S



27021611226635787

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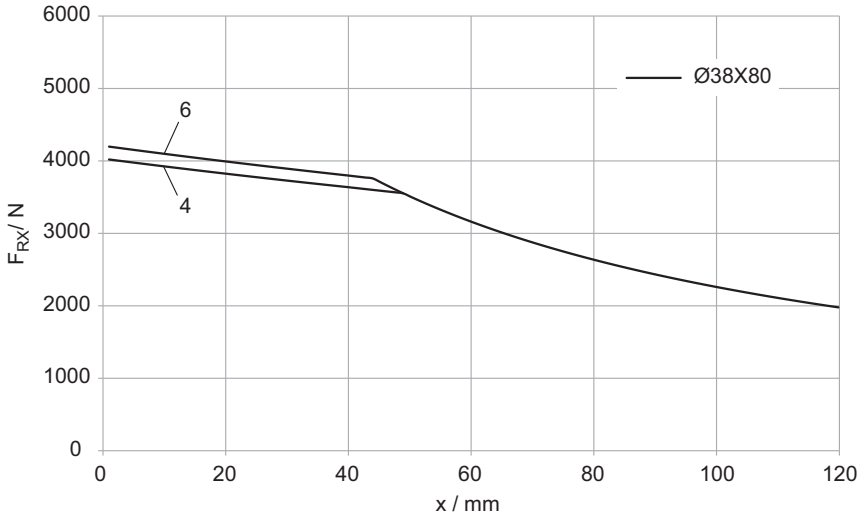
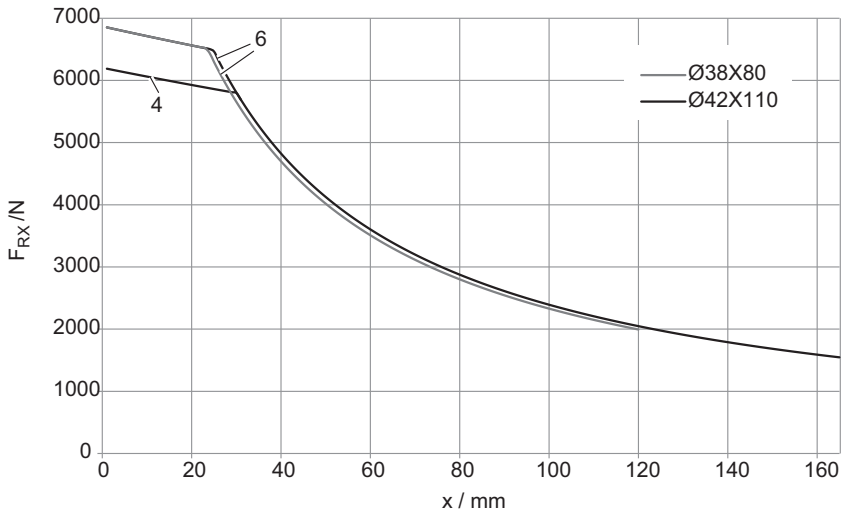
Overhung load diagram DRN132M – DRN132L



27021611226678027

Overhung load diagram DRN160



27021611226681867

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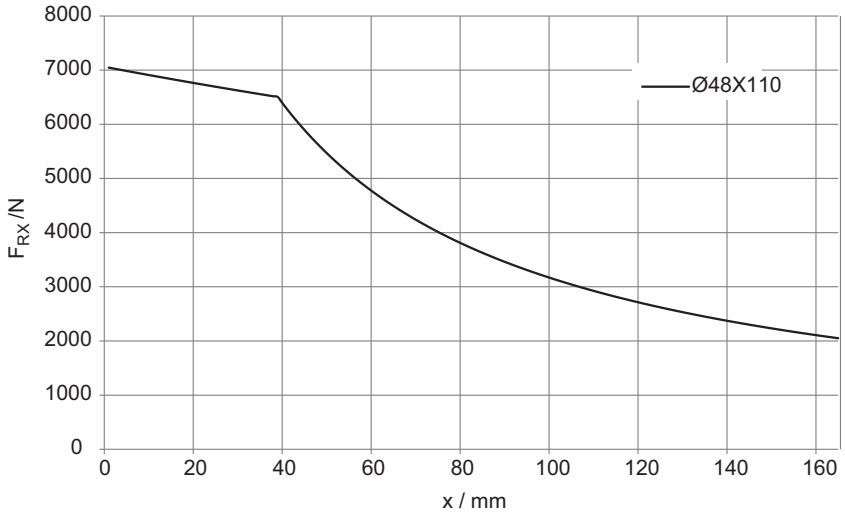
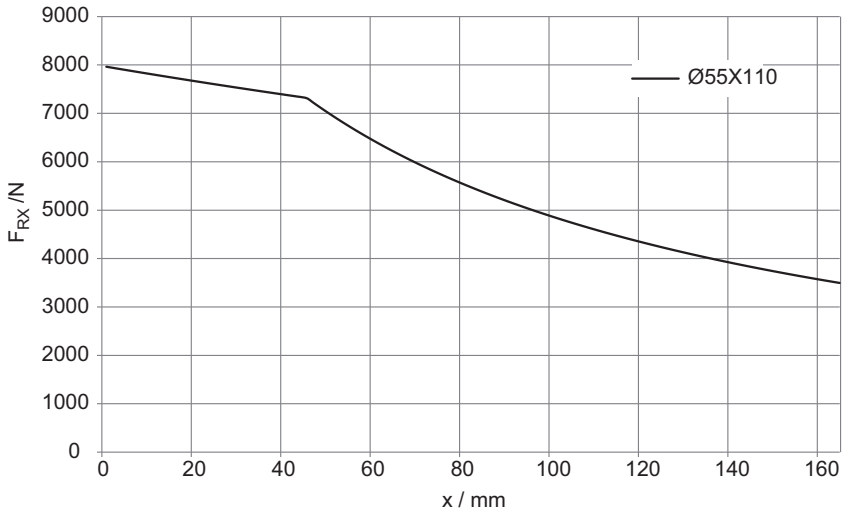
Overhung load diagram DRN180



18014411971944715

Overhung load diagram DRN200



18014411971948555

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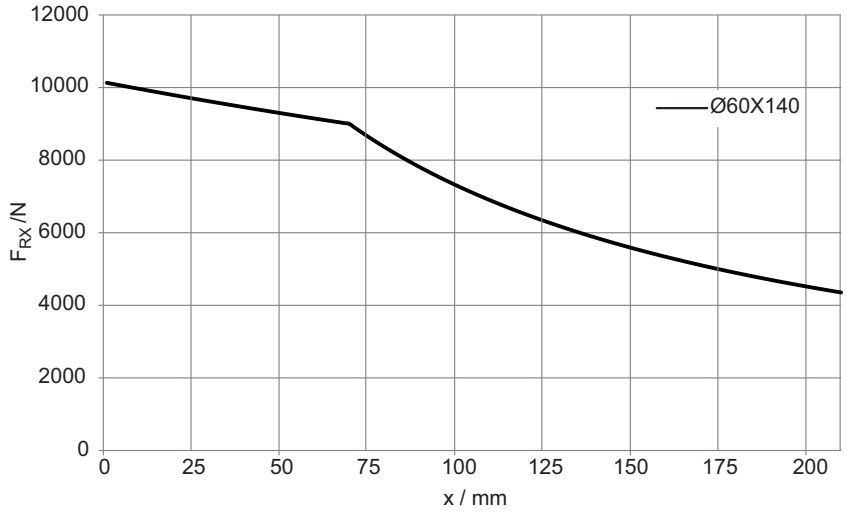
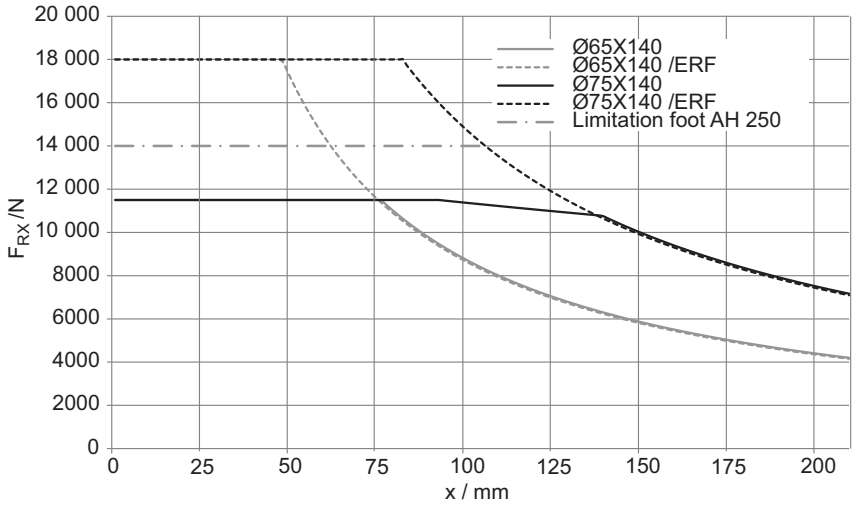
Overhung load diagram DRN225



27021611226693387

Overhung load diagram DRN250 – DRN280



27021611226697227

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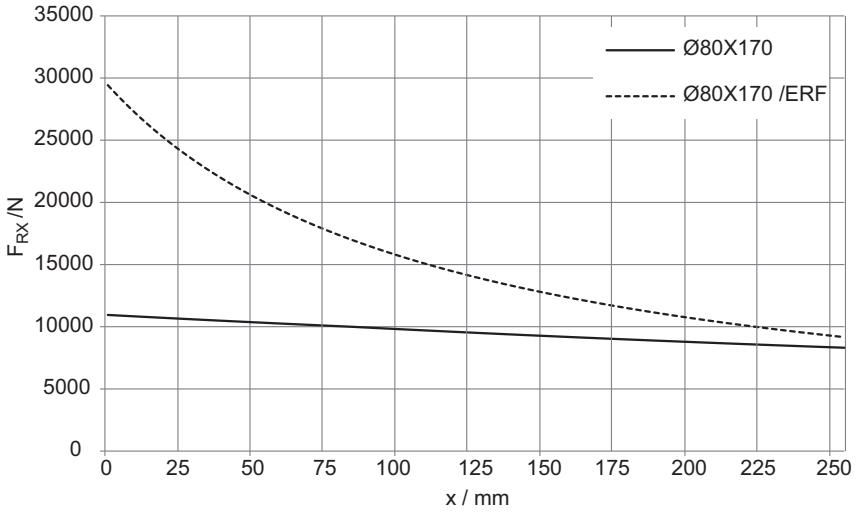
Overhung load diagram DRN315



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5.11 Bearings

5.11.1 Bearing types used

The asynchronous motors are delivered with deep groove ball bearings of sizes 62.. and 63.. with cover plate and bearing clearance C3 as standard. For brakemotors, bearings with shield rings are used on the B-side to prevent brake dust from entering.

Depending on the selected options, the bearing selection can deviate from the standard.

Motor size	A-side bearing		B-side bearing
	IEC motor	Gearmotor	
DR2S56		6302	6001
63	6202	6303	6203
71	6204	6303	6203
80	6205	6304	6304
90	6305		6205
100	6306		6205
112	6308		6207
132S	6308		6207
132M/L	6308	6309	6209
160	6310	6312	6212
180	6311	6312	6212
200	6312	6314	6314
225	6314		6314
250	6317[1)]		6315
280	6317[1)]		6315
315S	6319[2)]		6319[2)]
315M/ME	6319[2)]		6319[2)]
315L	6319[2)]	6322[2)]	6322[2)]
315H	6319[2)]	6322[2)]	6322[2)]

1) Bearing clearance C4

2) Without cover plate and shield ring

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5.12 Maximum speeds

The mechanical limit speeds of the motors depend on the size and are binding for operation on inverters. For limit speeds that have been configured differently, larger limit speeds may be possible depending on the options. Contact SEW-EURODRIVE in such cases. The guide values for limit speeds are listed in the following table:

Motors	Maximum mechanical speed n_{max} in 1/min		
	Motor	Brakemotor	Motor with backstop
DR2S56	6000	4500	-
DRN63, DR2S63	6000	4500	5000
DRN71, DR2S71	6000	4500	5000
DRN80, DR2S80	6000	4500	5000
DRN90	6000	3600	5000
DRN100	5200	3600	5000
DRN112	5000	3600	4500
DRN132S	5000	3600	4500
DRN132M/L	4500	3600	4500
DRN160	4500	3600	4500
DRN180	4000	3600	4000
DRN200	3500	2500[1)]	3500
DRN225	3100	2500[1)]	3100
DRN250	2600	2500	2600
DRN280	2600	2500	2600
DRN315	2500	2500	2500

1) For brakemotors with BE30 or BE32, refer to motor without brake

Brakemotors

Also observe the following points for brakemotors:

- The applicable drive selection regulations with regard to the braking work, see manual "Project Planning for BE.. Brakes – DR.., DRN.., DR2.., EDR.., EDRN.. AC Motors – Standard Brake/Safety Brake".
- Braking from speeds > 1800 min^{-1} is not permitted for brake sizes BE30 – BE122. Observe the project planning procedure and the application-specific maximum speeds for braking operations in the manual "Project Planning for BE.. Brakes – DR.., DRN.., DR2.., EDR.., EDRN.. AC Motors – Standard Brake/Safety Brake". Before activating the mechanical brake, use the controller to reduce the speed first.

Backstop

For motors with backstop, observe that the backstop can only be operated wear-free above its lift-off speed due to its operating principle. Observe chapter "Mechanical backstop" (→ 🗎 495).

Other motor options

Additional motor options influence these speeds. Contact SEW-EURODRIVE in such cases.

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5.13 Ventilation

Asynchronous motors from SEW-EURODRIVE are fan-cooled (IC code 411) as standard. The fan is attached to the rotor shaft at the B-side of the motor. The impellers of the fan wheels generate the same air flow, irrespective of the direction of rotation. The intensity of the air flow depends on the motor speed. This means that the cooling capacity of the motor fan decreases with lower motor speeds (e.g. FI-controlled drives). For this reason, the rated motor torque can be decreased at low speeds only with additional measures during continuous duty.

The forced cooling fan option is available as another ventilation option, see the chapter "Forced cooling fan" (→ 🗎 477). For this option, the fan wheel is removed from the rotor shaft and replaced by a cover with an integrated active fan. The forced cooling fan has to be supplied externally and thus is operation independent of the motor speed, see also chapter "Limit characteristic curves of the motors in inverter operation" (→ 🗎 136).

To fulfill different application-related requirements, the fan wheels can have different geometries and can be made of different materials. In the standard version, the motors are delivered with a plastic fan. They can be used in a temperature range of -20 °C to +60 °C. The technical data of the motors, e.g. the switching frequency or the inertia refer to the use of a plastic fan, see the chapter "Technical data of the motors" (→ 🗎 56).

As an alternative, the fan wheels can also be made of aluminum or gray cast iron. When using other fan wheel materials, the properties of the drive will change. Observe the relevant conditions during drive selection and project planning. For detailed information on the different fan options, refer to chapters "Aluminum fan" (→ 🗎 481), "Additional flywheel mass" (→ 🗎 482).

In addition to the various ventilated options, asynchronous motors from SEW-EURODRIVE can also be delivered non-ventilated. You can choose between a housing that is completely closed on the B-side and a design where the standard fan wheel is removed, see chapter "Non-ventilated motors" (→ 🗎 483). Consult SEW-EURODRIVE for the project planning of non-ventilated motors.

5.13.1 Fan wheel material

The impellers of the fan wheels are designed to create the same air flow independently of the direction of rotation.

To fulfill different application-related requirements, the fan wheels can have different geometries and can be made of different materials.

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5.14 Degrees of protection according to IEC 60034-5

In the standard version, the DRN.. AC motors are designed in degree of protection IP54 according to IEC 60034-5. Degrees of protection up to IP66 are available on request.

Instead, the motors can also be delivered in a basic design in IP44 degree of protection.

Drive selection

The required degree of protection must be selected with care. Otherwise, there is a risk of damage due to dirt particles or water entering the motor. In addition, there is the option to specifically protect the drive against corrosion as well as aggressive ambient conditions, see chapter "Surface and corrosion protection" (→ 🗎 493).

Definition of degrees of protection according to IEC 60034-5

First characteristic numeral		Second characteristic numeral	
	Brief description		**Brief description**
0	Unprotected machine	0	Unprotected machine
1	Machine protected against solid foreign objects > 50 mm	1	Machine protected against dripping water
2	Machine protected against solid foreign objects > 12 mm	2	Machine protected against dripping water at inclination of 15°
3	Machine protected against solid foreign objects > 2.5 mm	3	Machine protected against spraying water
4	Machine protected against solid foreign objects > 1 mm	4	Machine protected against splashing water
5	Machine protected against dust	5	Machine protected against water jets
6	Machine dust-tight	6	Machine protected against effects of rough seas
–	–	7	Machine protected when immersing
–	–	8	Machine protected when fully immersed

5.14.1 Labeling of degree of protection for global motors

SEW-EURODRIVE classifies the motor degrees of protection according to the international standard IEC 60034-5.

In North America, on the other hand, identification of a different degree of protection is used.

The degree of protection and the type of cooling are represented with an abbreviation made up of 4 letters. In the case of the global motor, SEW-EURODRIVE employs the following identifications and includes this information on the nameplate.

Abbreviation	English designation	German translation
TEFC	Totally Enclosed Fan Cooled	völlig geschlossen, lüftergekühlt
TEBC	Totally Enclosed Blower Cooled	völlig geschlossen, fremdlüftergekühlt
TENV	Totally Enclosed Non-Ventilated	völlig geschlossen, unbelüftet

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5.15 Vibration class and increased vibration stress

Irrespective of the mount-on components on the B-side, AC motors from SEW-EURODRIVE fulfill the requirements for achieving vibration class A according to DIN EN 60034-14. If special requirements for the mechanical running smoothness exist, motors without mount-on components (no brake, forced cooling fan, encoder, etc.) can be delivered in a low-vibration design in vibration class B. For this design, special measures for balancing the rotors are carried out.

For vibration classes A or B, the motor rotors are always dynamically balanced with a half key.

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5.15.1 Design for increased vibration stress

When installing the motors, make sure that the supports are even, the foot or flange mounting is solid and if there is direct coupling, align with precision. Avoid resonances between the rotational frequency and the double network frequency caused by the structure or the positioning of the motor.

If the installation of the drive cannot be ensured in accordance with the standard requirements by SEW-EURODRIVE, the motors can be delivered in a design for increased vibration stress.

Motors dimensioned for increased vibration stress achieve vibration stress level 1 (Vibration Level 1 = VL1). The values from the following table can be applied. The values are based on standardized information pursuant to DIN ISO 10816-1.

DRN.. motors

Motors	Periodic vibrations	Shock stress 1g = 9.81 m/s²
DRN63MS – 132S	Effective vibration speed ≤ 4.5 mm/s	Maximum acceleration = 10 g
DRN132M – 315H	Effective vibration speed ≤ 7.1 mm/s	Maximum acceleration = 15 g
DR2S63MS – 80M	Effective vibration speed	Maximum acceleration = 10 g

DR2S.. motors

If you require a drive for which the required values exceed the information for VL1, contact SEW-EURODRIVE.

The following design types and options for motors with increased vibration stress cannot be delivered:

Designation	Designation
Diagnostic unit for function and wear monitoring of the brake	/DUE
Built-in encoders	/EI7. and /EI8.
MOVIMOT®	/MM
MOVI-SWITCH®	/MSW
Plastic fan guard	/LN
Additional inertia mass (flywheel fan)	/Z
IEC foot-mounted motor[1)]	/FI
Motors according to VIK guideline	–
Thermal class 180 (H)	–
Ambient temperature T_{amb} > 60 °C	–
Safety brake	–
EDR../EDRN explosion-proof motors[2)]	

1) Can be delivered from DRN132M upwards
2) Can only be delivered upon consultation with SEW-EURODRIVE

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6 Dimension sheets for motors/brakemotors

6.1 Notes on the dimension sheets

Observe the following information regarding the dimension sheets:

- The collective term IV (= industrial plug connectors) in the dimension sheets includes the plug connectors AC.., AS.., AM.., AB.., AD.. and AK.. All other plug connectors have different dimensions, which are available on request.
- Not all cable entry positions X, 1, 2, 3 and terminal box positions 0°(R), 90°(B), 180°(L), 270°(T) are possible in any case. Some designs and options for the motor require a connection inside the terminal box, which means this terminal box is larger than the standard terminal box due to the normative air gaps and creepage distances. The dimension sheets depict only the standard terminal box.
- The terminal box of size 56 and 63 motors is encapsulated at the stator. This means the cable entry is always at the "X" and "2" position.
- Different positions are possible for the manual brake release, see following figure. The 4 positions 33°, 123°, 213° or 303° are basically possible. By default, the manual brake release is positioned at an angle of 303° to the terminal box – e.g., terminal box position 90° → position of manual brake release = 33°. If the position of the manual brake release is not specified, it rotates along with the terminal box. The manual brake release can be turned by 4 × 90°.

For more information on possible brake release positions, refer to the chapter "Manual brake release" (→ 🗎 307).

Due to the selection of specific designs and options, the dimensions of the motor can differ from the standard design. Observe the associated dimension sheets.

Observe the information in the order confirmation from SEW-EURODRIVE for special designs.

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6.1.1 Geometric tolerances

Shaft heights

The following tolerances apply to the indicated dimensions:

h	≤ 250 mm	→ -0.5 mm
h	> 250 mm	→ -1 mm

Shaft ends

Diameter tolerance:

Ø	≤ 28 mm	→ ISO j6
Ø	≤ 50 mm	→ ISO k6
Ø	> 50 mm	→ ISO m6

Center bores according to DIN 332, shape DR:

Ø	> 13 – 16 mm	→ M5	Ø	> 30 – 38 mm	→ M12
Ø	> 16 – 21 mm	→ M6	Ø	> 38 – 50 mm	→ M16
Ø	> 21 – 24 mm	→ M8	Ø	> 50 – 85 mm	→ M20
Ø	> 24 – 30 mm	→ M10			

Keys: according to DIN 6885 (domed type)

Flanges

Centering shoulder tolerance:

Ø	≤ 250 mm (flange sizes FF100 – FF265)	→ ISO j6
Ø	> 250 mm (flange sizes FF300 – FF600)	→ ISO h6

Different flange dimensions are available for each motor and brakemotor size. The respective dimension sheets show the flanges per size defined in the normative size-to-power relationship according to DIN EN 50347.

6.1.2 Lifting eyebolts, lifting eyes

Motors up to size 100LS are delivered without special transportation fixtures.

Motors of size ≥ 100LM are equipped with removable lifting eyebolts.

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6.1.3 Motor dimensions

Safety covers

Encoders ES7. and AS7. (DRN80M to 132S, DR2S80M) as well as EG7. and AG7. (DRN132M to 280M) are equipped with a protection device as standard to prevent any damage.

This protection is implemented in the form of a safety cover. The encoder safety cover of motor sizes DRN80M to DRN280M has the same diameter as the fan guard.

Second shaft end

For DRN71M – 132S and DR2S71M – 80M motors, the standard design of the 2nd shaft end is shown.

Second shaft ends are available as alternative for these motor sizes, see the chapter "Second shaft end (B-side)" (→ 🗎 459).

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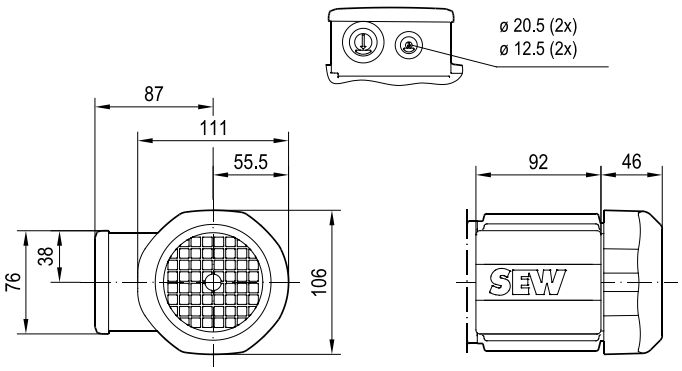
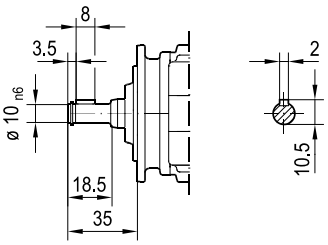
6.2 Dimension sheets for DRN.., DR2S..

DR2S56M 4
DR2S56MR 4

08 131 01 19
1(1)





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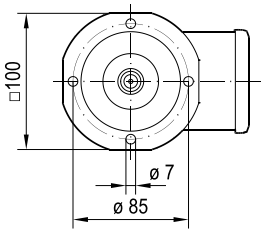

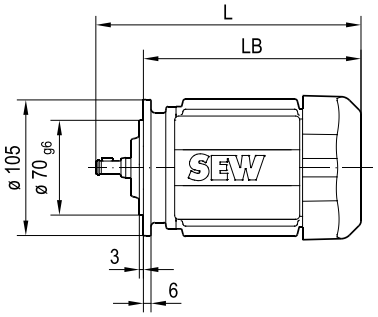

(→ 📖)	56M(R)							
L	196							
LB (B5/B14)	161							
LB (B3)	-							

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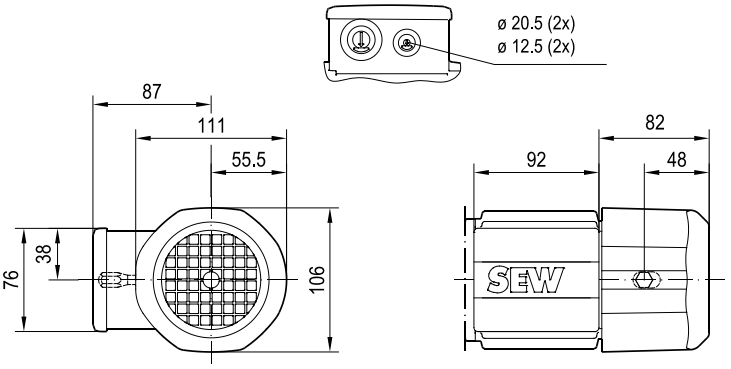
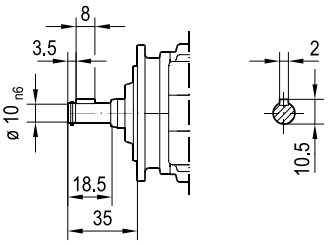
DR2S56M BE 4
DR2S56MR BE 4

09 149 01 19
1(1)





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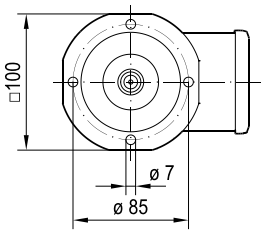

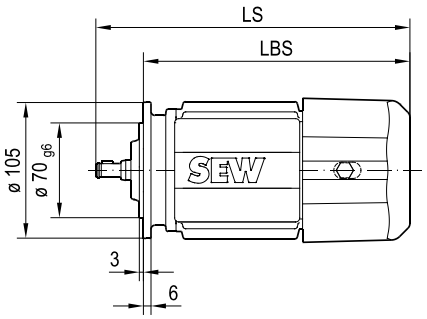

(→ 📖)	56M(R)							
LS	232							
LBS (B5/B14)	197							
LBS (B3)	-							

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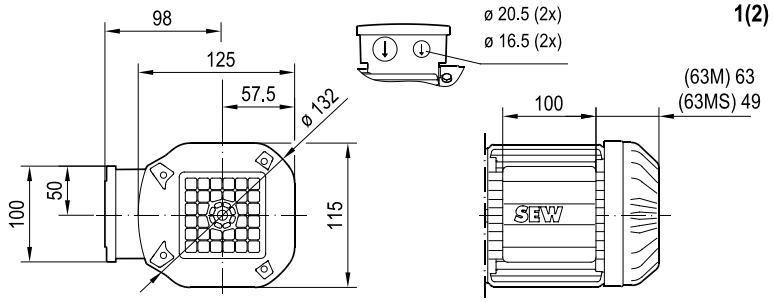
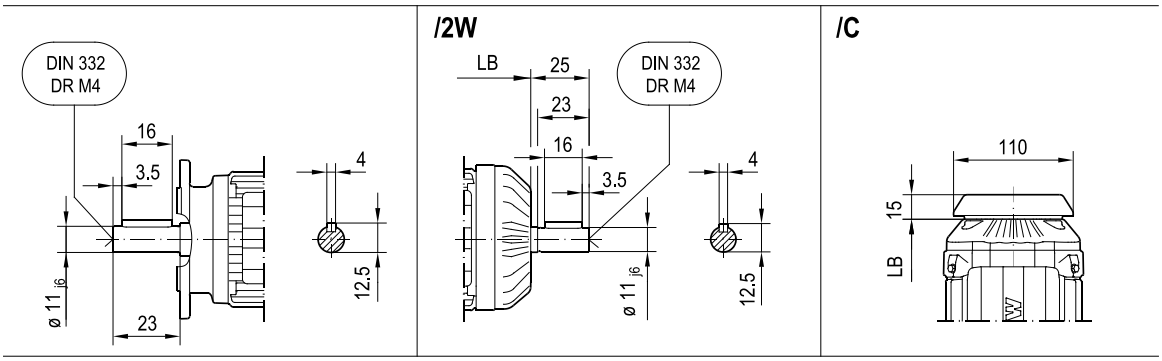
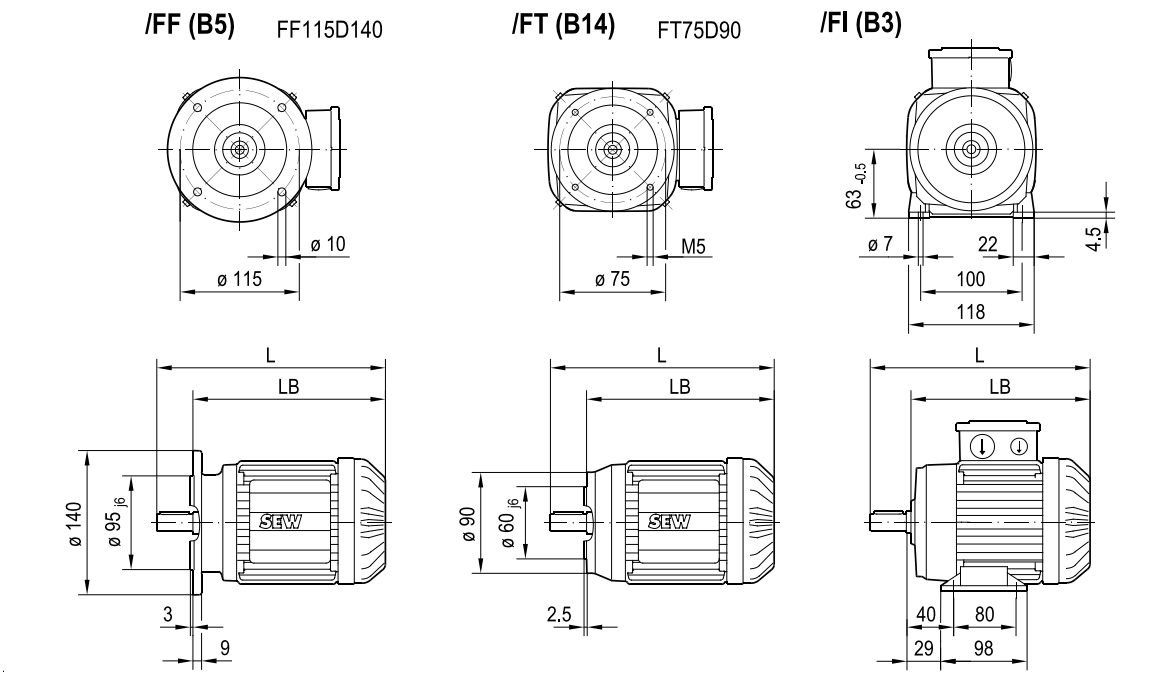
DRN63MS 2,4
DR2S63MS 2,4
DR2S63MSR 2,4
DRN63M 2,4,6
DRN63MR 6
DR2S63MR 6
DR2S63MQ 6

08 095 01 18
1(2)







(→ 📖)	63MS(R)	63M(R/Q)						
L	208	222						
LB (B5/B14)	185	199						
LB (B3)	183	197						

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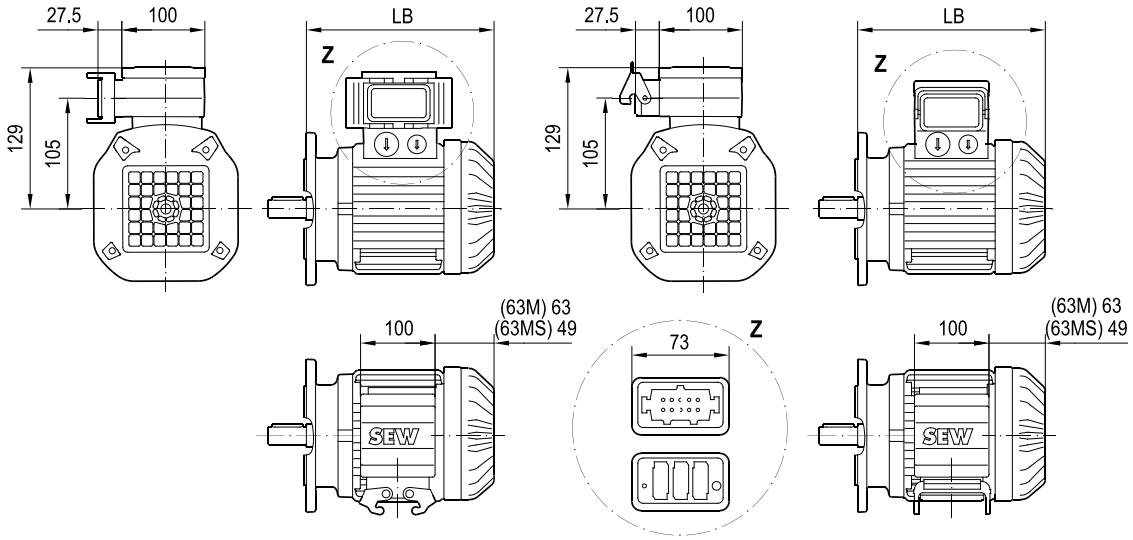
08 095 01 18
2(2)

/IV



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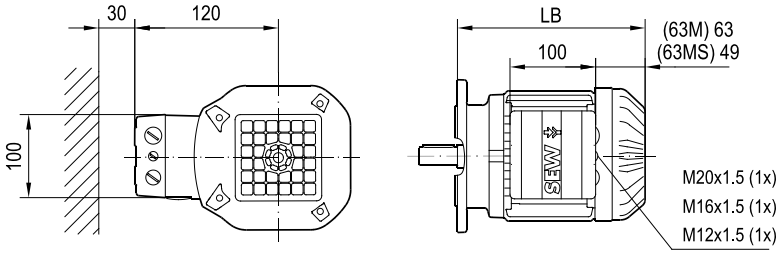

(→ 📖)	63MS(R)	63M(R/Q)						
L	208	222						
LB (B5/B14)	185	199						
LB (B3)	183	197						

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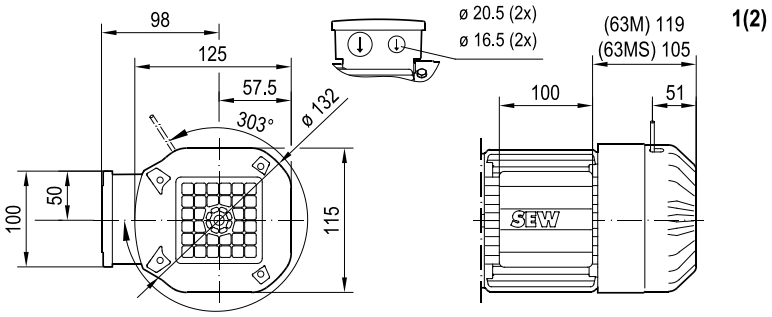
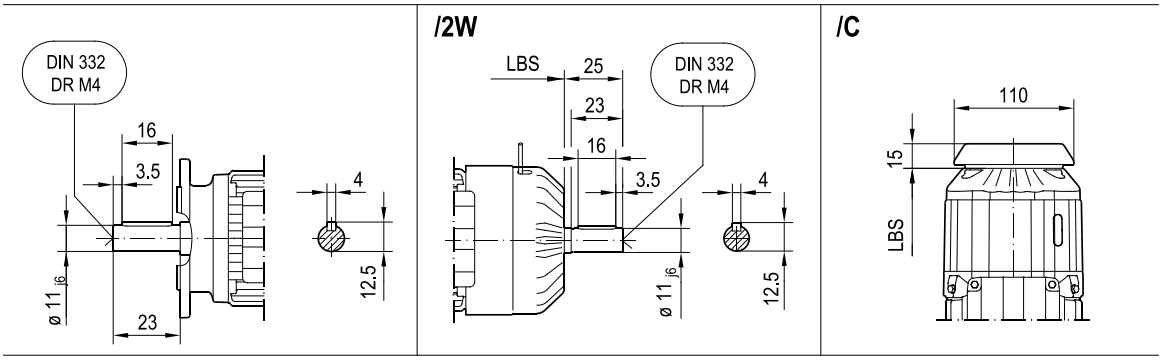
DRN63MS BE 2,4
DR2S63MS BE 2,4
DR2S63MSR BE 2,4
DRN63M BE 2,4,6
DRN63MR BE 6
DR2S63MR BE 6
DR2S63MQ BE 6

09 113 01 18
1(2)





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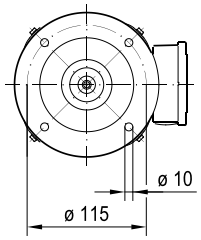

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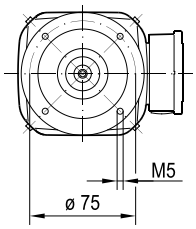

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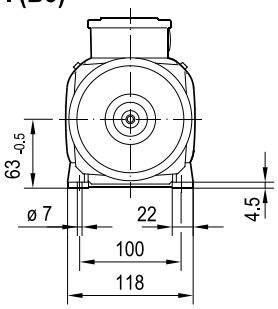
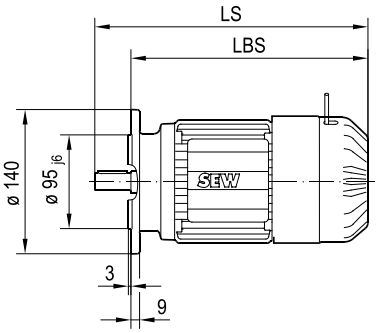
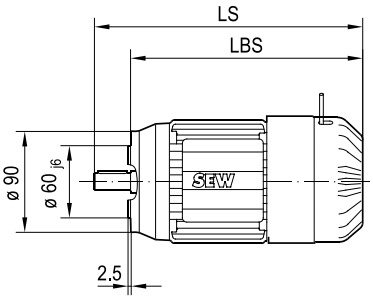
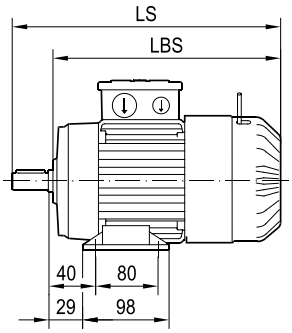




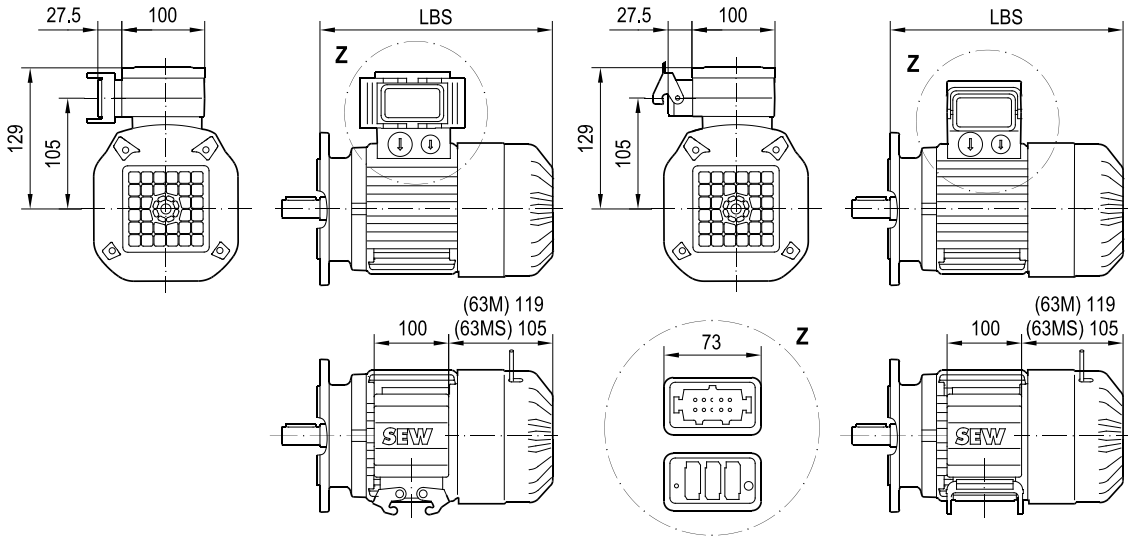




(→ 📖)	63MS(R)	63M(R/Q)						
LS	264	278						
LBS (B5/B14)	241	255						
LBS (B3)	239	253						

09 113 01 18
2(2)

/IV



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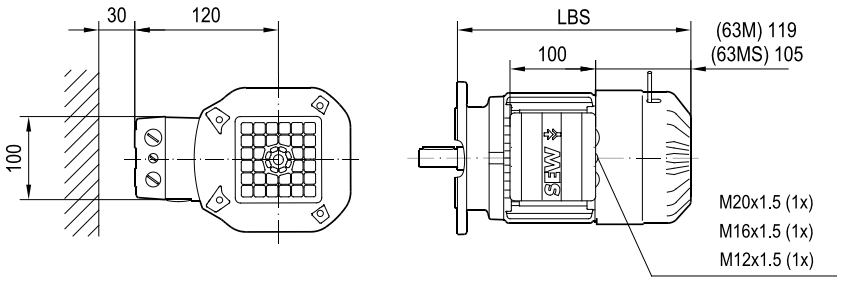

(→ 📖)	63MS(R)	63M(R/Q)						
LS	264	278						
LBS (B5/B14)	241	255						
LBS (B3)	239	253						

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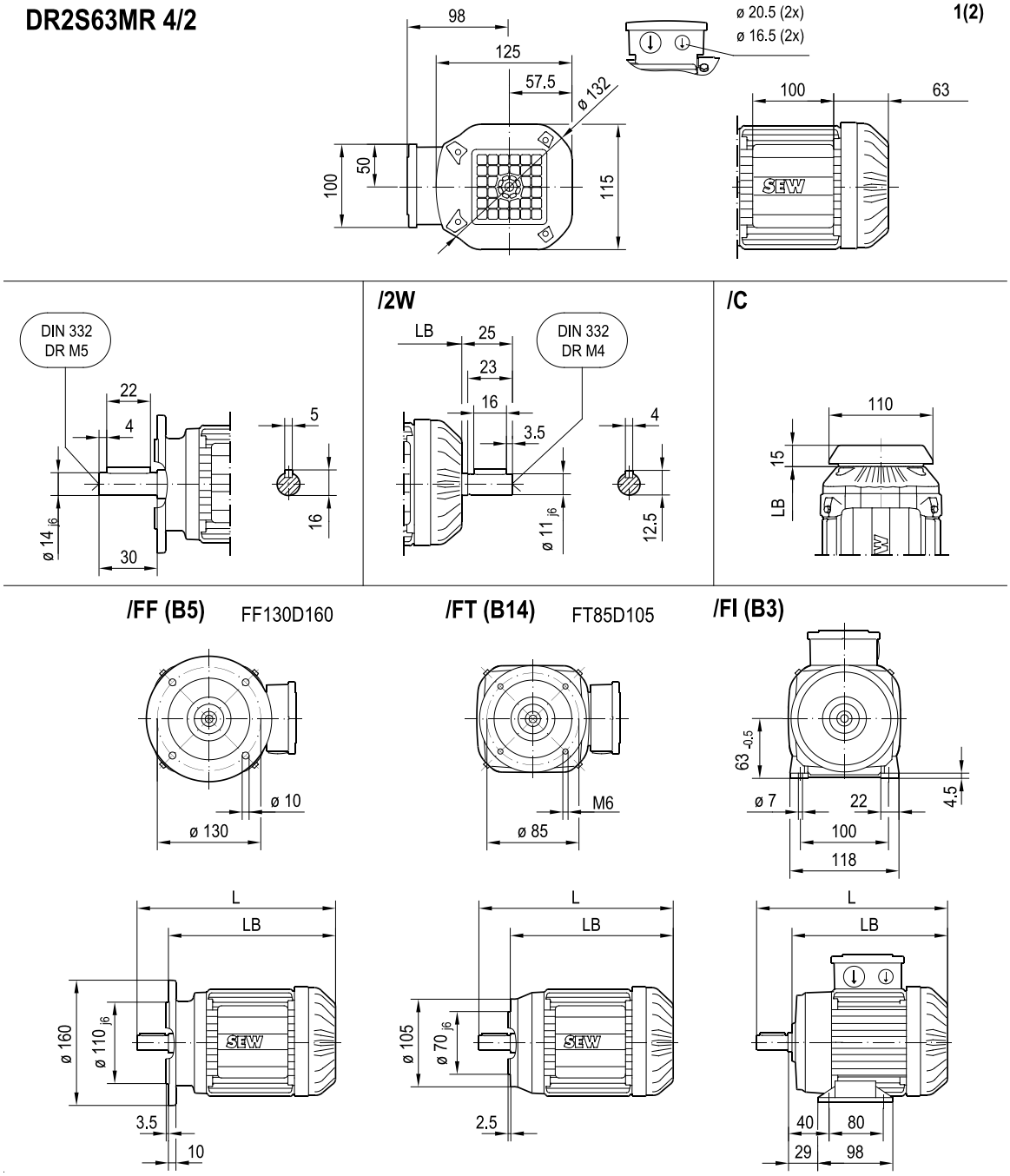
DR2S63M 2,4,6,4/2
DR2S63MR 4/2

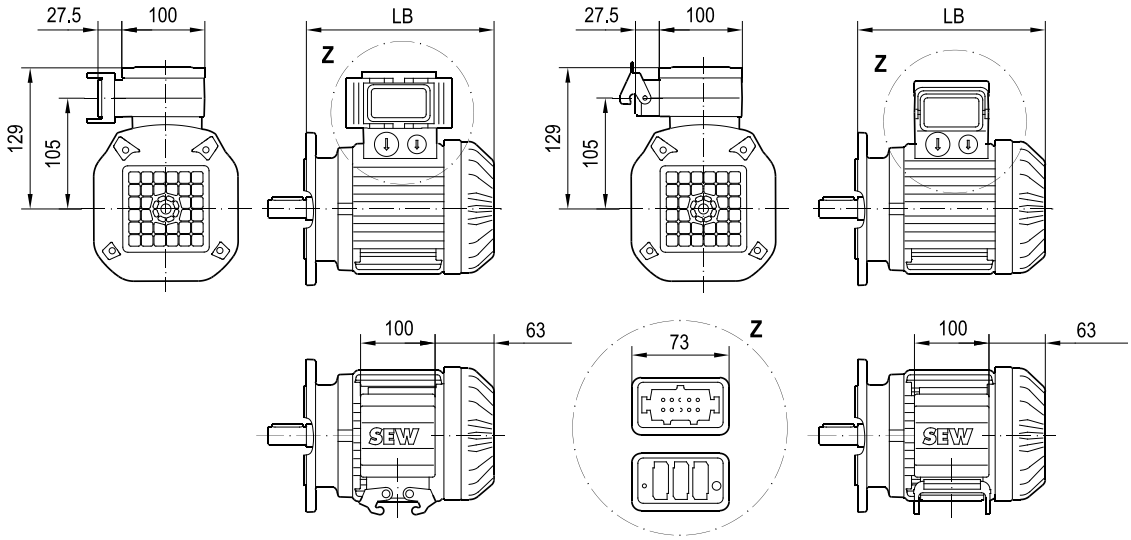
08 103 01 18
1(2)



(→ 📖)	63M(R)							
L	229							
LB (B5/B14)	199							
LB (B3)	197							

08 103 01 18
2(2)

/IV



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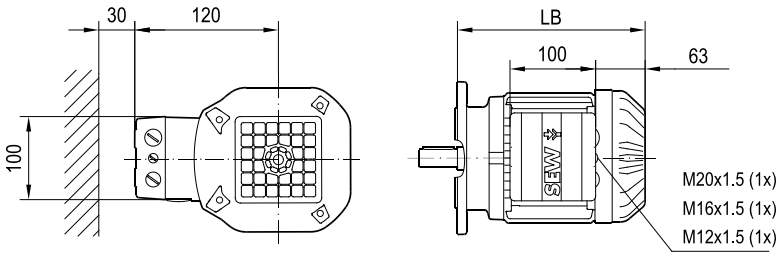

(→ 📖)	63M(R)							
L	229							
LB (B5/B14)	199							
LB (B3)	197							

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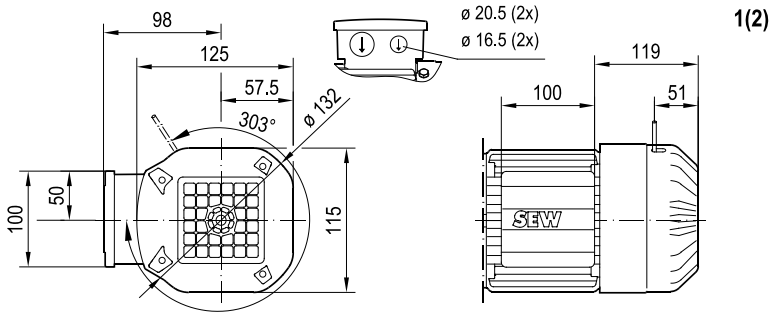
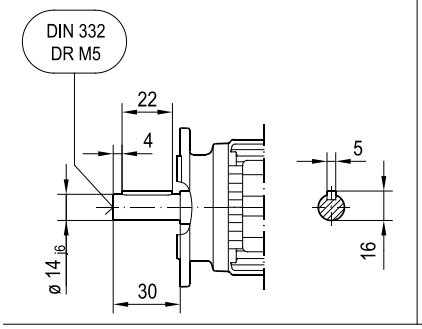
DR2S63M BE 2,4,6,4/2
DR2S63MR BE 4/2

09 118 01 18
1(2)





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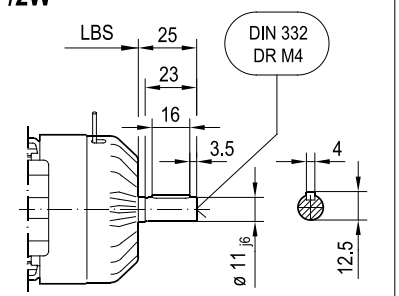

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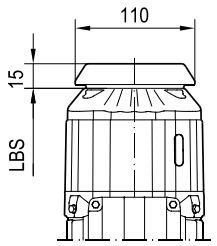

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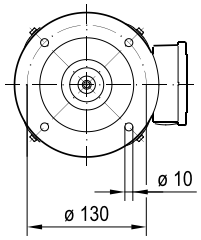

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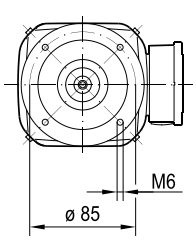

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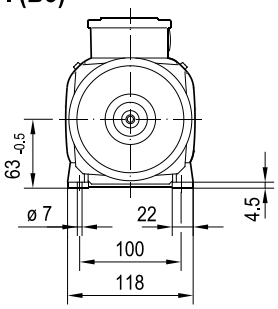

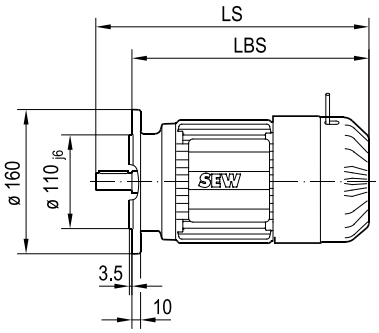

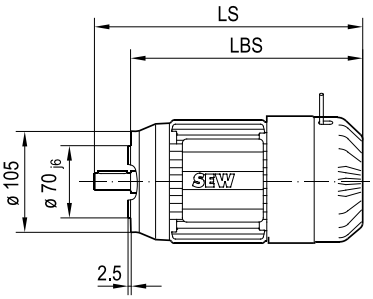

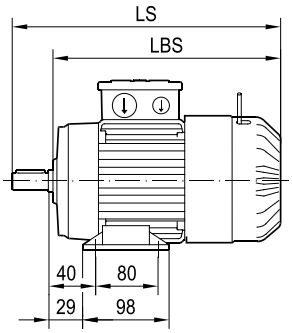

(→ 📖)	63M(R)							
LS	285							
LBS (B5/B14)	255							
LBS (B3)	253							

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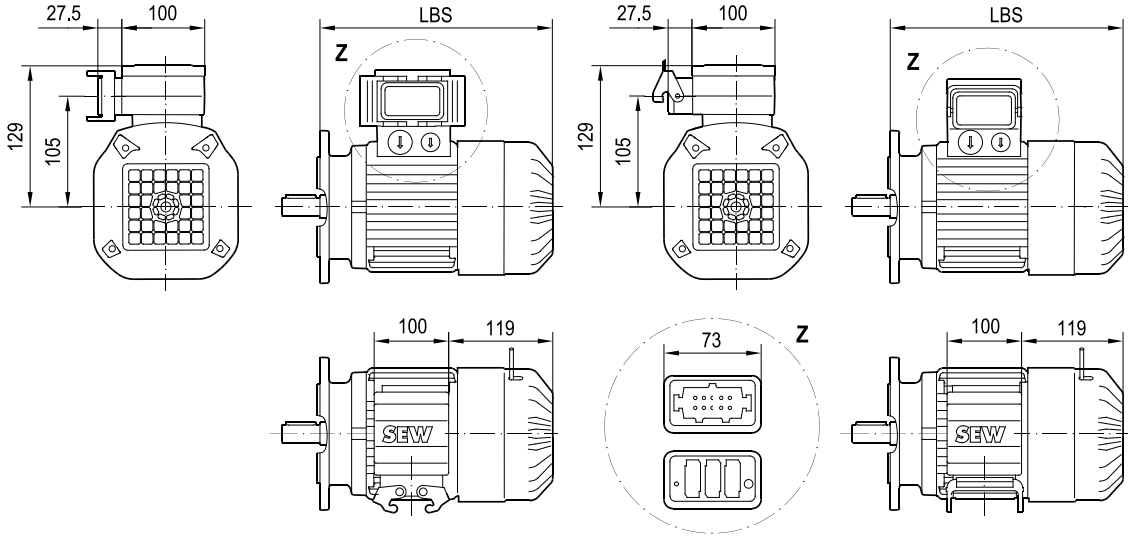
09 118 01 18
2(2)

/IV



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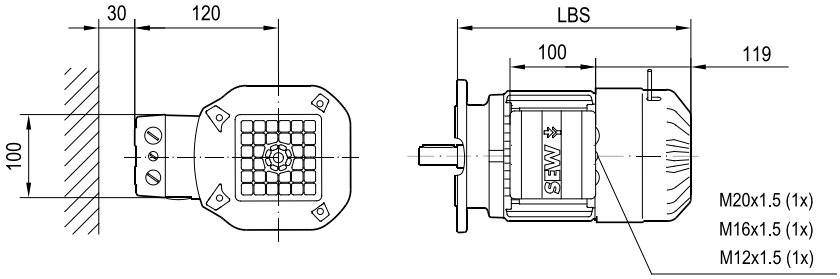

(→ 📖)	63M(R)							
LS	285							
LBS (B5/B14)	255							
LBS (B3)	253							

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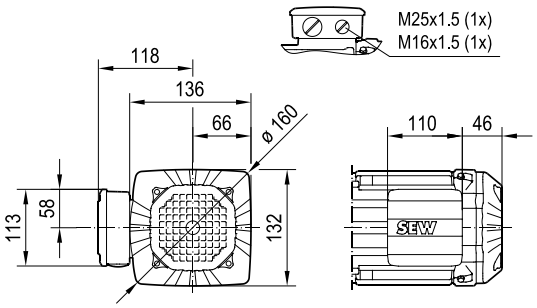
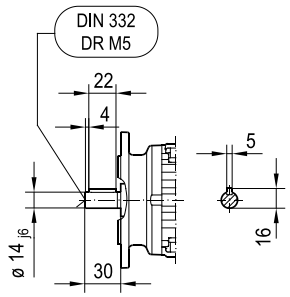
DRN71MS 2,4,6,8
DRN71MSR 8
DR2S71MS 4,6,4/2,8/2,8/4
DR2L71MS 4
DR2M71MS 12
DRN71M 2,4,6
DR2S71MR 2

08 092 01 18
1(2)





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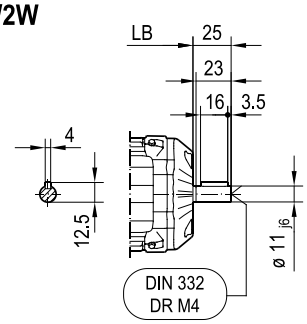

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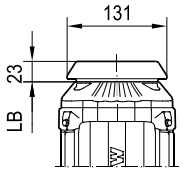

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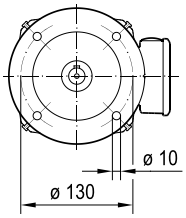

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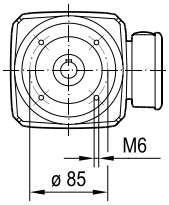

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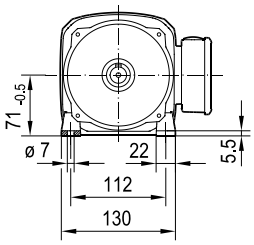

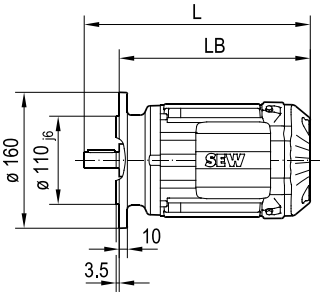

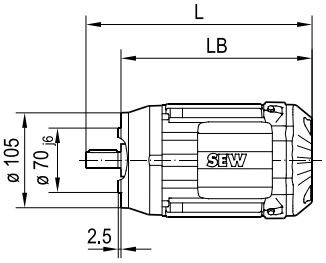

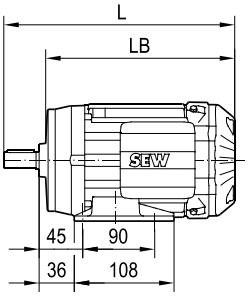

(→ 📖)	71MS(R)	71M(R)						
L	232	252						
LB (B5/B14)	202	222						
LB (B3)	200	220						

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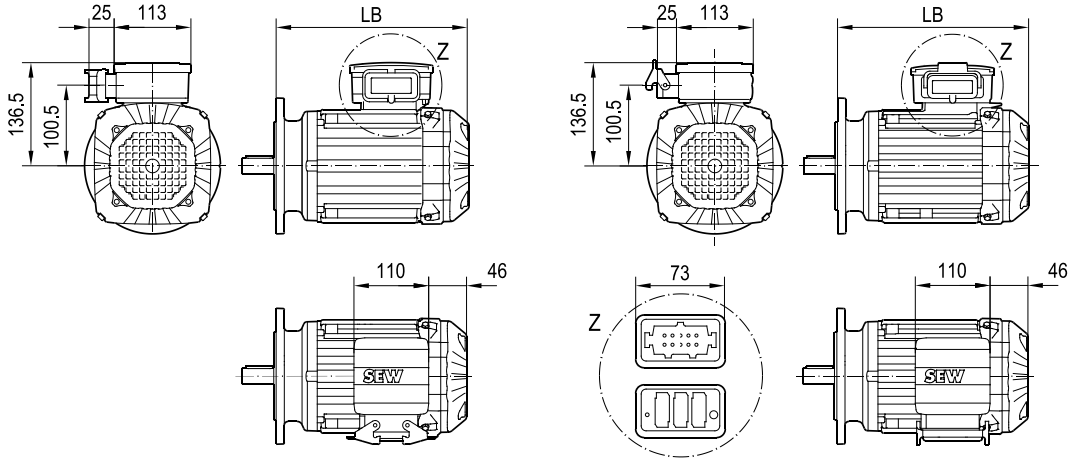
08 092 01 18
2(2)

/IV



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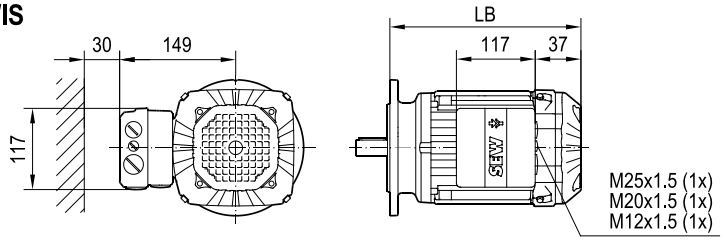

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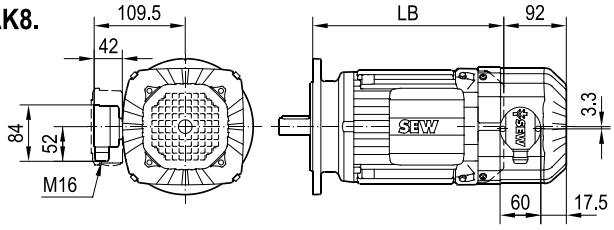

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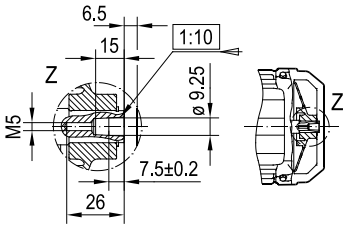

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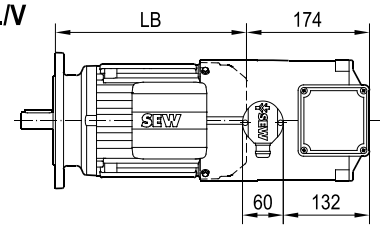

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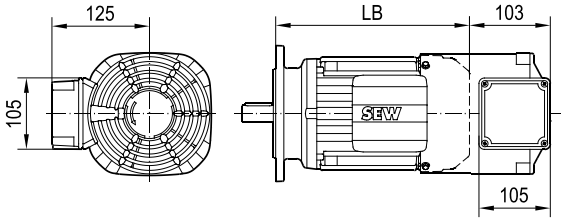

(→ 📖)	71MS(R)	71M(R)						
L	232	252						
LB (B5/B14)	202	222						
LB (B3)	200	220						

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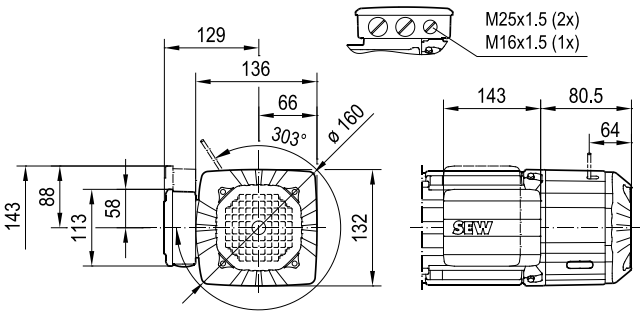
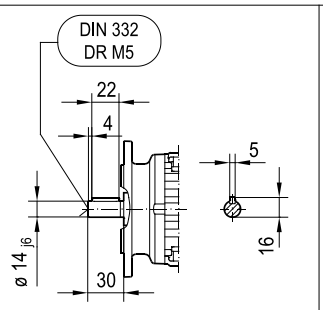
DRN71MS BE 2,4,6,8
DRN71MSR BE 8
DR2S71MS BE 4,6,4/2,8/2,8/4
DR2L71MS BE 4
DR2M71MS BE 12
DRN71M BE 2,4,6
DR2S71MR BE 2

09 110 01 18
1(2)





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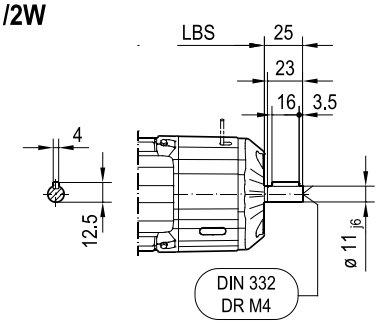

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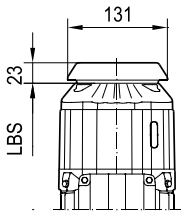

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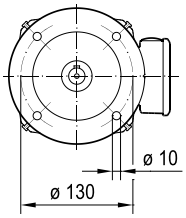

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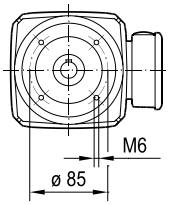

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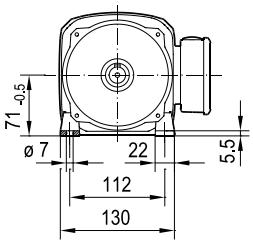
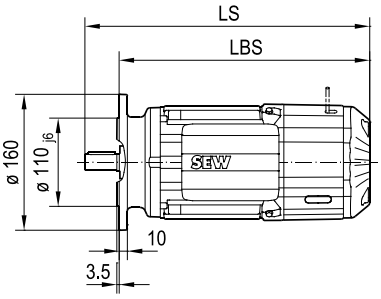
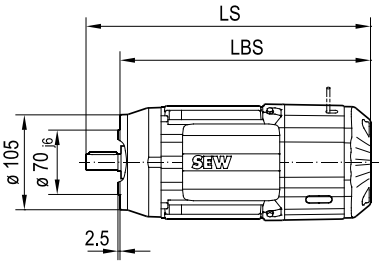
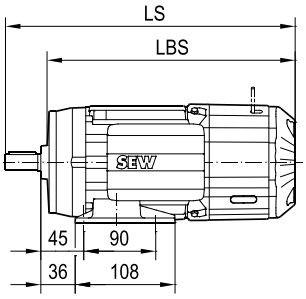




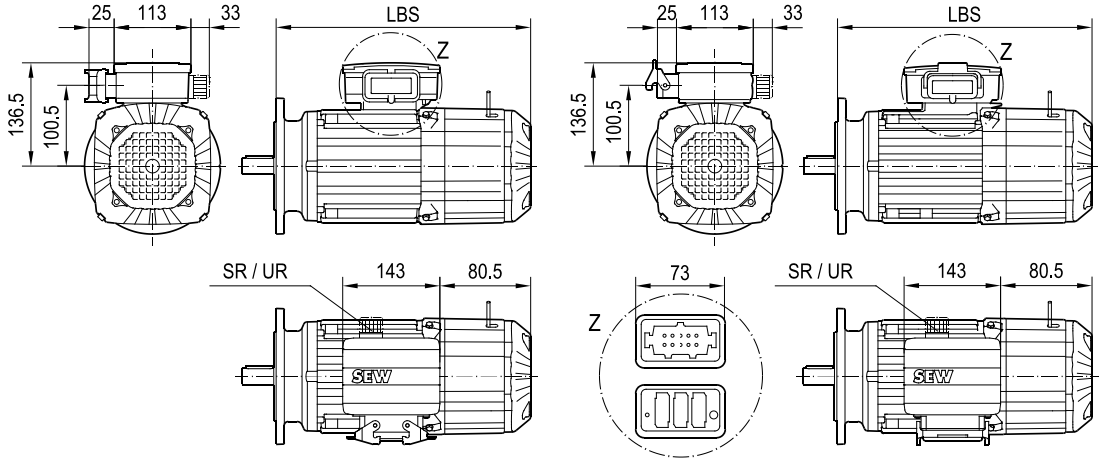




(→ 📖)	71MS(R)	71M(R)						
LS	299	319						
LBS (B5/B14)	269	289						
LBS (B3)	267	287						

09 110 01 18
2(2)

/IV



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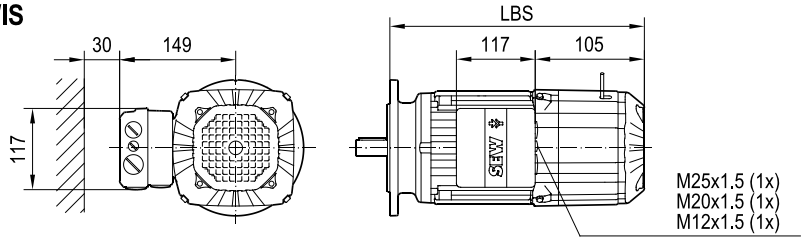

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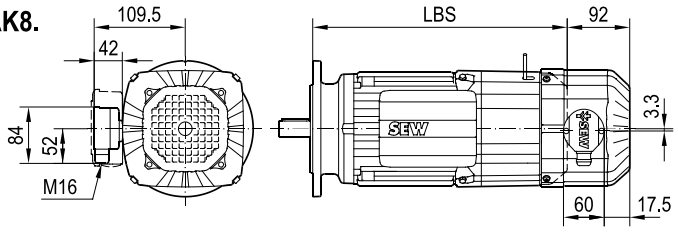
/AK8.



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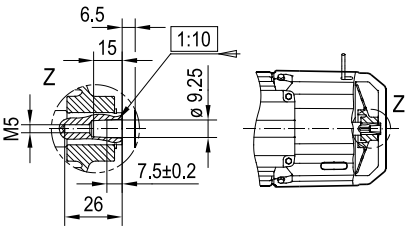

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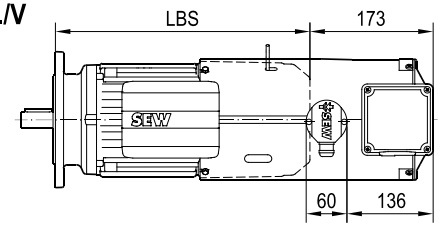
/AK8./V



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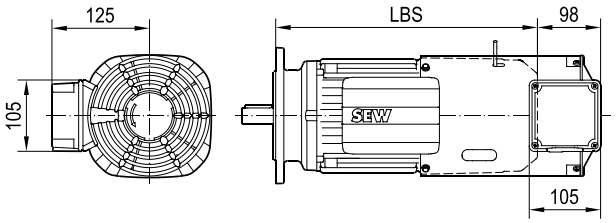

(→ 📖)	71MS(R)	71M(R)						
LS	299	319						
LBS (B5/B14)	269	289						
LBS (B3)	267	287						

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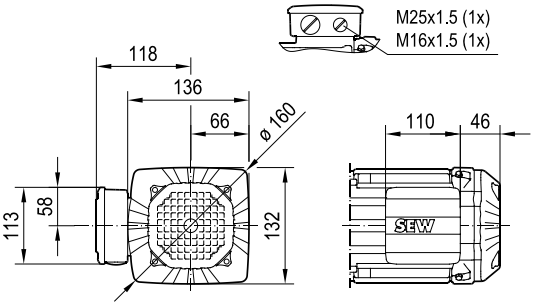
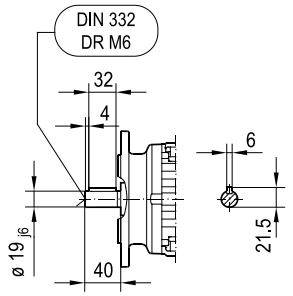
DR2S71M 2,4,6,4/2,8/2,8/4
DR2L71M 4
DR2M71M 12

08 104 01 18
1(2)





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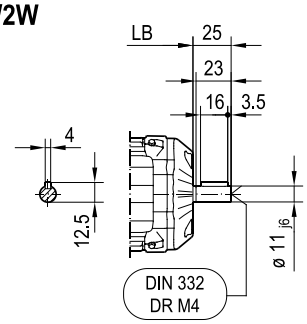

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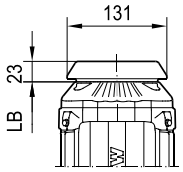

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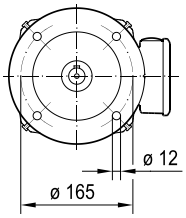

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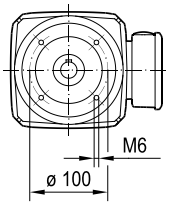

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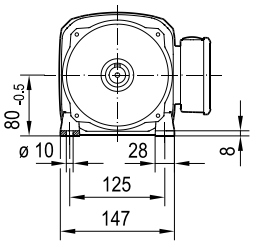

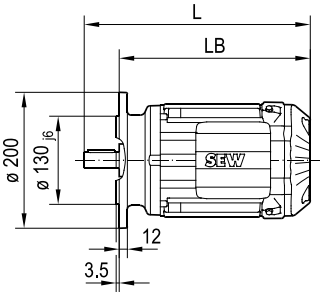

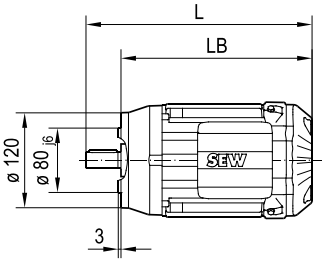

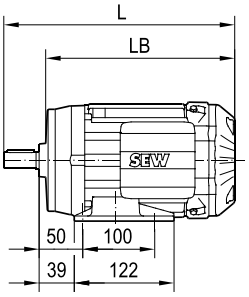

(→ 📖)	71M							
L	262							
LB (B5/B14)	222							
LB (B3)	220							

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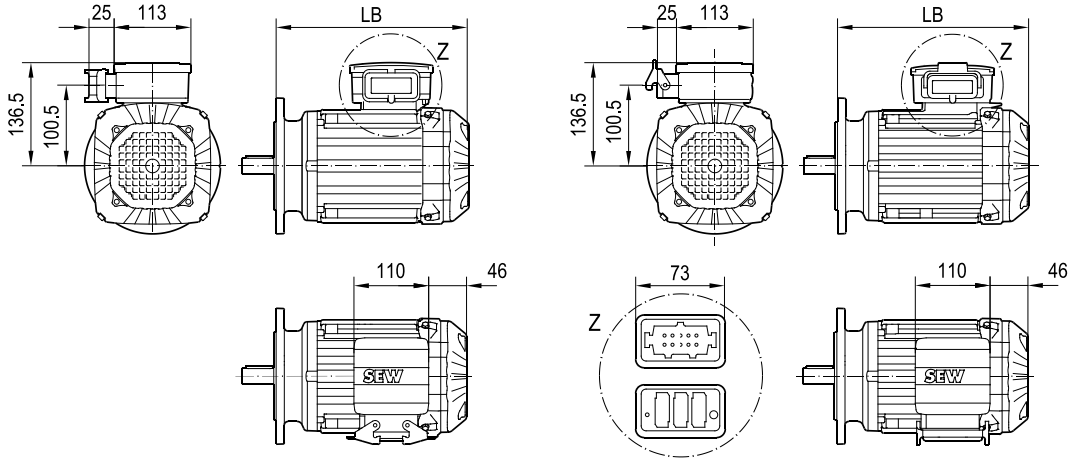
08 104 01 18
2(2)

/IV



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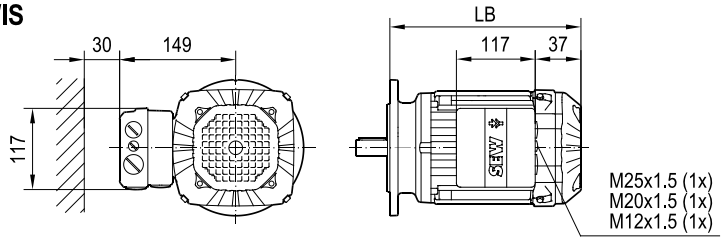

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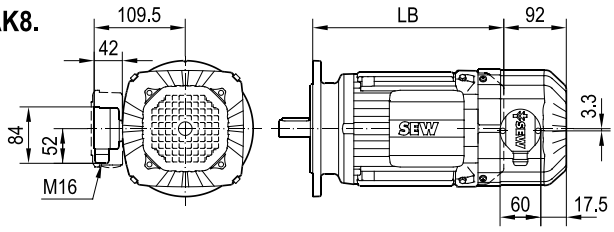

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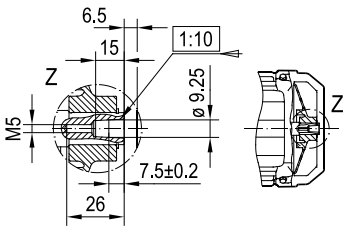

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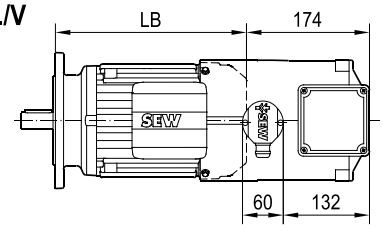
/AK8./V



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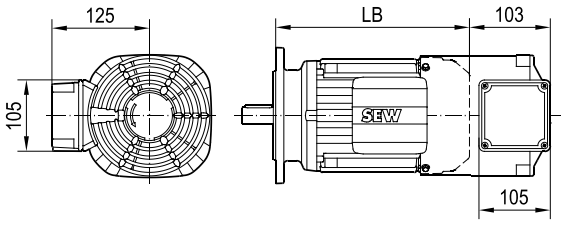

(→ 📖)	71M							
L	262							
LB (B5/B14)	222							
LB (B3)	220							

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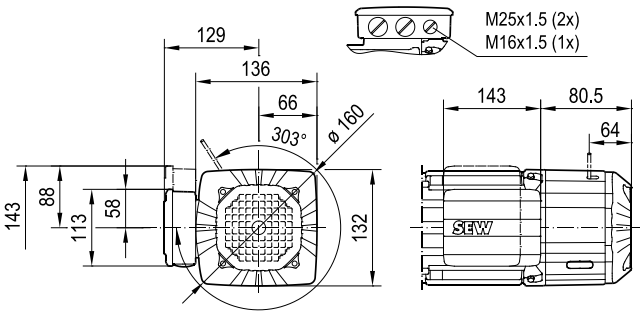
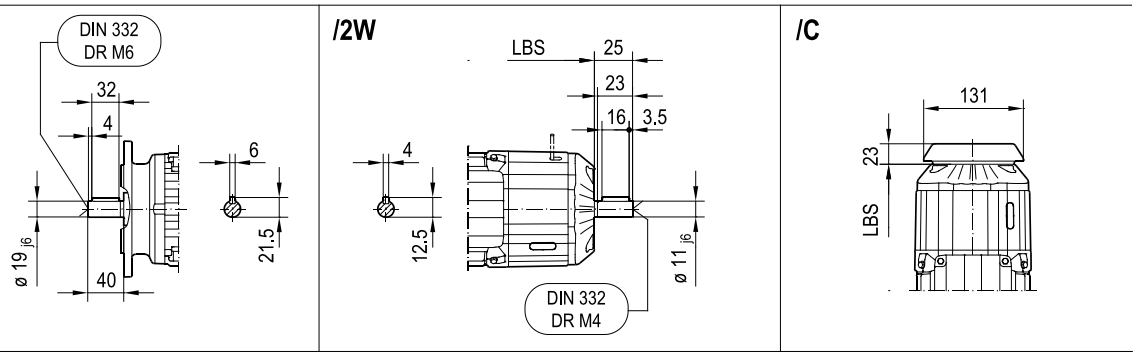
DR2S71M BE 2,4,6,4/2,8/2,8/4
DR2L71M BE 4
DR2M71M BE 12

09 119 01 18
1(2)





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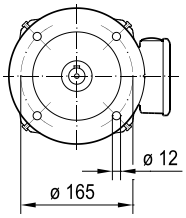

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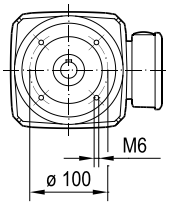

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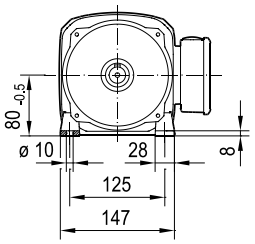
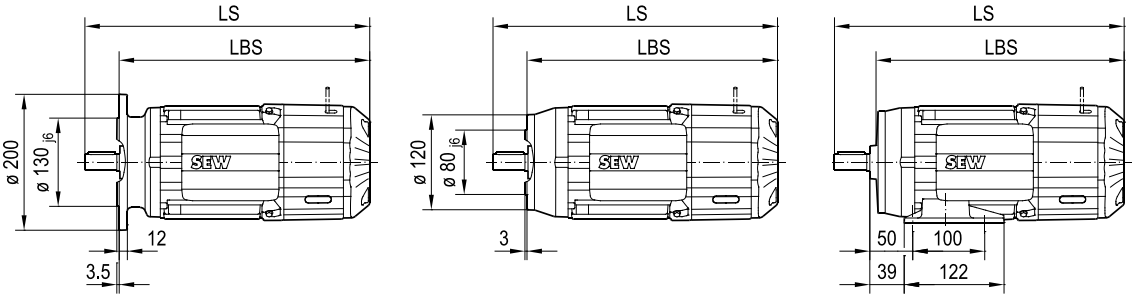
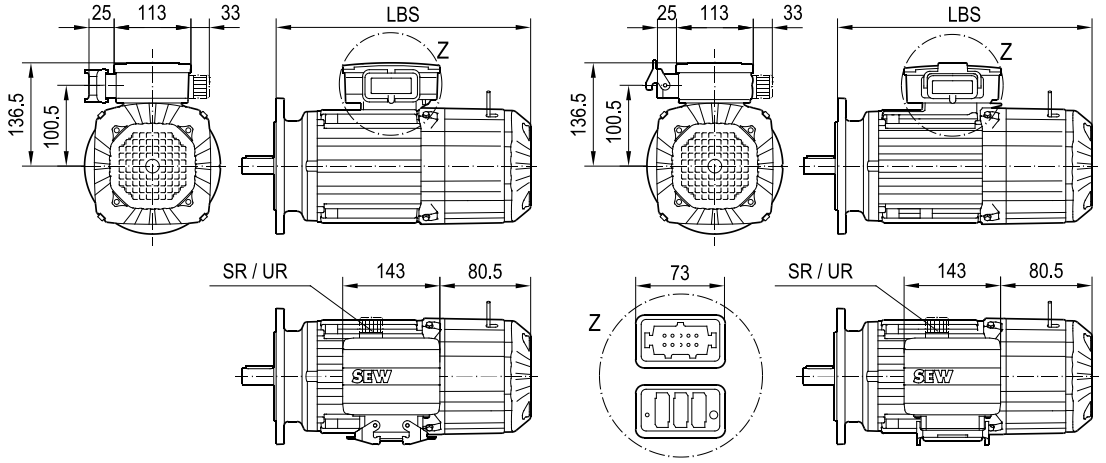




(→ 📖)	71M							
LS	329							
LBS (B5/B14)	289							
LBS (B3)	287							

09 119 01 18
2(2)

/IV



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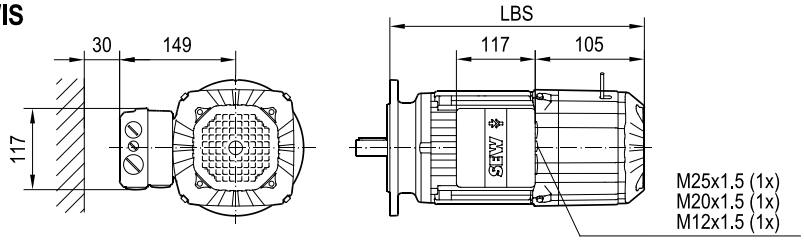

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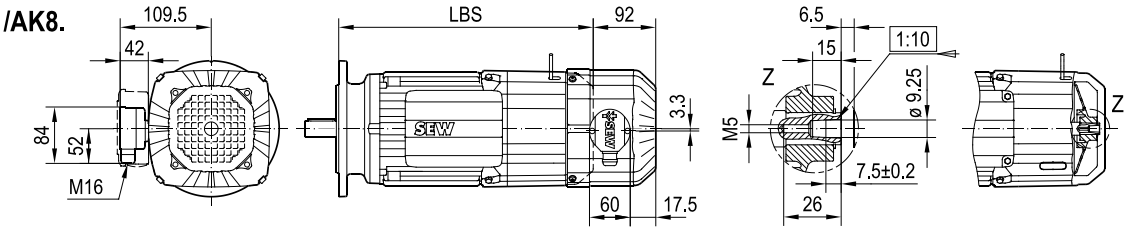
/EK8A



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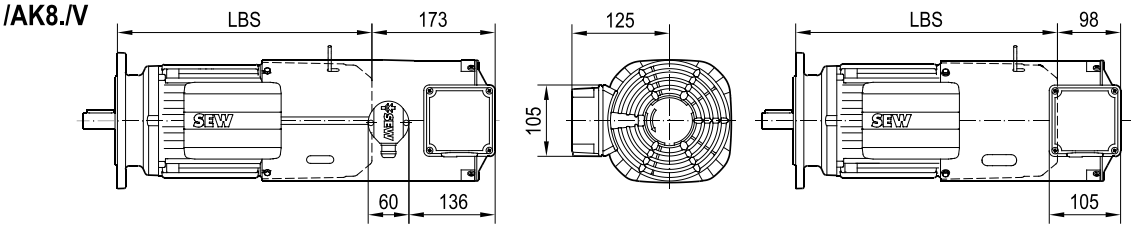

(→ 📖)	71M							
LS	329							
LBS (B5/B14)	289							
LBS (B3)	287							

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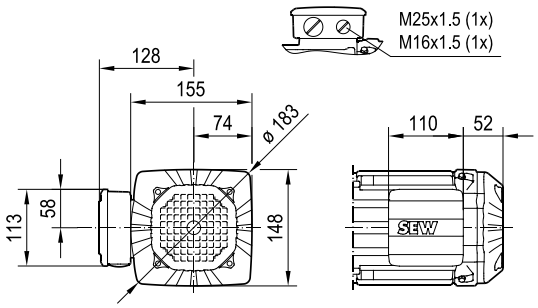
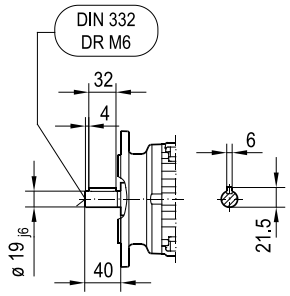
DRN80MK 4,6,8
DR2S80MK 4,6
DR2L80MK 4
DRN80MS 2
DR2S80MS 8/2,8/4
DRN80M 2,4,8

08 094 01 18
1(2)





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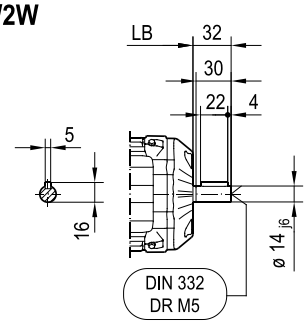

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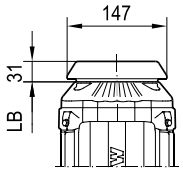

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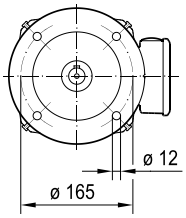

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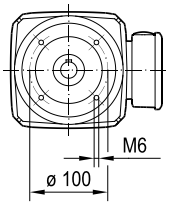

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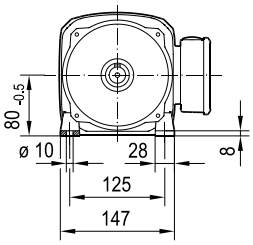

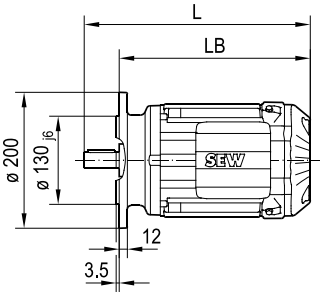

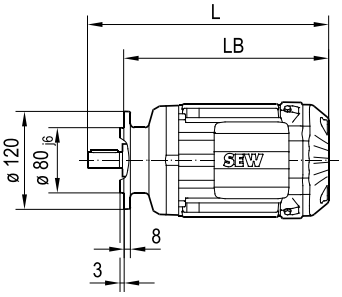

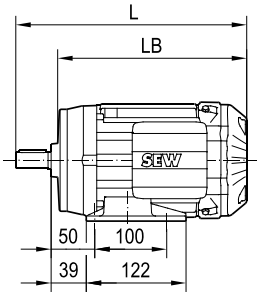

(→ 📖)	80MK	80MS	80M					
L	281	299	327					
LB (B5/B14)	241	259	287					
LB (B3)	239	257	285					

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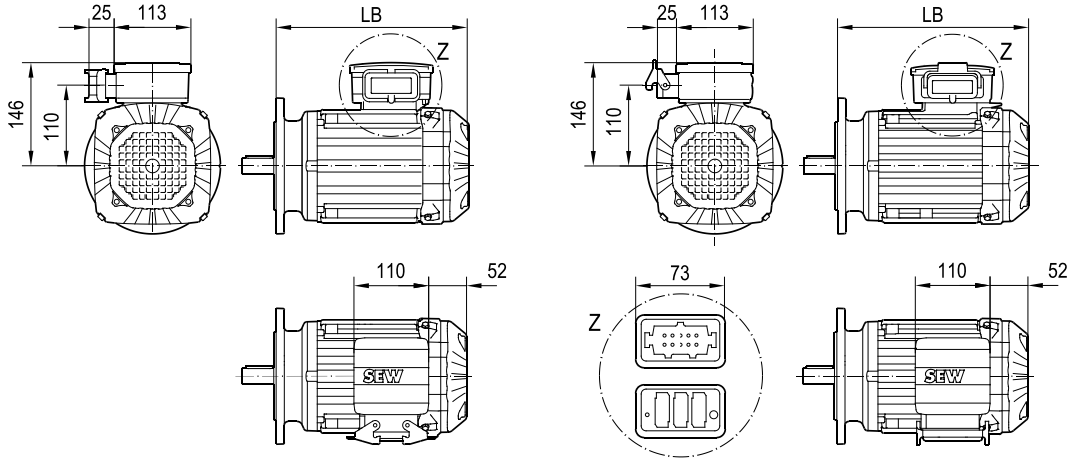
2(2)

/IV



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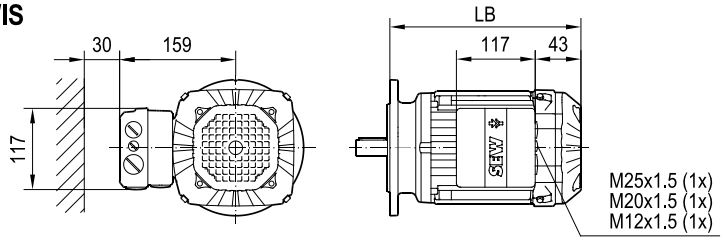

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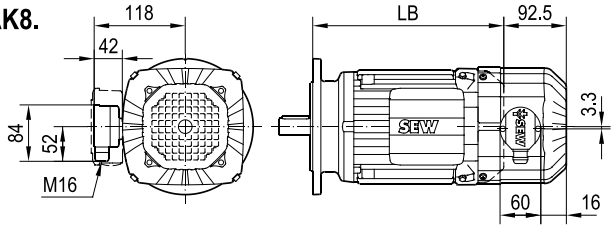

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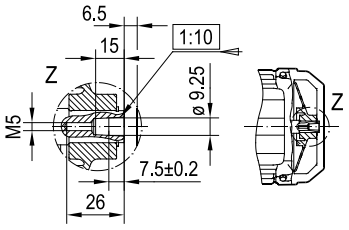

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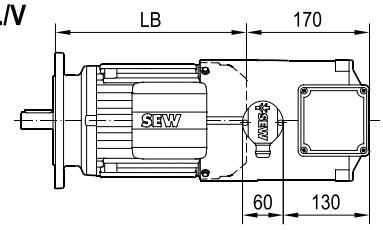

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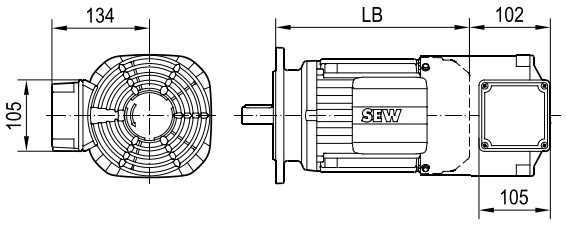

(→ 📖)	80MK	80MS	80M					
L	281	299	327					
LB (B5/B14)	241	259	287					
LB (B3)	239	257	285					

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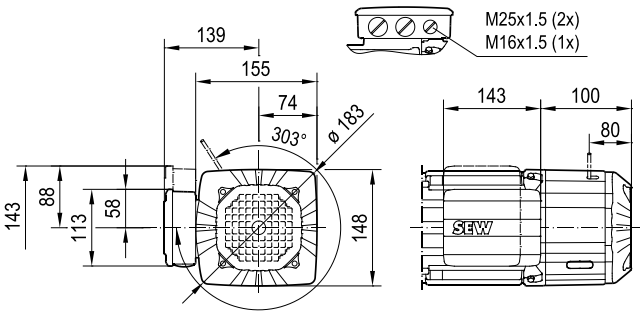
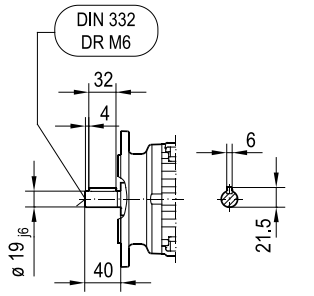
DRN80MK BE 4,6,8
DR2S80MK BE 4,6
DR2L80MK BE 4
DRN80MS BE 2
DR2S80MS BE 8/2,8/4
DRN80M BE 2,4,8

09 112 01 18
1(2)





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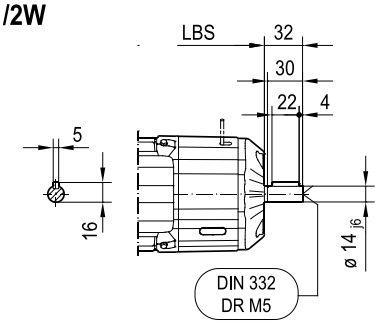

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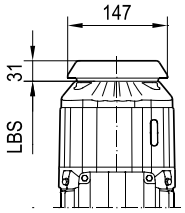

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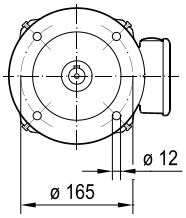

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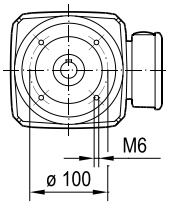

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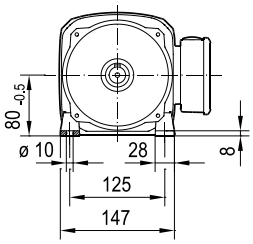

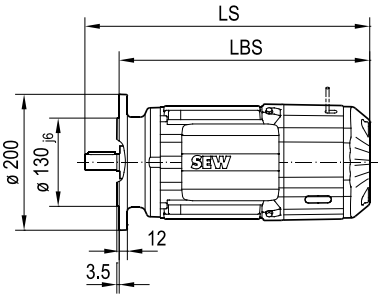

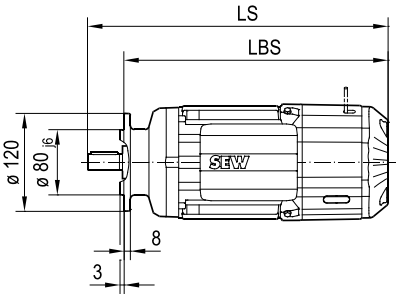

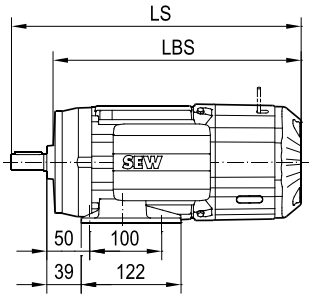

(→ 📖)	80MK	80MS	80M					
LS	362	380	408					
LBS (B5/B14)	322	340	368					
LBS (B3)	320	338	366					

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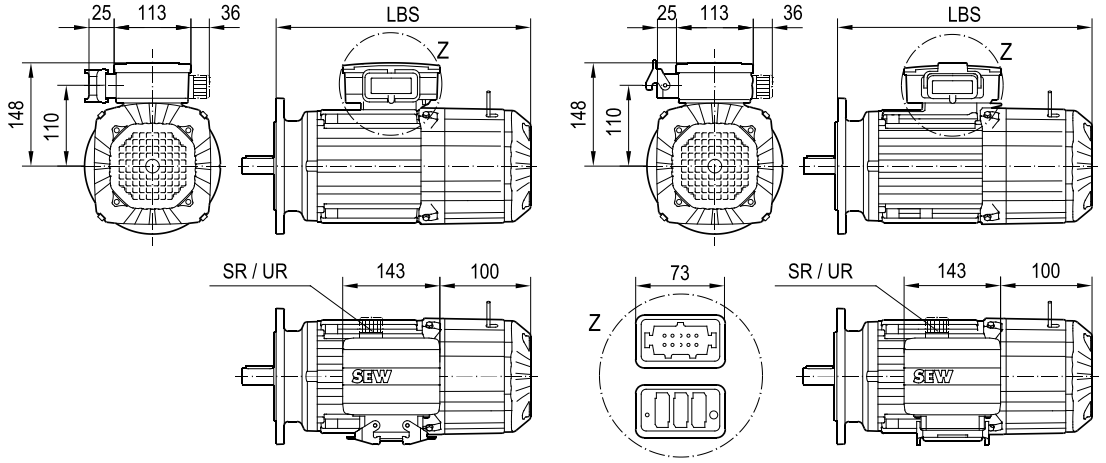
2(2)

/IV



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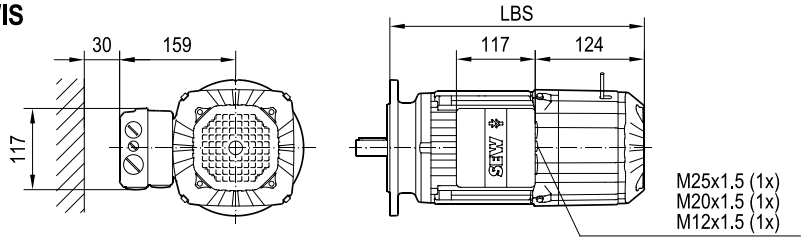

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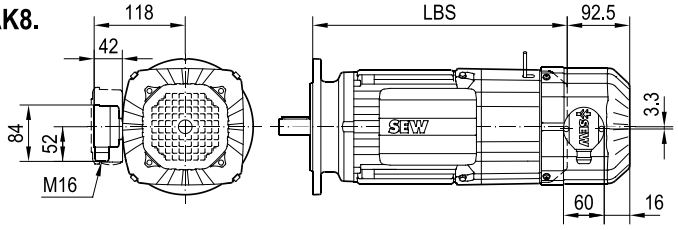

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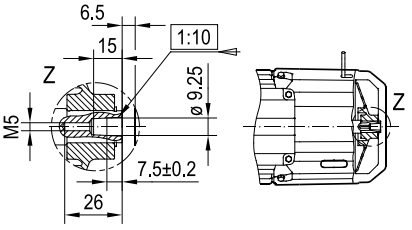

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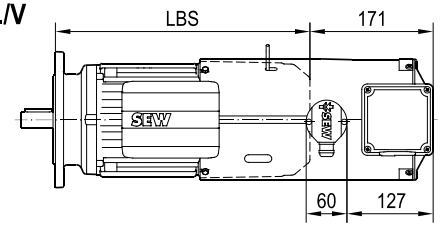

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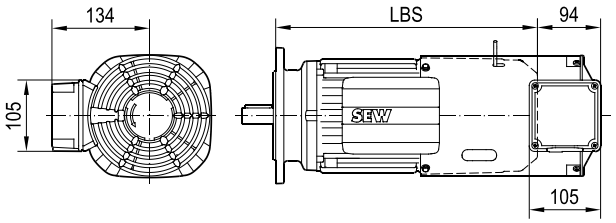

(→ 📖)	80MK	80MS	80M					
LS	362	380	408					
LBS (B5/B14)	322	340	368					
LBS (B3)	320	338	366					

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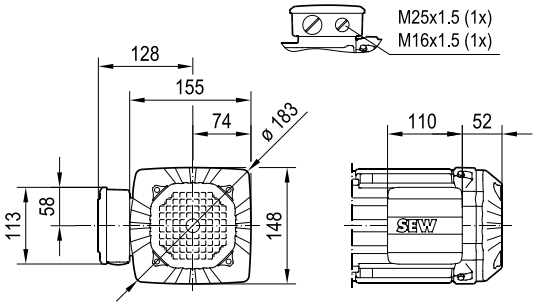
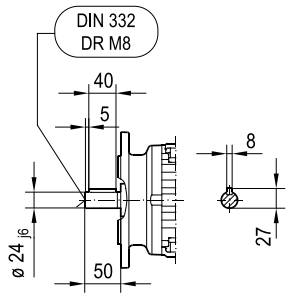
DR2S80M 2,4,4/2,8/2
DR2L80M 4

08 105 01 18
1(2)





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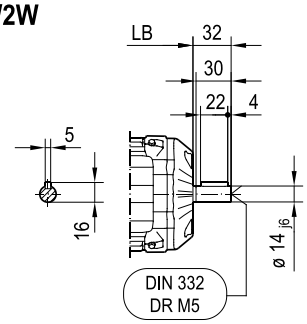

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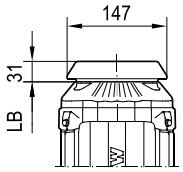

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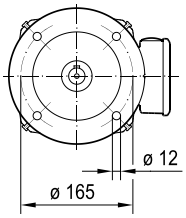

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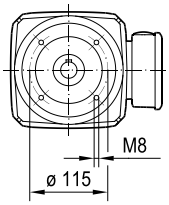

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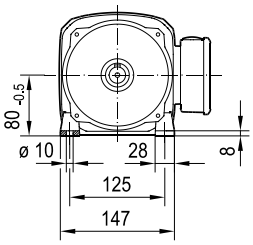

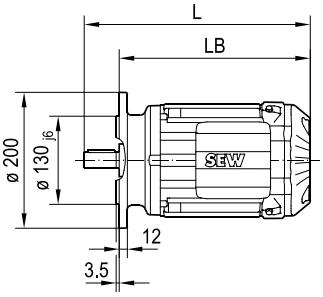

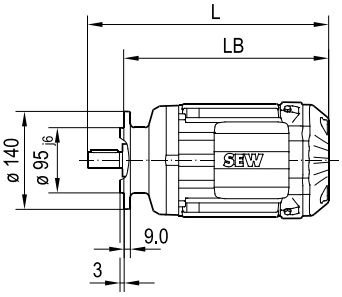

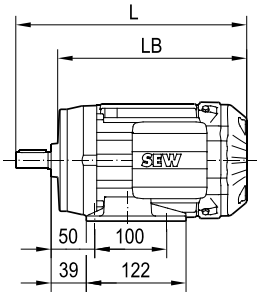

(→ 📖)	80M							
L	337							
LB (B5/B14)	287							
LB (B3)	285							

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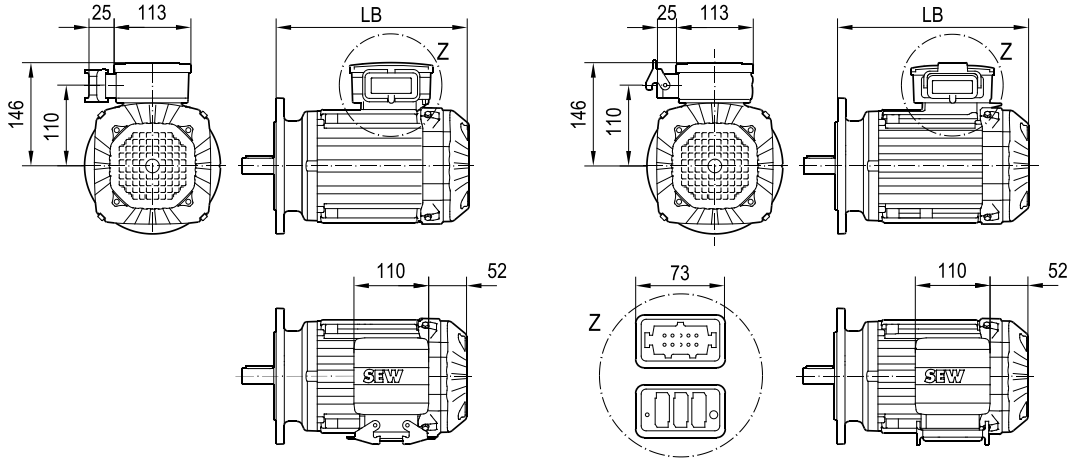
2(2)

/IV



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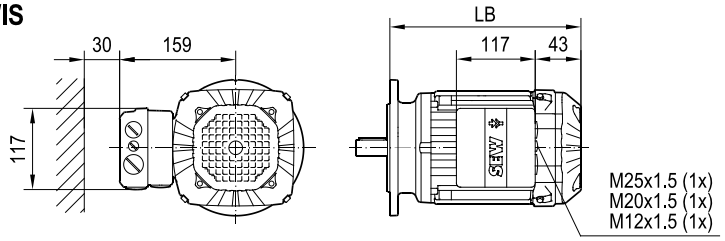

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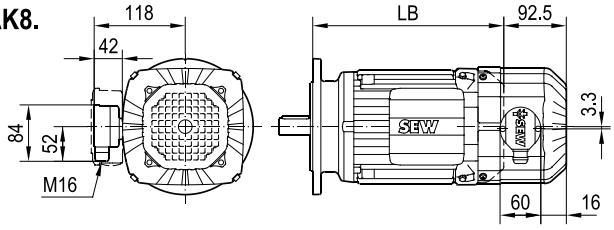

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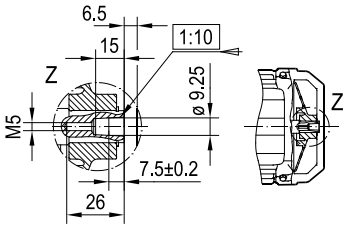

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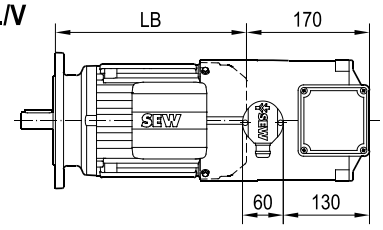

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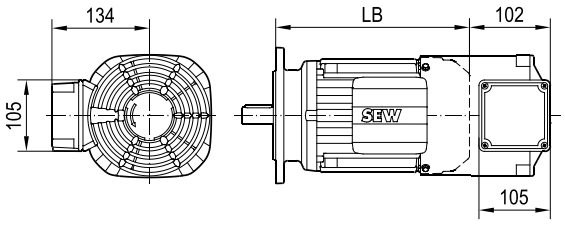

(→ 📖)	80M							
L	337							
LB (B5/B14)	287							
LB (B3)	285							

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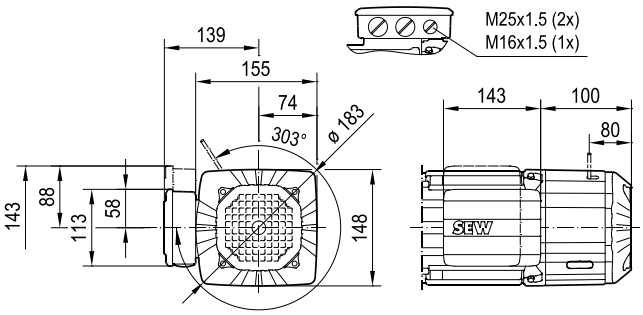
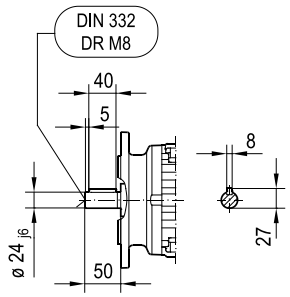
DR2S80M BE 2,4,4/2,8/2
DR2L80M BE 4

09 120 01 18
1(2)





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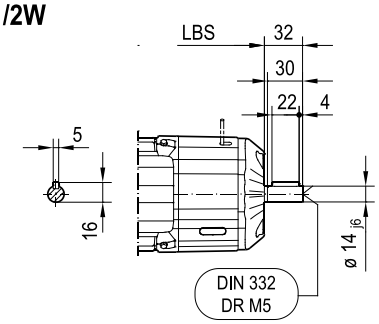

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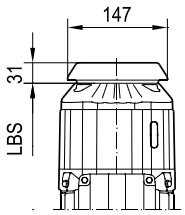

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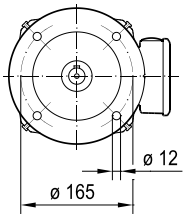

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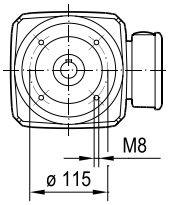

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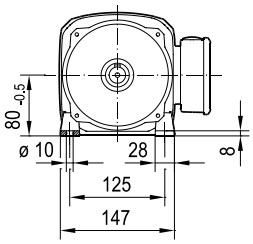

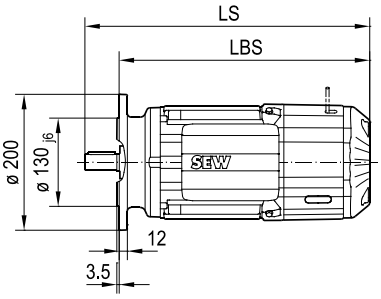

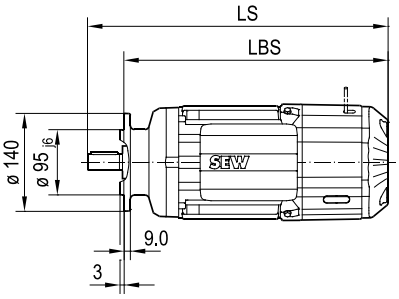

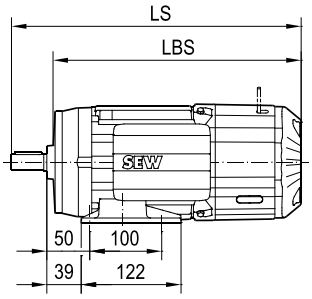

(→ 📖)	80M							
LS	418							
LBS (B5/B14)	368							
LBS (B3)	366							

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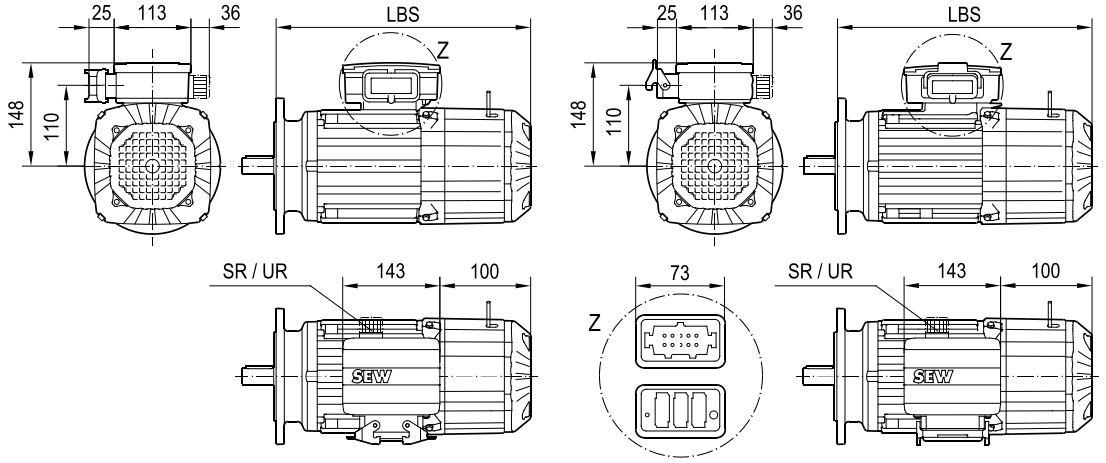
09 120 01 18
2(2)

/IV



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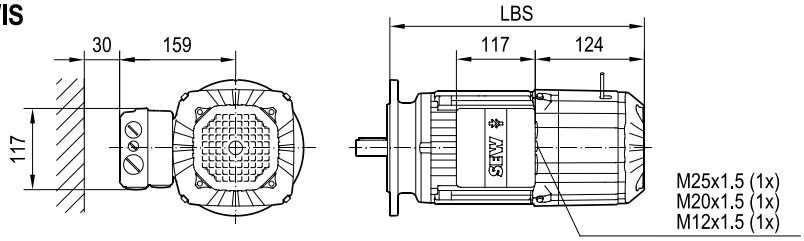

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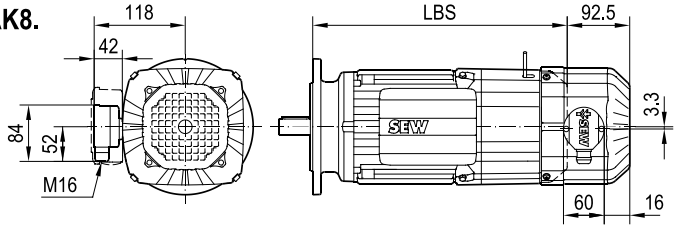

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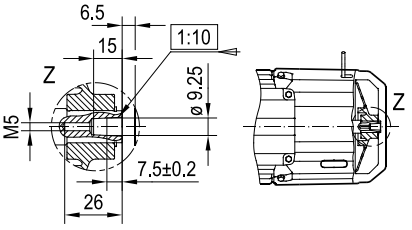

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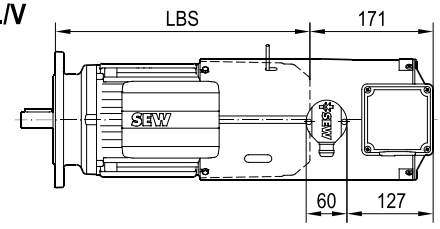
/AK8./V



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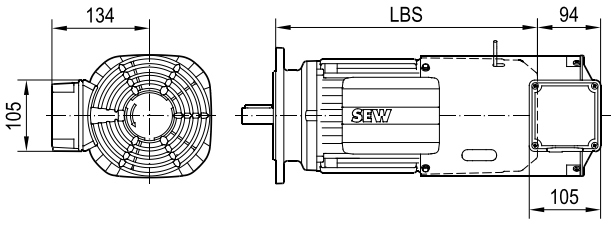

(→ 📖)	80M							
LS	418							
LBS (B5/B14)	368							
LBS (B3)	366							

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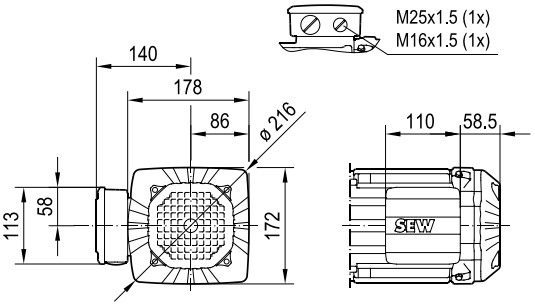
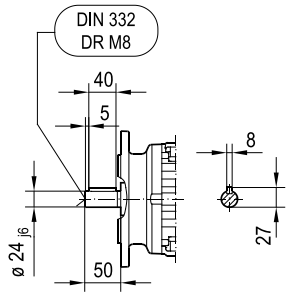
DRN90S 2,4,6
DRN90SR 6
DRN90L 2,4,6

08 567 00 14
1(2)





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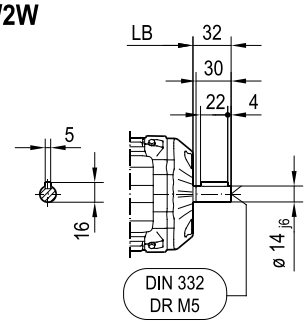

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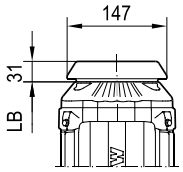

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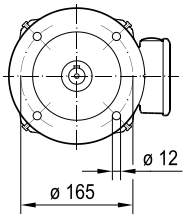

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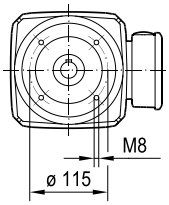

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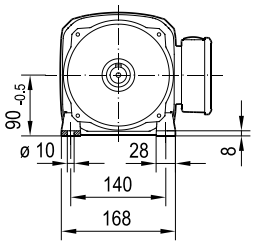

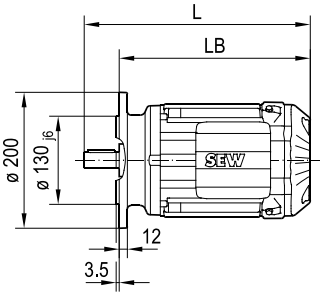

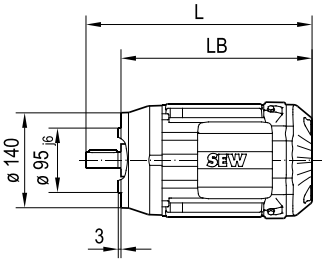

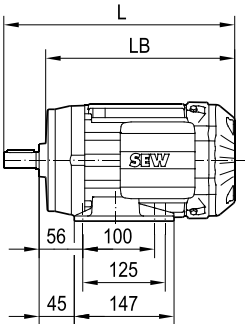

(→ 📖)	90S(R)	90L						
L	331	363						
LB (B5/B14)	281	313						
LB (B3)	279	311						

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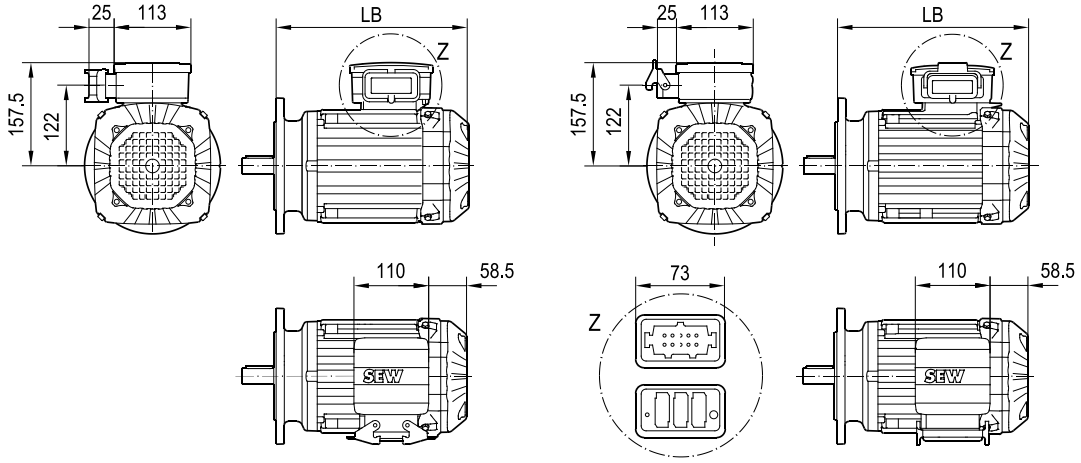
08 567 00 14
2(2)

/IV



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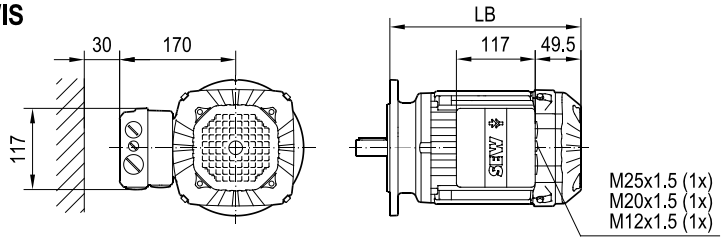

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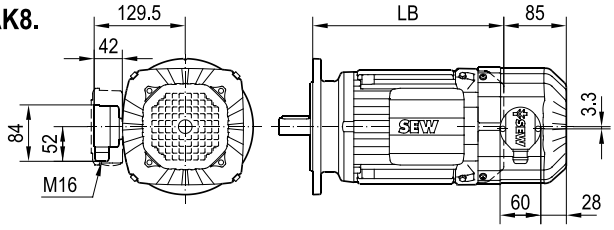
/AK8.



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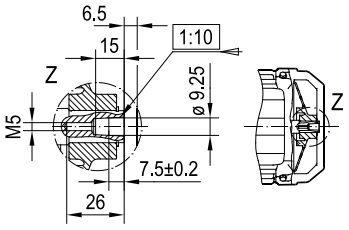

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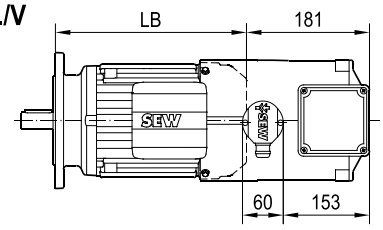

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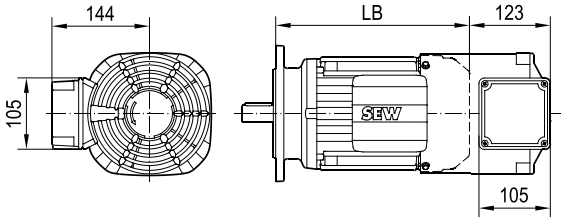

(→ 📖)	90S(R)	90L						
L	331	363						
LB (B5/B14)	281	313						
LB (B3)	279	311						

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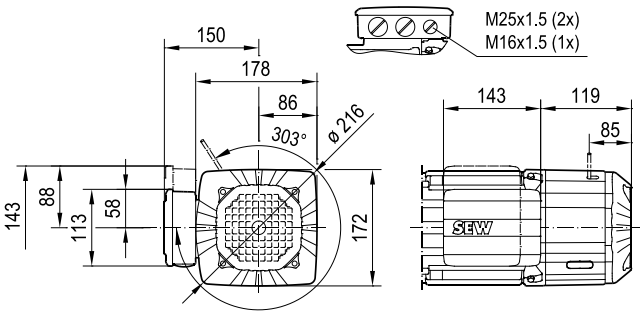
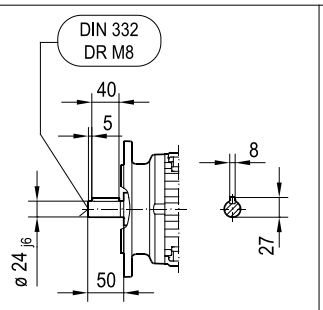
DRN90S BE 2,4,6
DRN90SR BE 6
DRN90L BE 2,4,6

09 932 01 14
1(2)





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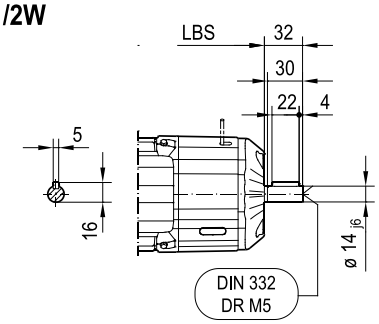

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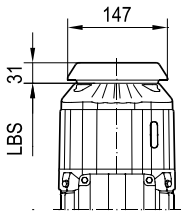

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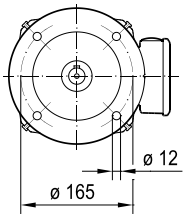

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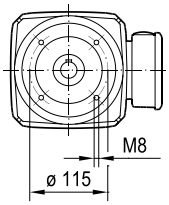

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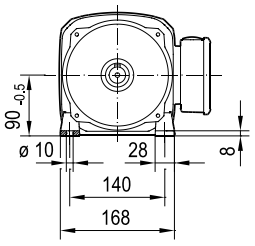

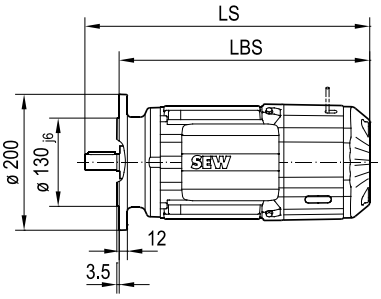

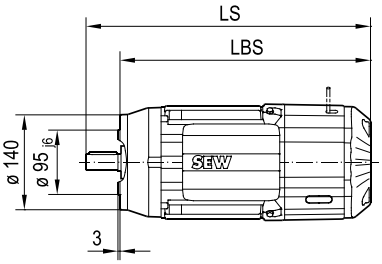

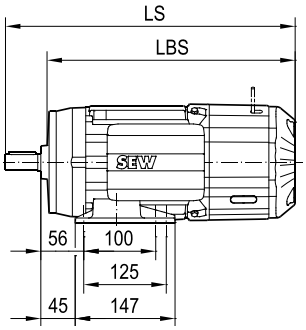

(→ 📖)	90S(R)	90L						
LS	425	457						
LBS (B5/B14)	375	407						
LBS (B3)	373	405						

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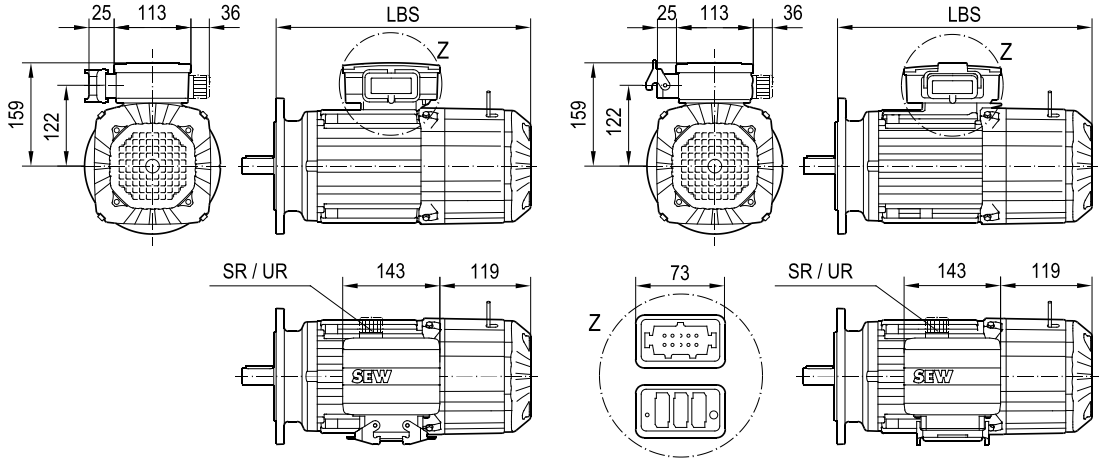
09 932 01 14
2(2)

/IV



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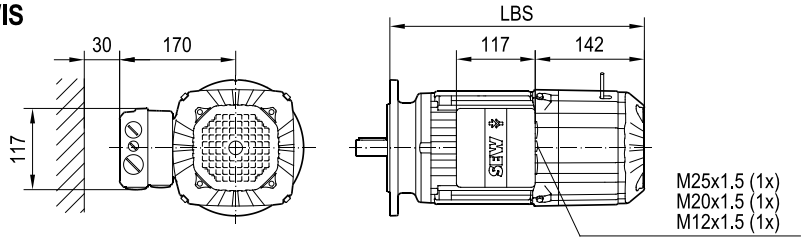

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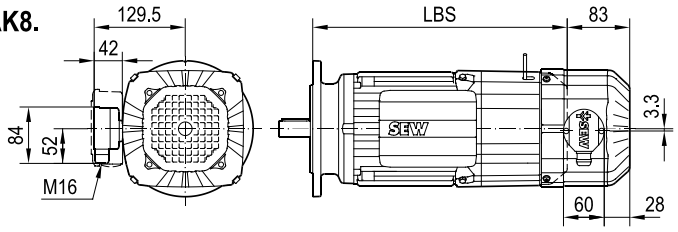
/AK8.



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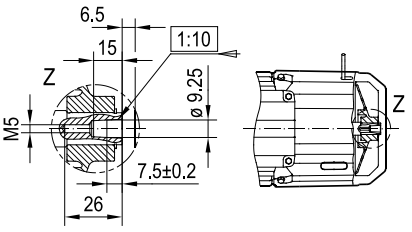

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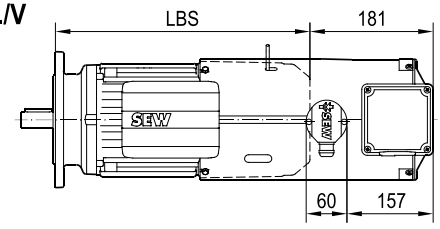
/AK8./V



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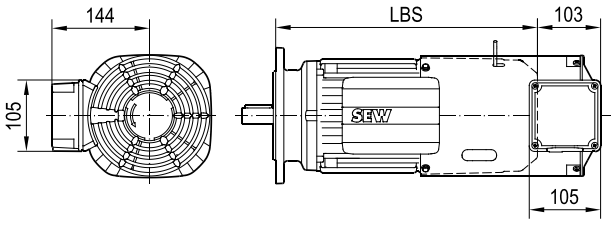

(→ 📖)	90S(R)	90L						
LS	425	457						
LBS (B5/B14)	375	407						
LBS (B3)	373	405						

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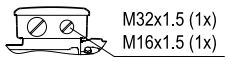
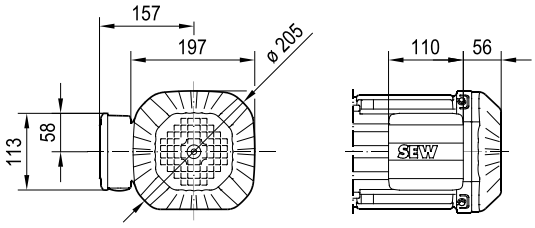
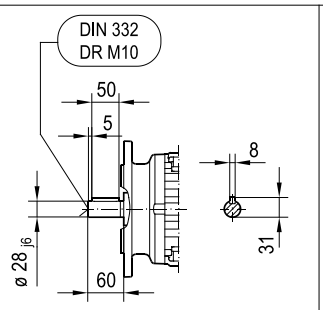
DRN100LS 4

08 569 01 14
1(2)







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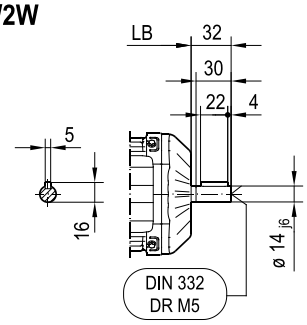

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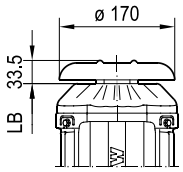

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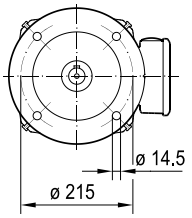

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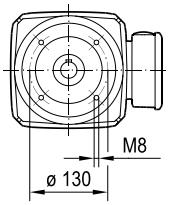

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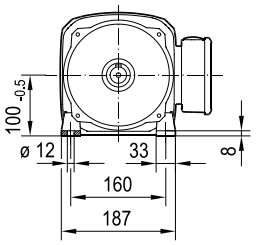
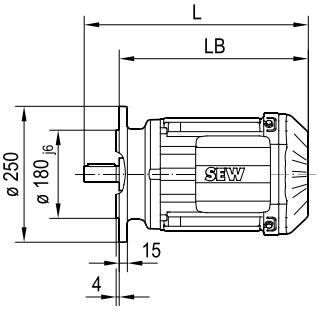
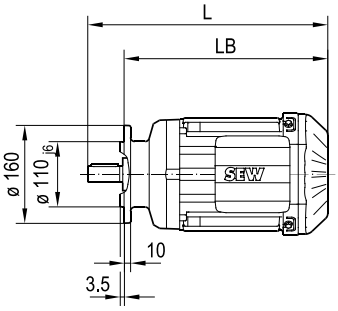
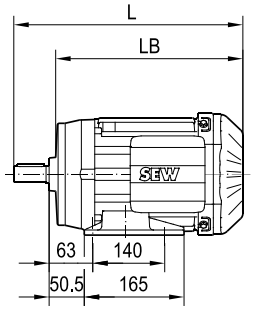




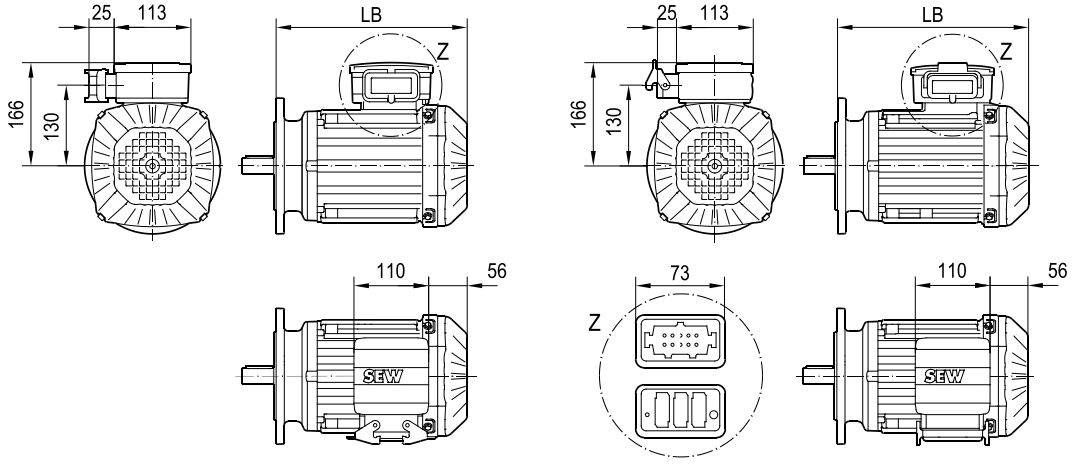




(→ 📖)	100LS							
L	369							
LB (B5/B14)	309							
LB (B3)	307							

08 569 01 14
2(2)

/IV



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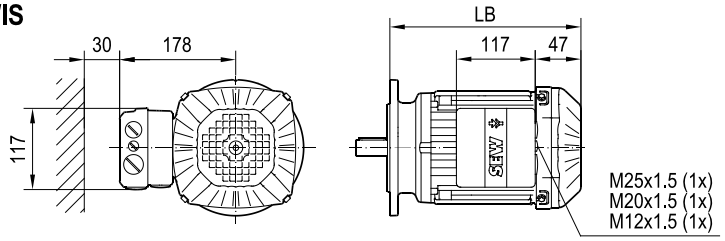

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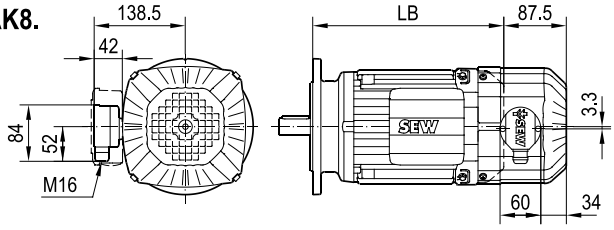

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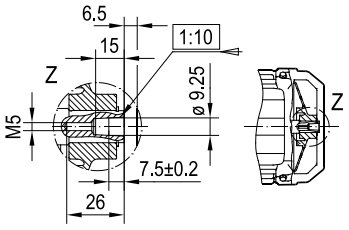

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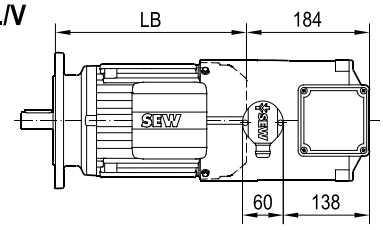
/AK8./V



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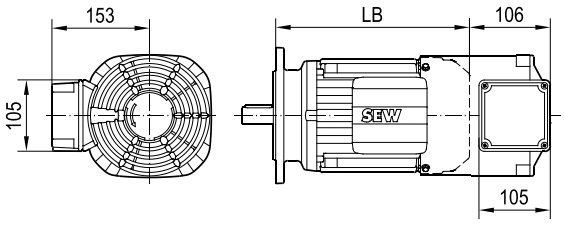

(→ 📖)	100LS							
L	369							
LB (B5/B14)	309							
LB (B3)	307							

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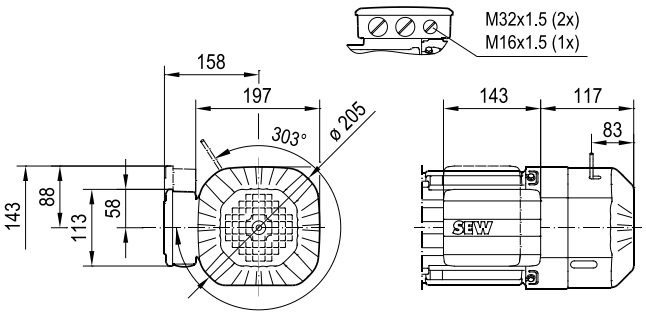
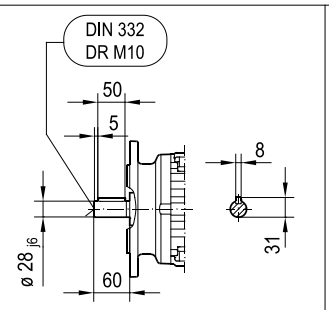
DRN100LS BE 4

09 934 01 14
1(2)





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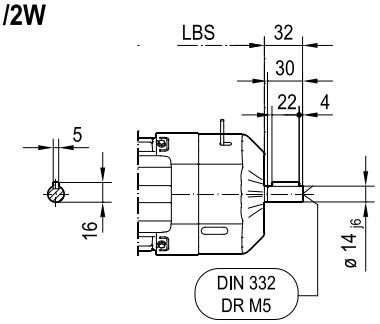

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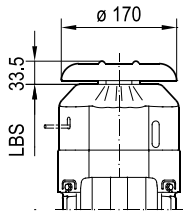

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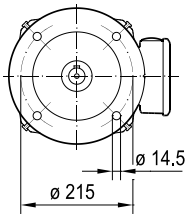

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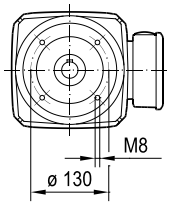

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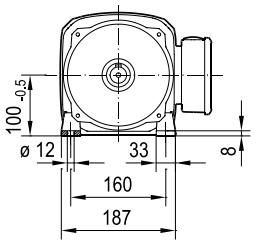

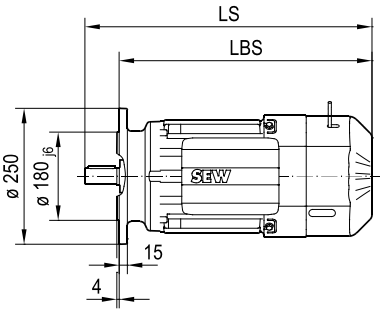

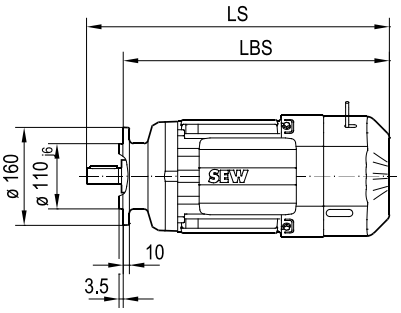

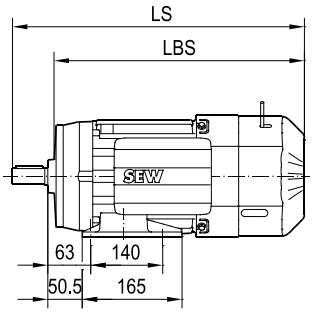

(→ 📖)	100LS							
LS	462							
LBS (B5/B14)	402							
LBS (B3)	400							

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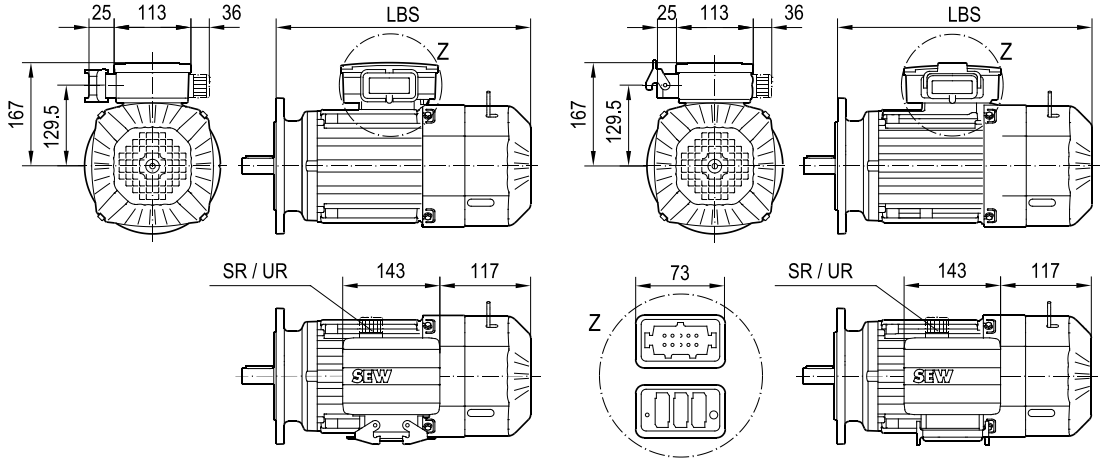
09 934 01 14
2(2)

/IV



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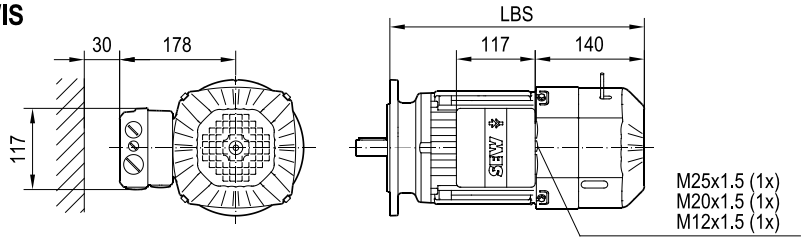

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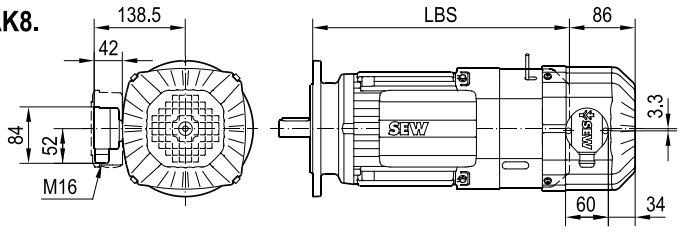

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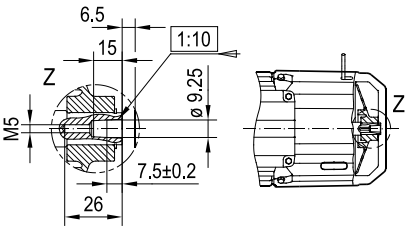

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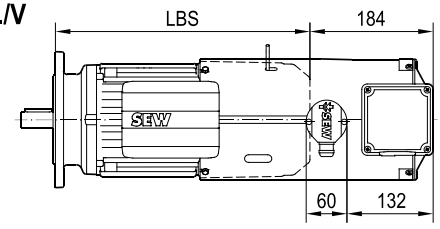
/AK8./V



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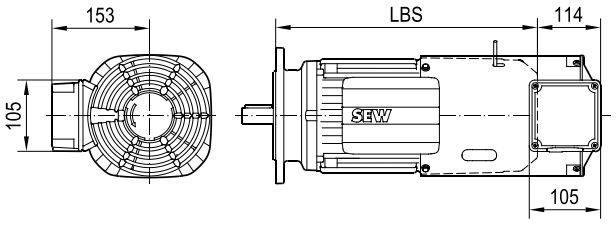

(→ 📖)	100LS							
LS	462							
LBS (B5/B14)	402							
LBS (B3)	400							

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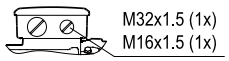
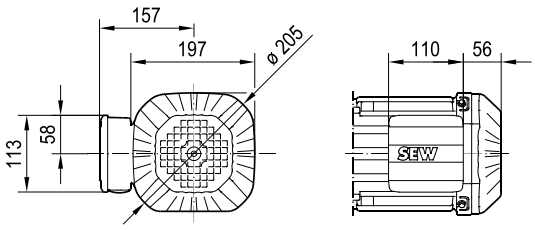
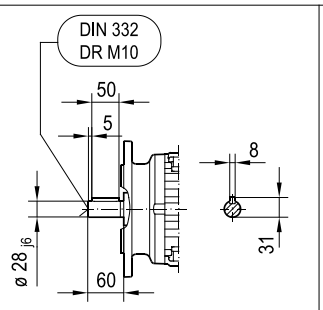
DRN100LM 2
DRN100L 6

08 570 02 14
1(2)







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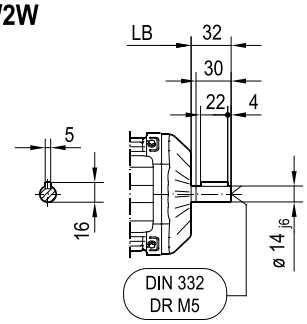

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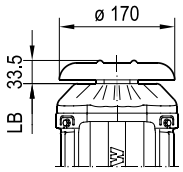

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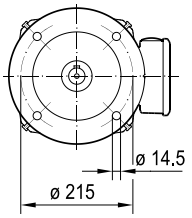

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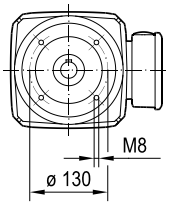

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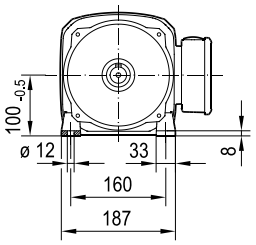

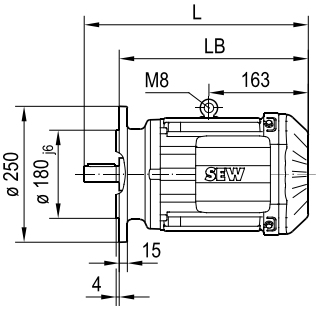

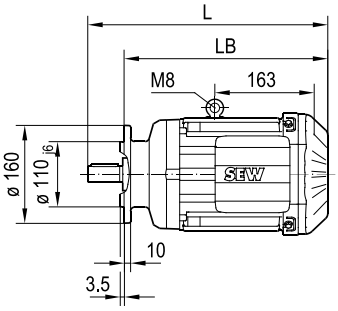

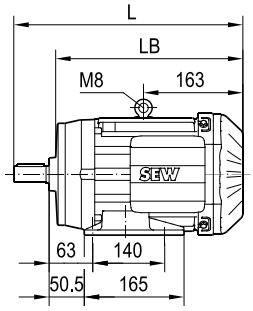

(→ 📖)	100LM	100L						
L	419	419						
LB (B5/B14)	359	359						
LB (B3)	357	357						

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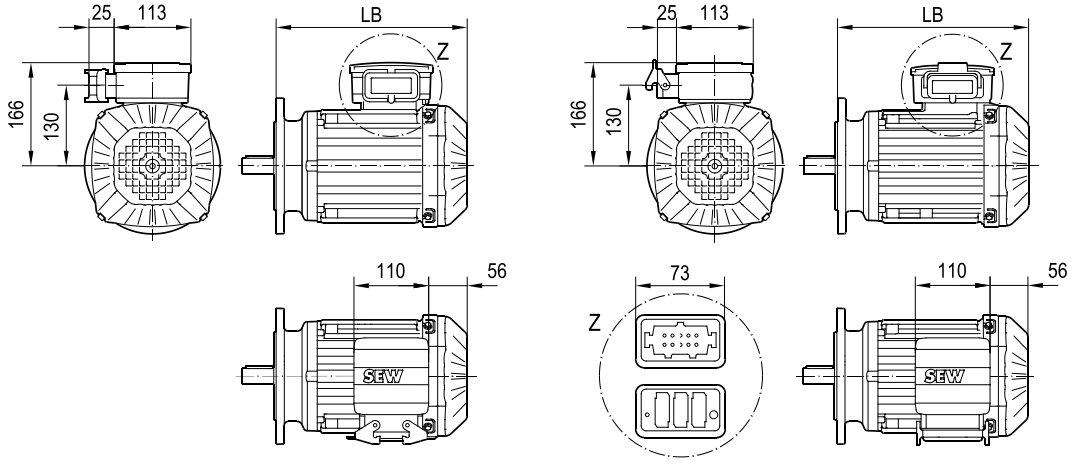
08 570 02 14
2(2)

/IV



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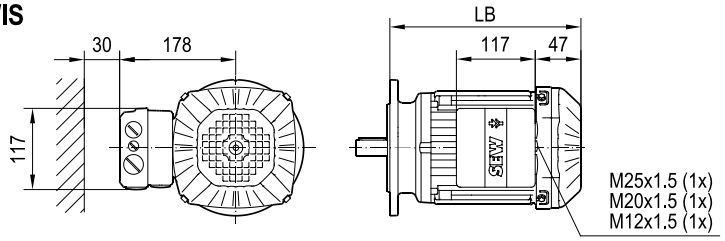

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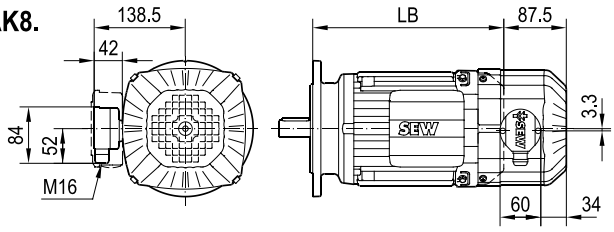
/AK8.



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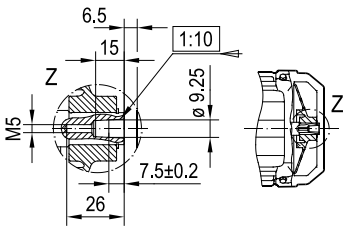
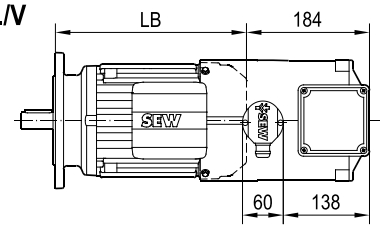


/EK8./V
/AK8./V



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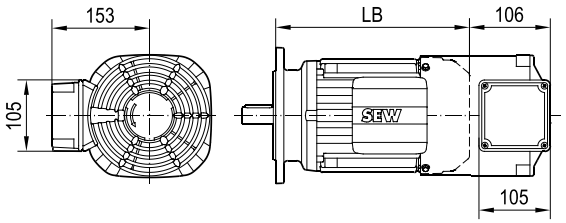

(→ 📖)	100LM	100L						
L	419	419						
LB (B5/B14)	359	359						
LB (B3)	357	357						

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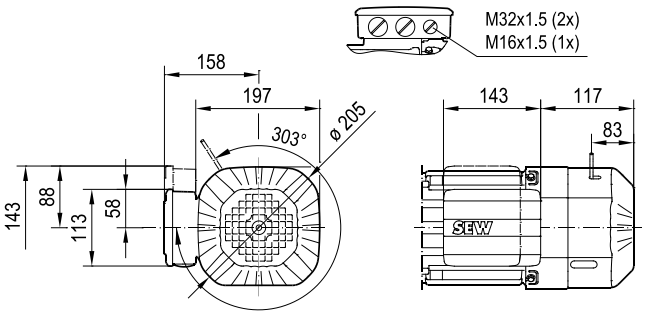
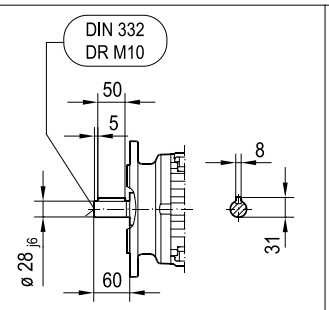
DRN100LM BE 2
DRN100L BE 6

09 935 02 14
1(2)





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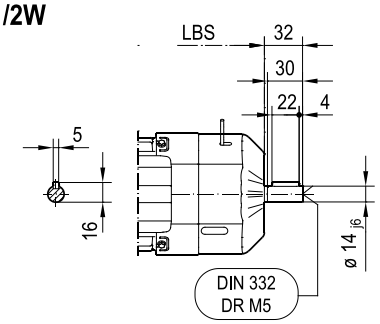

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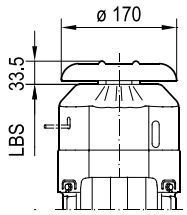

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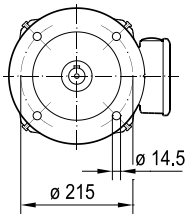

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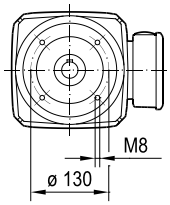

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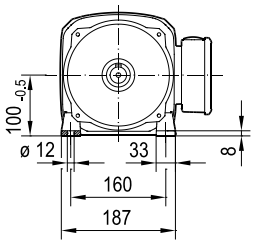

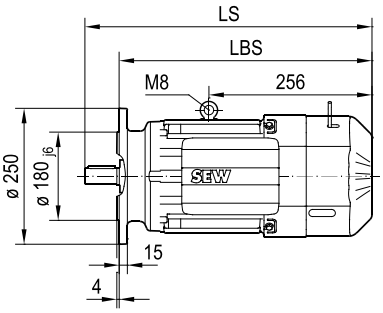

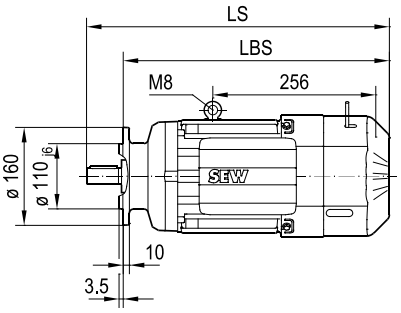

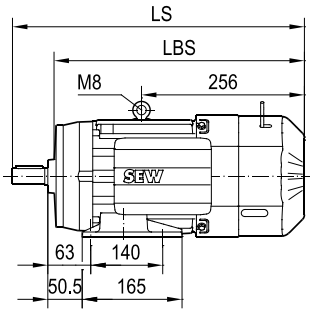

(→ 📖)	100LM	100L						
LS	512	512						
LBS (B5/B14)	452	452						
LBS (B3)	450	450						

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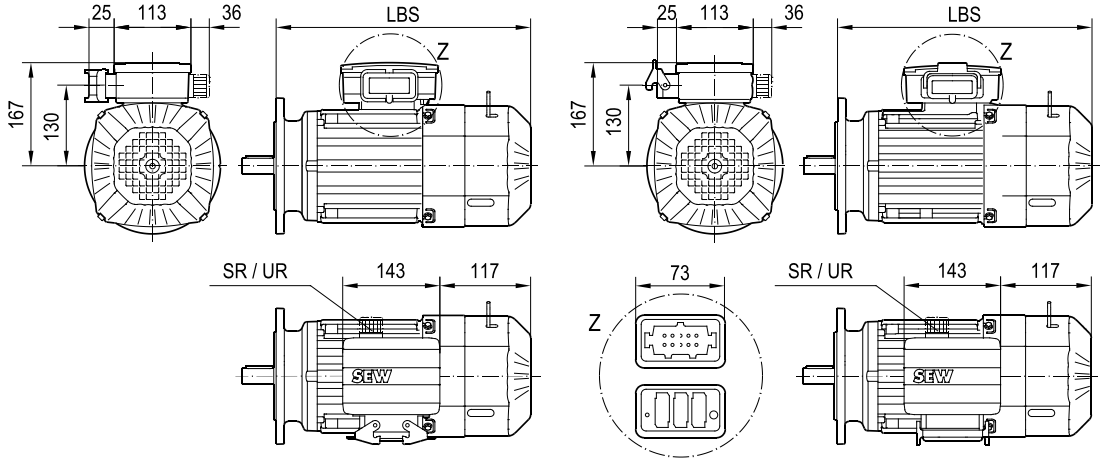
09 935 02 14
2(2)

/IV



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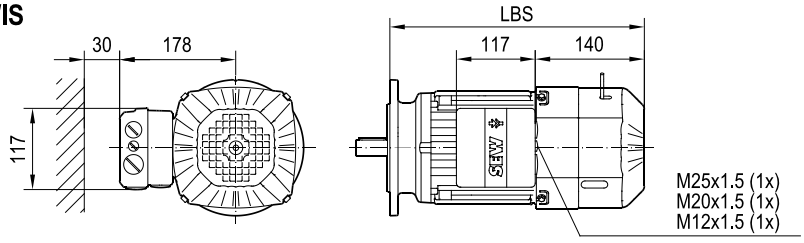

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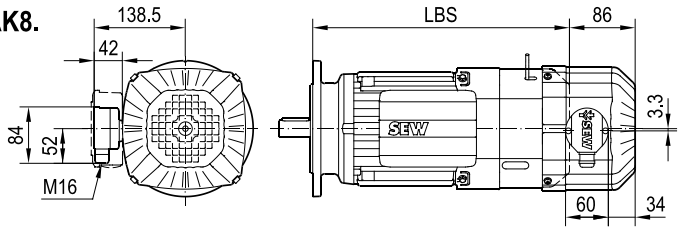
/AK8.



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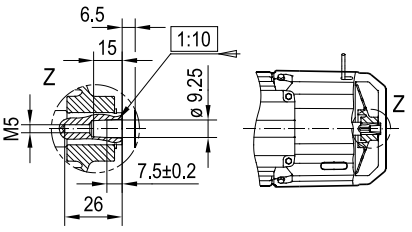
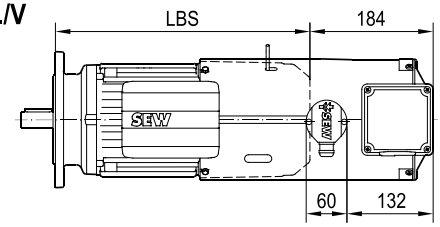


/EK8./V
/AK8./V



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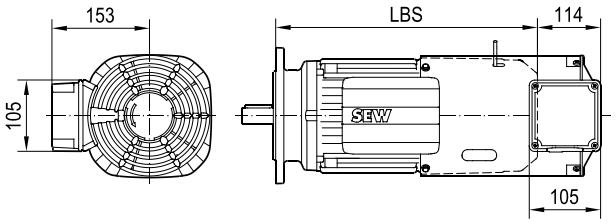

(→ 📖)	100LM	100L						
LS	512	512						
LBS (B5/B14)	452	452						
LBS (B3)	450	450						

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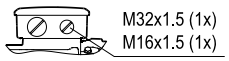
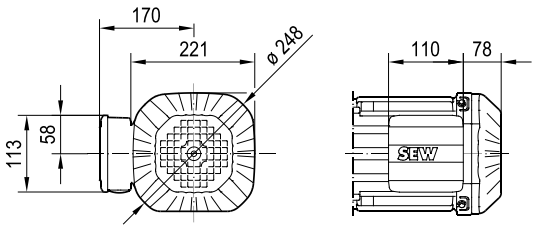
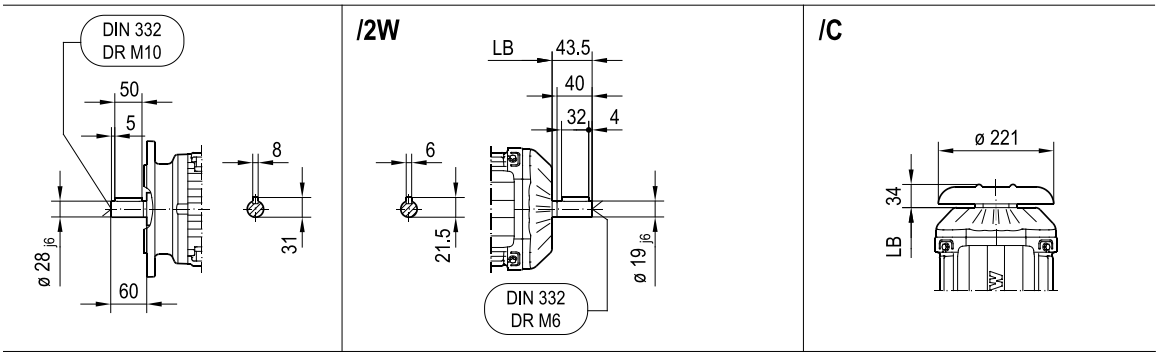
DRN112M 2,4,6

08 571 02 14
1(2)







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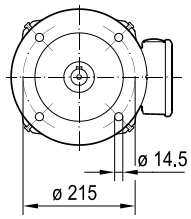

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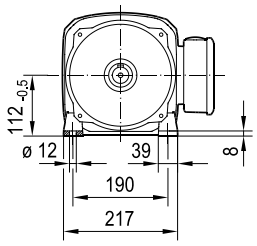
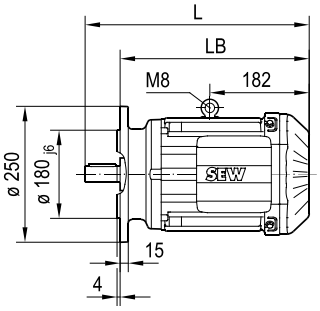
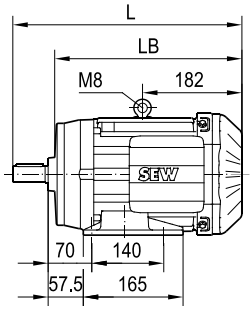


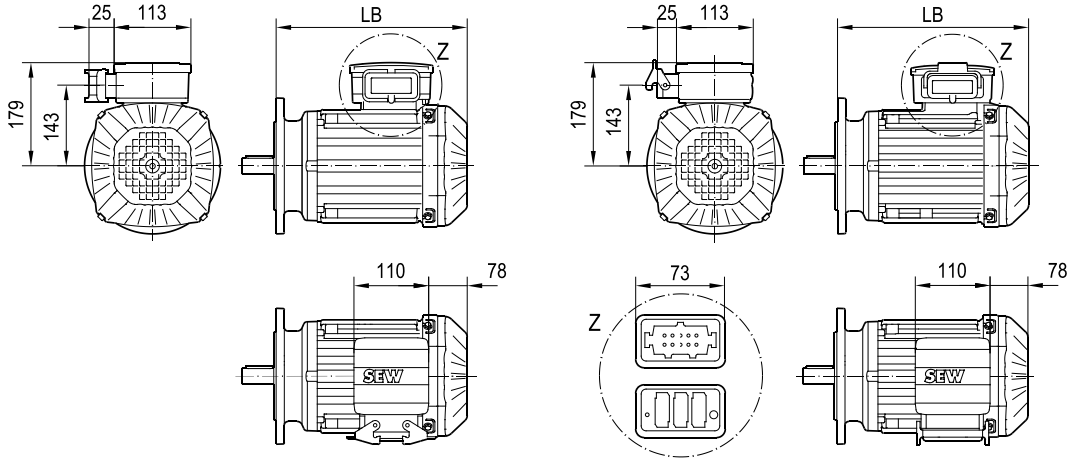




(→ 📖)	112M(B)							
L	447							
LB (B5/B14)	387							
LB (B3)	385							

08 571 02 14
2(2)

/IV



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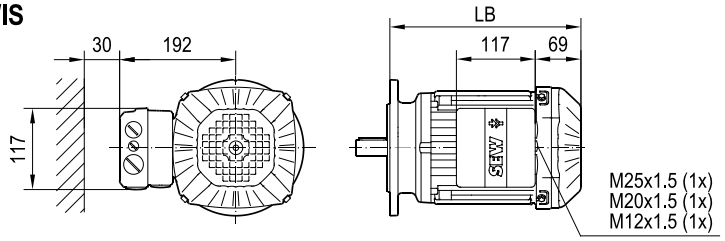

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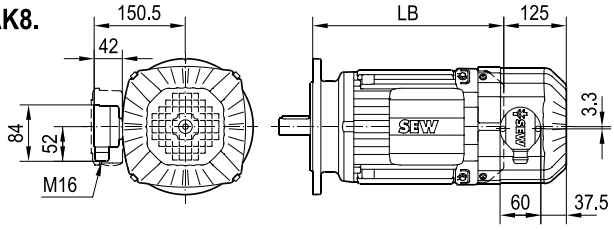

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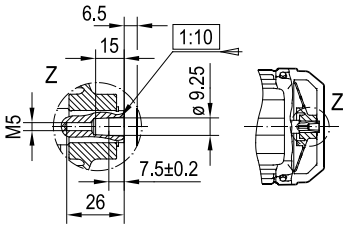

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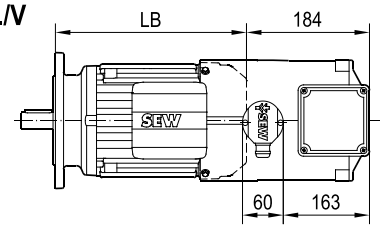

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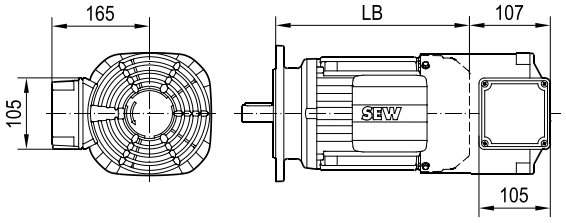
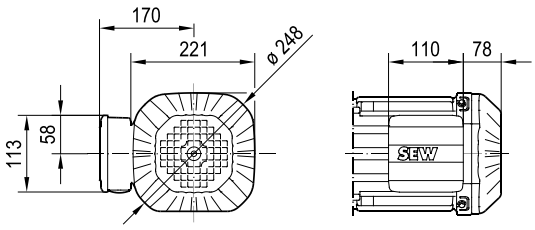


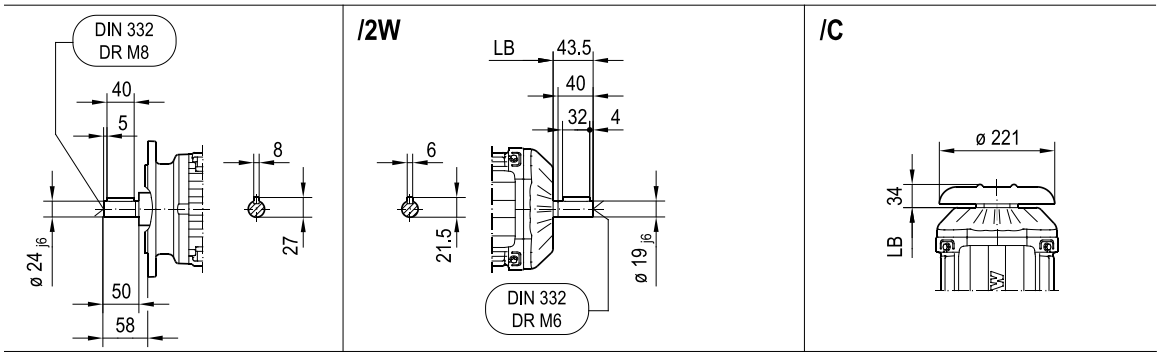
(→ 📖)	112M(B)							
L	447							
LB (B5/B14)	387							
LB (B3)	385							

25880748/EN – 11/2019

DRN112M 6

08 150 01 19
1(2)





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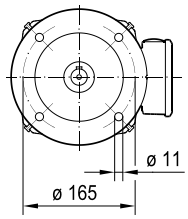

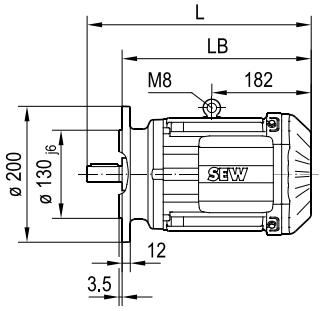

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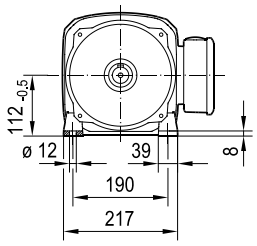
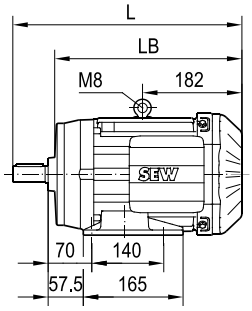
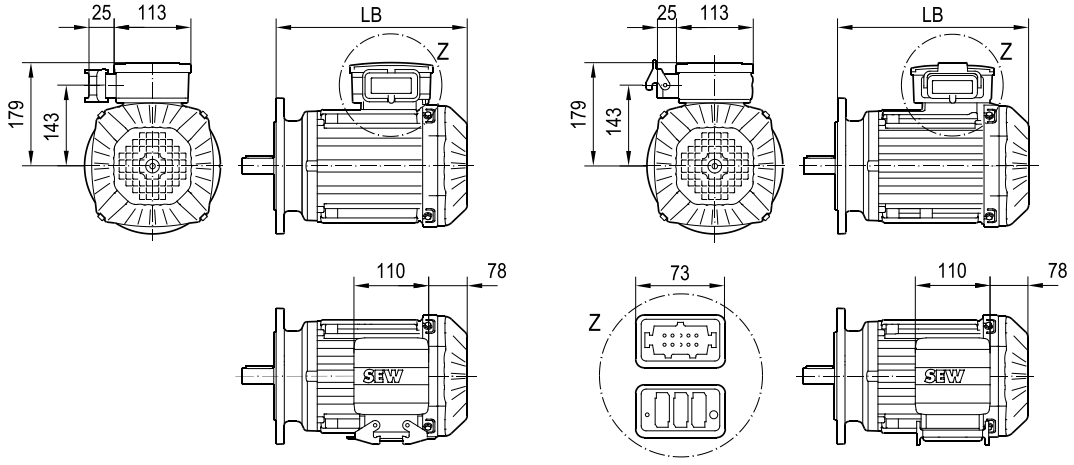




(→ 📖)	112M							
L	437							
LB (B5/B14)	379							
LB (B3)	385							

08 150 01 19
2(2)

/IV



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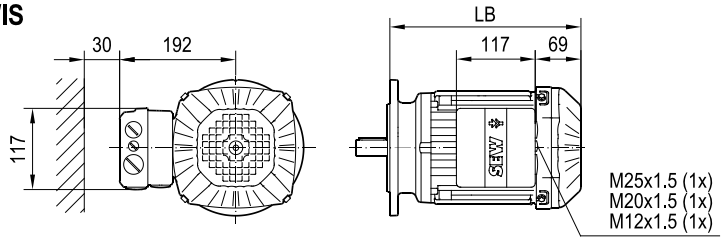

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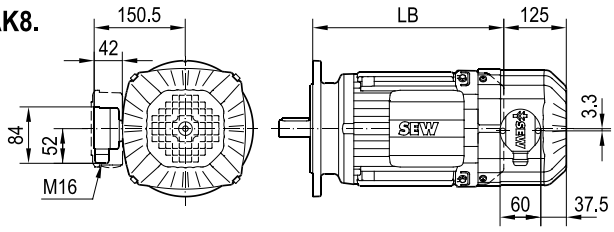

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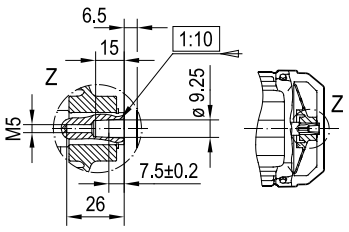

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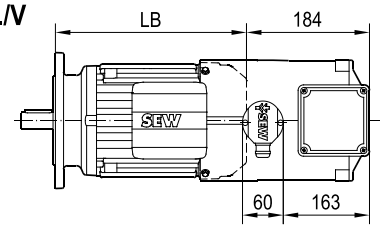

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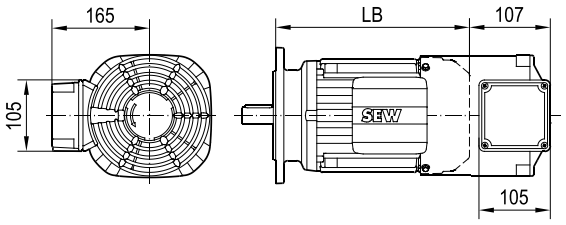

(→ 📖)	112M							
L	437							
LB (B5/B14)	379							
LB (B3)	385							

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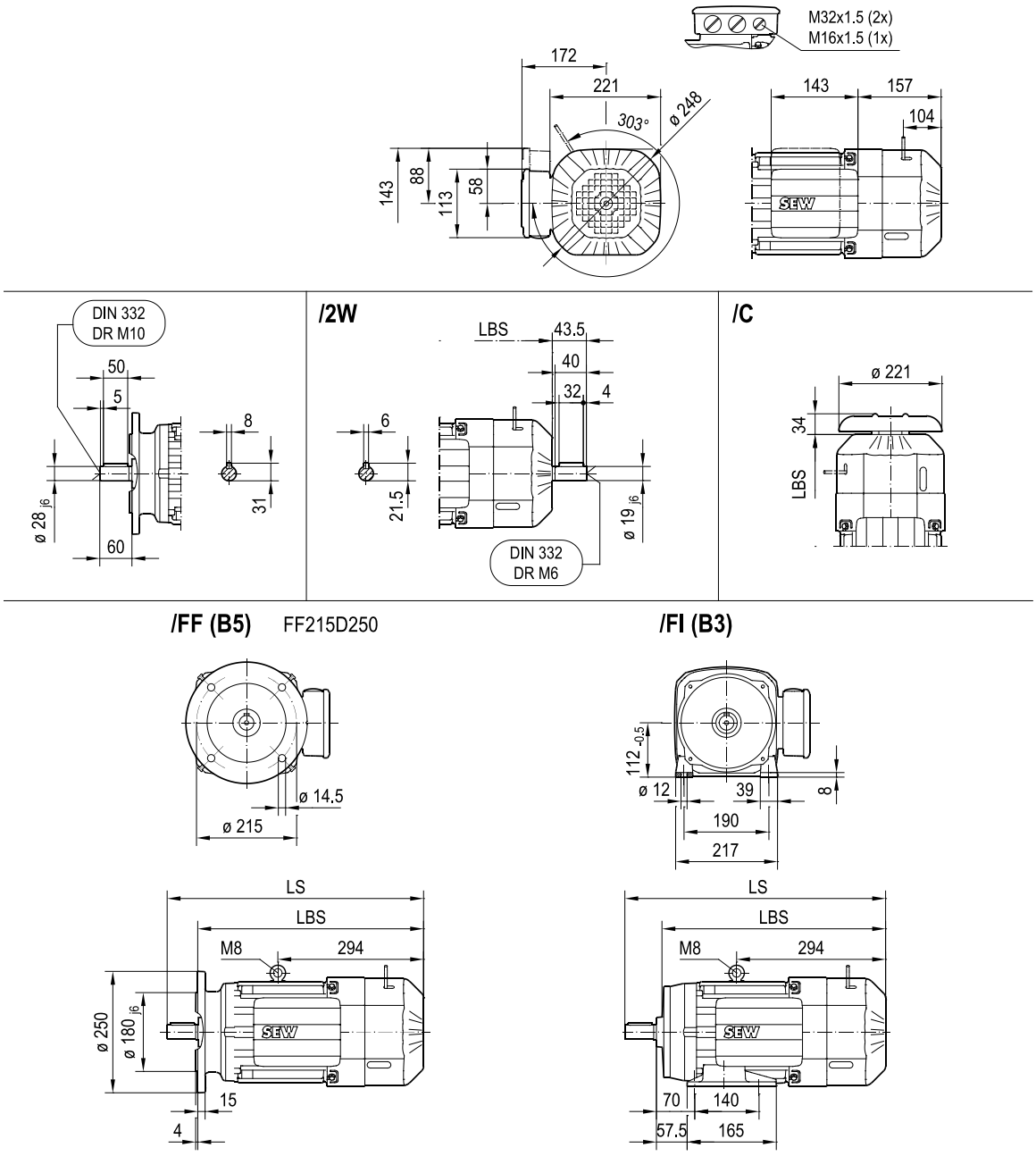
DRN112M BE 2,4,6

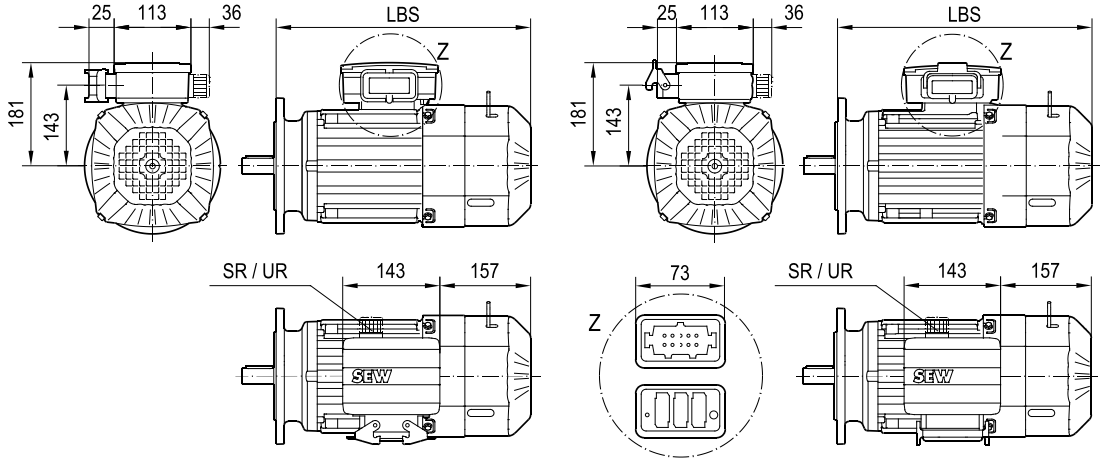
09 936 02 14
1(2)



(→ 📖)	112M(B)							
LS	559							
LBS (B5/B14)	499							
LBS (B3)	497							

09 936 02 14
2(2)

/IV



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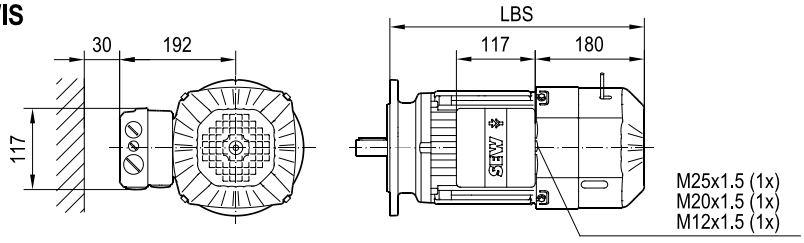

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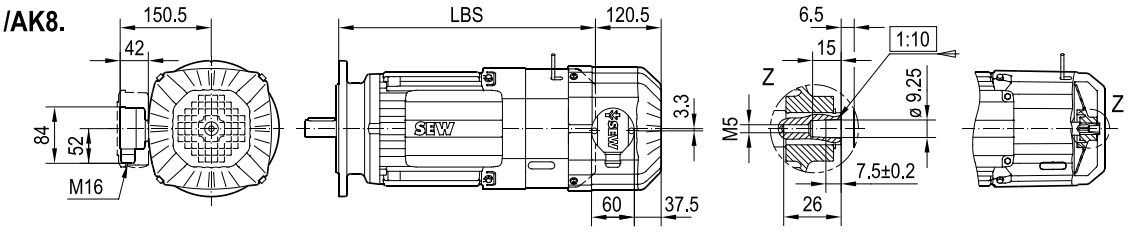

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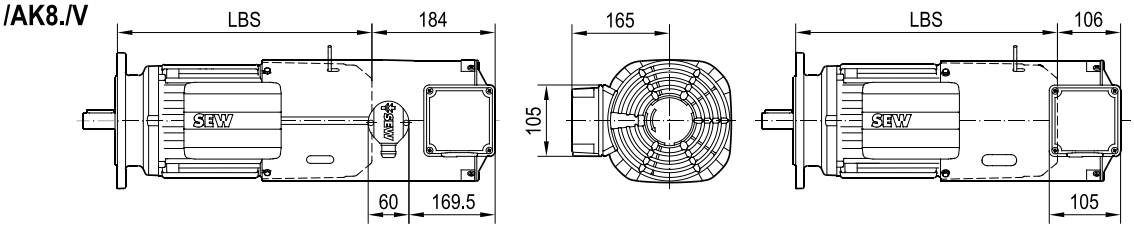
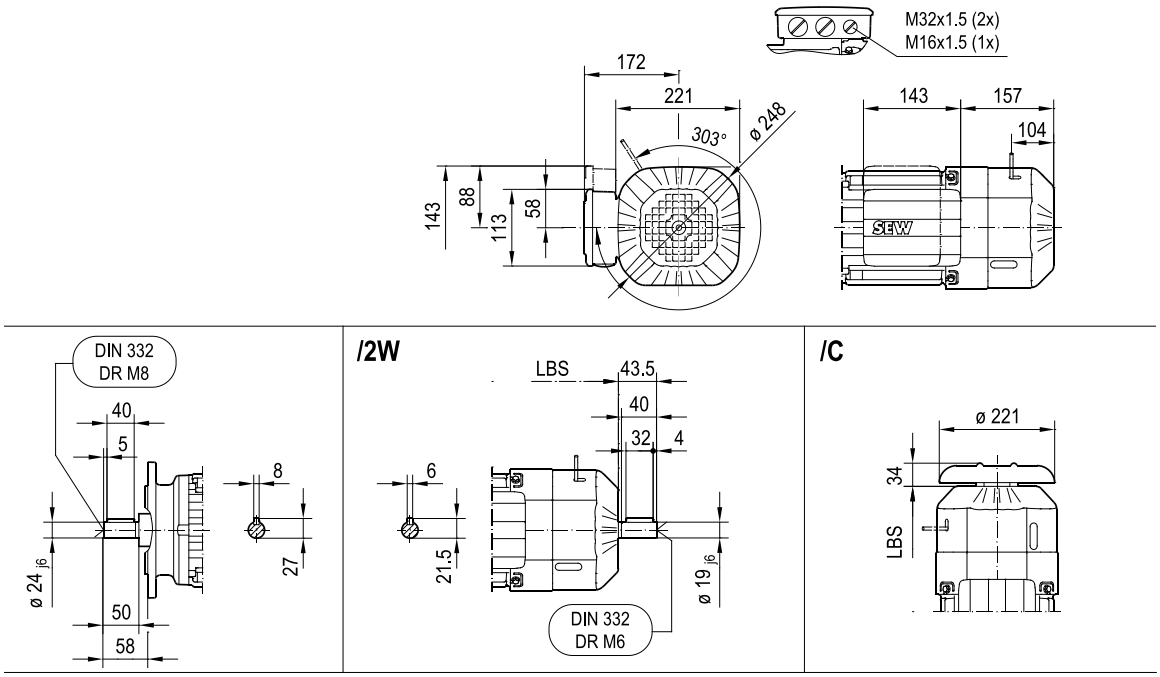


(→ 📖)	112M(B)							
LS	559							
LBS (B5/B14)	499							
LBS (B3)	497							

25880748/EN – 11/2019

DRN112M BE 6

09 151 01 19
1(2)



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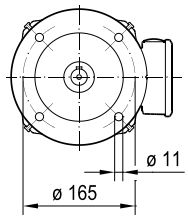

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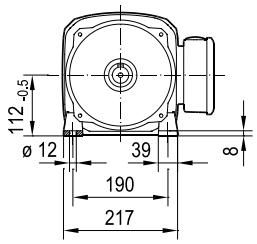
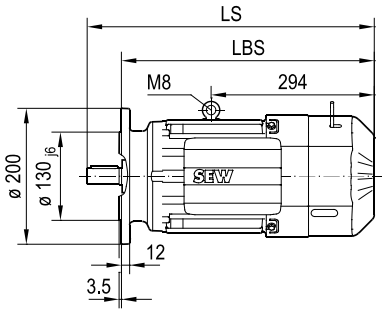
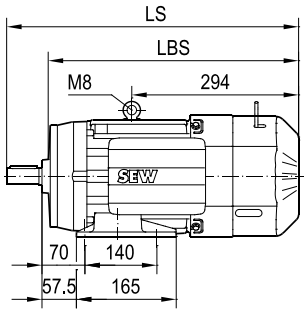


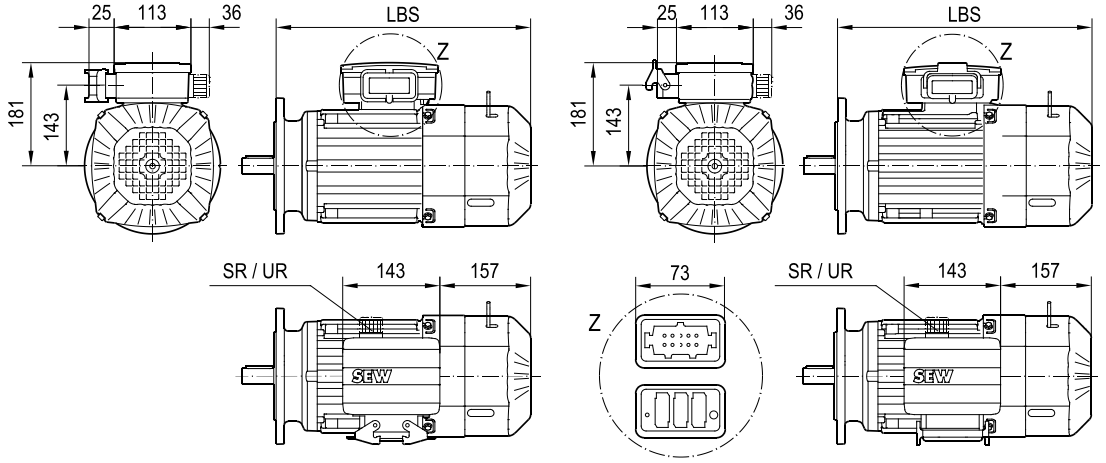




(→ 📖)	112M							
LS	549							
LBS (B5/B14)	491							
LBS (B3)	497							

09 151 01 19
2(2)

/IV



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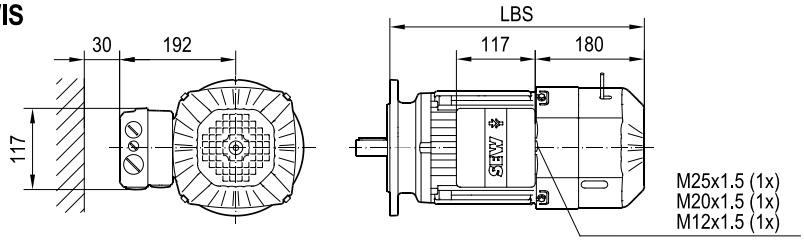

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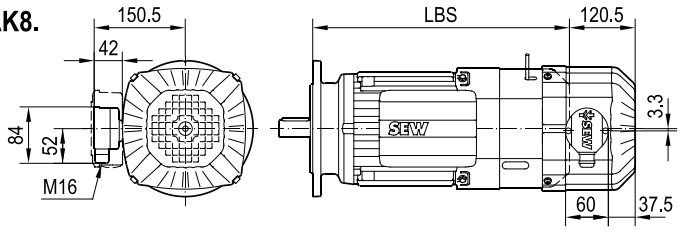

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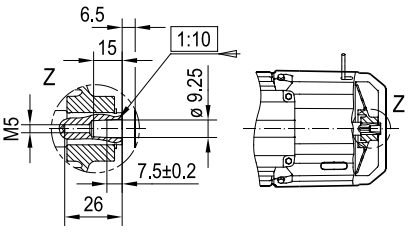

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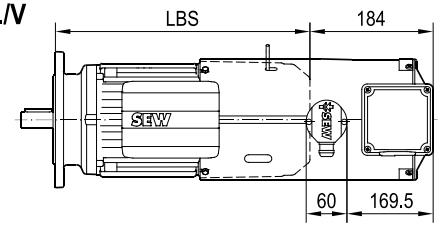
/AK8./V



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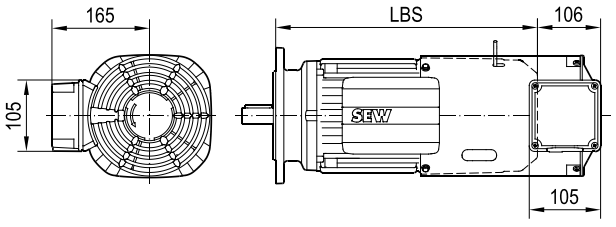

(→ 📖)	112M							
LS	549							
LBS (B5/B14)	491							
LBS (B3)	497							

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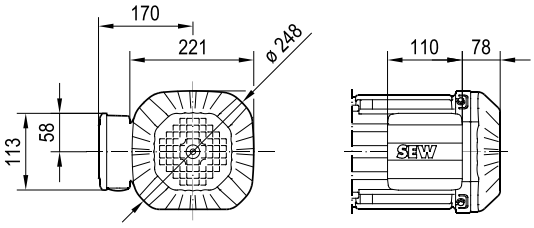
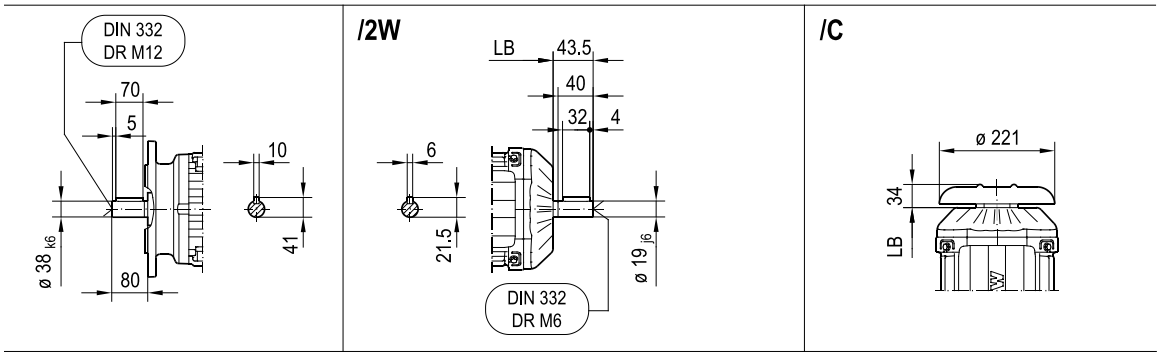
DRN132S 2,4,6

08 572 01 14
1(2)





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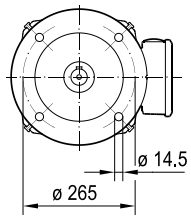

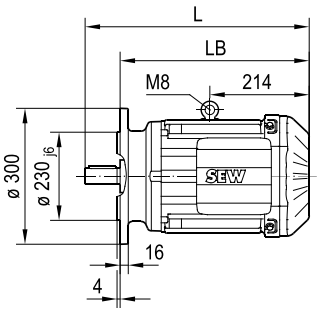

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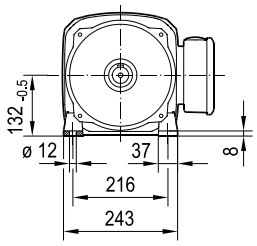
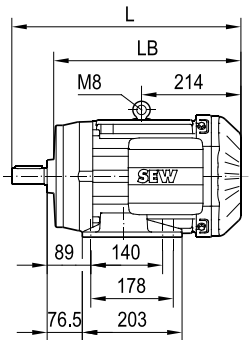
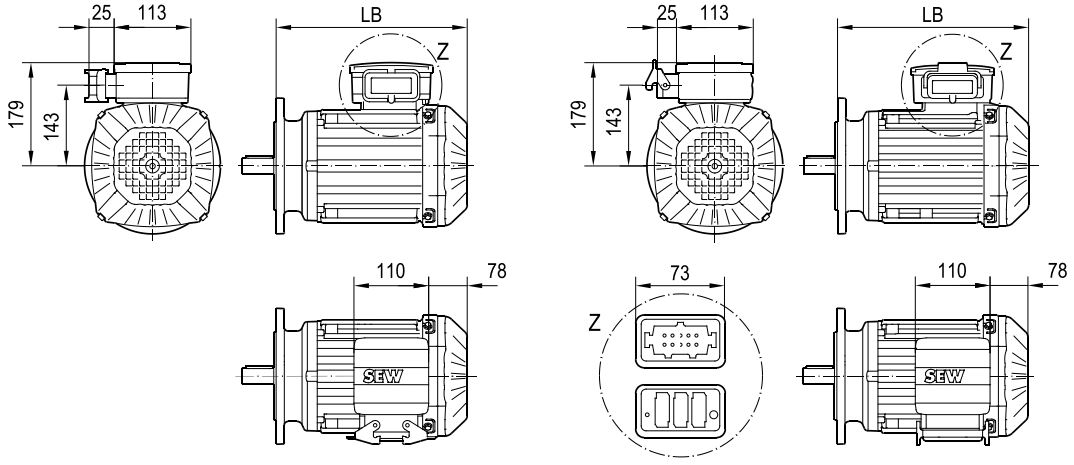




(→ 📖)	132S							
L	517							
LB (B5/B14)	437							
LB (B3)	435							

08 572 01 14
2(2)

/IV



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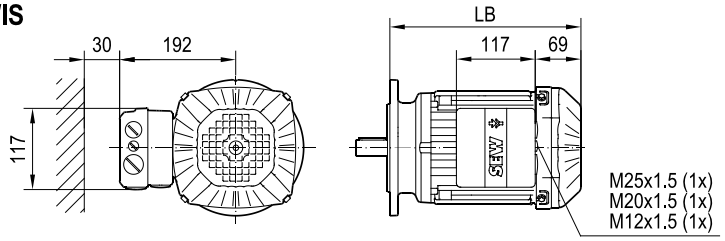

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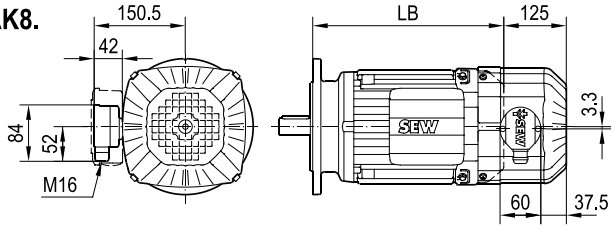

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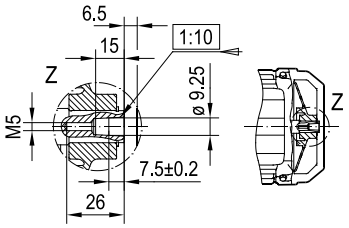

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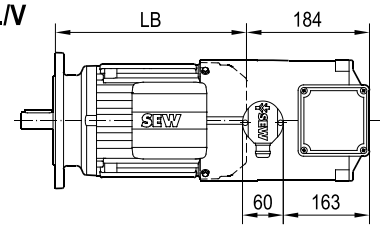

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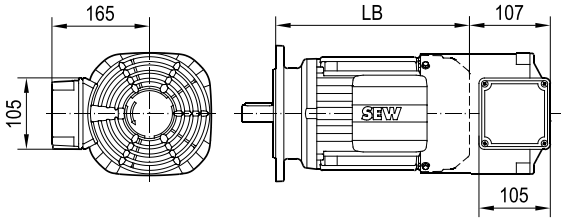

(→ 📖)	132S							
L	517							
LB (B5/B14)	437							
LB (B3)	435							

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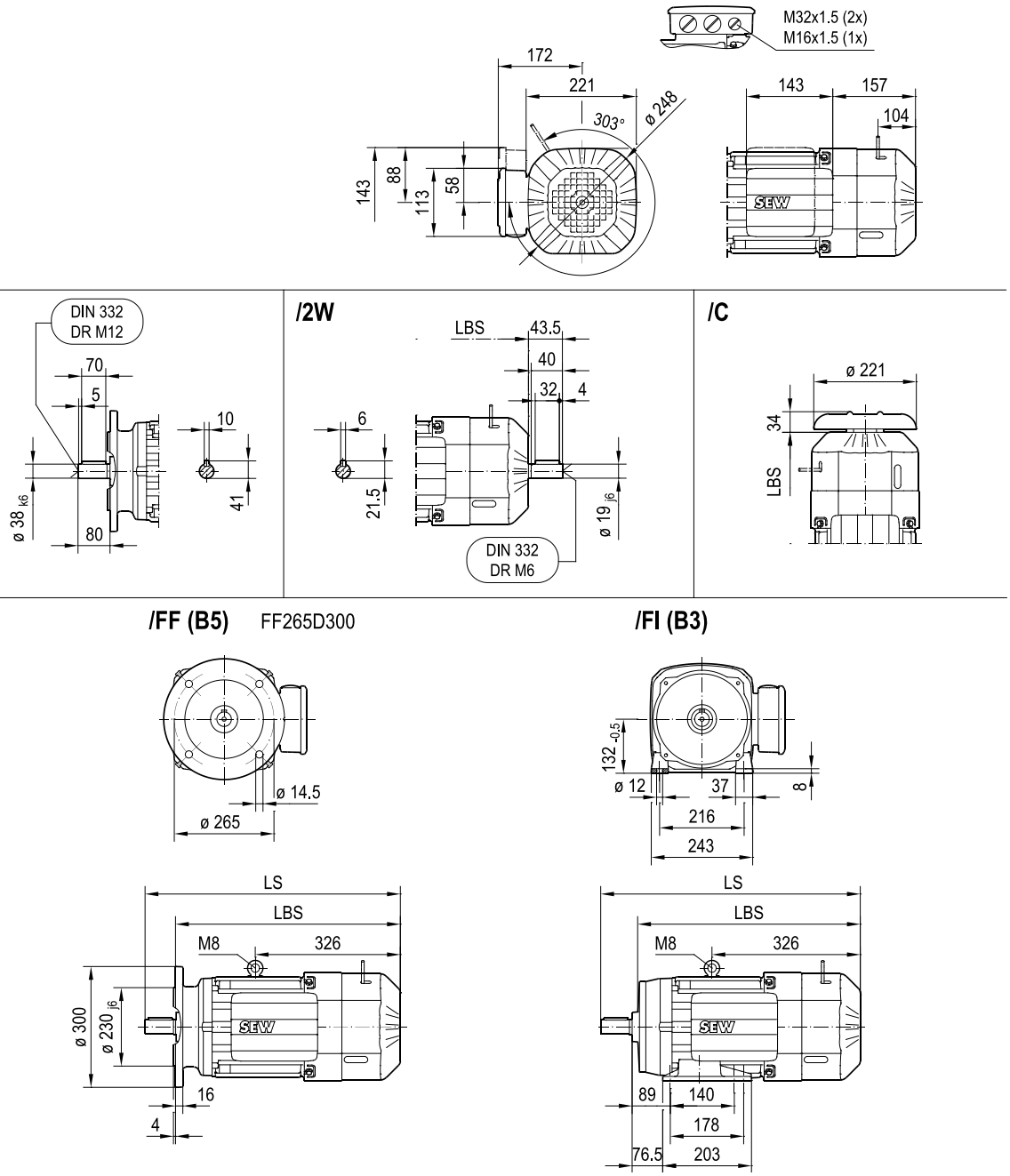
DRN132S BE 2,4,6

09 937 01 14
1(2)



(→ 📖)	132S							
LS	629							
LBS (B5/B14)	549							
LBS (B3)	547							

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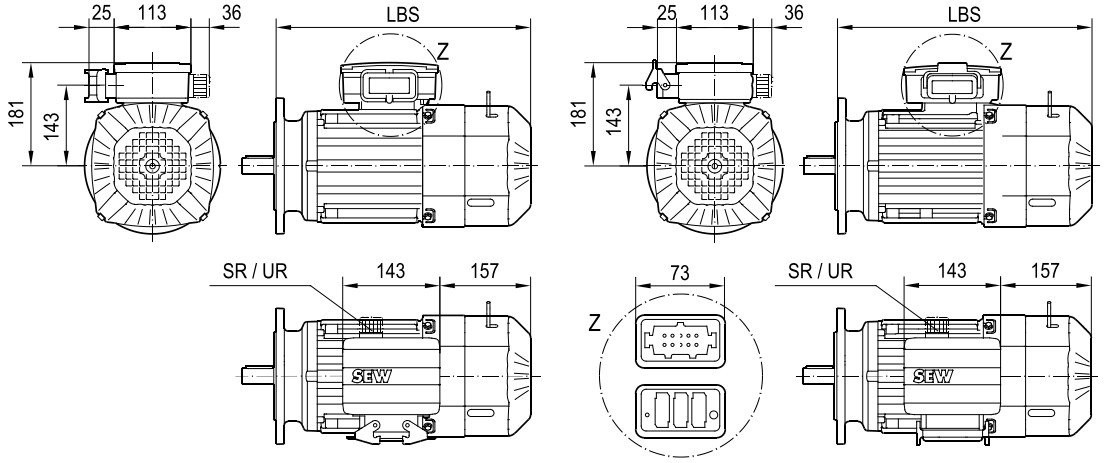
09 937 01 14
2(2)

/IV



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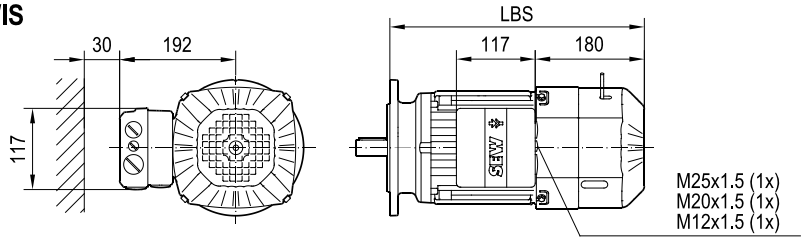

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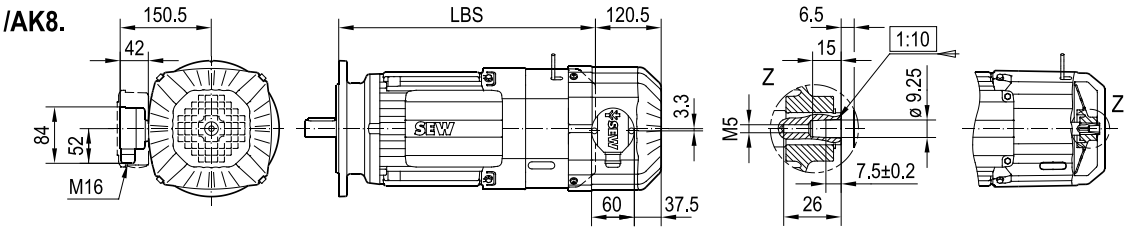

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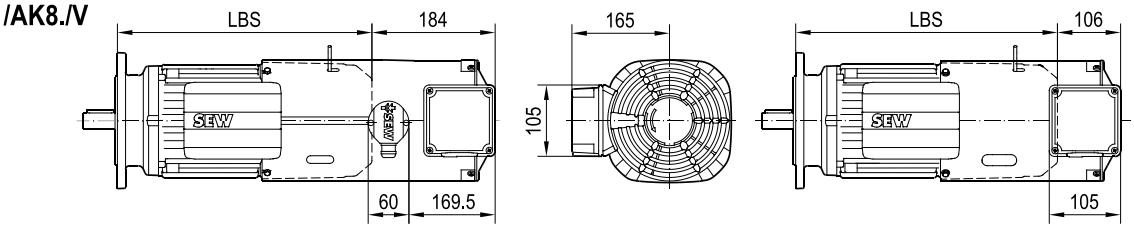
/V

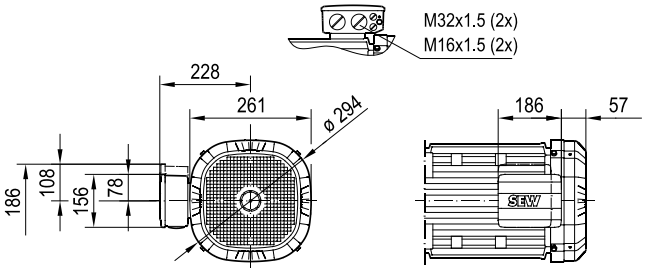


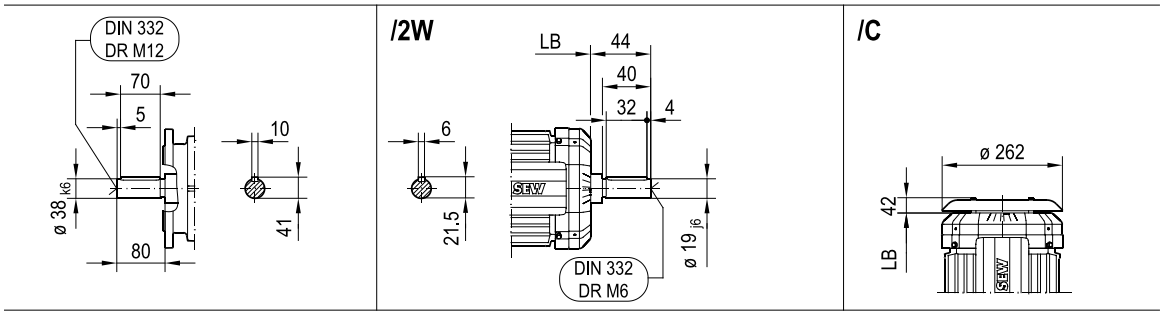
(→ 📖)	132S							
LS	629							
LBS (B5/B14)	549							
LBS (B3)	547							

25880748/EN – 11/2019

DRN132M 4
DRN132L 4,6

08 573 02 14
1(2)





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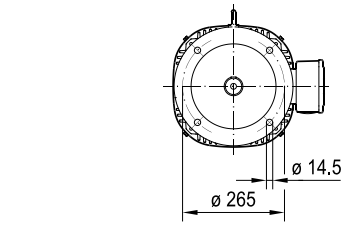

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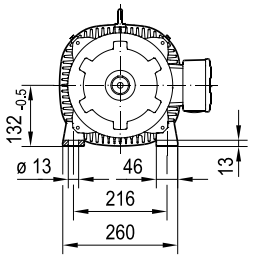

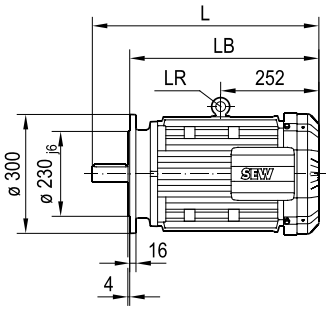

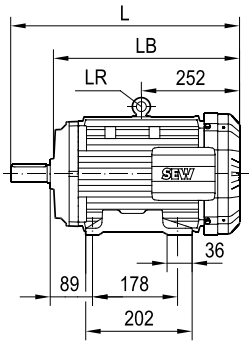

(→ 📖)	132M	132L						
L	519	544						
LB (B5/B14)	439	464						
LB (B3)	437	462						
LR	M10	M12						

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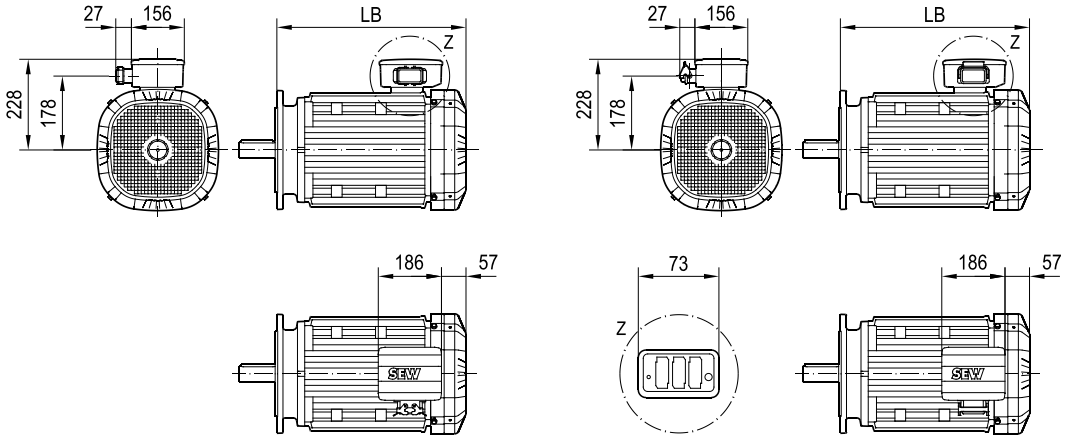
08 573 02 14
2(2)

/IV



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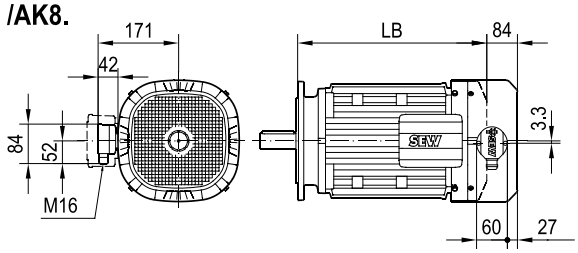
/AK8.



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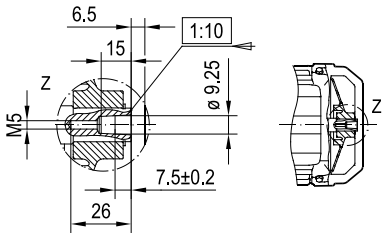

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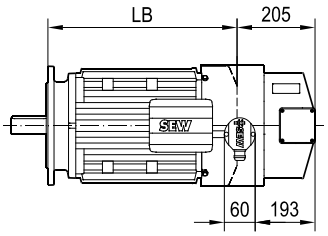
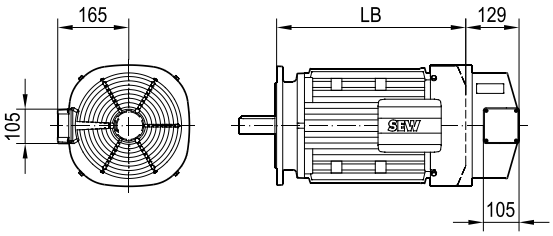
/AK8./V



/V



(→ 📖)	132M	132L						
L	519	544						
LB (B5/B14)	439	464						
LB (B3)	437	462						
LR	M10	M12						

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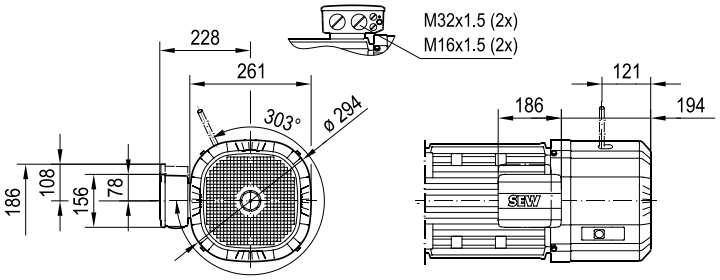
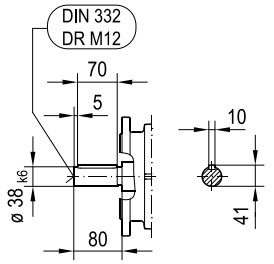
DRN132M BE 4
DRN132L BE 4,6

09 938 02 14
1(2)





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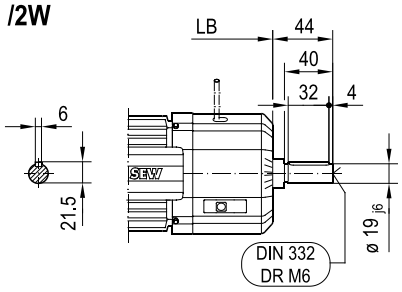

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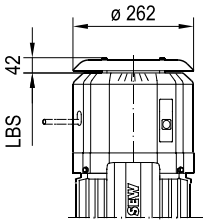

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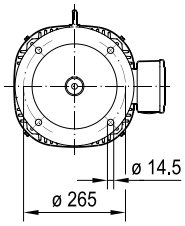

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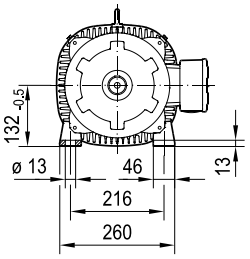

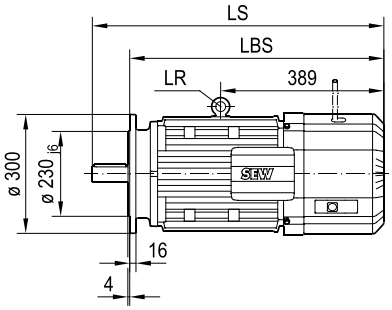

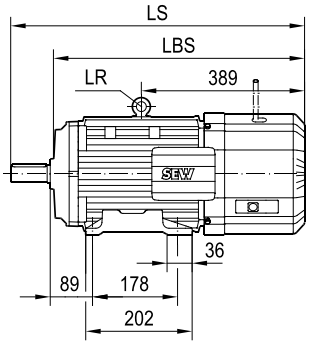

(→ 📖)	132M	132L						
LS	656	681						
LBS (B5/B14)	576	601						
LBS (B3)	574	599						
LR	M10	M12						

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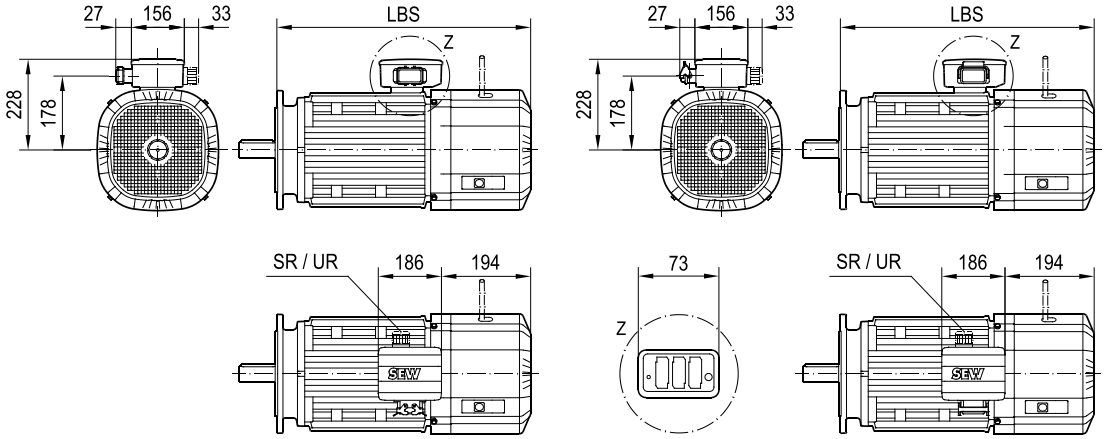
09 938 02 14
2(2)

/IV



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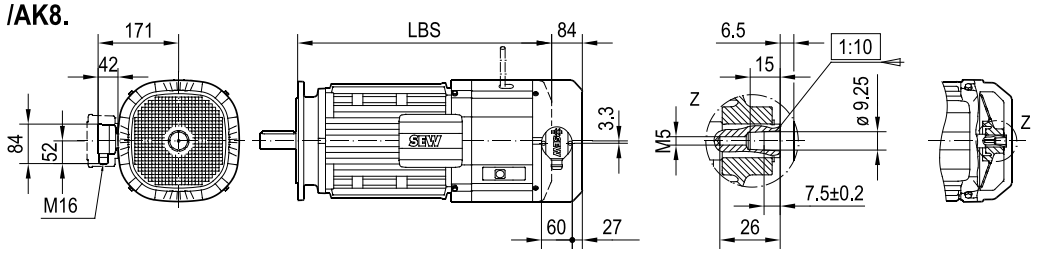
/EK8A



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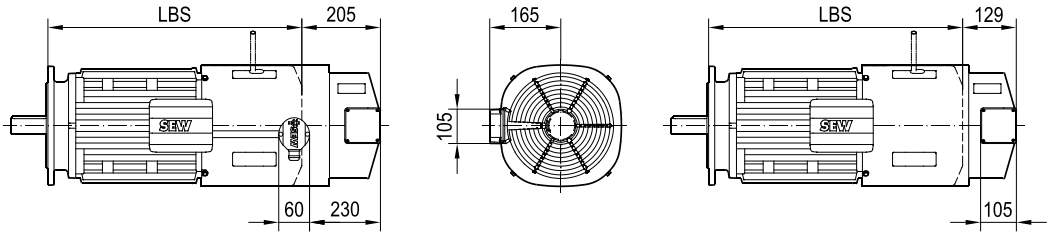
/AK8./V

/V



(→ 📖)	132M	132L						
LS	656	681						
LBS (B5/B14)	576	601						
LBS (B3)	574	599						
LR	M10	M12						

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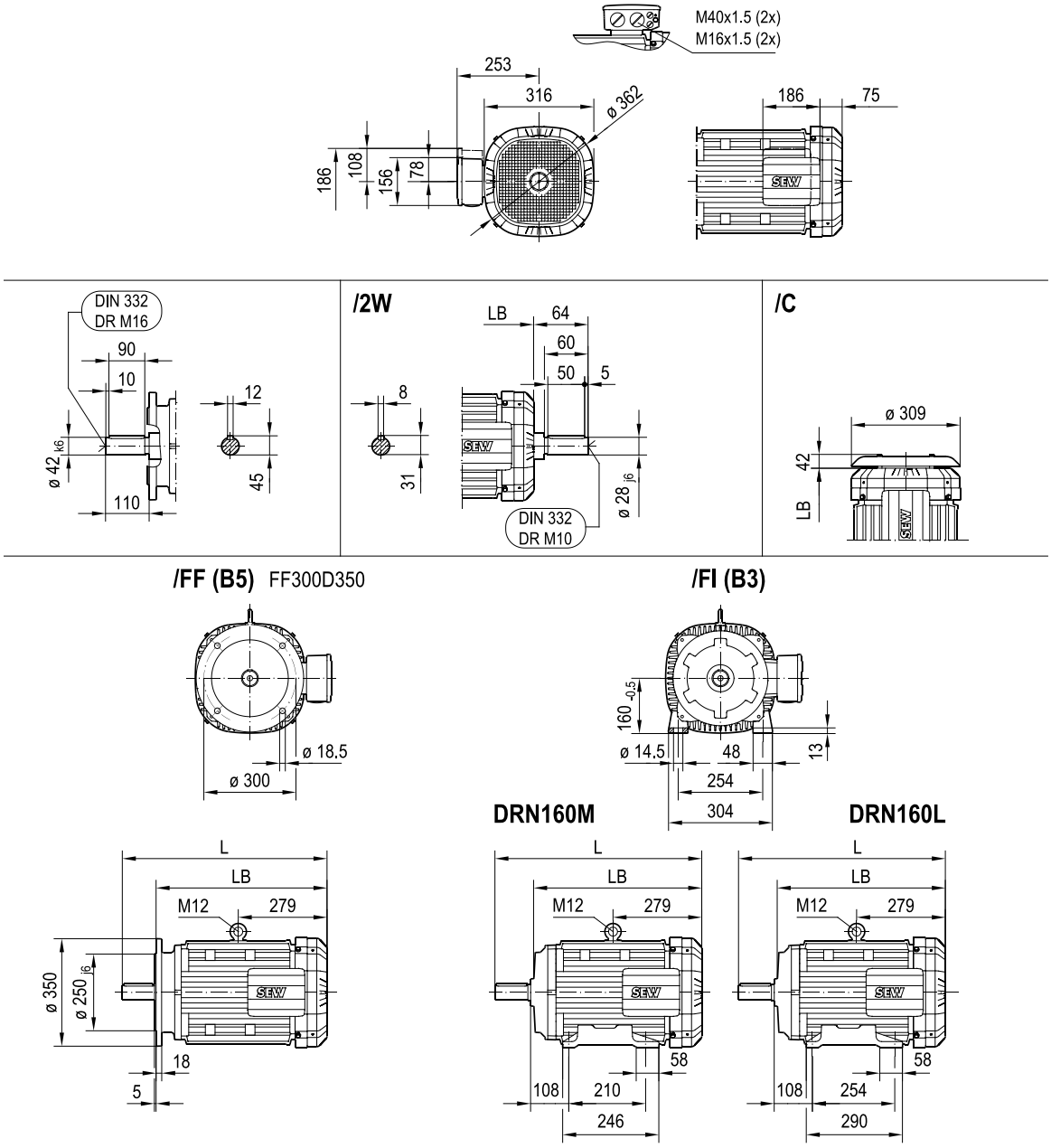
DRN160M 4,6
DRN160L 4

08 575 03 14
1(2)



(→ 📖)	160M	160L						
L	642	642						
LB (B5/B14)	532	532						
LB (B3)	529	529						

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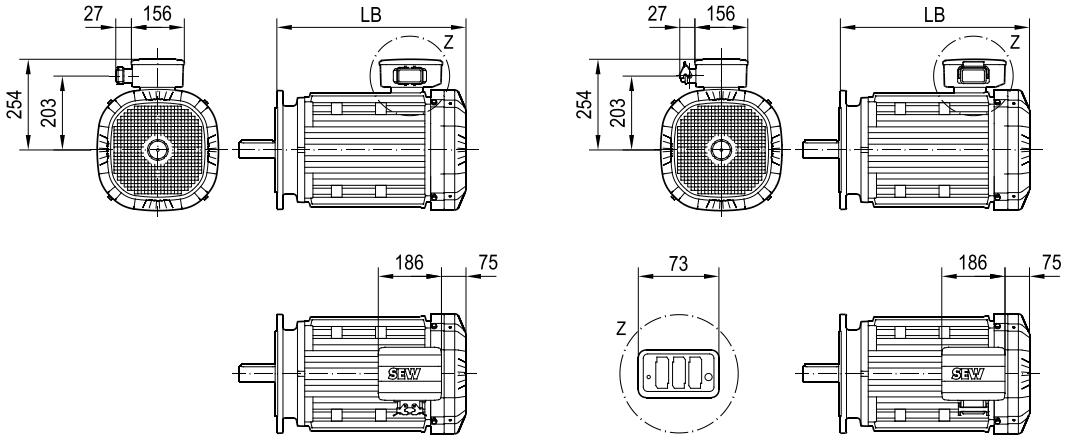
08 575 03 14
2(2)

/IV



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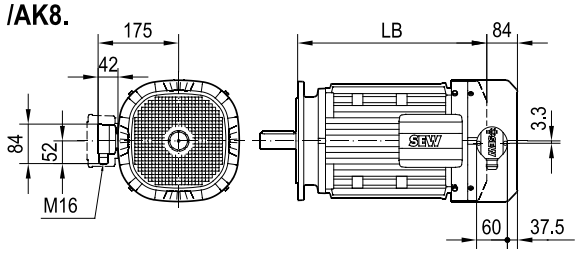

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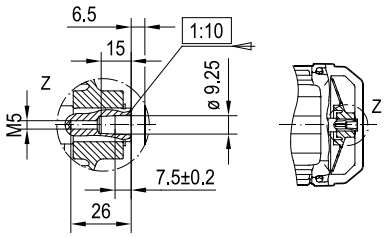
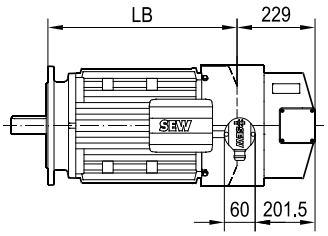


/EK8./V
/AK8./V



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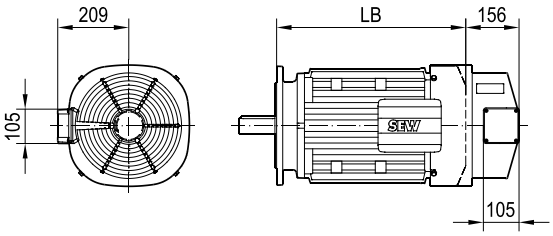

(→ 📖)	160M	160L						
L	642	642						
LB (B5/B14)	532	532						
LB (B3)	529	529						

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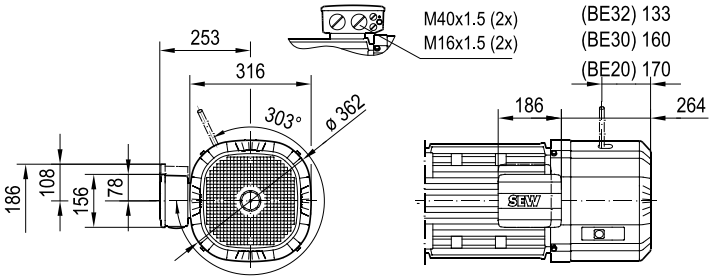
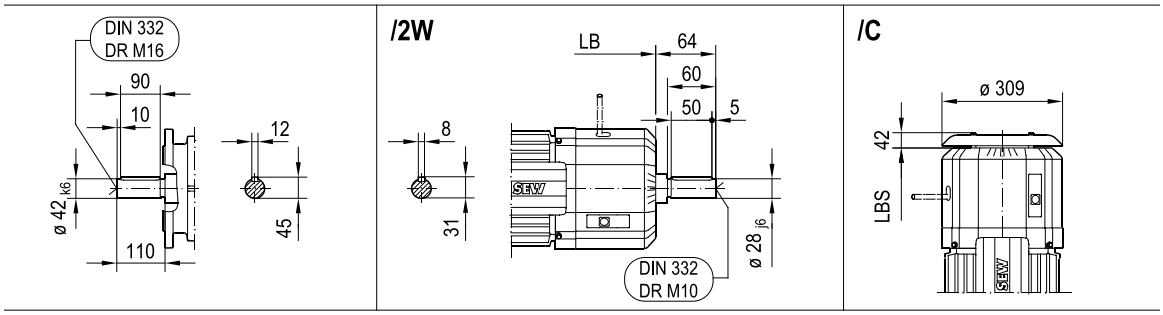
DRN160M BE 4,6
DRN160L BE 4

09 940 03 14
1(2)





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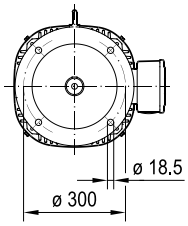
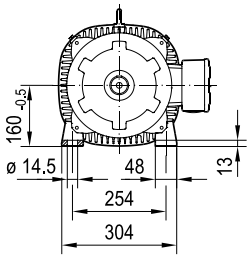
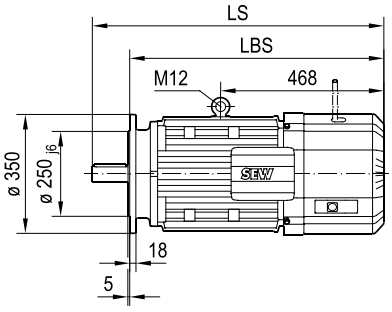
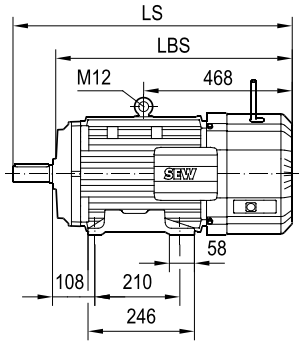


/FI (B3)

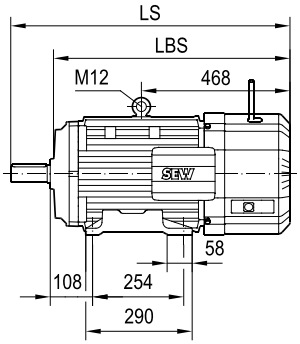


DRN160M





DRN160L



(→ 📖)	160M	160L						
LS	831	831						
LBS (B5/B14)	721	721						
LBS (B3)	718	718						

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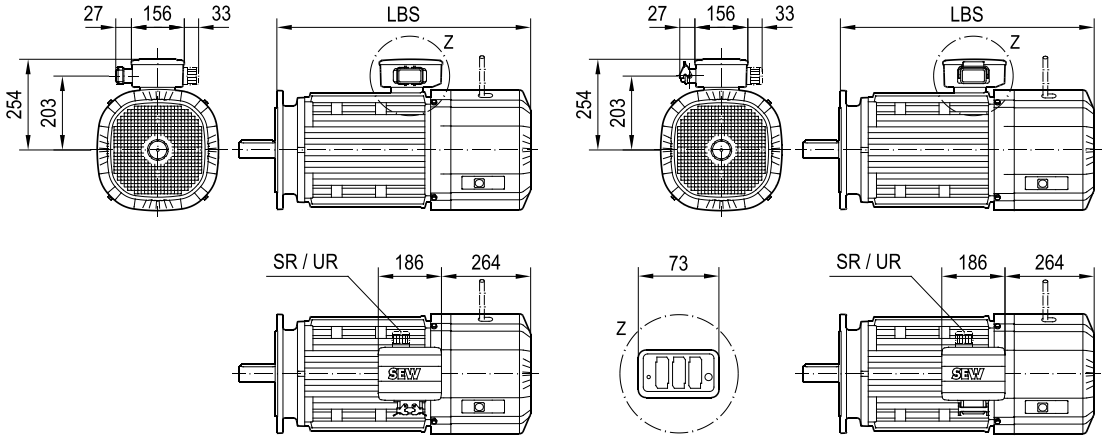
09 940 03 14
2(2)

/IV



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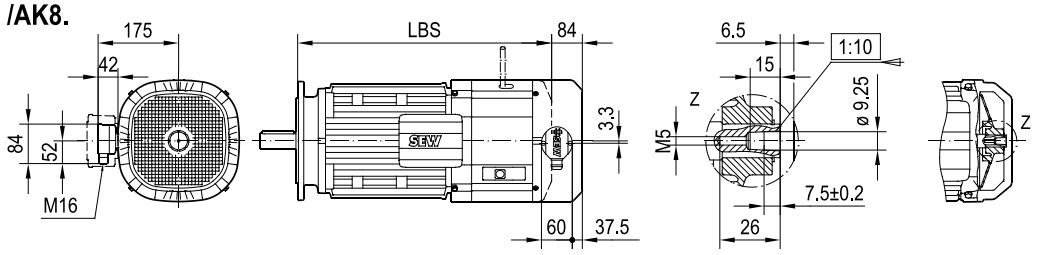
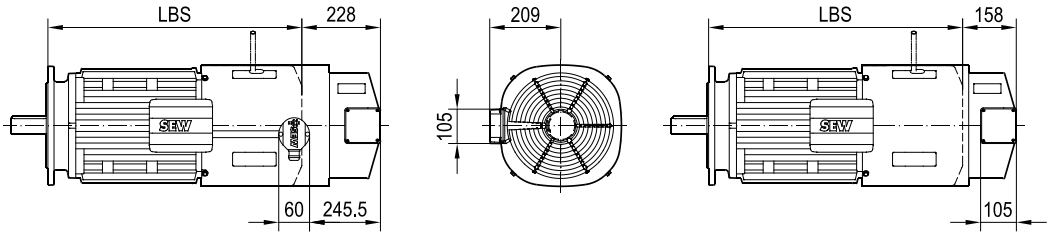
/EK8A



/EK8./V
/AK8./V

/V



(→ 📖)	160M	160L						
LS	831	831						
LBS (B5/B14)	721	721						
LBS (B3)	718	718						

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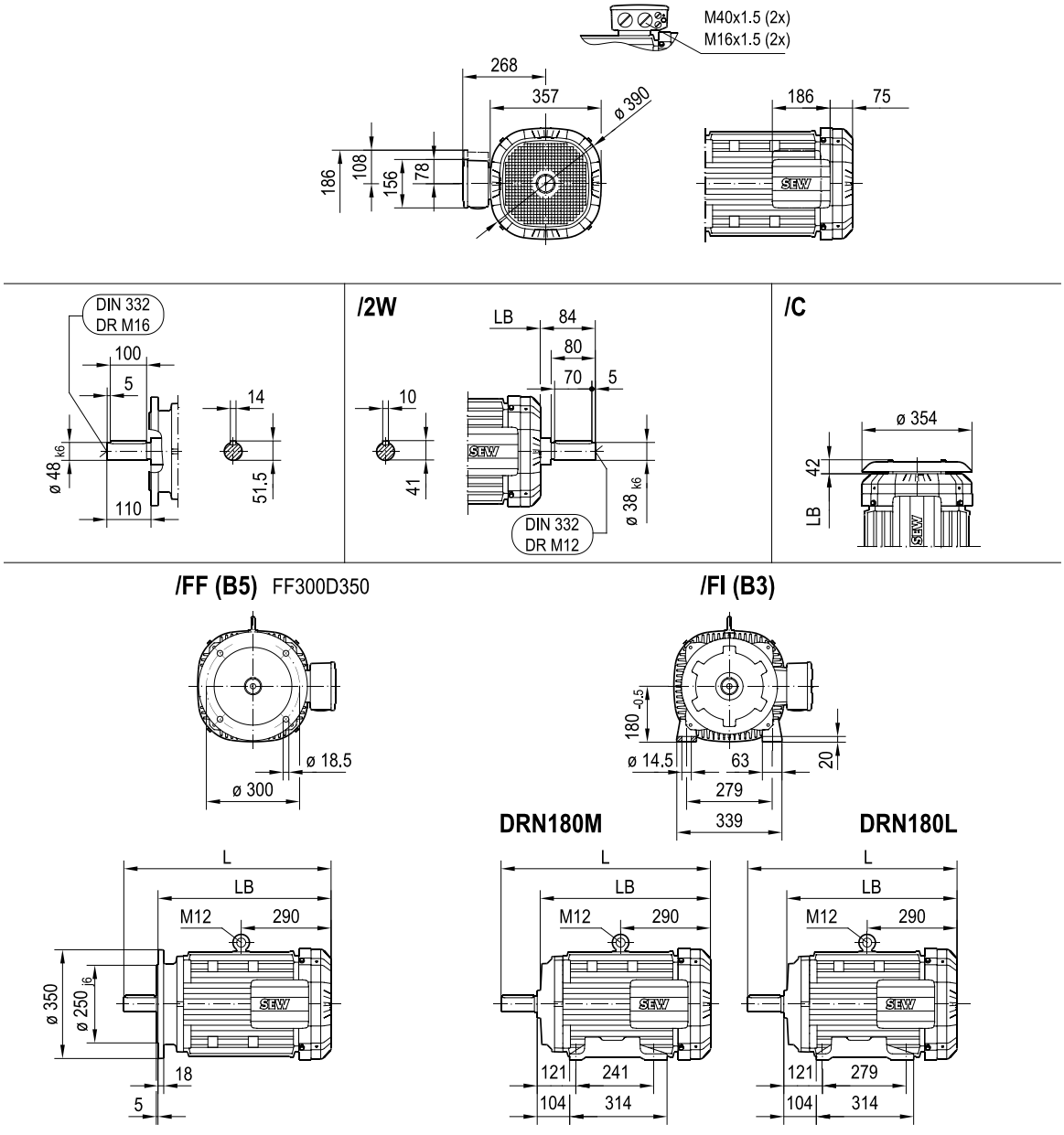
DRN180M 4
DRN180L 4

08 576 03 14
1(2)



(→ 📖)	180M	180L						
L	665	665						
LB (B5/B14)	555	555						
LB (B3)	554	554						

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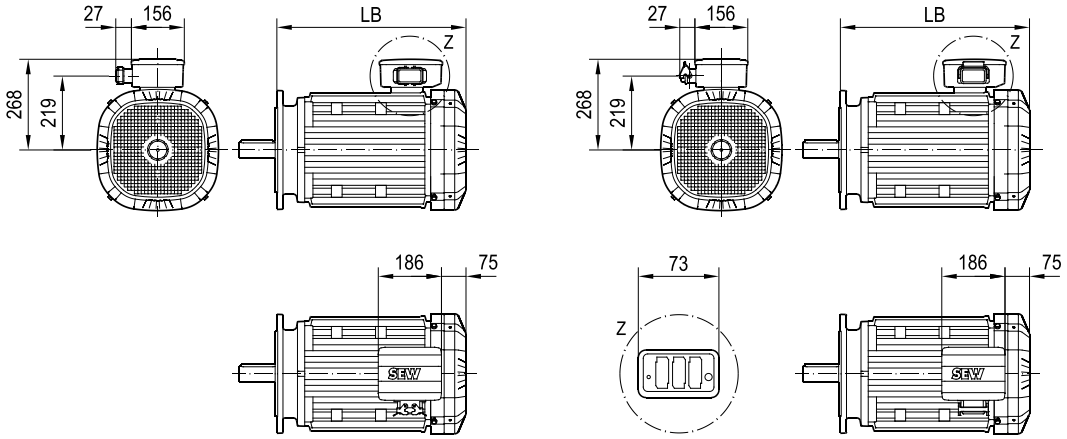
08 576 03 14
2(2)

/IV



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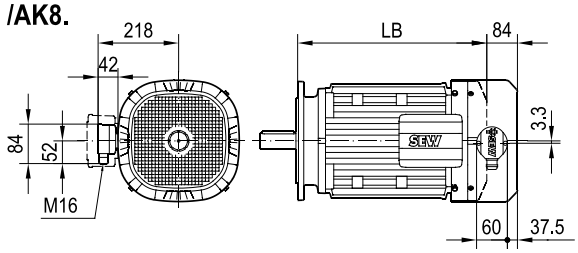

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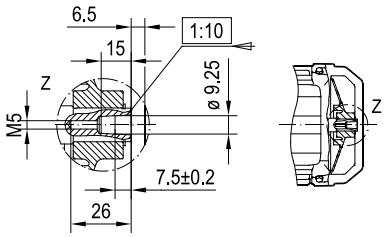
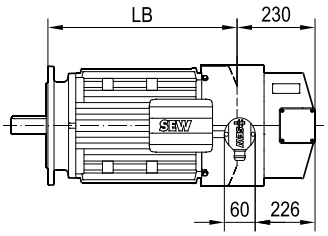
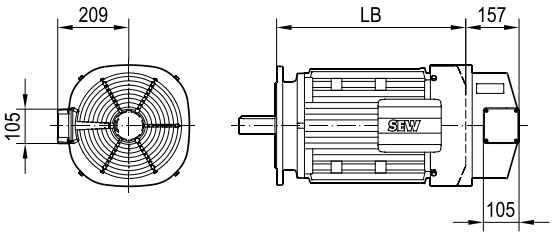


/EK8./V
/AK8./V



/V



(→ 📖)	180M	180L						
L	665	665						
LB (B5/B14)	555	555						
LB (B3)	554	554						

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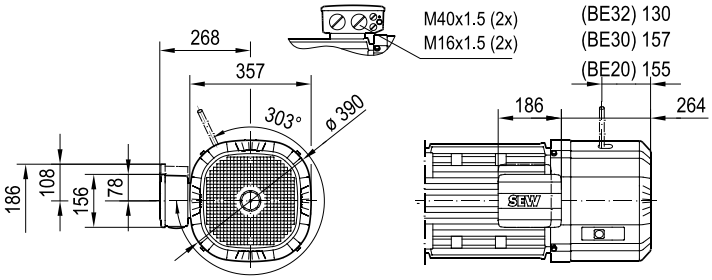
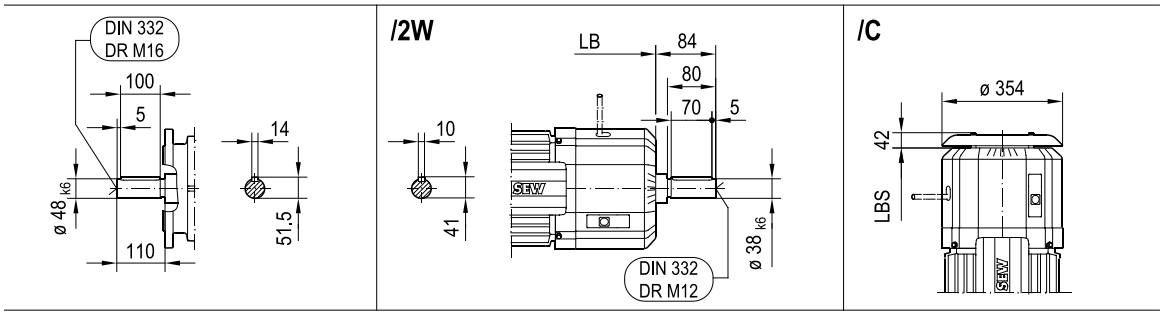
DRN180M BE 4
DRN180L BE 4

09 941 03 14
1(2)





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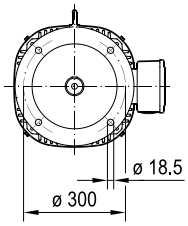

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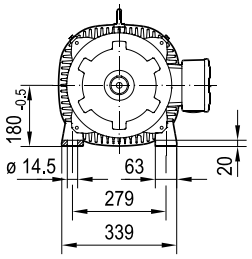
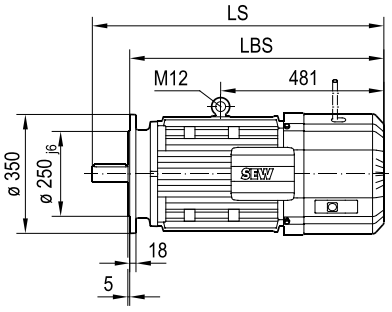
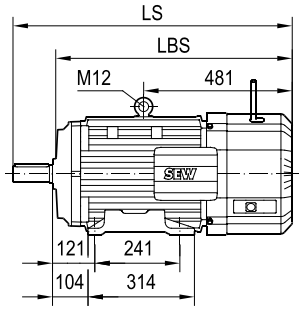
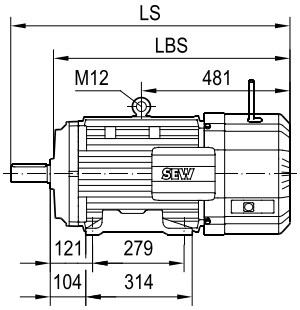


DRN180M





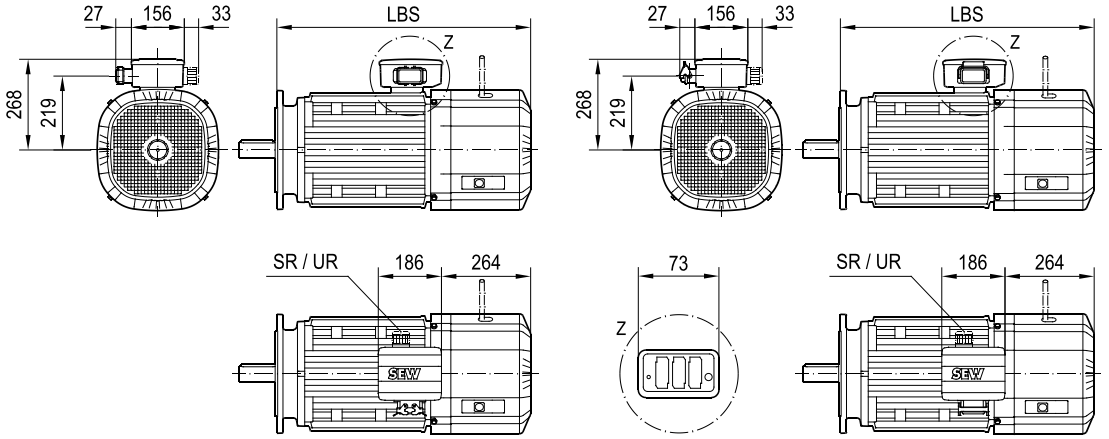
DRN180L



(→ 📖)	180M	180L						
LS	858	858						
LBS (B5/B14)	748	748						
LBS (B3)	745	745						

09 941 03 14
2(2)

/IV



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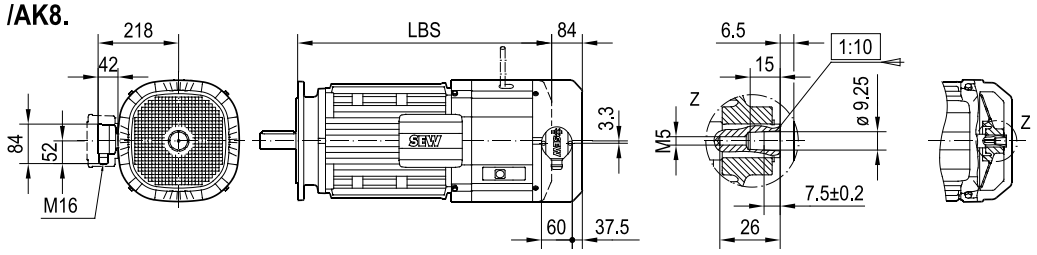
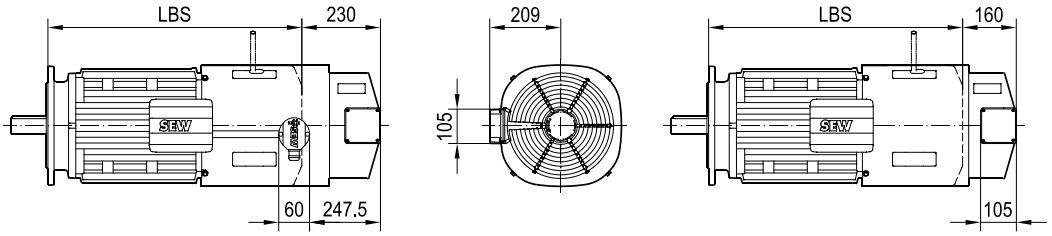
/AK8.

/EK8A



/EK8./V
/AK8./V

/V



(→ 📖)	180M	180L						
LS	858	858						
LBS (B5/B14)	748	748						
LBS (B3)	745	745						

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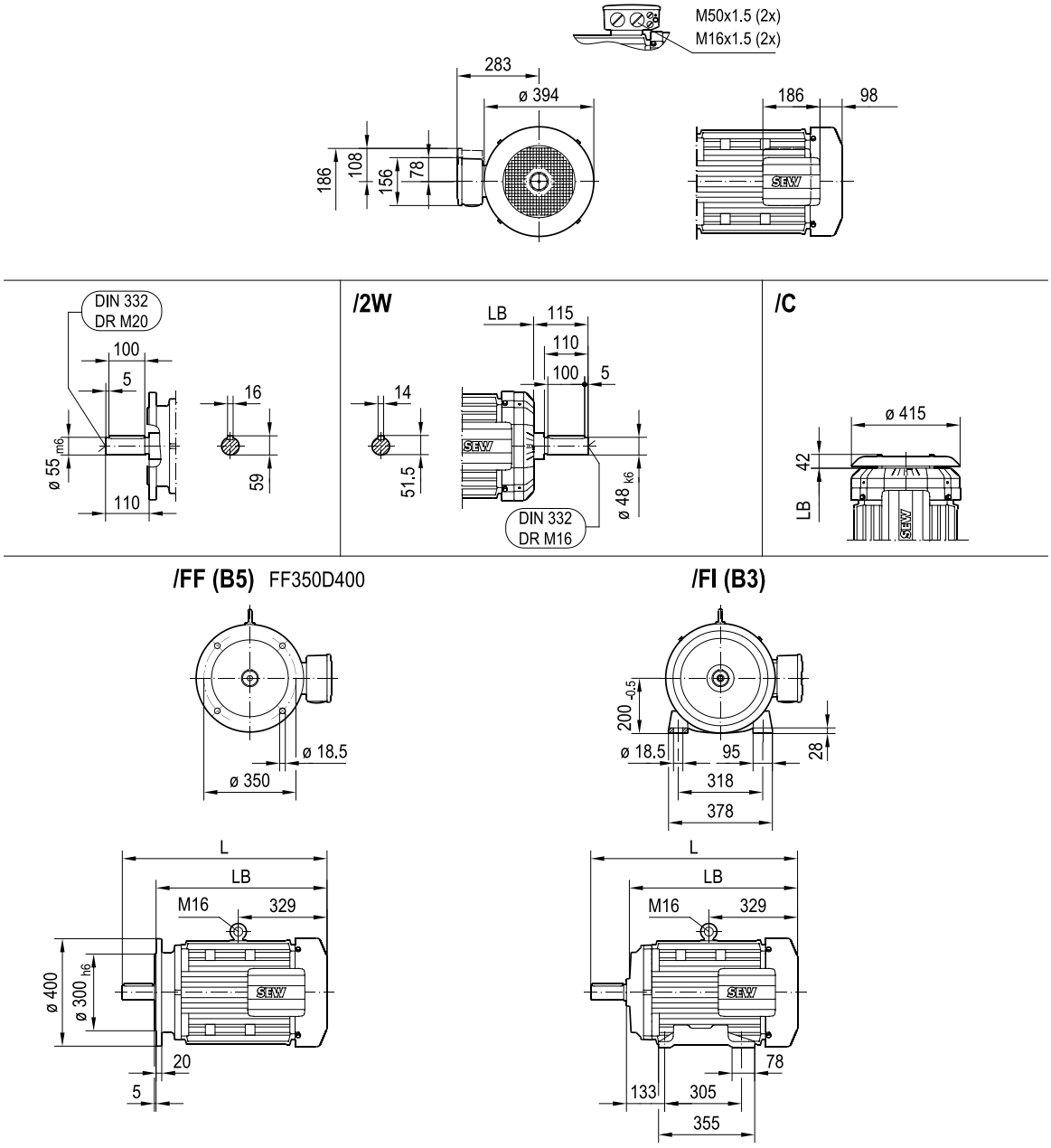
DRN200L 4

08 577 02 14
1(2)



(→ 📖)	200L							
L	759							
LB (B5/B14)	649							
LB (B3)	646							

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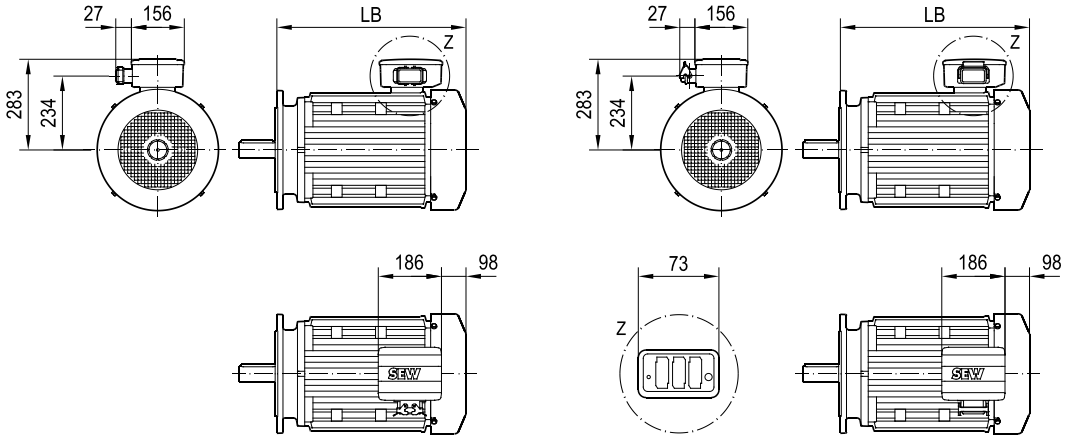
08 577 02 14
2(2)

/IV



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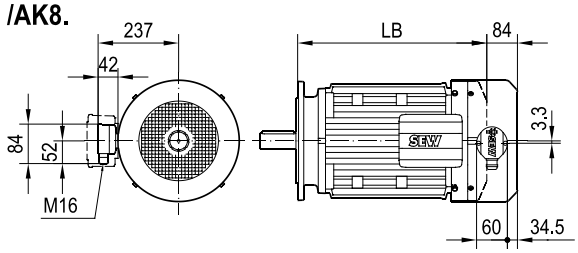

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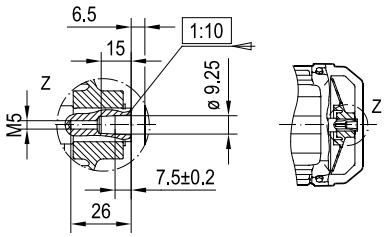

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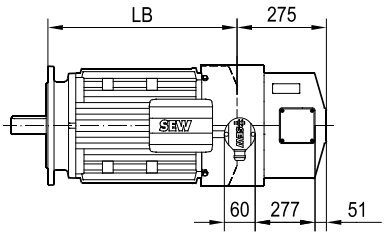

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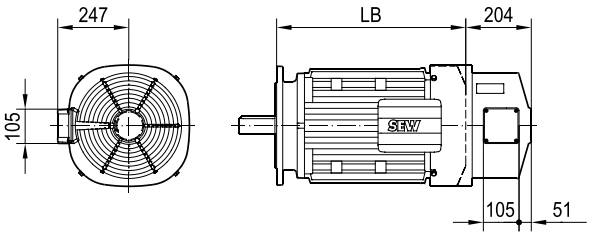


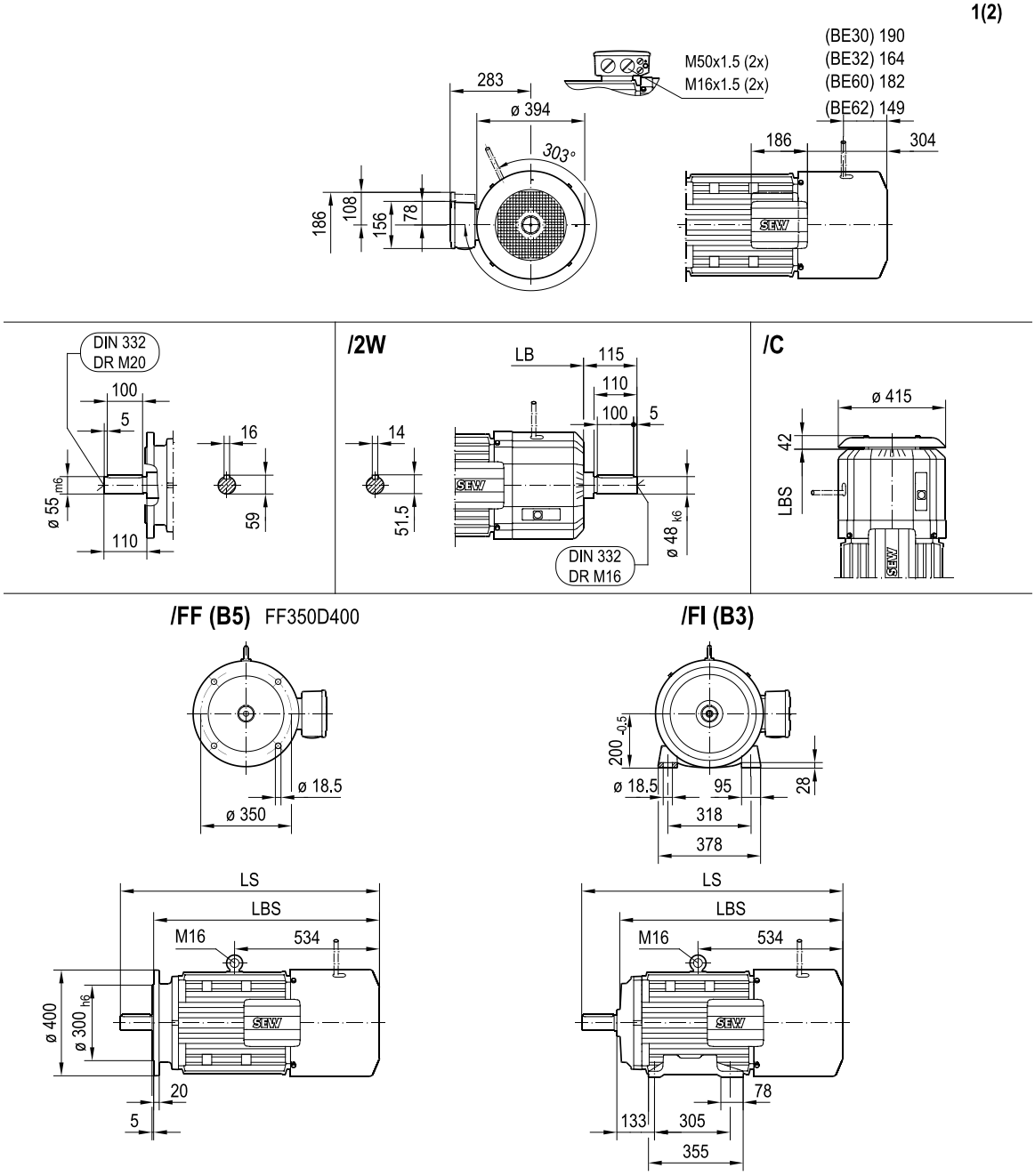
(→ 📖)	200L							
L	759							
LB (B5/B14)	649							
LB (B3)	646							

25880748/EN – 11/2019

DRN200L BE 4

09 942 02 14

1(2)



(→ 📖)	200L							
LS	964							
LBS (B5/B14)	854							
LBS (B3)	851							

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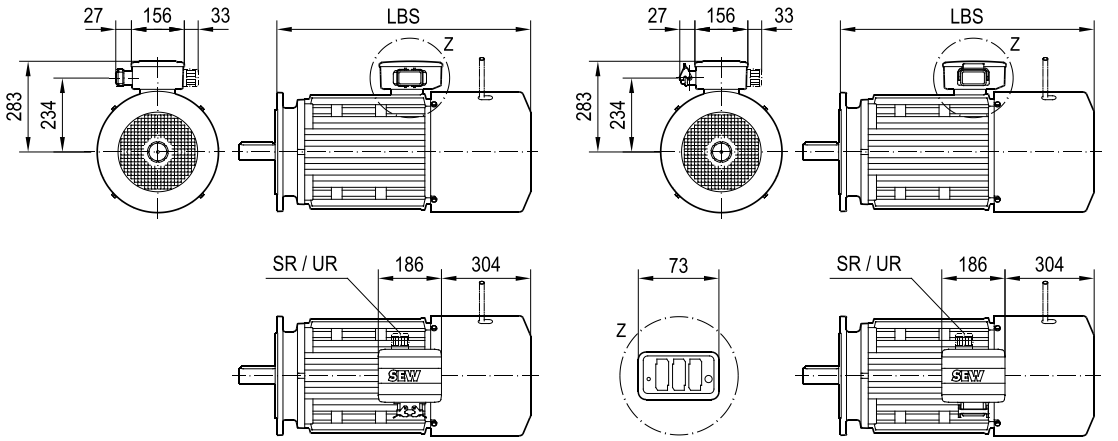
09 942 02 14
2(2)

/IV



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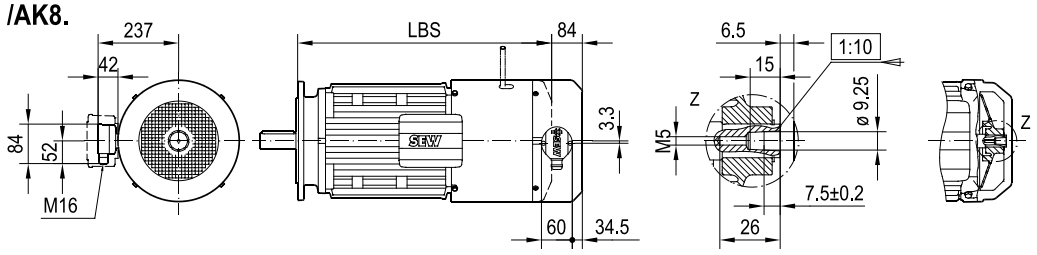

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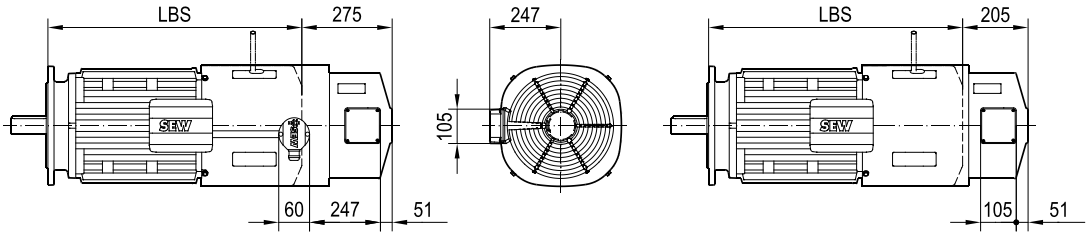
/AK8./V

/V



(→ 📖)	200L							
LS	964							
LBS (B5/B14)	854							
LBS (B3)	851							

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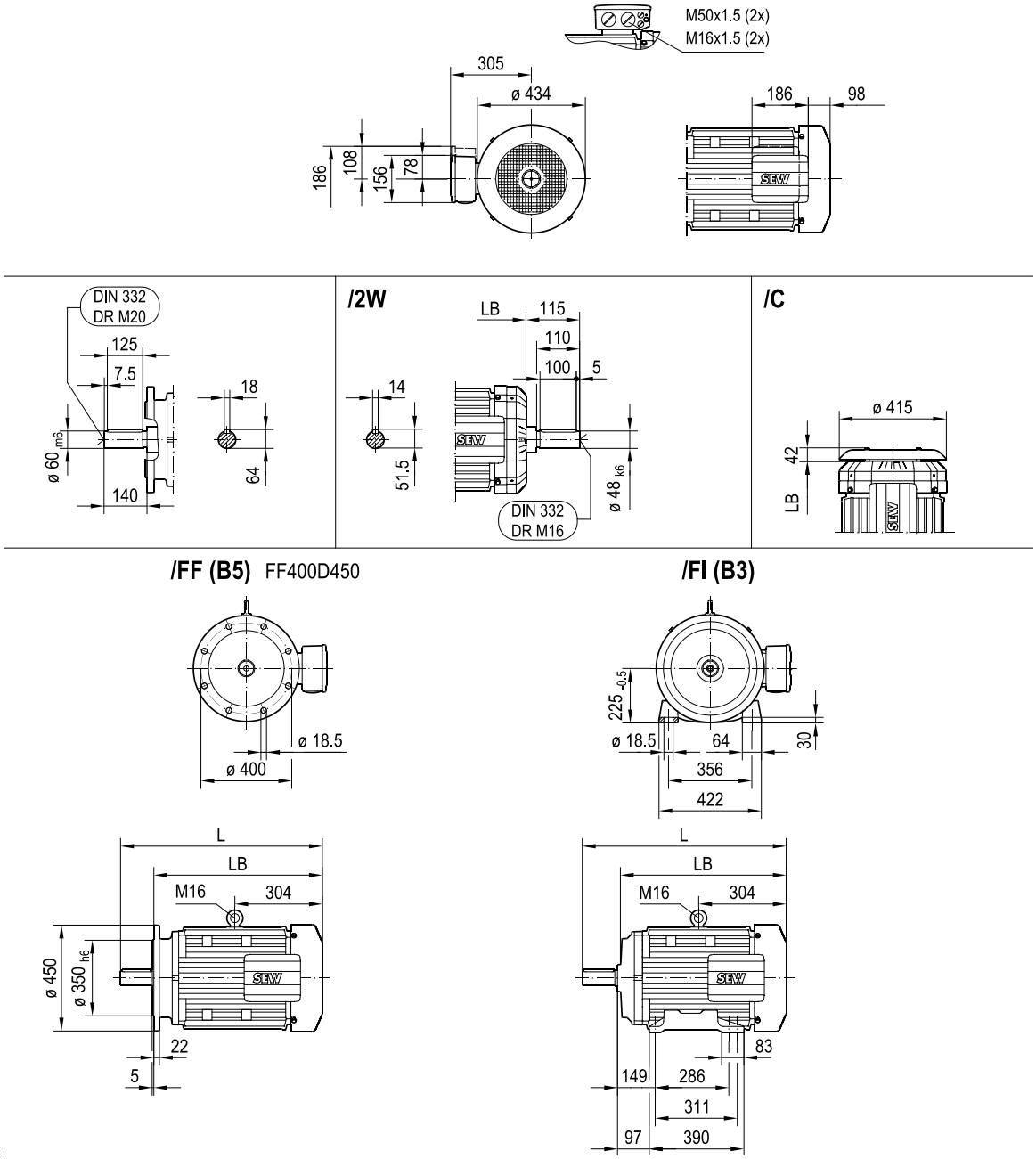
DRN225S 4
DRN225M 4

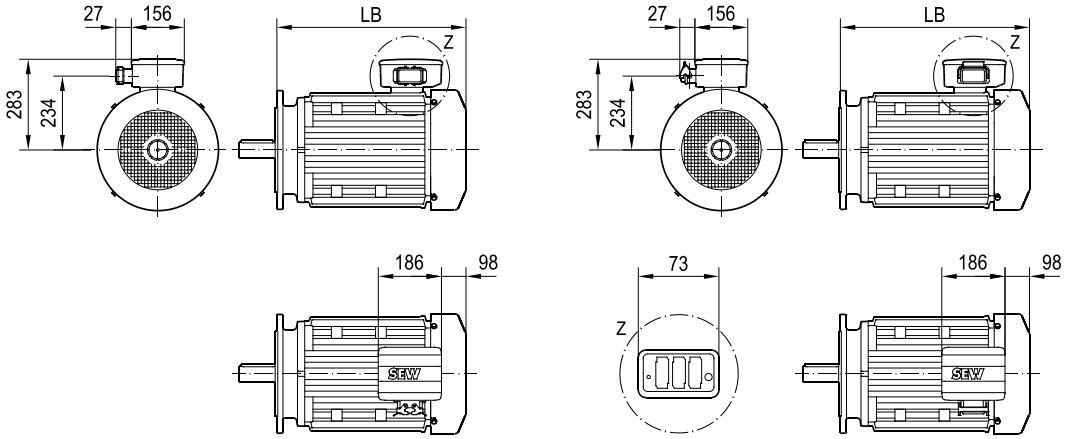
08 578 03 14
1(2)



(→ 📖)	225S	225M						
L	757	757						
LB (B5/B14)	617	617						
LB (B3)	614	614						

08 578 03 14
2(2)

/IV



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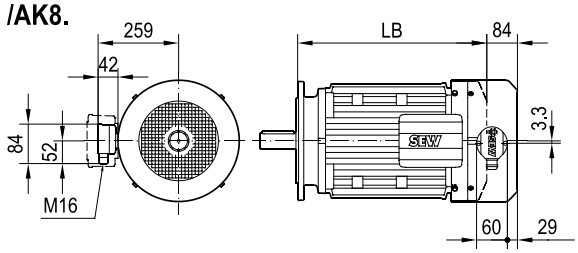

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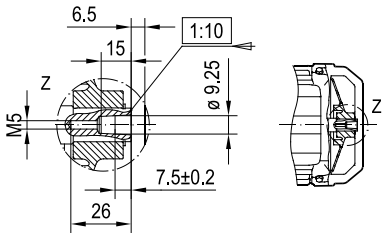

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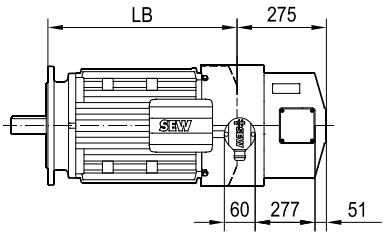
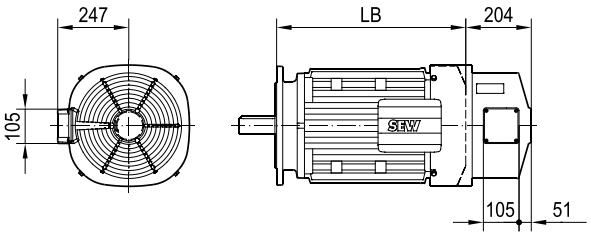
/AK8./V



/V



(→ 📖)	225S	225M						
L	757	757						
LB (B5/B14)	617	617						
LB (B3)	614	614						

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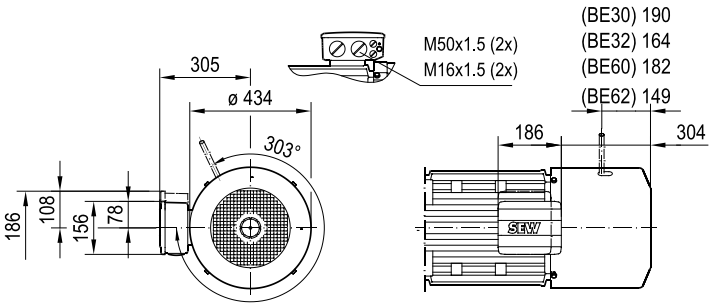
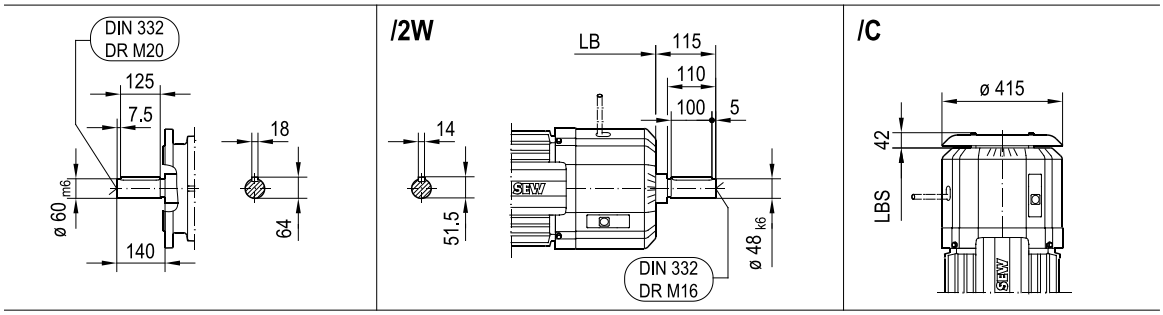
DRN225S BE 4
DRN225M BE 4

09 943 03 14
1(2)





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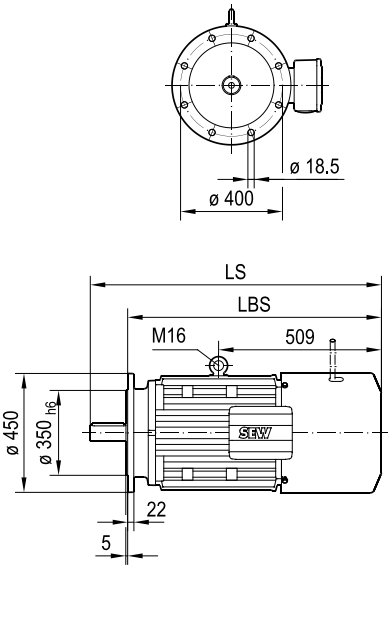
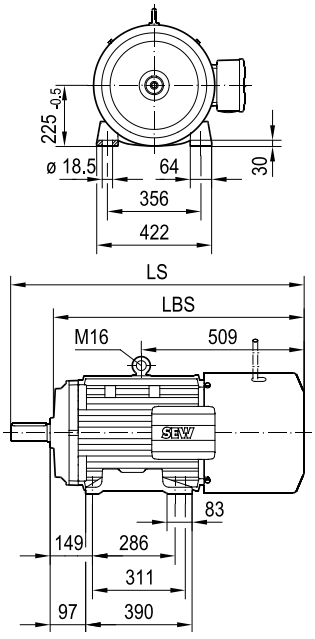


/FI (B3)



(→ 📖)	225S	225M						
LS	962	962						
LBS (B5/B14)	822	822						
LBS (B3)	819	819						

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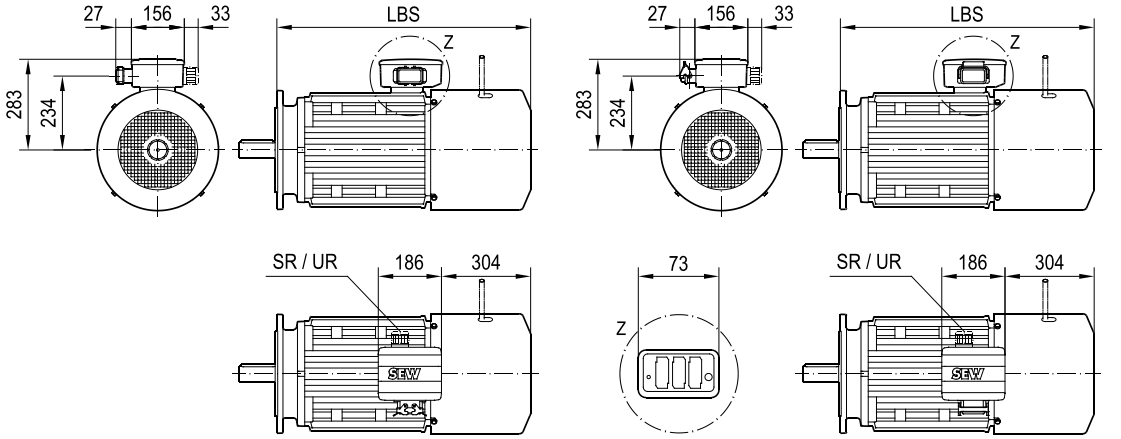
09 943 03 14
2(2)

/IV



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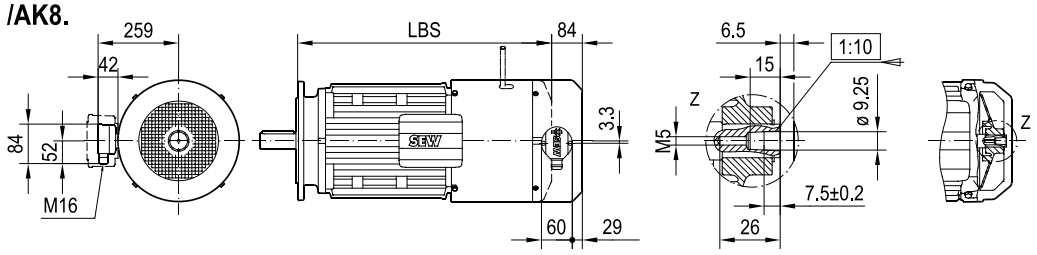

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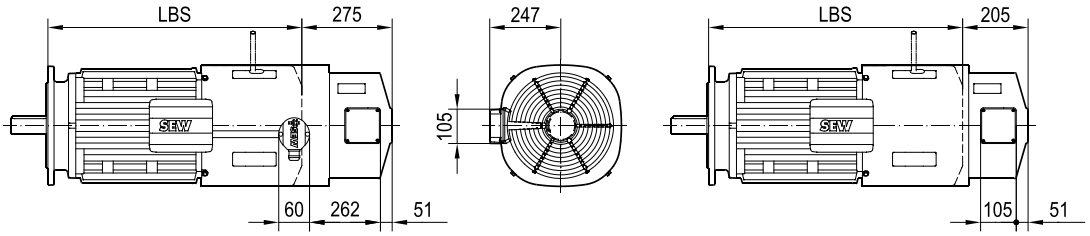
/AK8./V

/V



(→ 📖)	225S	225M						
LS	962	962						
LBS (B5/B14)	822	822						
LBS (B3)	819	819						

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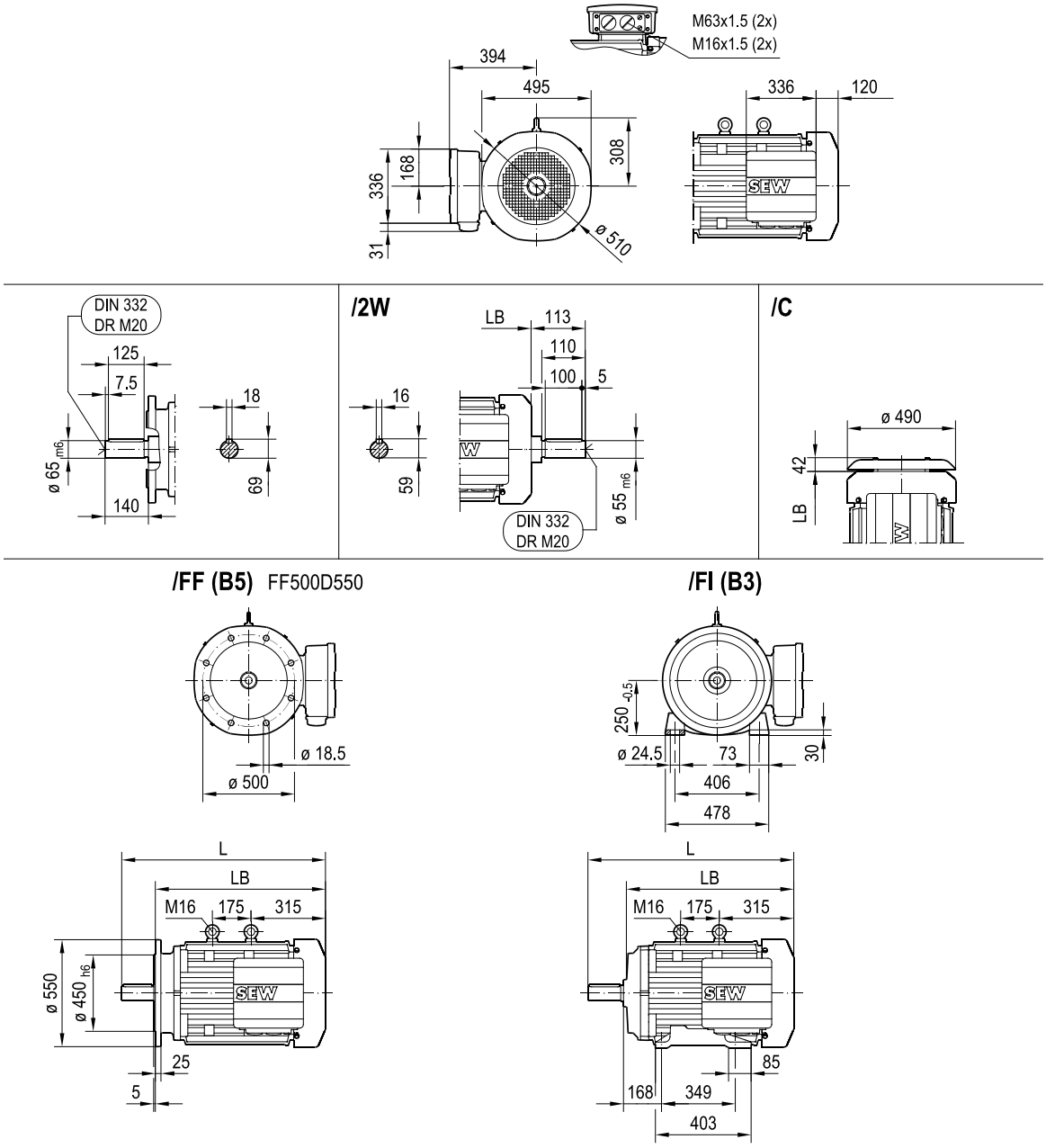
DRN250M 4
DRN250ME 4

08 579 01 14
1(2)



(→ 📖)	250M	250ME						
L	892	892						
LB (B5/B14)	752	752						
LB (B3)	750	750						

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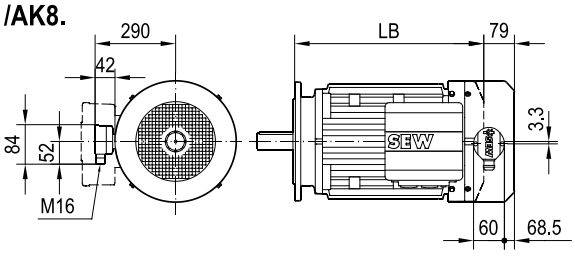
08 579 01 14
2(2)

/EK8.
/AK8.



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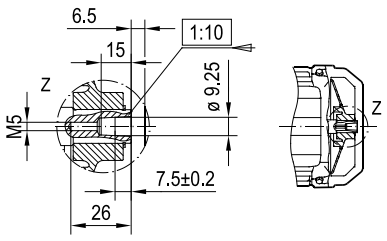

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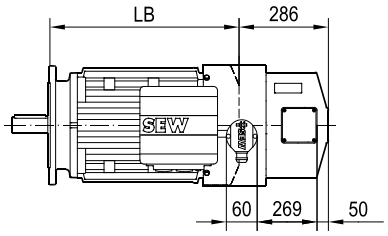
/AK8./V



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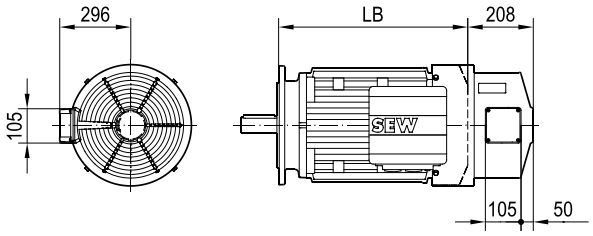

(→ 📖)	250M	250ME						
L	892	892						
LB (B5/B14)	752	752						
LB (B3)	750	750						

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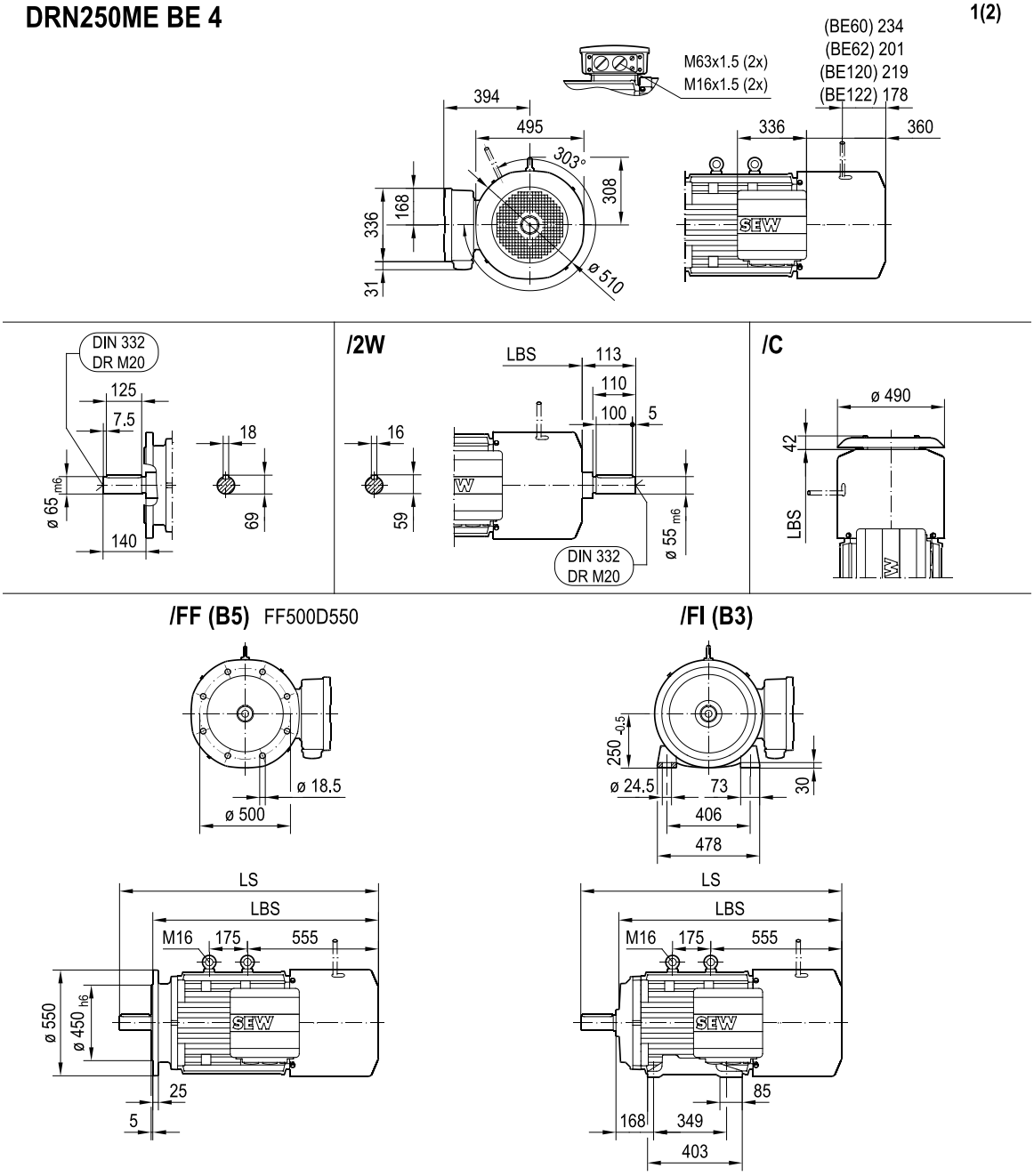
DRN250M BE 4
DRN250ME BE 4

09 944 01 14
1(2)



(→ 📖)	250M	250ME						
LS	1132	1132						
LBS (B5/B14)	992	992						
LBS (B3)	990	990						

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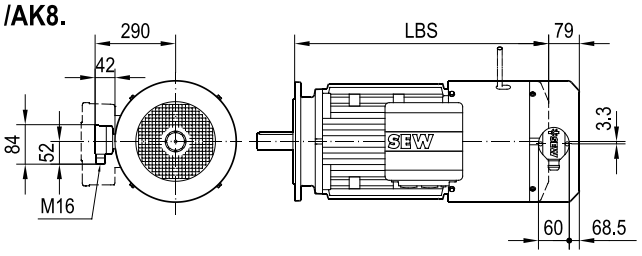
09 944 01 14
2(2)

/EK8.
/AK8.



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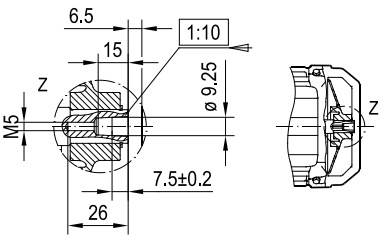

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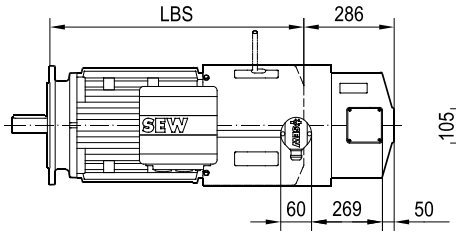

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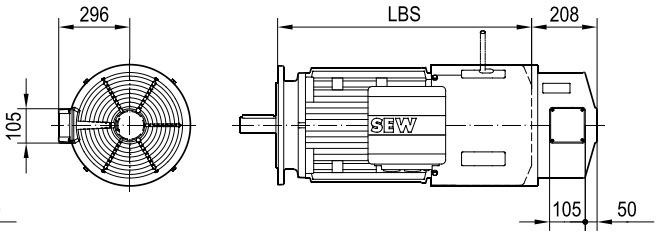

(→ 📖)	250M	250ME						
LS	1132	1132						
LBS (B5/B14)	992	992						
LBS (B3)	990	990						

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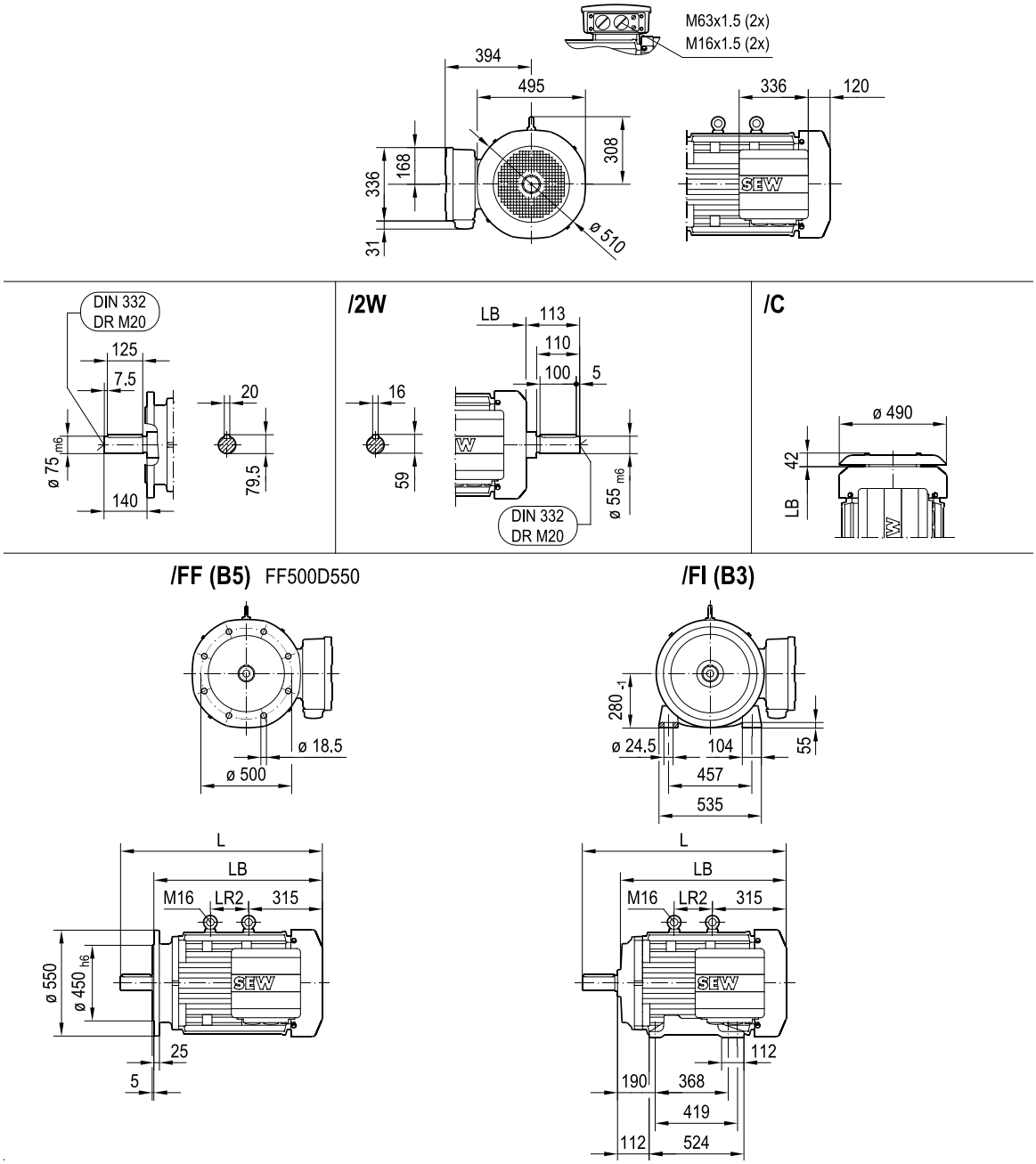
DRN280S 4
DRN280M 4

08 580 02 14
1(2)



(→ 📖)	280S	280M						
L	892	987						
LB (B5/B14)	752	847						
LB (B3)	750	845						
LR2	175	270						

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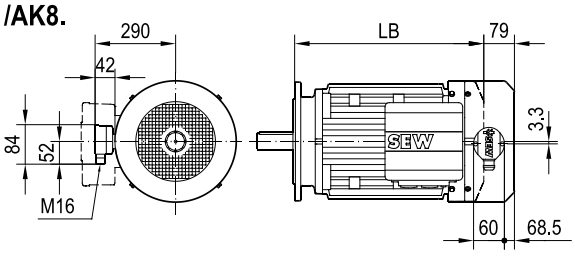
08 580 02 14
2(2)

/EK8.
/AK8.



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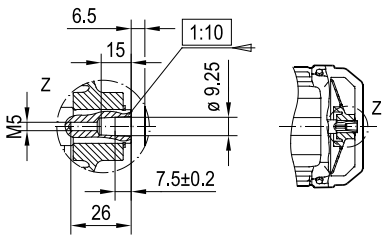

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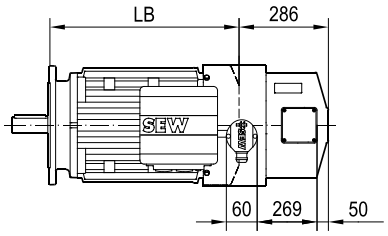

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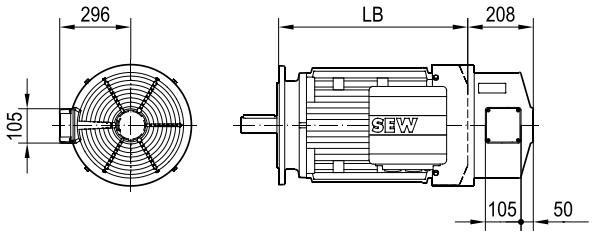

(→ 📖)	280S	280M						
L	892	987						
LB (B5/B14)	752	847						
LB (B3)	750	845						
LR2	175	270						

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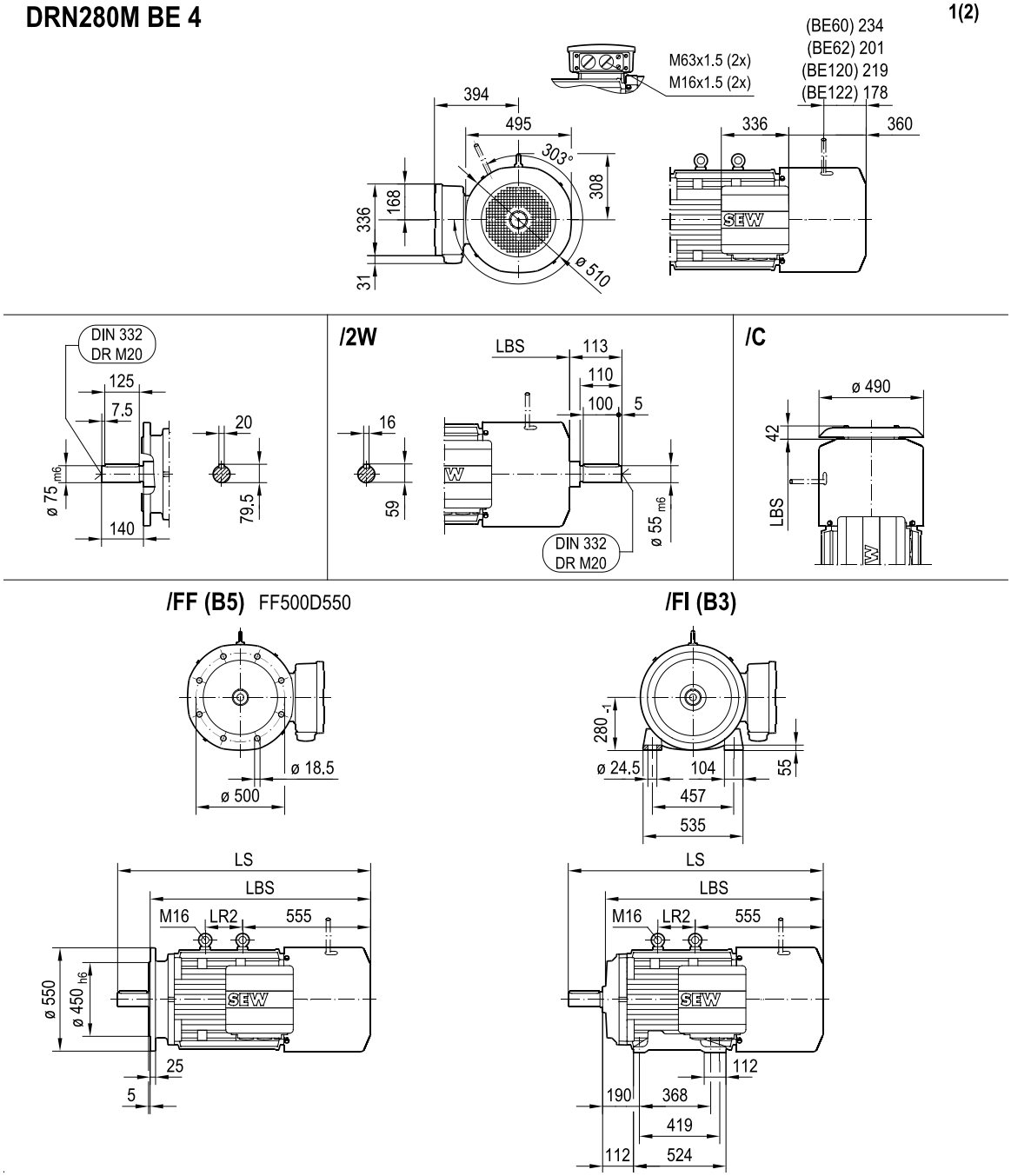
DRN280S BE 4
DRN280M BE 4

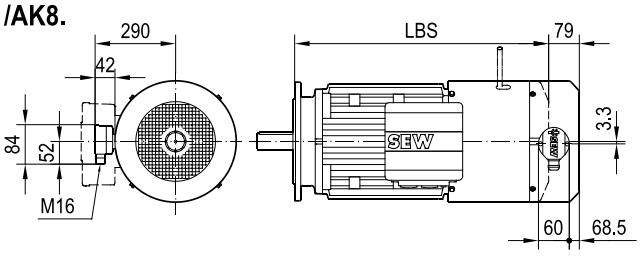
09 945 02 14
1(2)



(→ 📖)	280S	280M						
LS	1132	1227						
LBS (B5/B14)	992	1087						
LBS (B3)	990	1085						
LR2	175	270						

09 945 02 14
2(2)

/EK8.
/AK8.



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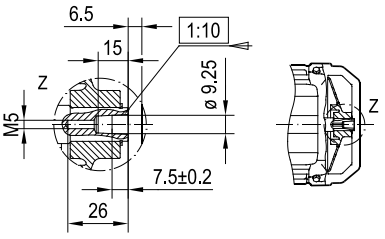

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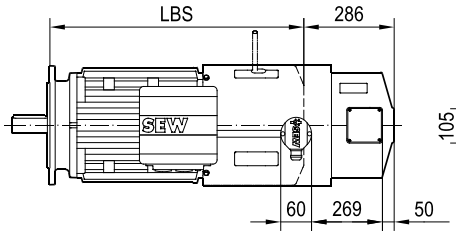
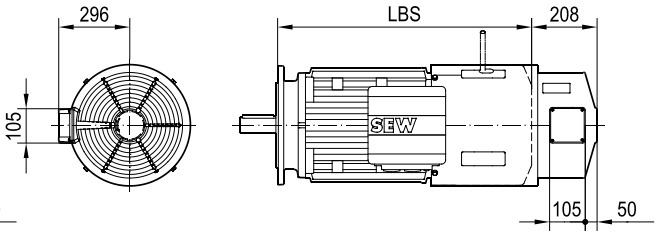
/AK8./V



/V



(→ 📖)	280S	280M						
LS	1132	1227						
LBS (B5/B14)	992	1087						
LBS (B3)	990	1085						
LR2	175	270						

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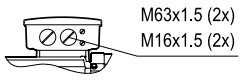
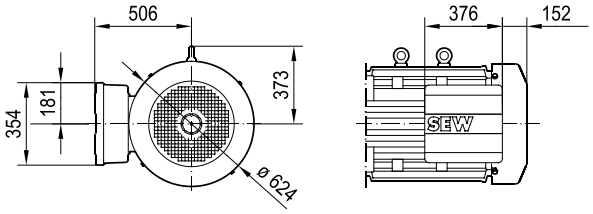
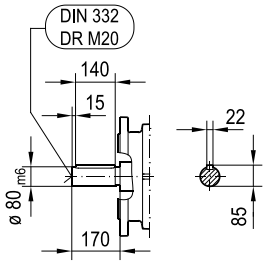
DRN315S 4
DRN315M 4
DRN315ME 4

08 582 03 14
1(2)







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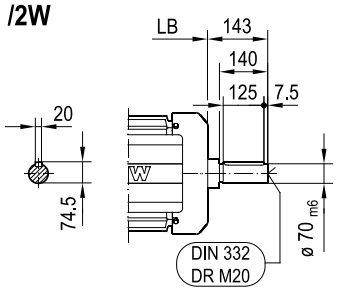
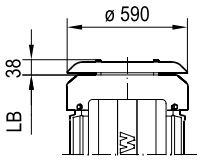
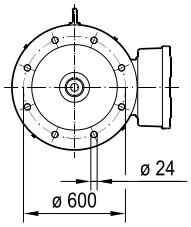


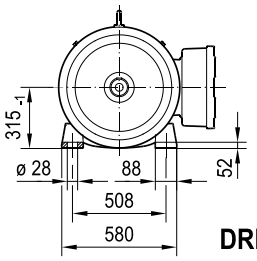
/C



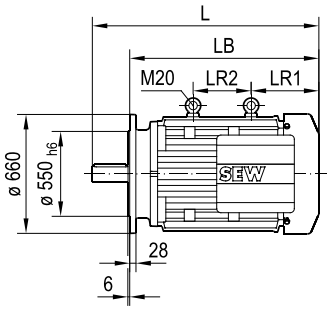
/FF (B5) FF600D660

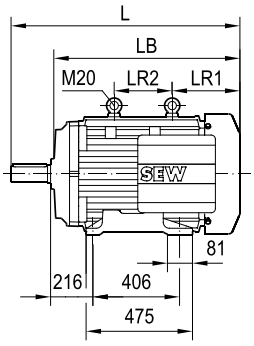


/FI (B3)

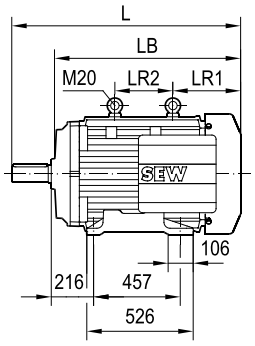


DRN315S





DRN315M/ME



(→ 📖)	315S	315M	315ME					
L	1111	1111	1241					
LB (B5/B14)	941	941	1071					
LB (B3)	939	939	1069					
LR1	334	334	364					
LR2	300	300	400					

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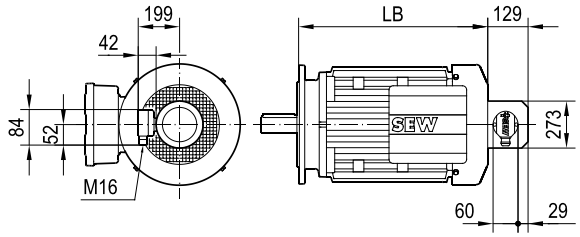
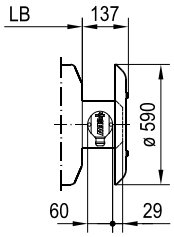
08 582 03 14
2(2)

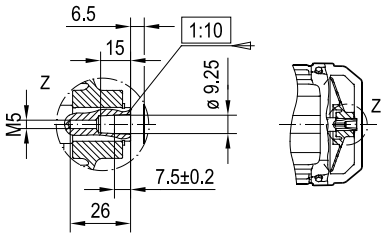
/EK8.
/AK8.



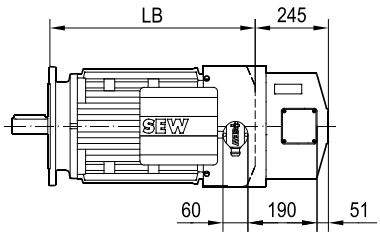
/EK8./C
/AK8./C



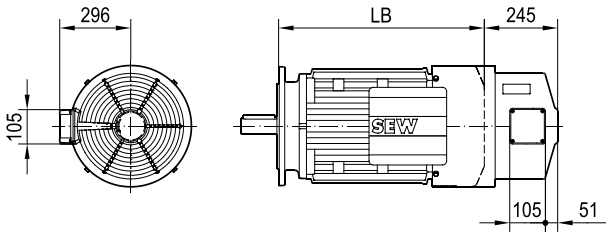
/EK8A



/EK8./V
/AK8./V



/V



(→ 📖)	315S	315M	315ME					
L	1111	1111	1241					
LB (B5/B14)	941	941	1071					
LB (B3)	939	939	1069					
LR1	334	334	364					
LR2	300	300	400					

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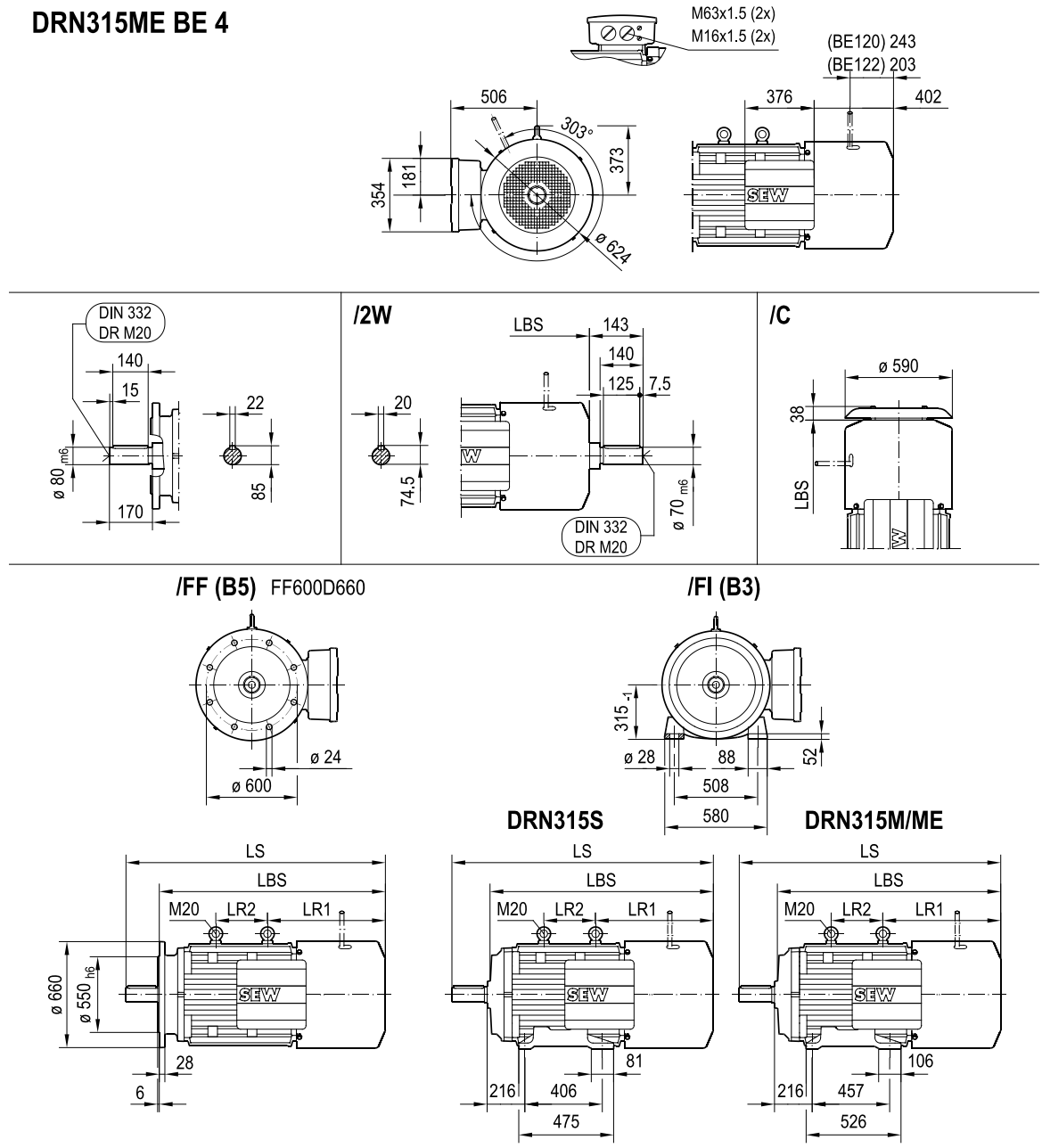
DRN315S BE 4
DRN315M BE 4
DRN315ME BE 4

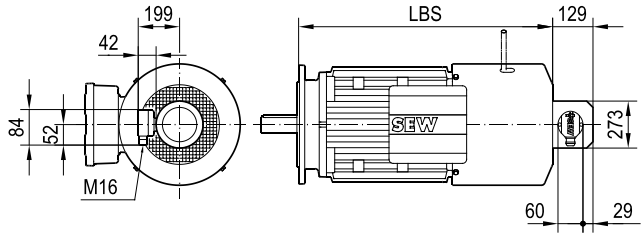
09 947 03 14
1(2)



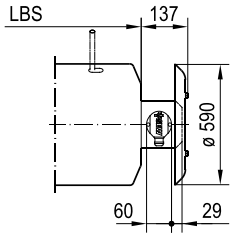
(→ 📖)	315S	315M	315ME					
LS	1362	1362	1492					
LBS (B5/B14)	1192	1192	1322					
LBS (B3)	1190	1190	1320					
LR1	585	585	615					
LR2	300	300	400					

09 947 03 14
2(2)

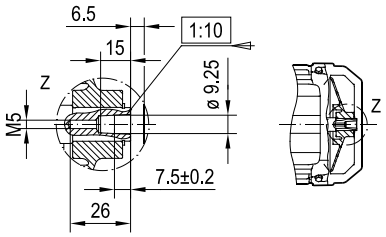
/EK8.
/AK8.



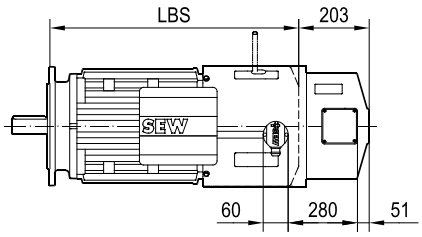
/EK8./C
/AK8./C



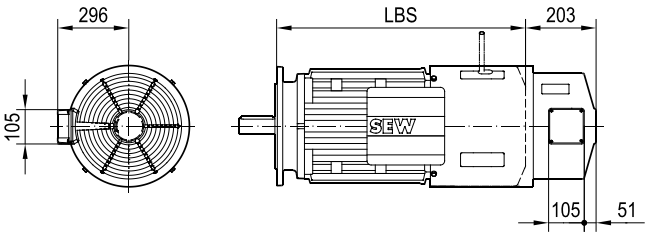
/EK8A



/EK8./V
/AK8./V



/V



(→ 📖)	315S	315M	315ME					
LS	1362	1362	1492					
LBS (B5/B14)	1192	1192	1322					
LBS (B3)	1190	1190	1320					
LR1	585	585	615					
LR2	300	300	400					

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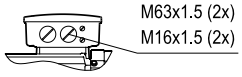
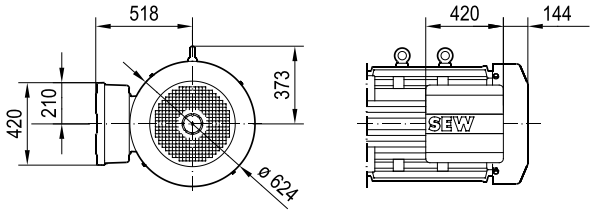
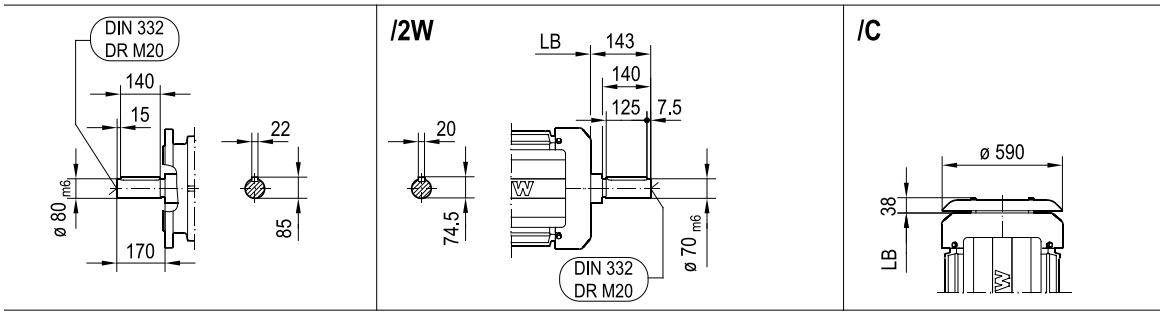
DRN315L 4
DRN315H 4

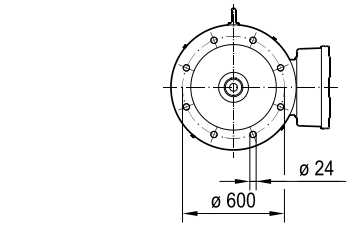
08 584 03 14
1(2)



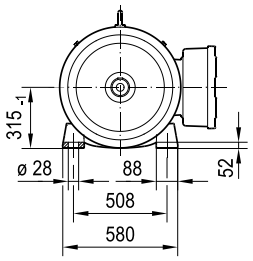


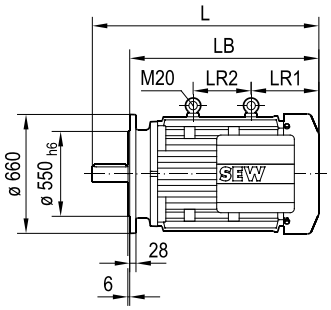


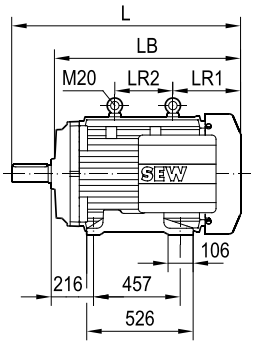
/FF (B5) FF600D660



/FI (B3)







(→ 📖)	315L	315H						
L	1241	1241						
LB (B5/B14)	1071	1071						
LB (B3)	1069	1069						
LR1	364	364						
LR2	400	400						

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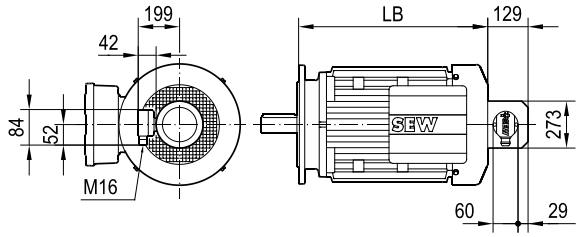
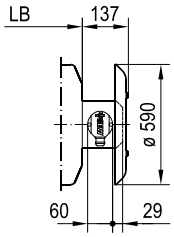
08 584 03 14
2(2)

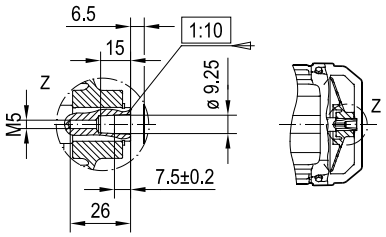
/EK8.
/AK8.



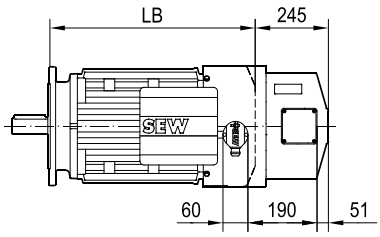
/EK8./C
/AK8./C



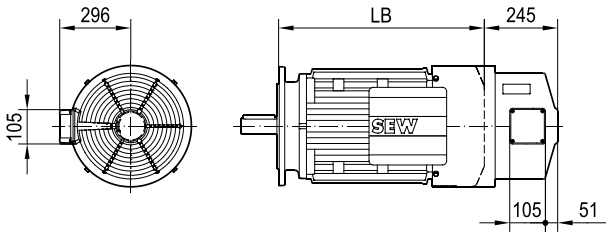
/EK8A



/EK8./V
/AK8./V



/V



(→ 📖)	315L	315H						
L	1241	1241						
LB (B5/B14)	1071	1071						
LB (B3)	1069	1069						
LR1	364	364						
LR2	400	400						

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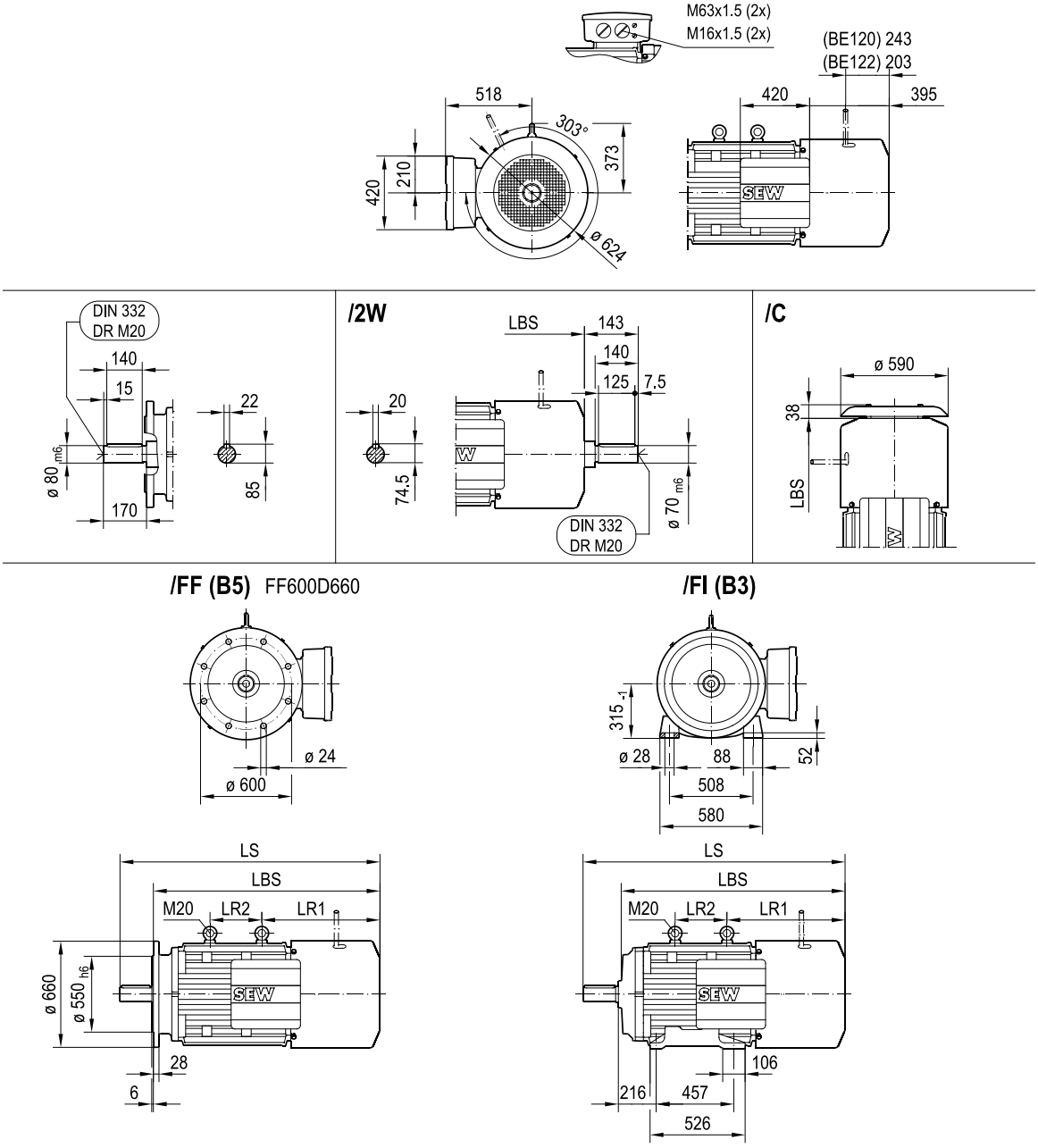
DRN315L BE 4
DRN315H BE 4

09 949 03 14
1(2)



(→ 📖)	315L	315H						
LS	1492	1492						
LBS (B5/B14)	1322	1322						
LBS (B3)	1320	1320						
LR1	615	615						
LR2	400	400						

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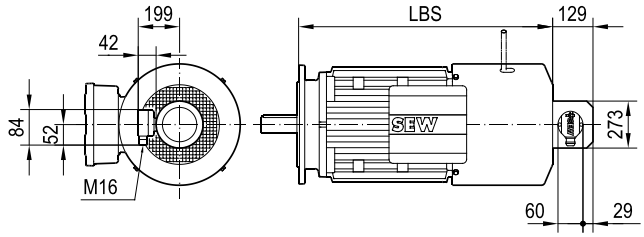
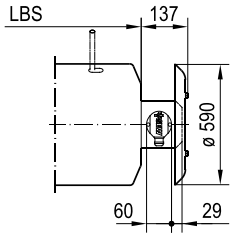
09 949 03 14
2(2)

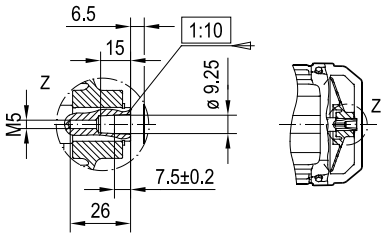
/EK8.
/AK8.



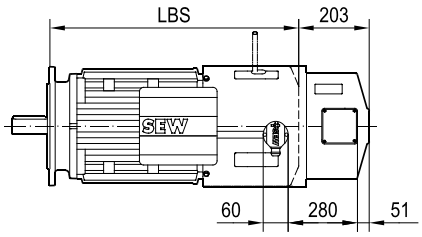
/EK8./C
/AK8./C



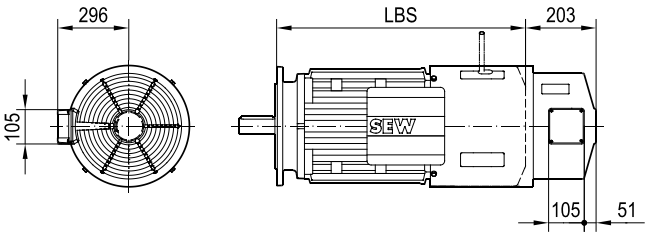
/EK8A



/EK8./V
/AK8./V



/V



(→ 📖)	315L	315H						
LS	1492	1492						
LBS (B5/B14)	1322	1322						
LBS (B3)	1320	1320						
LR1	615	615						
LR2	400	400						

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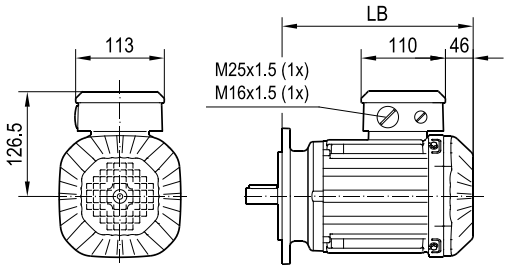
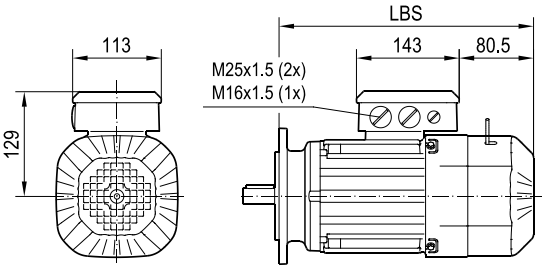
6.3 Dimension sheets for DRN.., DR2S.. with cage clamp terminal KCC, KC1

DRN71-90 /KCC **08 595 02 14**
DR2.71-80 1(2)

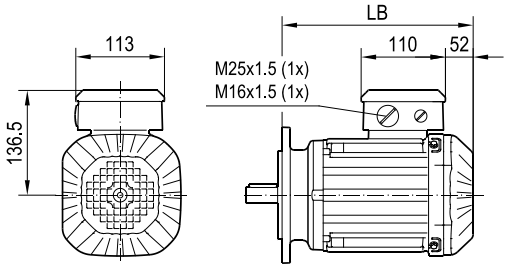
DRN71..KCC
DR2.71..KCC



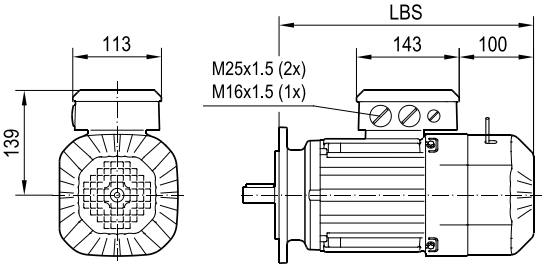
DRN71..BE KCC
DR2.71..BE KCC



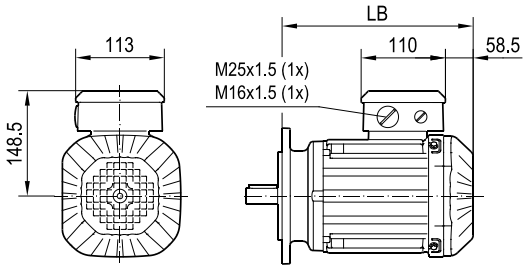
DRN80..KCC
DR2.80..KCC



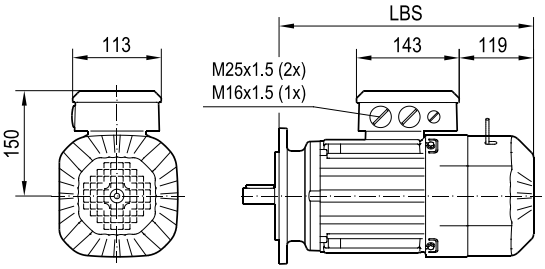
DRN80..BE KCC
DR2.80..BE KCC



DRN90..KCC



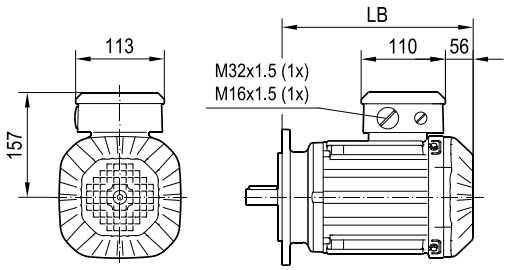
DRN90..BE KCC



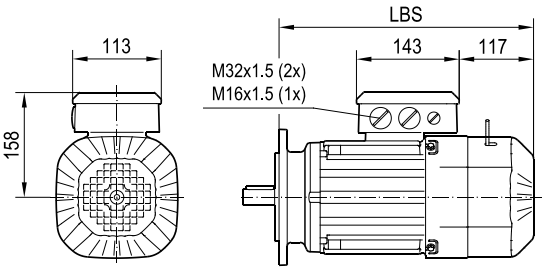
(→ 📖)	71MS	71M	80MK	80MS	80M	90S(R)	90L	
LB (B5/B14)	202	222	241	259	287	281	313	
LB (B3)	200	220	239	257	285	279	311	
LBS (B5/B14)	269	289	322	340	368	375	407	
LBS (B3)	267	287	320	338	366	373	405	

DRN100-132S /KCC **08 595 02 14**
2(2)

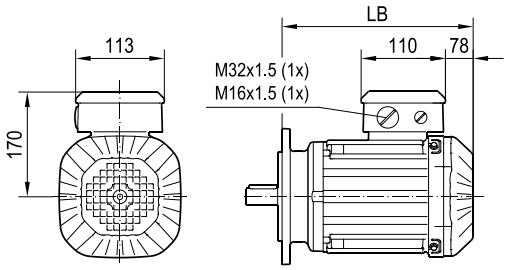
DRN100..KCC



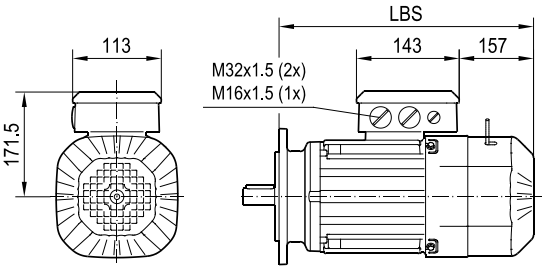
DRN100..BE KCC



DRN112-132S..KCC



DRN112-132S..BE KCC



(→ 📖)	100LS	100LM	100L	112M(B)	132S			
LB (B5/B14)	309	359	359	387	437			
LB (B3)	307	357	357	385	435			
LBS (B5/B14)	402	452	452	499	549			
LBS (B3)	400	450	450	497	547			

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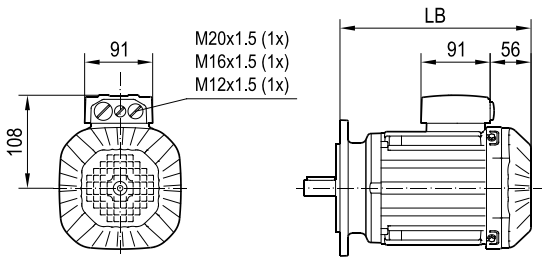
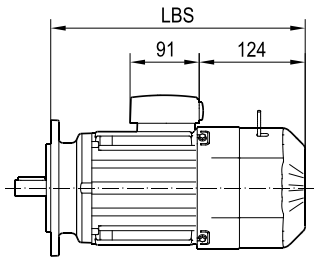
DRN71-100 /KC1 **08 596 02 14**
DR2.71-80 1(1)

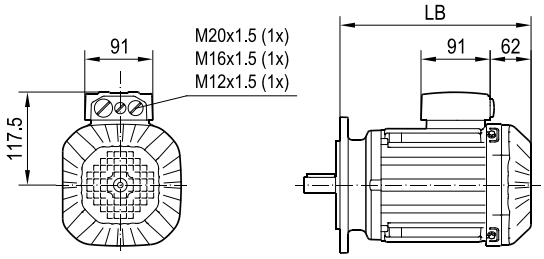
DRN71..KC1
DR2.71..KC1



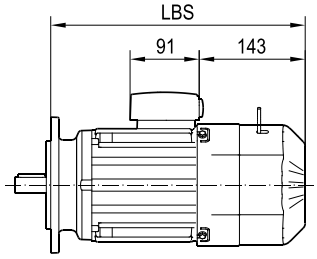
DRN71..BE KC1
DR2.71..BE KC1



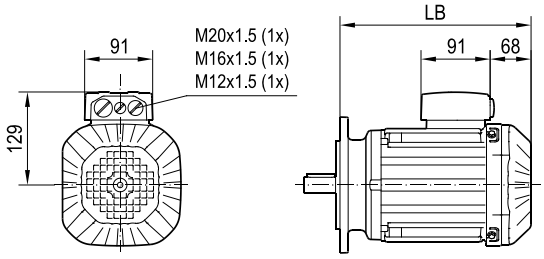
DRN80..KC1
DR2.80..KC1



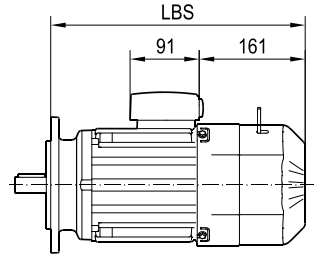
DRN80..BE KC1
DR2.80..BE KC1



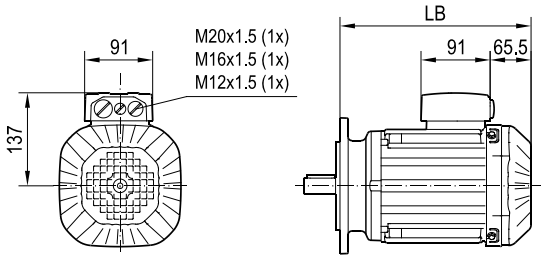
DRN90..KC1



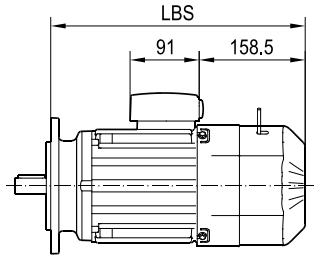
DRN90..BE KC1



DRN100..KC1



DRN100..BE KC1

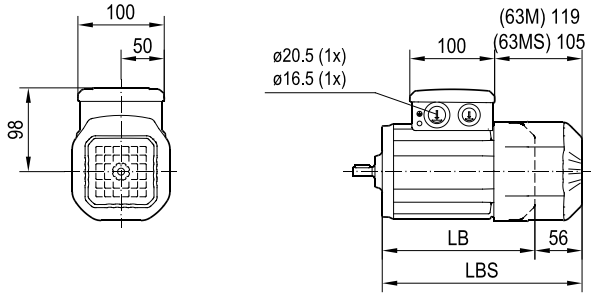


(→ 📖)	71MS	71M	80MK	80MS	80M	90S(R)	90L	100LS	100LM	100L
LB (B5/B14)	202	222	241	259	287	281	313	309	359	359
LB (B3)	200	220	239	257	285	279	311	307	357	357
LBS (B5/B14)	269	289	322	340	368	375	407	402	452	452
LBS (B3)	267	287	320	338	366	373	405	400	450	450

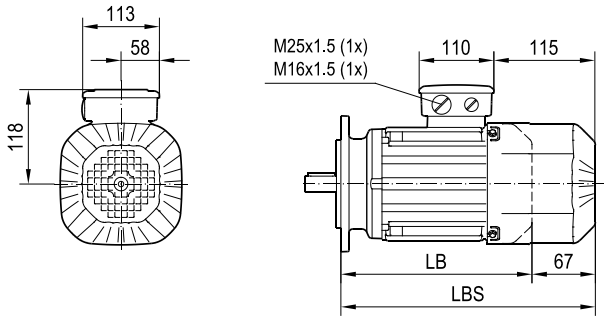
6.4 Dimension sheets for DRN.., DR2S.. with backstop RS

DRN63-90 /RS 08 599 02 14
DR2.63-80 1(4)

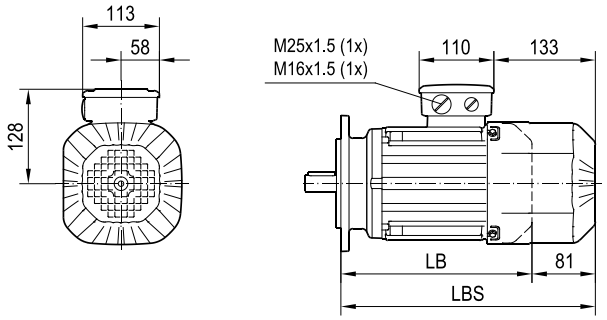
DRN63..RS
DR2.63..RS



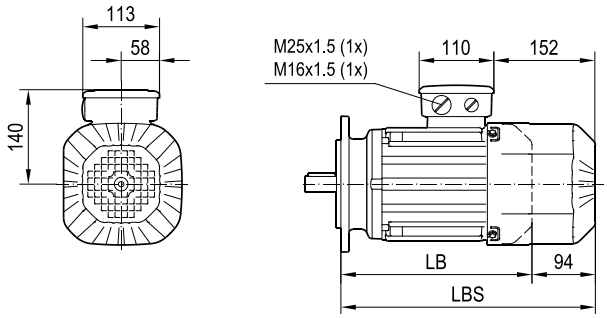
DRN71..RS
DR2.71..RS



DRN80..RS
DR2.80..RS



DRN90..RS



(→ 📖)	63MS	63M	71MS	71M	80MK	80MS	80M	90S	90L
LBS (B5/B14)	241	255	269	289	322	340	368	375	407
LBS (B3)	239	253	267	287	320	338	366	373	405

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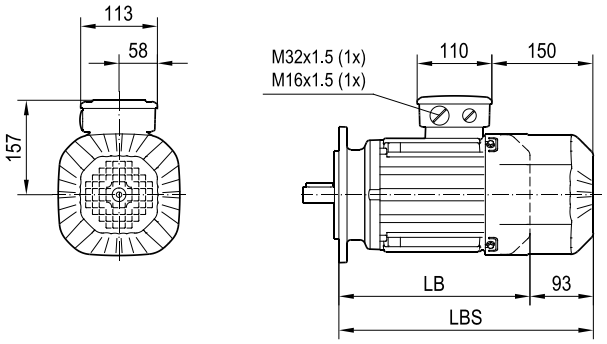
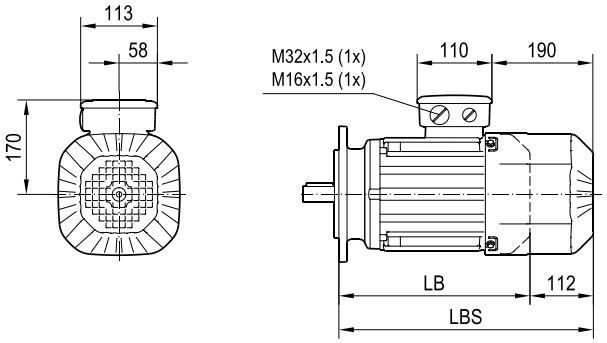
DRN100-132M/L /RS

08 599 02 14
2(4)

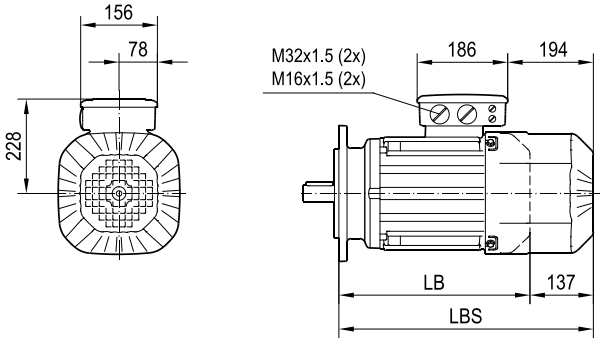
DRN100..RS



DRN112-132S..RS



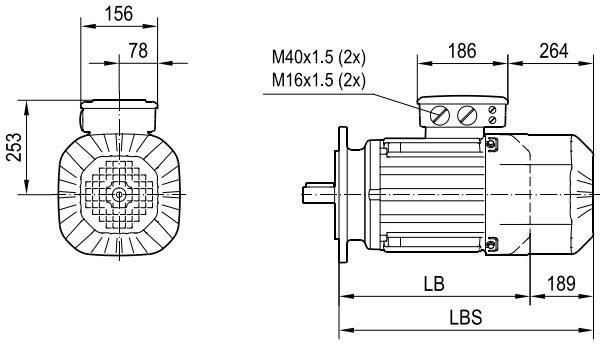
DRN132M/L..RS



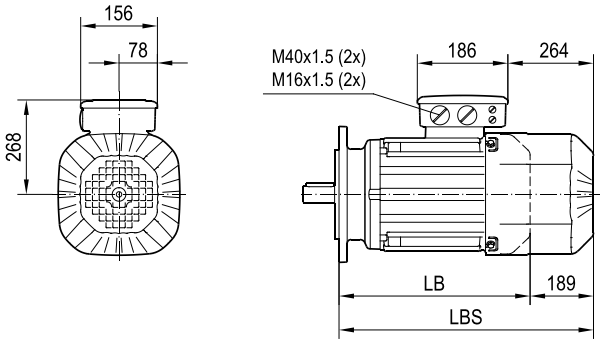
(→ 📖)	100LS	100LM	100L	112M(B)	132S	132M	132L	
LBS (B5/B14)	402	452	452	499	549	576	601	
LBS (B3)	400	450	450	497	547	574	599	

DRN160-200 **/RS** **08 599 02 14**
3(4)

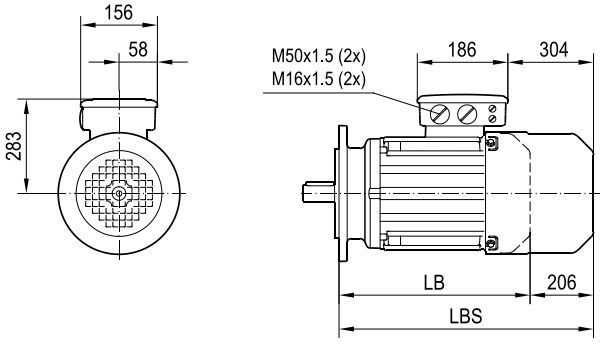
DRN160..RS



DRN180..RS



DRN200..RS



(→ 📖)	160M	160L	180M	180L	200L			
LBS (B5/B14)	721	721	748	748	854			
LBS (B3)	718	718	745	745	851			

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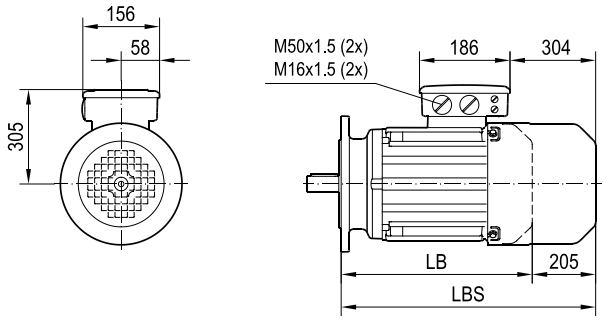
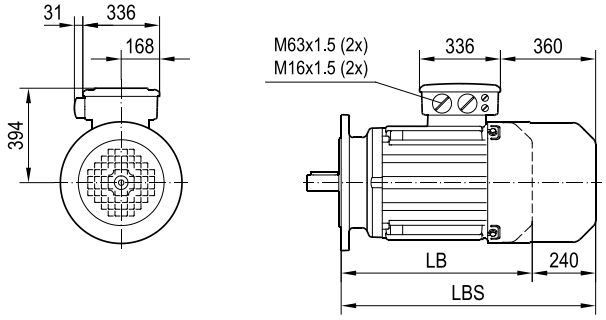
DRN225-315 /RS

08 599 02 14
4(4)

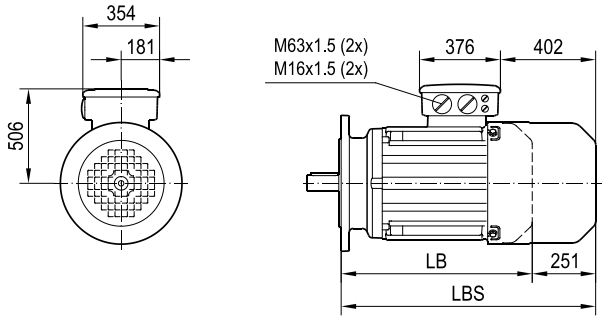
DRN225..RS



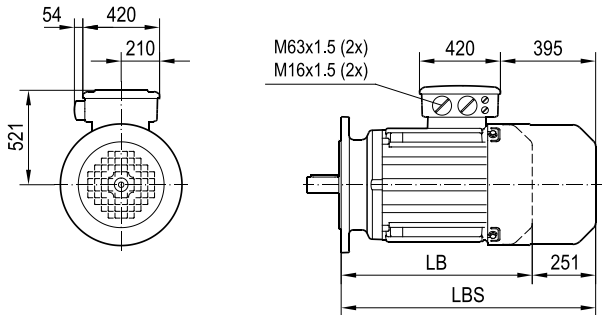
DRN250-280..RS



DRN315S/M/ME..RS



DRN315L/H..RS



(→ 📖)	225S	225M	250M	250ME	280S	315S	315M	315ME	315L	315H
LBS (B5/B14)	822	822	992	992	992	1192	1192	1322	1322	1322
LBS (B3)	819	819	990	990	990	1190	1190	1320	1320	1320

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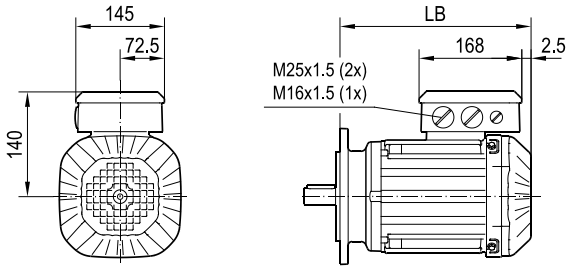
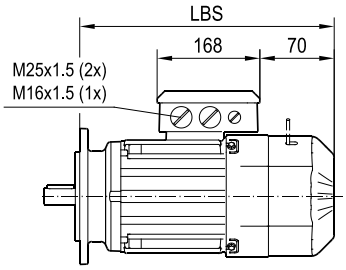
6.5 Dimension sheets for DRN.., DR2S.. with gray cast iron terminal box

DRN71-100 /KLK GG **08 600 02 14**
DR2.71-80 1(3)

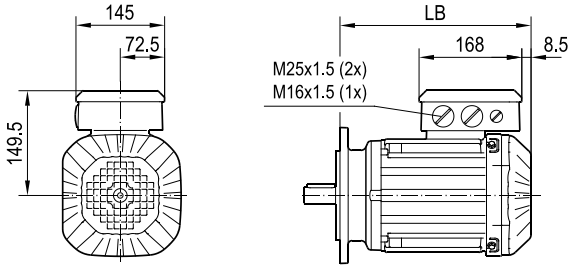
DRN71..
DR2.71..



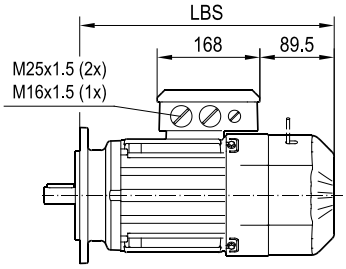
DRN71..BE
DR2.71..BE



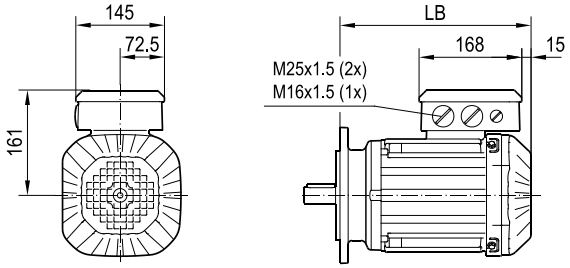
DRN80..
DR2.80..



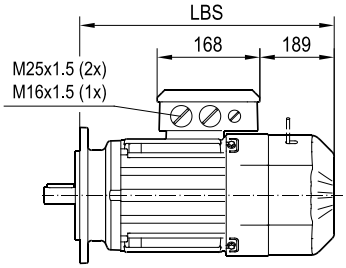
DRN80..BE
DR2.80..BE



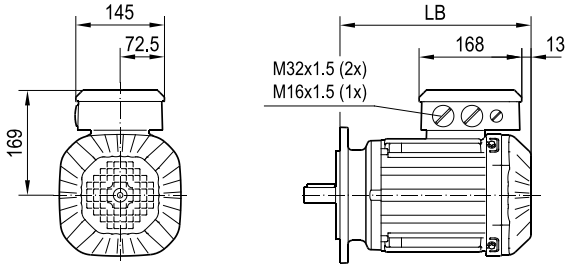
DRN90..



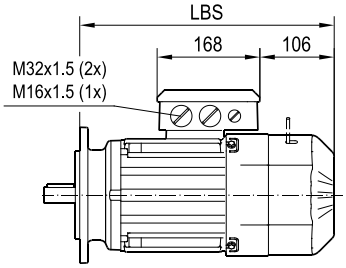
DRN90..BE



DRN100..



DRN100..BE



(→ 📖)	71MS	71M	80MK	80MS	80M	90S(R)	90L	100LS	100LM	100L
LB (B5/B14)	202	222	241	259	287	281	313	309	359	359
LB (B3)	200	220	239	257	285	279	311	307	357	357
LBS (B5/B14)	269	289	322	340	368	375	407	402	452	452
LBS (B3)	267	287	320	338	366	373	405	400	450	450

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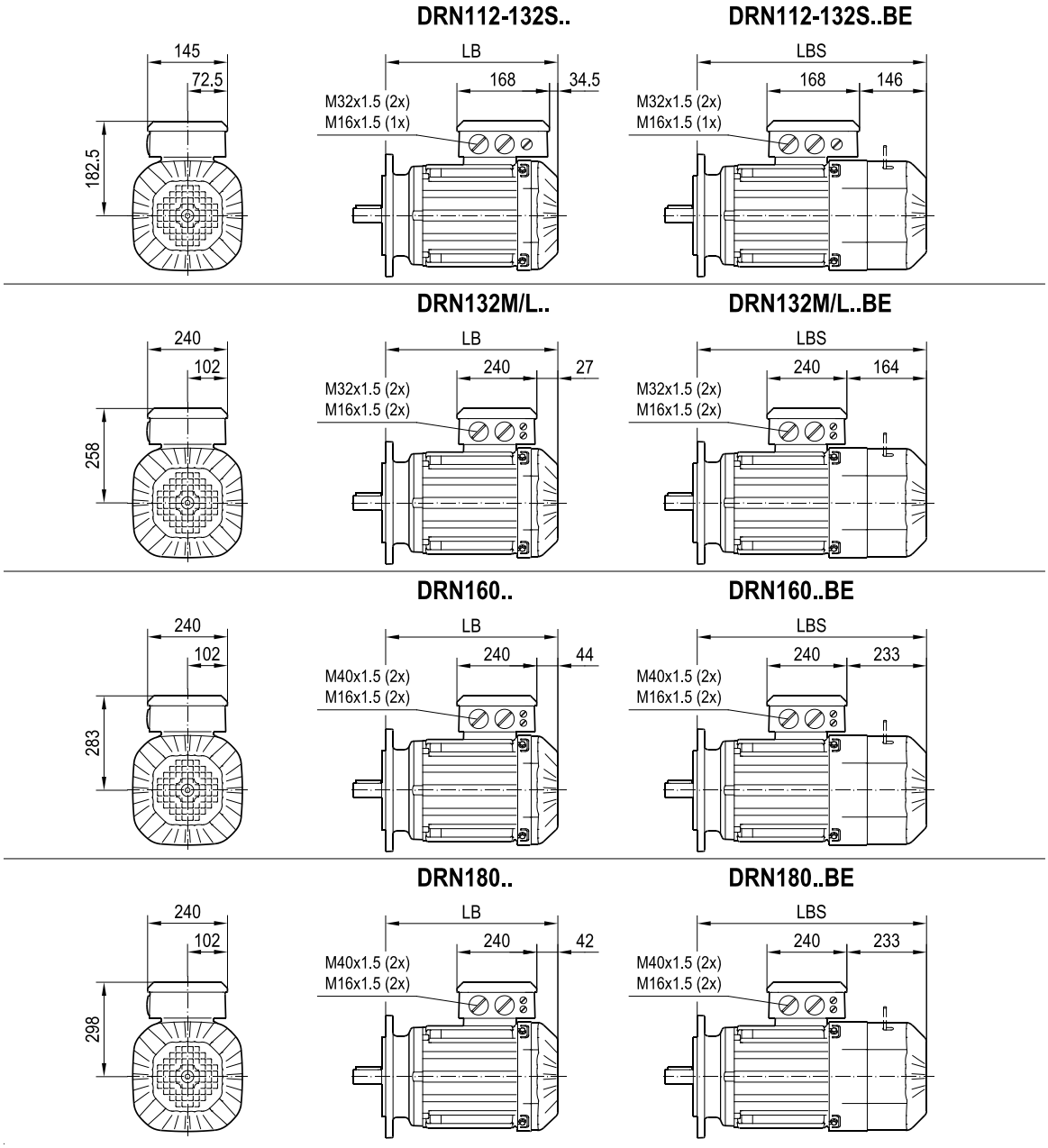
DRN112-180 **/KLK GG** **08 600 02 14**
2(3)



(→ 📖)	112M(B)	132S	132M	132L	160M	160L	180M	180L
LB (B5/B14)	387	437	439	464	532	532	555	555
LB (B3)	385	435	437	462	529	529	554	554
LBS (B5/B14)	499	549	576	601	721	721	748	748
LBS (B3)	497	547	574	599	718	718	745	745

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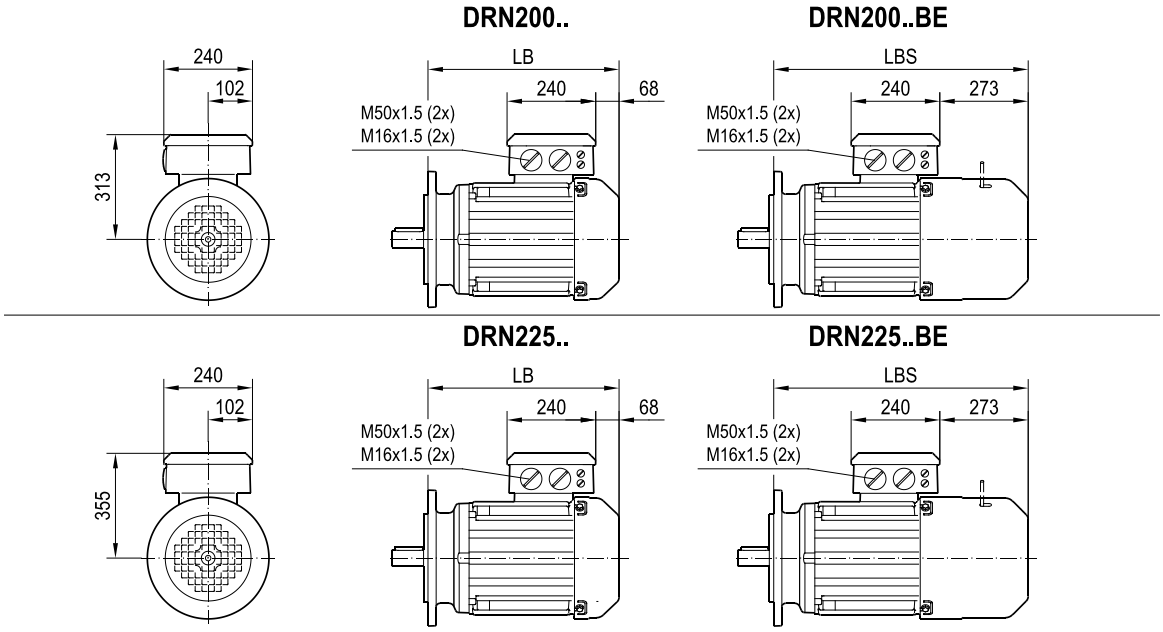
DRN200-225 **/KLK GG** **08 600 02 14**
3(3)



(→ 📖)	200L	225S	225M					
LB (B5/B14)	649	617	617					
LB (B3)	646	614	614					
LBS (B5/B14)	854	822	822					
LBS (B3)	851	819	819					

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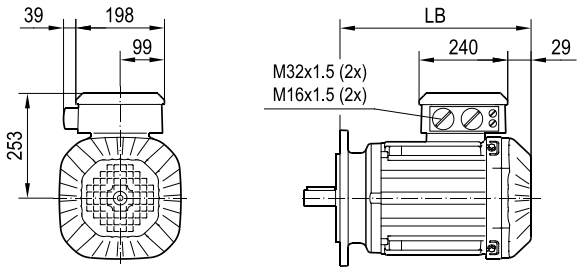
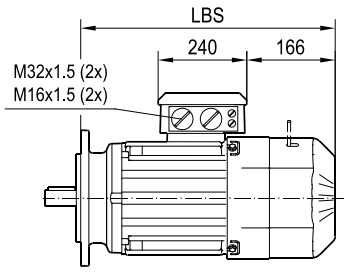
DRN132M-200 /KLK-AS GG 08 151 00 19

1(2)

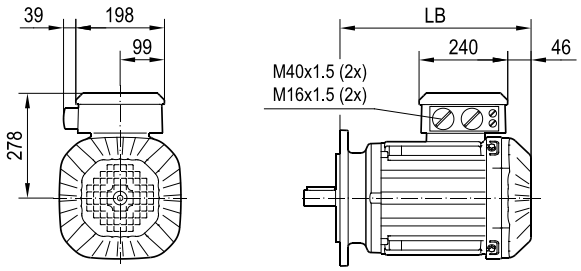
DRN132M/L..



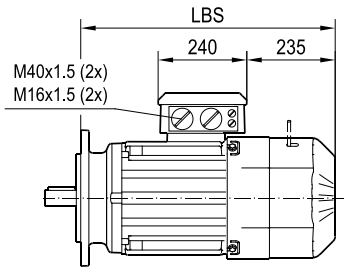
DRN132M/L..BE



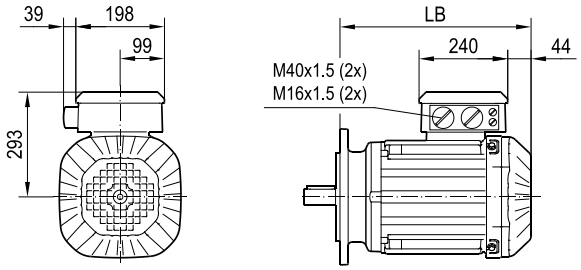
DRN160..



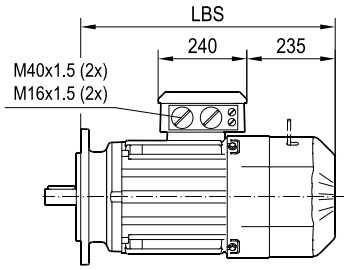
DRN160..BE



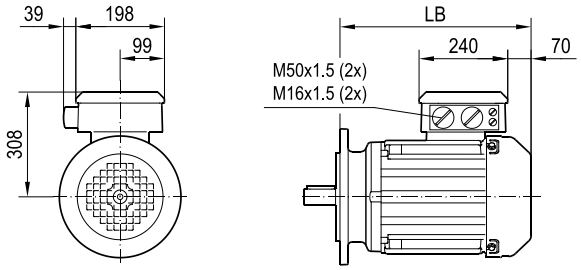
DRN180..



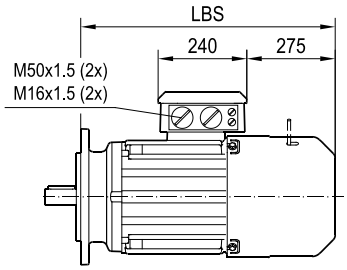
DRN180..BE



DRN200..



DRN200..BE



(→ 📖)	132M	132L	160M	160L	180M	180L	200L	
LB (B5/B14)	439	464	532	532	555	555	649	
LB (B3)	437	462	529	529	554	554	646	
LBS (B5/B14)	576	601	721	721	748	748	854	
LBS (B3)	574	599	718	718	745	745	851	

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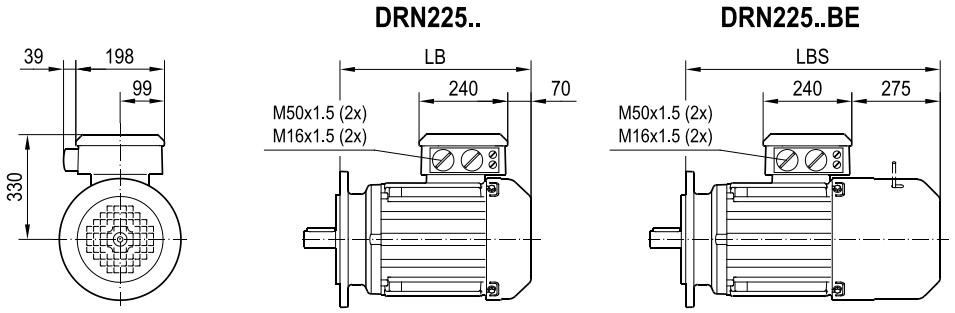
DRN225 **/KLK-AS GG** **08 151 00 19**
2(2)



(→ 📖)	225S	225M						
LB (B5/B14)	617	617						
LB (B3)	614	614						
LBS (B5/B14)	822	822						
LBS (B3)	819	819						

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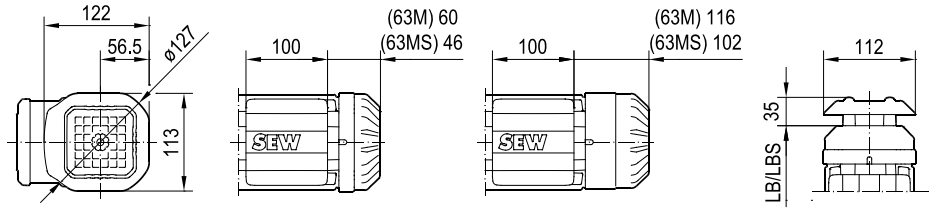
6.6 Dimension sheet for DRN.., DR2S.. with metal fan guard

DRN63-90 **/ML** **08 141 00 19**
DR2.63-80 1(1)

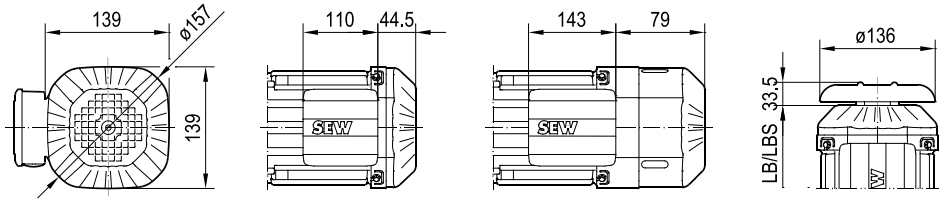
DRN63
DR2.63

/BE **/C**



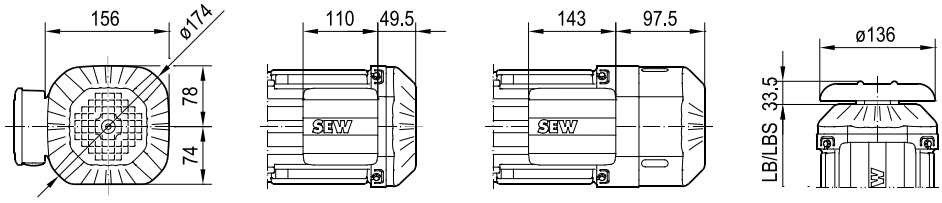
DRN71
DR2.71

/BE **/C**



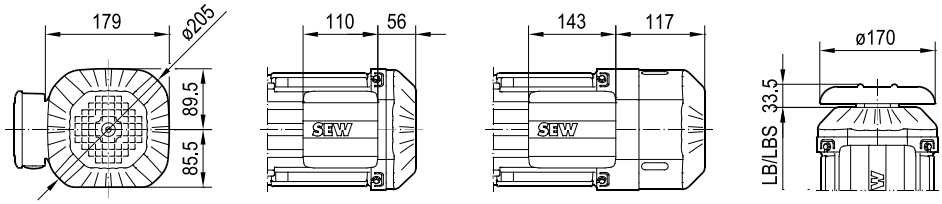
DRN80
DR2.80

/BE **/C**



DRN90

/BE **/C**



(→ 📖)	63MS	63M	71MS	71M	80MK	80MS	80M	90S	90L
LB (B5/B14)	182	196	200	220	239	257	285	279	311
LB (B3)	180	194	198	218	237	255	283	277	309
LBS (B5/B14)	238	252	268	288	320	338	366	373	405
LBS (B3)	236	250	266	286	318	336	364	371	403

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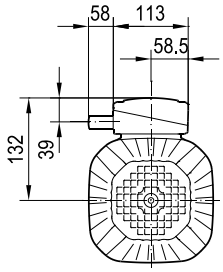
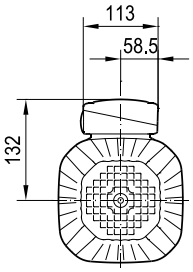
6.7 Dimension sheets of DRN.. with terminal box for MOVILINK® DDI

DRN71-90
DR2.71-80

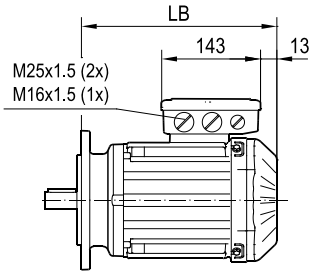
08 152 00 19
1(2)

KD1

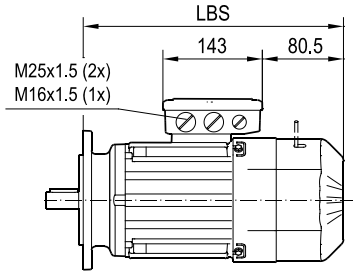




DRN71..
DR2.71..



DRN71..BE
DR2.71..BE



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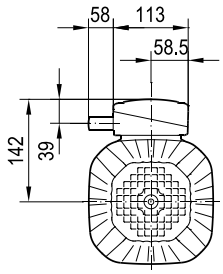

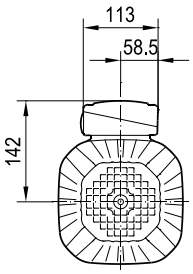

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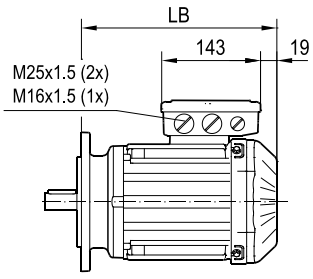
DR2.80..



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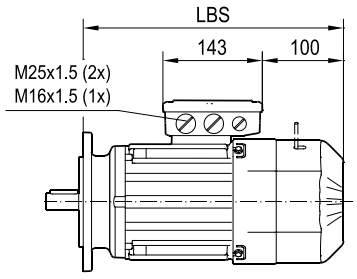
DR2.80..BE



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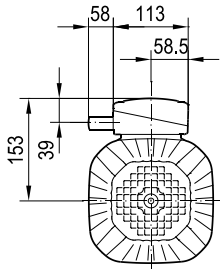

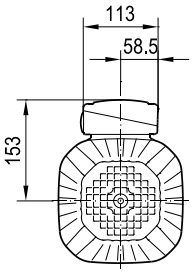

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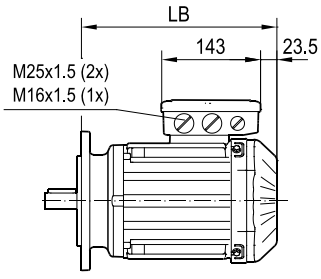
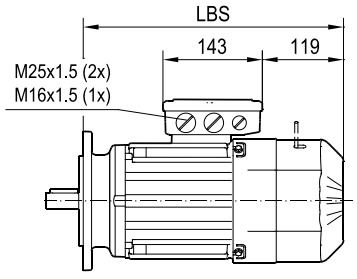


DRN90..BE



(📖)	71MS	71M	80MK	80MS	80M	90S(R)	90L	
LB (B5/B14)	202	222	241	259	287	281	313	
LB (B3)	200	220	239	257	285	279	311	
LBS (B5/B14)	269	289	322	340	368	375	407	
LBS (B3)	267	287	320	338	366	373	405	

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DRN100-132S

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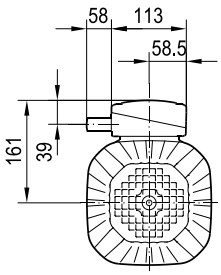

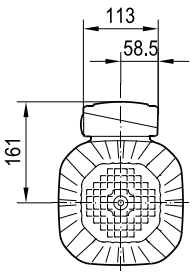

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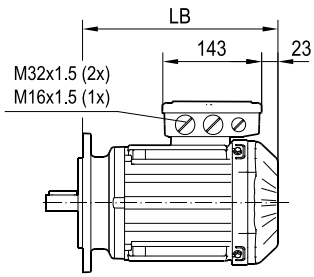
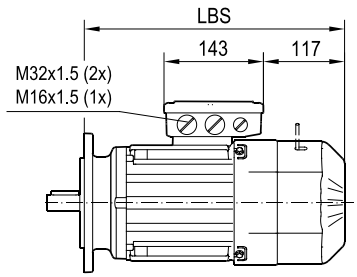
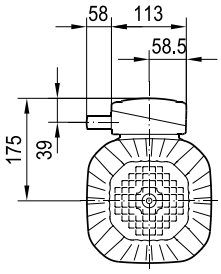
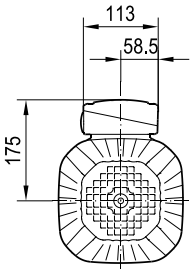


DRN100..BE

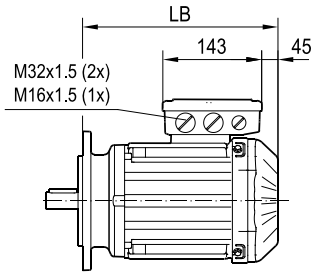


KD1

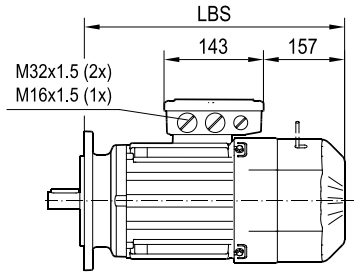




DRN112-132S..



DRN112-132S..BE



(📖)	100LS	100LM	100L	112M(B)	132S			
LB (B5/B14)	309	359	359	387	437			
LB (B3)	307	357	357	385	435			
LBS (B5/B14)	402	452	452	499	549			
LBS (B3)	400	450	450	497	547			

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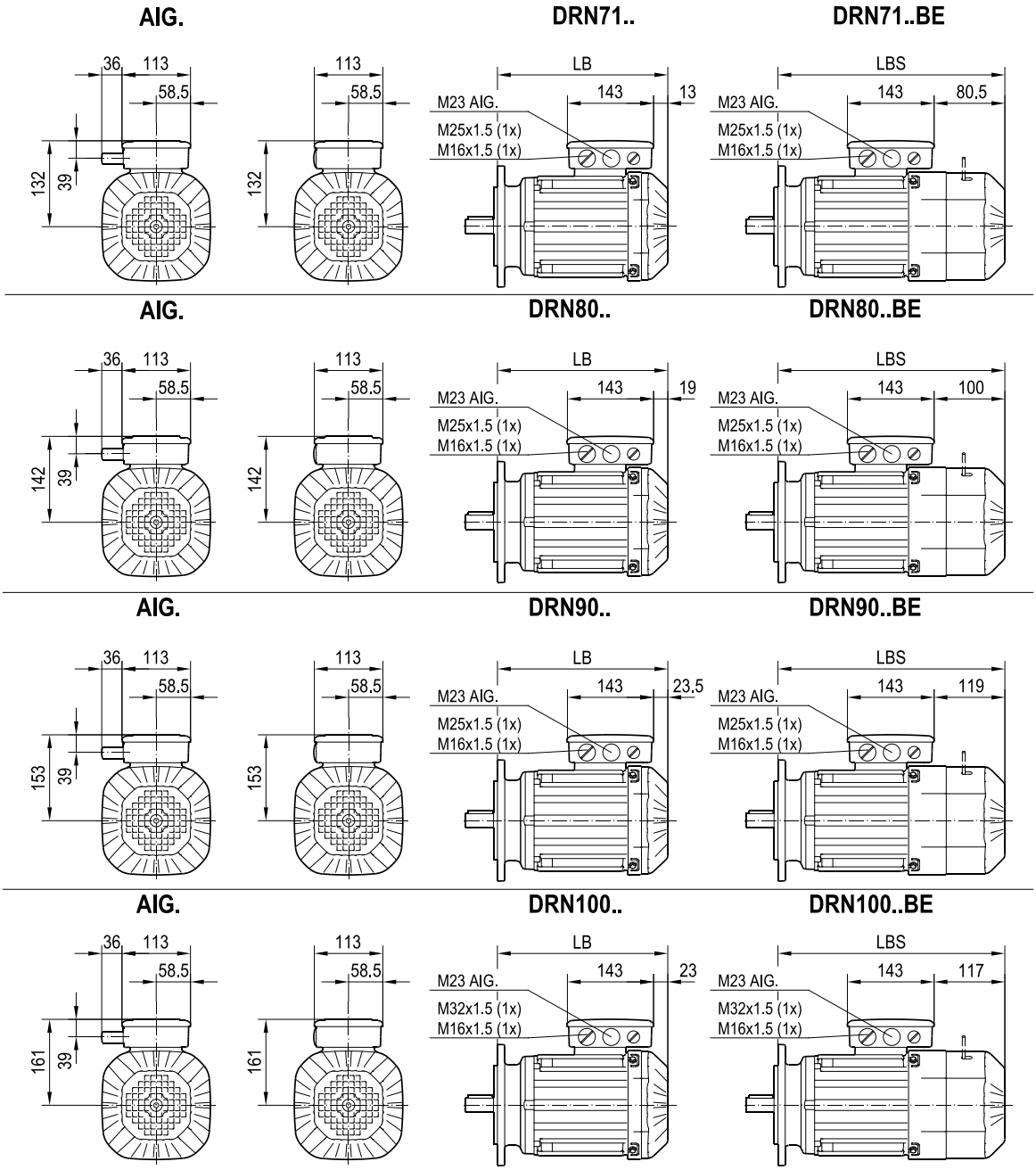
6.8 Dimension sheets for DRN.. with EI8. encoder

DRN71-100 /EI8. **08 162 00 19**

1(2)



(→ 📖)	71MS	71M	80MK	80MS	80M	90S(R)	90L	100LS	100LM	100L
LB (B5/B14)	202	222	241	259	287	281	313	309	359	359
LB (B3)	200	220	239	257	285	279	311	307	357	357
LBS (B5/B14)	269	289	322	340	368	375	407	402	452	452
LBS (B3)	267	287	320	338	366	373	405	400	450	450

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DRN112-132S /EI8.

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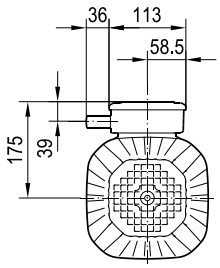
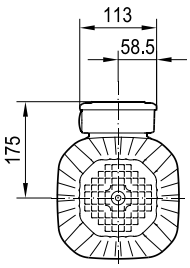
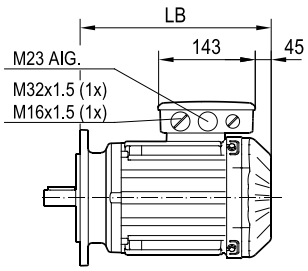
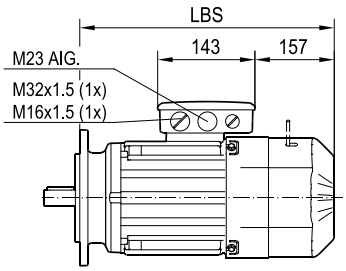




DRN112-132S..



DRN112-132S..BE



(→ 📖)	112M(B)	132S						
LB (B5/B14)	387	437						
LB (B3)	385	435						
LBS (B5/B14)	499	549						
LBS (B3)	497	547						

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7 Brake and backstop

On request, SEW-EURODRIVE motors can be supplied with an integrated mechanical brake or backstop.

The BE.. brake is part of SEW-EURODRIVE's modular brake system. You can choose from up to 4 different brake sizes for mounting to the motor. Various braking torque steps are available for each brake size. This means that a wide range of braking torque steps is available for each motor size.

Furthermore, the brakes can be equipped with additional options such as manual brake release or function and wear monitoring system.

AC motors from SEW-EURODRIVE can be equipped with a backstop /RS instead of a BE.. brake. It is used in applications where a fixed main direction of rotation of the drive is necessary and where unintended movements in the opposite direction of rotation in the event of a current failure or in a switched off state have to be avoided. It must not be used as a safeguard against the incorrect direction of rotation that occurs as a result of switching against a lock.

For further information on the backstop /RS, please refer to the chapter "Mechanical backstop" (→ 🗎 495).

7.1 BE.. brakes from SEW-EURODRIVE

BE.. brakes from SEW-EURODRIVE are DC-operated electromagnetic disk brakes. They open electrically and brake using spring force. The brake is installed on the B-side and integrated into the motor. The advantage is that brakemotors from SEW-EURODRIVE are very short and robust. Furthermore, SEW-EURODRIVE brakemotors are especially low-noise. This means they are especially suited for environments sensitive to noise.

The brake coil can be adapted to different connection voltages. It is powered via a brake control which is either placed in the terminal box of the motor or in the control cabinet.

The brake is applied in case of a power failure. It is therefore suited for basic safety requirements in travel and hoist applications (e.g. according to EN 115).

Due to the high overload capacity in case of emergency stops, the BE.. brake is ideally suited as a holding brake in controlled applications. The working capacity is available for emergency stop braking operations.

Refer to -40 °C to +100 °C for the ambient temperature range at which motors with BE.. brake can be operated. They can be delivered in degrees of protection IP54, IP55, IP65, and IP66.

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7.1.1 Mounted to the B-side of the motor

With manual brake release as an option

The brake can also be released without voltage supply if equipped with a manual brake release. This enables, for example, manual lowering of hoists or "weathervane" mode for cranes.

Two options are available for manual brake release:

1. With automatic manual brake release (option designation /HR), a hand lever is included in the delivery.
2. For the lockable manual brake release (option designation /HF), a set screw is included in the delivery.

7.1.2 With patented two-coil system

The BE.. brake is a DC-operated electromagnetic spring-loaded brake. It is equipped with the patented two-coil system from SEW-EURODRIVE. It works particularly rapid and wear-free in supply system startup in combination with brake controls from SEW-EURODRIVE with acceleration function.

When using the two-coil system, BE.. brakes are suitable for high switching frequencies as they are required for fast cycle applications for example.

While operation of the brake is also possible without acceleration function or with a direct DC voltage supply without SEW-EURODRIVE brake control for sizes up to BE2, all brakes of sizes BE5 and higher are optimized for using the two-coil system.

This allows for particularly energy-efficient operation as the power loss can be reduced in stop state. For brakes without two-coil system, the magnetic circuit has to be dimensioned larger for implementing the same braking torque and wear distance.

7.1.3 With SEW-EURODRIVE brake control in the terminal box or control cabinet

Usually, the brake is controlled by a brake control that is installed in either the motor terminal box or the control cabinet. You can choose from a wide range of brake controls. In addition to various connection voltages, brake controls for specific application requirements are available as well:

- With acceleration function for high switching frequency (by using the patented two-coil system, e.g. BGE../BME../BSG..)
- With rapid switch-off function for high stopping accuracy (with integrated or additional high-speed relays, e.g. BMP../BSR../BUR..)
- With integrated heating function (BMH..)
- With additional DC 24 V control inputs for PLC or inverter (e.g. BMK.. or BMV..)
- As safety-related component for functionally safe interruption of the energy supply to the brake (BST..)

Brakes up to BE2 can also be delivered for operation at an external DC voltage source without additional brake control, if requested by the customer.

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7.1.4 Available as safety brake according to EN ISO 13849

BE.. brakes are also available as safety brakes according to EN ISO 13849 for safety-relevant applications.

The use of a safety brake allows for safety functions which force the motor to stop and hold it safely in its position:

- SBA (Safe Brake Actuation)
- SBH (Safe Brake Hold)

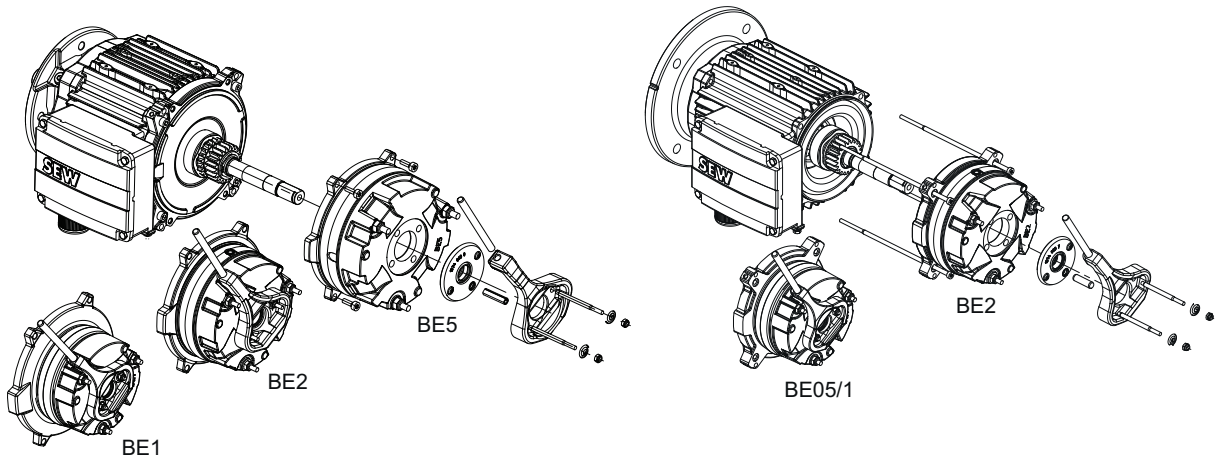
A suitable integration into a safe brake system (SBS) allows for all performance levels (up to PL e).

7.1.5 Maintenance-friendly and suitable for condition monitoring

A difference is made between integral and modular design when BE.. brakes and motors from SEW-EURODRIVE are connected.

- Integrated design of the brake for motors of size 56 – 80 with BE02 – 2 brake means the B-side endshield of the motor is an integral part of the brake with a friction surface.
- The modular design of the BE03 brake for motors of sizes 63 – 71 and all BE.. brakes for motors from size 90 means the brake has a separate friction disk. The complete bearing of the motor is maintained even when the brake is removed.

The modular design allows for mounting of up to 4 brake sizes to one motor, especially for motors of size 90 and higher. The B-side endshield is to be regarded like a connecting flange, which accommodates the BE.. brake pre-mounted on a friction disk. When it comes to maintenance of the drive, the modular structure has the particular advantage that the brake can be removed without having to remove the entire drive from the system or disassembling it.



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Adjustability

BE.. brakes allow you to adjust the working air gap quickly and easily as standard. This makes it possible to use the asbestos-free brake linings over a long period of time even in wear-intensive applications.

In contrast, the BE02 and BE03 brakes cannot be adjusted. However, they are equipped with a considerably higher wear limit and thus provide a long service life, even without adjustment.

Internal brake plug connector from BE20 – 122

Brakemotors from SEW-EURODRIVE equipped with a brake of size BE20 or higher have an internal brake plug connector. The plug connector allows to maintain the brake without having to loosen the cabling in the terminal box of the motor.

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Optional with air gap monitoring

For predictive planning of the service intervals, BE1 – 122 brakes on motors of sizes 80 – 315 can optionally be designed with air gap monitoring.

The diagnostic unit /DUE (Diagnostic Unit Eddy Current) is used for monitoring the working air gap. The diagnostic unit /DUE consists of the following components:

- An evaluation unit in the motor terminal box that is supplied via a 24 V DC voltage.
- A sensor, integrated in the magnet body of the brake

The diagnostic unit /DUE monitors the switching status of the brake and the wear on the basis of the current air gap. This information is output as digital or analog signals.

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7.1.6 Accessories overview brake/motor

Depending on the demands placed on the brake, different brake mounting sizes with different braking torque steps are available for mounting to the respective motor.

The following tables show the possible combinations of motor and brake as well as the braking torque steps for each brake to achieve the desired nominal braking torque:

	Motors										
Brake	**DRN63**	**DRN71**	**DRN80**	**DRN90**	**DRN100**	**DRN112 DRN132S**	**DRN132M DRN132L**	**DRN160 DRN180**	**DRN200 DRN225**	**DRN250 DRN280**	**DRN315**
BE03											
BE05											
BE1											
BE2											
BE5											
BE11											
BE20											
BE30											
BE32											
BE60[1)]											
BE62[1)]											
BE120[1)]											
BE122[1)]											

1) Not available as BE.. safety brake.

		Motors		
Brake	**DR2S56**	**DR2S63**	**DR2S71**	**DR2S80**
BE02[1)]				
BE03				
BE05				
BE1				
BE2				

1) Not available as BE.. safety brake.

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7.1.7 Braking torque graduations

Depending on the demands placed on the brake, different braking torque graduations are available depending on the brake sizes.

The following table shows the available braking torque graduations depending on the brake size:

Braking torque (M_B) in Nm	BE02	BE03	BE05	BE1	BE2	BE5	BE11	BE20
0.8[1)]								
0.9								
1.2[1)]								
1.3								
1.7								
1.8[1)]								
2.1								
2.5[1)]								
2.7								
3.4								
3.5								
5								
7								
10								
14								
20								
28								
40								
55								
80								
110								
150								
200								

1) Not available for BE.. safety brakes.

Braking torque (M_B) in Nm	BE30	BE32	BE60	BE62	BE120	BE122
75						
100						
150						
200						
300						
400						
500						
600						
800[1)]						
1000[1)]						
1200[1)]						
1600[1)]						
2000[1)]						

1) Not available for BE.. safety brakes.

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INFORMATION

Note that there may be limitations for the braking torques M_B to be selected depending on the motor design, especially for:

- AC motors for ambient temperatures above +60 °C.
- AC motors with BE safety brake in combination with the manual brake release option.

→ Consult SEW-EURODRIVE in these cases.

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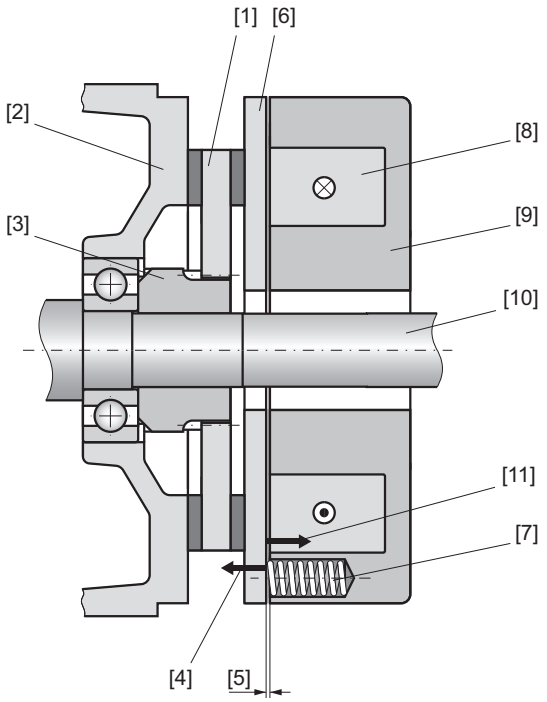
7.2 Technical details

7.2.1 Basic design and functional principle

The essential parts of the brake system are the mobile pressure plate [6], the brake springs [7], the brake lining carrier [1], the brake endshield [2] and the brake coil [8] (accelerator coil BS + coil section TS = holding coil HS). The magnet body consists of the magnet body housing [9] with cast winding and a tapping.

The pressure plate is forced against the brake lining carrier by the brake springs when the electromagnet is de-energized. The brake is applied to the motor. The number and type of brake springs determine the braking torque. When the brake coil is connected to the corresponding DC voltage, the force of the brake springs [7] is overcome by electromagnetic force [11], thereby bringing the pressure plate into contact with the magnet. The brake lining carrier moves clear and the rotor can turn.



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[1] Brake lining carrier
[2] Brake endshield
[3] Driver
[4] Spring force
[5] Working air gap
[6] Pressure plate
[7] Brake spring
[8] Brake coil
[9] Magnet body housing
[10] Motor shaft
[11] Electromagnetic force

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7.2.2 Braking torque definition

The braking torques of the BE.. brakes are defined on the basis of DIN VDE 0580. A distinction is made between the following braking torques here:

Abbreviation according to DIN VDE 0580	Designation	Description
M_1	Dynamic braking torque	Torque acting upon the motor shaft with a slipping brake (brake safely disconnected). It depends on the current operating temperature and the current friction speed/motor speed.
M_2	Virtually static braking torque (= nominal braking torque M_B)	Braking torque with slowly slipping brake (relative speed between the friction components: 1 m/s) at 20 °C
M_4	Static braking torque	Breakaway torque that is necessary to rotate the motor shaft from a standstill with the brake closed.

The nominal braking torque M_B of the brakes is subjected to 100% final testing in the factory at SEW-EURODRIVE within the scope of quality control and is within a tolerance range of -10% and +50% in the as-delivered condition.

This nominal value M_B is used both during brake selection and also during planning. The differences between M_1 (dynamic braking torque) and M_4 (static braking torque) and the nominal braking torque are taken into consideration by SEW-EURODRIVE with the formulas and the calculation coefficients that are used when doing this.

The characteristic values M_1 and M_4 are therefore not relevant within the scope of the planning and selection of the brake. For more extensive applicative requirements of the brake, such as carrying out a brake diagnosis, the characteristic values M_1 and M_4 must be examined and evaluated separately.

INFORMATION

The characteristic values M_1 and M_4 can differ significantly from the nominal braking torque M_B depending on the wear and operating state of the brake in some cases, and can particularly be outside the above-mentioned tolerance range for M_B.

If you require more specific information, contact SEW-EURODRIVE.

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7.2.3 Use as a working or holding brake

BE.. brakes are suitable for both line-operated motors (non-controlled applications) and inverter-operated motors (controlled applications).

Working brake

With line-operated motors, the brake is used for stopping the motor during normal operation. Brake application from the operating speed is the normal case here.

Holding brake

On the other hand, when it comes to inverter-operated motors, it is assumed that the brake will primarily be used for holding when at an idle state. In this context, we refer to the brake as a "holding brake". Brake application from a speed only takes place in the event of emergency stop braking (non-controlled stopping of the drive, comparable with stop category 0 in accordance with EN 60204-1). Normally, the brake is activated after controlled stopping (stop category 1 in accordance with EN 60204-1) at speeds of < 20 min^{-1}.

The type of use must be taken into consideration during the selection and configuration of the brake, see chapter "Selection and project planning" (→ 🗎 317).

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7.2.4 Supply voltage

Brake voltage

BE.. brakes are available in various voltage types.

As standard, the brake voltage is assigned as follows:

- Fixed voltage AC 230 V: DRN63 – DRN132S, DR2S56 – DR2S80
- Fixed voltage AC 400 V: DRN132M – DRN315

The brakes are also available with other windings on request so that they are suitable for operation on the respective DC and AC voltage sources.

For example, if a motor in a certain voltage range is delivered in combination with a global motor, then the brake voltage is also confirmed as voltage range.

Design	Motor sizes and brake sizes	
	DRN63 – DRN180 DR2S56 – DR2S80	DRN180 – DRN315
	BE02 – BE20	BE30 – BE122
Fixed voltage	AC 230 V	
	AC 400 V	
	DC 24 V	–
50 Hz voltage range	AC 220 – 242 V	
	AC 380 – 420 V	
50/60 Hz voltage range	AC 220 – 277 V	
	AC 380 – 480 V	

INFORMATION

Continuous operation of the brake on a global motor in the voltage range 60 Hz is only permitted when the global motor is operated in direct line operation. Otherwise the brake cooling cannot be ensured.

When the motor is operated at an inverter, the effective cyclic duration factor (cdf) of the brake must be limited to 40%, or the motor must be equipped with a forced cooling fan.

INFORMATION

In some cases, extra-low voltages cannot be avoided due to safety regulations. But extra-low voltages result in higher costs and efforts for cables, switching devices, transformers, rectifiers, and overvoltage protection (for example in case of direct DC 24 V voltage supply) than brakes that are operated at an AC voltage system using a brake control by SEW-EURODRIVE, see chapter "Cable selection" (→ 🗎 324).

Brake voltage supply

The supply voltage for brakes with a brake rectifier for operation on AC voltage is either supplied separately or picked up from the supply system of the motor in the terminal box. Only motors with a fixed speed may be supplied by the motor supply voltage from the terminal board of the motor. For motors with variable speed, the supply voltage for the brake must be supplied separately.

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Furthermore, bear in mind that the brake response is delayed by the remanence voltage of the motor if the brake is powered by the motor terminal board. In hoists and hoist-like applications, this type of voltage supply is only permitted with an additional current relay (BSR control), which ensures the application of the brake also when the hoist is moving downward. The brake application time $t_{2,I}$ for cut-off in the AC circuit, specified in the brake's technical data, applies to a separate voltage supply to the brake only.

If the brake is directly supplied from the motor terminal board, the brake application times may extend to a multiple of the value $t_{2,\,I}$, depending on the application and the remanence voltage of the motor.

INFORMATION

In variable-speed motors, the brake voltage must not be picked up at the terminal board because the voltage there is not steady and constant.

This includes:

- Pole-changing motors
- Motors operated on an inverter

INFORMATION

Motors with a fixed speed are often operated on soft start devices that work with phase angle controls, for example. In these cases, the brake must not be supplied from the terminal board as the voltage present at the terminal board is not constant.

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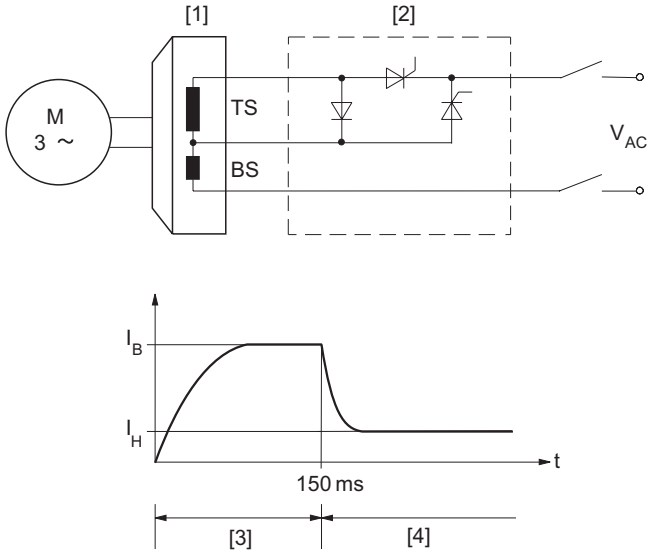
7.2.5 Two-coil system and brake controls

Particularly short response times at switch-on

BE.. brakes are equipped with the two-coil system patented by SEW-EURODRIVE. When using special brake control systems from SEW-EURODRIVE with acceleration function, the brake control ensures that only the accelerator coil is switched on first, followed by the holding coil (entire coil). The powerful impulse magnetization (high acceleration current) of the accelerator coil results in a very short response time, particularly in large brakes, without reaching the saturation limit. The brake lining carrier moves clear very swiftly and the motor starts up with hardly any braking losses.



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BS Accelerator coil
TS Coil section
[1] Brake
[2] Brake control
[3] Acceleration
[4] Hold
I_B Acceleration current
I_H Holding current
BS + TS = Holding coil HS

The particularly short response times of the BE.. brakes from SEW-EURODRIVE have the following advantages:

- Reduced run-up time of the drive
- Minimum heating of the motor during start-up and thus energy savings with negligible brake wear during start-up, see the following figure
- High switching frequency
- Long operating life of the brake lining and thus long maintenance intervals

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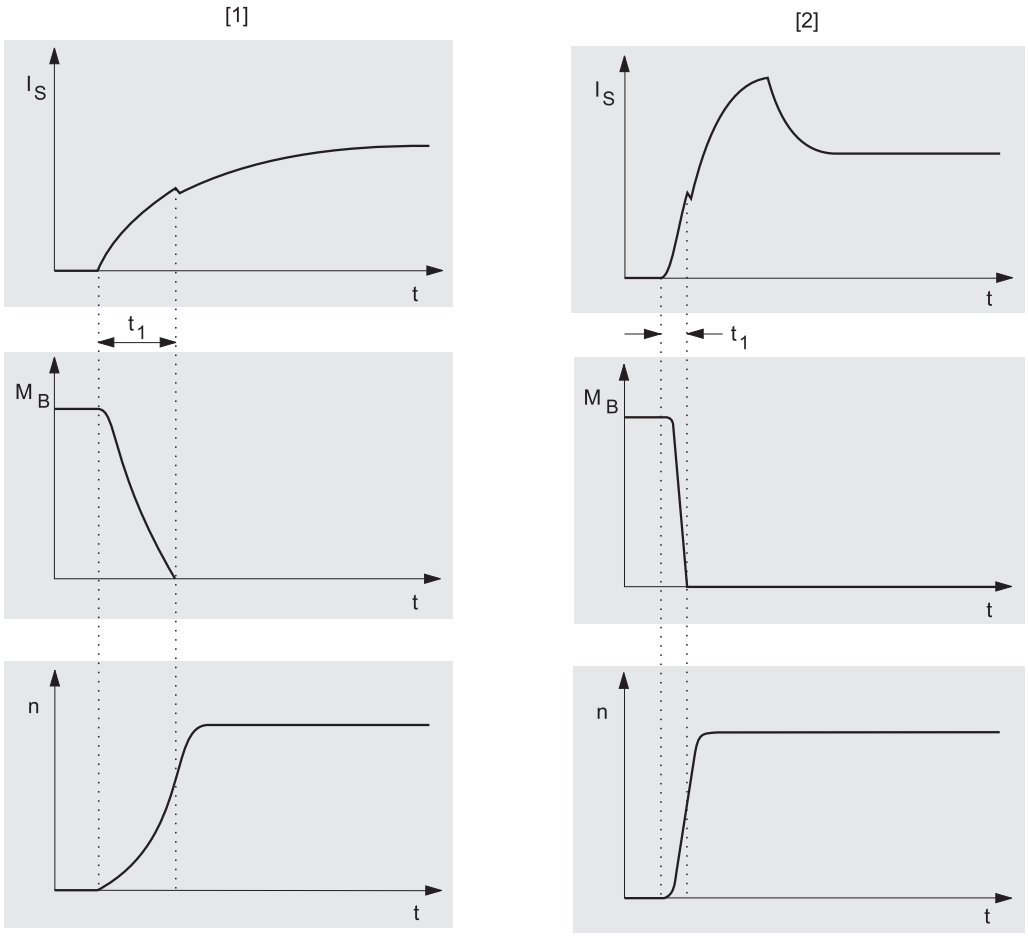

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[1] Switch-on procedure for operation with rectifier without switching electronics, e.g. BG..
[2] Switch-on procedure for operation with rectifier from SEW-EURODRIVE with switching electronics, e.g. BGE.. (standard as of brakes BE5)
I_S Coil current
M_B Braking torque
n Rotational speed
t_1 Brake response time

The system switches to the holding coil electronically as soon as the BE.. brake has released. The braking magnet is now only magnetized to such an extent (weak holding current) as to ensure that the pressure plate is held open with a sufficient degree of safety and minimum brake heating and the drive can turn freely.

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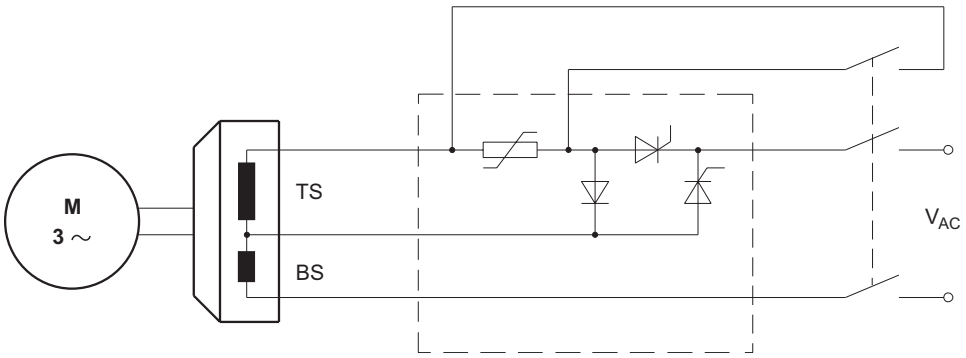
Particularly short response time at switch-off

The response time for the application of the brake also depends on how rapidly the energy stored in the brake coil is dissipated when the current supply is switched off. A freewheeling diode is used to dissipate the energy for a “cut-off in the AC circuit”. The current decreases at an exponential rate.

The current dissipates much more rapidly via a varistor when the DC and AC circuits are cut-off at the same time as the coil's DC circuit. The response time is considerably reduced. Conventionally, cut-off in the DC and AC circuits is implemented using an additional contact on the brake contactor (suitable for an inductive load).

Under certain conditions, you can make good use of the SR.. electronic current relays or UR voltage relays for interrupting the DC circuit, see the following section.



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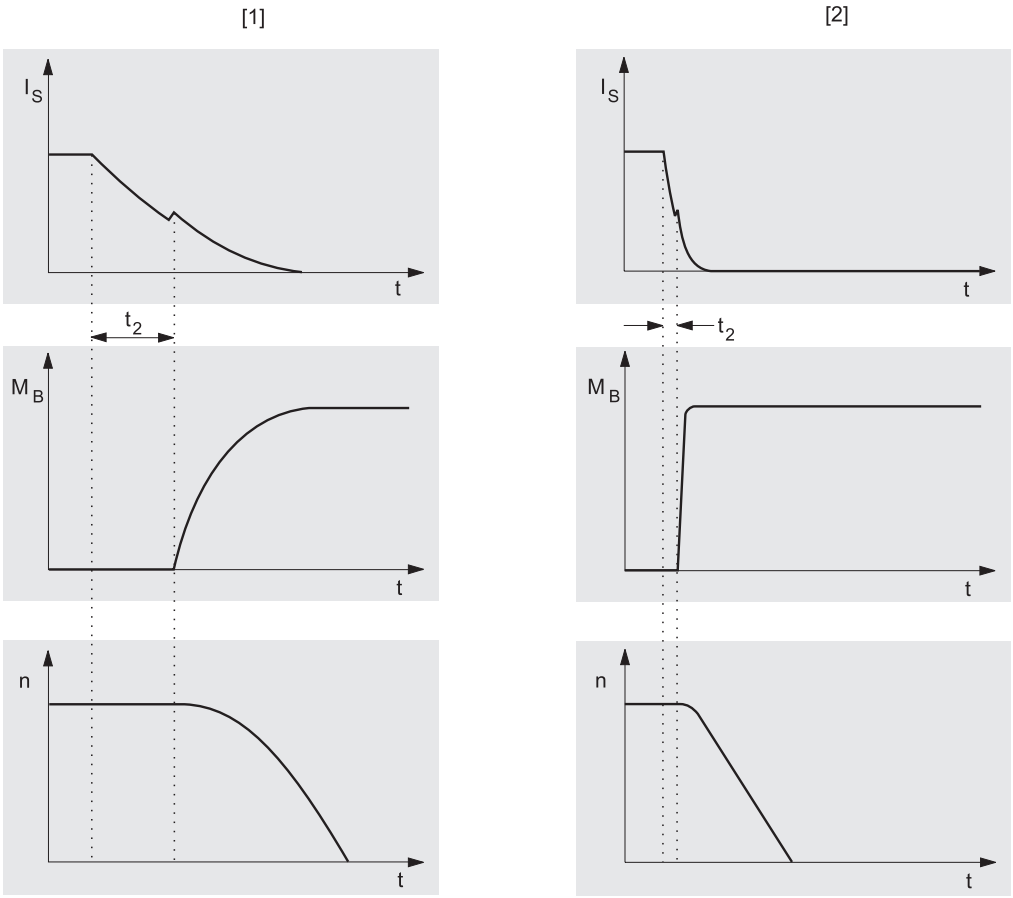

[1] Brake application to cut-off in the AC circuit
[2] Brake application to cut-off in the AC and DC circuits
I_S Coil current
M_B Braking torque
n Speed
t_2 Brake application time

Due to their mechanical principle, the degree of wear on the linings, and on-site basic physical conditions, brakemotors are subject to an empirically determined repetition accuracy of the braking distance of ±12%. The shorter the response times, the smaller the absolute value of the braking distance variation.

Cut-off in the DC and AC circuits makes it possible to shorten the brake application time t_2 considerably.

Cut-off in the DC and AC circuits is enabled by the following:

- A separate electromechanical switch contact, see chapter "Brake control block diagrams" (→ 🗎 340)
- The selection of a BMP.. or BMK.. brake control with integrated voltage relay for control cabinet installation, see chapter "Installation in the control cabinet" (→ 🗎 319)
- Wear-free electronic relays in the terminal box
  - Current relay (BSR..) for motors with fixed speed
  - Voltage relay (BUR..) for adjustable-speed motors

Relay retrofitting options suited to the motor and voltage are provided in the chapters "Installation in the control cabinet" (→ 🗎 319) and "Installation in the motor terminal box" (→ 🗎 321). Refer to the operating instructions for the part numbers.

Influence of low and fluctuating ambient temperatures

In case of low and fluctuating ambient temperatures, motors are exposed to the risk of condensation and icing. Functional limitations of the brake due to corrosion and ice can be prevented by using the BMH.. brake control with the additional "anti-condensation heating" function.

The "heating" function is activated externally. As soon as the brake has been applied and the heating function switched on during lengthy breaks, both coil sections of the brake control system are supplied with reduced voltage in an inverse-parallel connection by a thyristor operating at a reduced control factor setting. On the one hand, this practically eliminates the induction effect (brake does not release). On the other hand, it results in heating in the coil system, increasing the temperature by approx. 25 K in relation to the ambient temperature.

The heating function must be ended before the brake resumes its normal switching function following a heating period (see brake control "BMH, K1 contactor" (→ 🗎 350)).

Increased ambient temperature or restricted ventilation

In addition to the functional considerations, increased ambient temperature, insufficient supply of cooling air and/or the dimensioning of the motor according to thermal class 180 (H) are valid reasons for installing the brake control system in the control cabinet.

For marginal conditions of this type, SEW-EURODRIVE always recommends using brake controls with electronic switching.

This is mandatory especially for brakemotors for increased ambient temperatures above +40 °C.

DC 24 V control input

The control input with DC 24 V is an advantage especially for controlled applications where the brake control is to be switched e.g. via a higher-level controller or an inverter.

The available brake controls BMK..,BMKB.. and BMV.. are only intended for control cabinet installation.

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Safe brake control

The safe BST brake module allows the brake to be controlled in a device in a functional and safety-related manner.

The safe BST brake module replaces the conventional brake controls. The brake can be functionally switched with the DC 24 V control input e.g. via a higher-level controller or an inverter. The brake can be switched in a safety-related manner with the functionally safe DC 24 V control input e.g. via a higher-level safety relay.

The electronic structure of the BST without mechanical switching elements has its advantages for high switching cycles as well as in the safety-related overall evaluation. The usual calculation of the theoretical failure probability $MTTF_D$ and the monitoring of the switch contacts is omitted.

The safe BST brake module fulfills the following safety requirement:

- Performance level d according to EN ISO 13849-1

IP degree of protection, corrosion protection and ambient temperature range

BE.. brakes can be designed according to application-related ambient conditions.

IP degree of protection

Standard design BE.. brakes have degree of protection IP54. As an alternative, they can be ordered in degrees of protection IP55, IP56, IP65 and IP66 depending on the motor design.

Corrosion protection

As standard, BE.. brakes are designed with a resistant corrosion protection.

As an option, they can be ordered with the surface protection option without restrictions depending on the motor design, see chapter "Surface protection" (→ 🗎 493).

Ambient temperature range

Standard design BE.. brakes are suitable for operation at ambient temperatures between -20 to +40 °C.

- If the two-coil system and a brake control in the control cabinet are used, the brake can be operated at ambient temperatures up to -40 °C. In this temperature range, the use of the heating function is recommended when using the BMH.. brake control.
- AC motors with BE.. brake can also be designed for increased ambient temperatures of up to +100 °C. Note that the availability of individual braking torque steps may be restricted, see chapter "Braking torque graduations" (→ 🗎 291). In case of questions, contact SEW-EURODRIVE.

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7.2.6 Design for functional safety

Brakes up to BE32 can be ordered as safety brakes according to EN ISO 13849 if required.

By adding a BE.. safety brake into a safe overall system, safety functions can be implemented, which force the motor to stop (safe braking) and hold the motor in its position (safe holding).

General

When implementing safety functions in machines, the components have to be evaluated regarding their suitability for implementing a safety function.

When using a safety brake from SEW-EURODRIVE, the following safety-related requirements, e.g. according to EN ISO 13849 – parts 1 and 2, are already considered:

- Application of basic safety principles
- Application of proven safety principles
- Information on the characteristic safety value B_{10d}
- Common Cause Failure (CCF)
- Notice of influences and ambient conditions
- Determination of the category (Cat.)
- Retraceability by the unique motor assignment
- Production monitoring with 100% final inspection
- Compliance with normative requirements regarding documentation

For safety brakes, SEW-EURODRIVE has already solved this safety-related requirement as an advantage for the machine designer. The machine designer can rely on the manufacturer confirmation (e.g. through product documentation or TÜV certificate) in his safety-related overall evaluation and considerably reduce own efforts for evaluation and documentation of a brake.

If other components (standard components) are used for implementing safety functions, the machine designer has to evaluate the safety-related requirements.

Underlying standards

The safety assessment is based on the following standard and safety class:

Safety brakes	
Safety class/underlying standard	Category (Cat.) according to EN ISO 13849-1

Safety class SIL 3 or PL e can be achieved if a suitable functionally safe motor option is integrated into a safety system. The requirements (e.g. on the system architecture, the required diagnostics, if necessary, and the characteristic safety values) are to be implemented in accordance with the normative specifications and with this documentation.

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TÜV certification

The following certificate is available for the described safety brakes:

- Certificate of the TÜV NORD Systems GmbH & Co. KG

The TÜV certificate is available from SEW-EURODRIVE on request.

Safety functions of the safety brake

The implementation of a safety function with brakes requires that the brake is applied on request. The safety function is activated when the brake is applied. The brake coil has to be de-energized and the energy stored in the brake coil reduced.

By adding a BE.. safety brake into a safe overall system, the following safety functions can be implemented:

- SBA (Safe Brake Actuation)
- SBH (Safe Brake Hold)

INFORMATION

Safety functions SBA and SBH are defined by SEW-EURODRIVE based on the standard EN 61800-5-2.

The implementation of the SBA and SBH safety functions additionally require the safety functions SBC and STO in the overall system. For safety-related requests of the brake, SBC and STO ensure that the brake applies and that the drive does not generate a torque against the applied brake.

The SBC and STO safety functions are not part of the brake and have to be additionally implemented in the overall safety system. The performance level (PL) of the SBC and STO safety functions must at least meet the required performance level (PLr) of the application.

SEW-EURODRIVE recommends to stop the drive using the stop category 1 according to EN 60204-1 prior to activating the SBC and STO safety functions.

Performance levels that can be achieved

The brake complements a safe braking system consisting of several system components.

The achievable performance level of the resulting safe braking system according to EN ISO 13849-1 is mainly determined by:

- The selected safety structure, category (Cat.)
- Reliability of the used system components (PL, B_{10d}, $MTTF_d$, etc.)

  The $MTTF_d$ value is calculated specifically for the application based on the B_{10d} value for the brake and the switching frequency of the application.
- Diagnostic coverage (DC_{avg})

  The diagnostic coverage is fulfilled with a brake diagnostics.
- The failure due to a common cause (CCF) with categories 2, 3, and 4.

The achieved performance level must be determined for the selected safe braking system based on an overall evaluation of the system. Observe the characteristic safety values necessary for the brake.

For the characteristic safety values of the SEW-EURODRIVE components, refer to the product-related documentation as well as the library for the SISTEMA software available for download at www.sew-eurodrive.com.

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BE.. brake compared to the BE.. safety brake

Depending on the use of the BE.. brake, conditions and restrictions exist both for the brake itself as well as for the other drive components. Observe these points when configuring and ordering the overall drive.

For a list of conditions and restrictions, refer to the manual "Project Planning for BE.. Brakes – DR.., DRN.., DR2.., EDR.., EDRN.. AC Motors – Standard Brake/Safety Brake".

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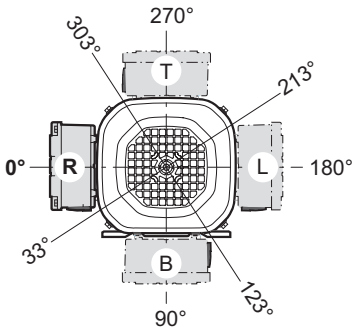
7.3 Options

7.3.1 Manual brake release

The BE.. brake can be released manually with a manual brake release. Two designs of the manual brake release are available:

- Lockable manual brake release for brakes BE03 to BE122
- Manual brake release with automatic re-engaging function for brakes BE02 to BE62

If the position of the manual brake release is not specified, it rotates along with the terminal box. The manual brake release can be turned by 4 × 90°.



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Observe the following notes:

- DR2.56/BE02: The manual brake release is always aligned to the terminal box.
- For DR2.63 – 71 and DRN63 – 71 motors with BE03, positions 303° (standard position) or 123° as viewed from the terminal box are possible.
- All other types: 303° standard position, 33°, 123° and 213° are possible.

INFORMATION

The hand lever of foot-mounted motors might protrude into the assembly level of the motors depending on the orientation of the hand lever. In these cases, check whether the installation space allows for using the manual brake release properly.

Lockable manual brake release /HF

For the lockable manual brake release /HF, a set screw is included in the delivery to permanently open the brake mechanically.

Avoid the lockable /HF type of manual brake release for hoists and other statically stressed applications as it can lead to severe incidents when activated by accident.

INFORMATION

Please note that the manual brake release /HF cannot be combined with the safety brakes.

Manual brake release with automatic re-engaging function /HR

With automatic manual brake release /HR, a hand lever is included in the delivery. The screw-in hand lever serves to manually open the brake for a short period of time. The mechanical components are pretensioned in such a way that the brake is applied automatically without hand pressure.

Manual brake release /HR is available for brakes up to BE62. If you require BE120 – 122 brakes with /HR option, contact SEW-EURODRIVE.

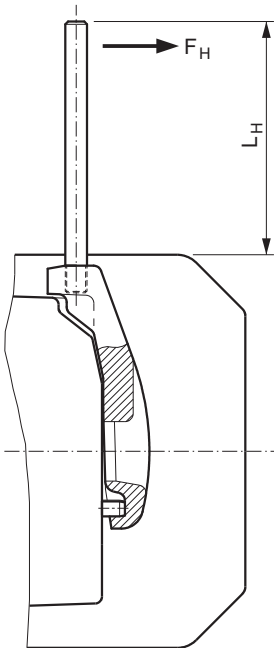
INFORMATION

For safety brakes up to BE32, the combinations with the /HR option can be limited for some cases.

Technical details

Actuating forces manual brake release

In brakemotors with the /HR option "Manual brake release with automatic reengaging function", you can release the brake manually using the supplied lever. The following table specifies the actuation force required at maximum braking torque to release the brake by hand. The values are based on the assumption that you operate the lever at the upper end. The length of that part of the manual lever projecting out of the fan guard is stated as well.



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Nominal actuation force F_H for manual brake release /HR

Brake	Nominal actuation force F_H
	N
BE02	30
BE03	30
BE05	20
BE1	40
BE2	80
BE5	215
BE11	300
BE20	375
BE30 BE32	400
BE60 BE62	500

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Lever protrusion L_H

Motors	BE02	BE03	BE05	BE1	BE2	BE5	BE11	BE20	BE30 BE32	BE60 BE62
	Lever protrusion L_H in mm									
DR2S56M	32	–	–	–	–	–	–	–	–	–
DRN63, DR2S63	–	34	–	–	–	–	–	–	–	–
DRN71, DR2S71	–	16	81	81	–	–	–	–	–	–
DRN80, DR2S80	–	–	71	71	82	–	–	–	–	–
DRN90	–	–	57	57	68	90	–	–	–	–
DRN100	–	–	–	54	65	87	–	–	–	–
DRN112 DRN132S	–	–	–	–	–	70	139	–	–	–
DRN132M DRN132L	–	–	–	–	–	–	121	189	–	–
DRN160	–	–	–	–	–	–	–	150	235	–
DRN180	–	–	–	–	–	–	–	139	224	–
DRN200	–	–	–	–	–	–	–	–	216	416
DRN225	–	–	–	–	–	–	–	–	176	376
DRN250 DRN280	–	–	–	–	–	–	–	–	–	358

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7.3.2 Function/wear monitoring of the brake

The option diagnostic unit /DUE (Diagnostic Unit Eddy Current) is a contactless measuring system for function and wear monitoring of the BE.. brake.

This option is designed for industrial environments and is used to monitor the function and the maximum working air gap of the BE.. brakes from SEW-EURODRIVE.

The diagnostic unit /DUE comprises the following parts:

- An evaluation unit in the motor terminal box that is supplied via a DC 24 V voltage.
- A sensor, installed in the magnet body of brakes BE1 to BE122.

Retrofitting options

Brakemotors from SEW-EURODRIVE can be retrofitted with the diagnostic unit /DUE. However, the drive combination has to be checked to determine all necessary conversion parts. Contact SEW-EURODRIVE if you would like to retrofit an existing drive with the diagnostic unit /DUE.

Technical details

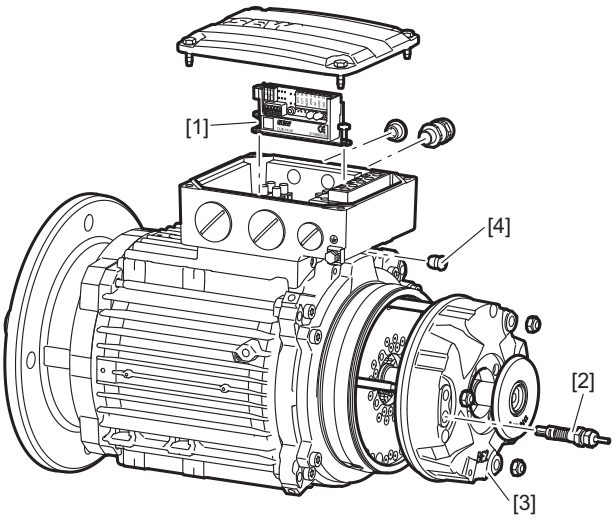
Structure

The bore required to insert the eddy current sensor is sealed by a cable gland when the /DUE diagnostic unit is installed.

The sensor is connected to the evaluation unit (installed in the terminal box and precalibrated at delivery) via a shielded twisted-pair cable.

The sensor diameter varies depending on the brake size.

Sensor diameter	Brakes
6 mm	BE1 – BE5
8 mm	BE11 – BE122



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[1] Evaluation unit
[2] Sensor
[3] Brake
[4] Grommet

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Functional description

It is a contactless measuring system, based on the current eddy principle. High-frequency alternating current flows through the sensor. The electromagnetic field induces eddy currents in the pressure plate that change the alternating current resistance of the sensor. The evaluation unit converts this change in impedance into an electrical signal (4 to 20 mA) that is proportional to the working air gap of the brake.

The function monitoring of the brake is realized via a digital signal (NO contact). A digital output (NC contact) signals if the wear limit was reached. Further, a current output allows for continuous monitoring of the brake wear. In addition to the outputs, LEDs at the evaluation unit indicate the function and the wear of the brake.

- The red LED indicates the state of wear of the brake.
- The green LED indicates the function of the brake.

Further diagnosis can also be carried out using the various light codes of the LEDs. For the exact meaning of the light codes, refer to the "AC Motors DRN63 – 315, DR2S56 – 80" operating instructions.

If the brake is ordered in combination with the diagnostic unit /DUE, it leaves the factory with function monitoring and wear monitoring already installed, calibrated and set to the permitted wear limit for the brake.

Output signals for function and wear monitoring

The evaluation unit has the following signals for brake monitoring:

- 2 digital output signals. Signal FCT for brake function monitoring (brake released) and signal WEAR that is sent if the defined maximum permitted working air gap is reached.
- An analog output signal (range 4 mA – 20 mA) for continuous monitoring of the air gap.

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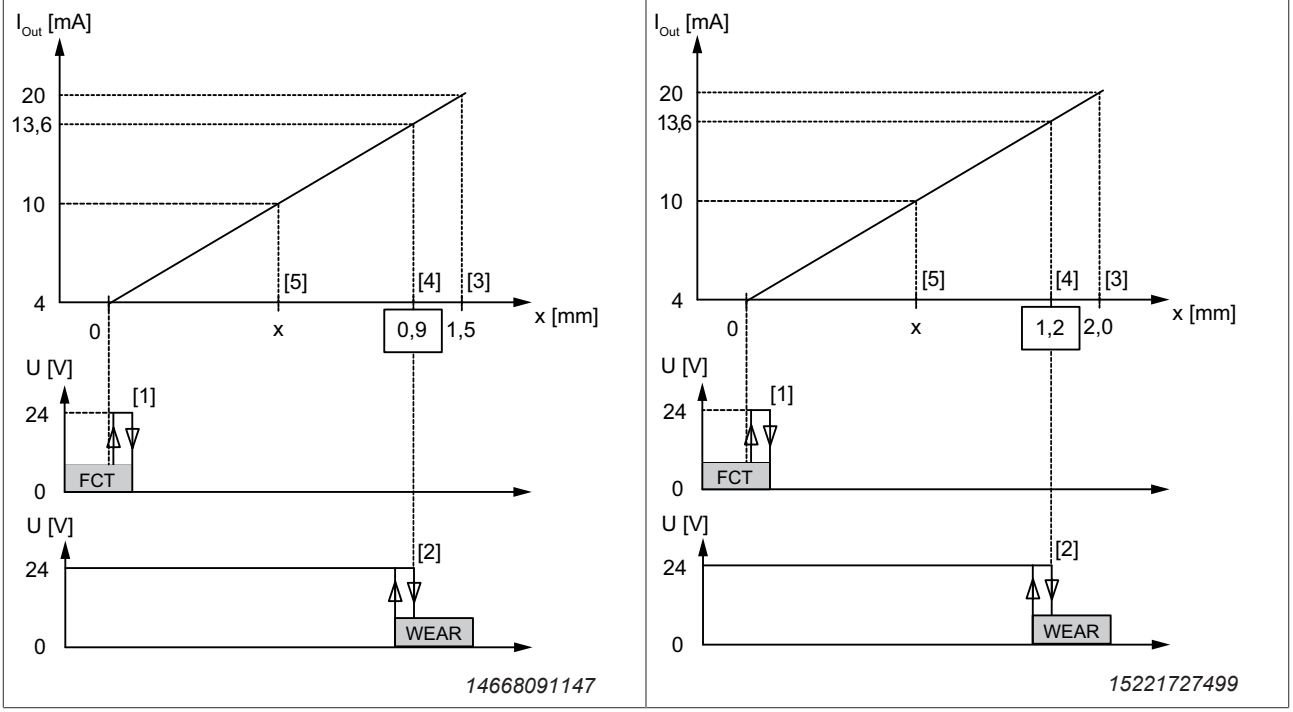
The illustration shows the switching states of the diagnostic unit /DUE depending on the brake size and/or the sensor diameter as well as the current strength depending on the air gap.

DUE-d6 (6 mm)	DUE-d8 (8 mm)



[1] FCT: Digital output function (DC 24 V, DIN EN 61131-2)
[2] WEAR: Digital output wear (DC 24 V, DIN EN 61131-2)
[3] Measuring range of the sensor
[4] Maximum working air gap of the brake (exemplary)
[5] Currently measured working air gap (exemplary)

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Connecting the evaluation unit

The maximum permitted cable cross section at terminals "k" of the evaluation unit is 1.5 mm^2 with conductor end sleeve without plastic collar, 0.75 mm^2 with plastic collar. The recommended cable cross section at terminals "k" is 0.5 mm^2 with conductor end sleeve with plastic collar.

INFORMATION

Use shielded cables to wire the evaluation unit. Connect the shield to the GND potential, or use the shield plate at the user's signal evaluation.

SEW-EURODRIVE recommends routing the power cable of the drive and the cable of the diagnostic unit separately.

- Unless they are shielded, sensor cables must always be routed separately from other power cables with phased currents.
- Provide the appropriate equipotential bonding between drive and control cabinet.

Important characteristics of the cable to be used are:

- Total shielding (outer shield) of the cable
- 100 m maximum length for fixed installation
- 50 m maximum length for cable carrier installation

The required number of cores depends on the type of function/signals that are to be transferred to the higher-level controller and then processed.

At the factory, the diagnostic unit /DUE is pre-installed, calibrated and set to the wear limit permitted for the brake. The diagnostic unit has to be calibrated again after service or maintenance work such as sensor replacement or replacement of the evaluation electronics. The calibration can be take place directly at the evaluation electronics (at the terminal box) or alternatively via the higher-level controller. In the second case, the required signals for calibration have to be routed to the higher-level controller.

The reference ground GND and the reference ground analog output AGND have the same potential. In case this potential is not treated separately in the application, AGND is not necessary.

Number of required cores	Function	Abbreviation
3	Voltage supply	DC 24 V
	Reference ground	GND
	Digital output function	FCT
3	Voltage supply	DC 24 V
	Reference ground	GND
	Digital output wear	WEAR
4	Voltage supply	DC 24 V
	Reference ground	GND
	Digital output function	FCT
	Digital output wear	WEAR

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Number of required cores	Function	Abbreviation
4	Voltage supply	DC 24 V
	Reference ground	GND
	Analog output current air gap	OUT
	Reference ground analog output	AGND
6	Voltage supply	DC 24 V
	Reference ground	GND
	Digital output function	FCT
	Digital output wear	WEAR
	Analog output current air gap	OUT
	Reference ground analog output	AGND
8	Voltage supply	DC 24 V
	Reference ground	GND
	Digital output function	FCT
	Digital output wear	WEAR
	Analog output current air gap	OUT
	Reference ground analog output	AGND
	Calibration zero value	ZERO
	Calibration of infinite value	INF

INFORMATION

If the calibration inputs ZERO and/or INF are routed to the outside to a PLC or a controller, they have to be continuously connected to AGND in normal operation to avoid EMC interferences in the calibration cables.

INFORMATION

Signal outputs of the evaluation unit /DUE that are switched may not be used as voltage supply for other evaluation units /DUE or comparable systems. Each evaluation unit /DUE has to be supplied with voltage separately.

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Technical data

			DUE-1K-00	
Installation in			BE1 – BE5	BE11 – BE122
Channels			1	
Sensor			DUE-d6	DUE-d8
Sensor diameter		mm	6	8
Measuring range		mm	1.5	2.0
Limit frequency			100 Hz (-3 dB)	
Temperature			Sensor and cable: -50 to +150 °C Evaluation unit: -40 to +105 °C	
Enclosure			Sensor: up to IP66 Evaluation unit: IP20 (in the closed terminal box up to IP66)	
Signal outputs			OUT1: 4 – 20 mA FCT1: DC 24 V (150 mA) WEAR1: DC 24 V (150 mA)	
Calibration outputs			ZERO: DC 24 V INF: DC 24 V	
Supply voltage			DC 24 V (±15%)	
Current consumption	max.[1]	mA	190	
	min.[2]	mA	40	
Electromagnetic compatibility			DIN EN 61800-3, environment 1	

1) All outputs are fully loaded with 150 mA each externally by relays, for example
2) Only internal supply with current output at maximum gain

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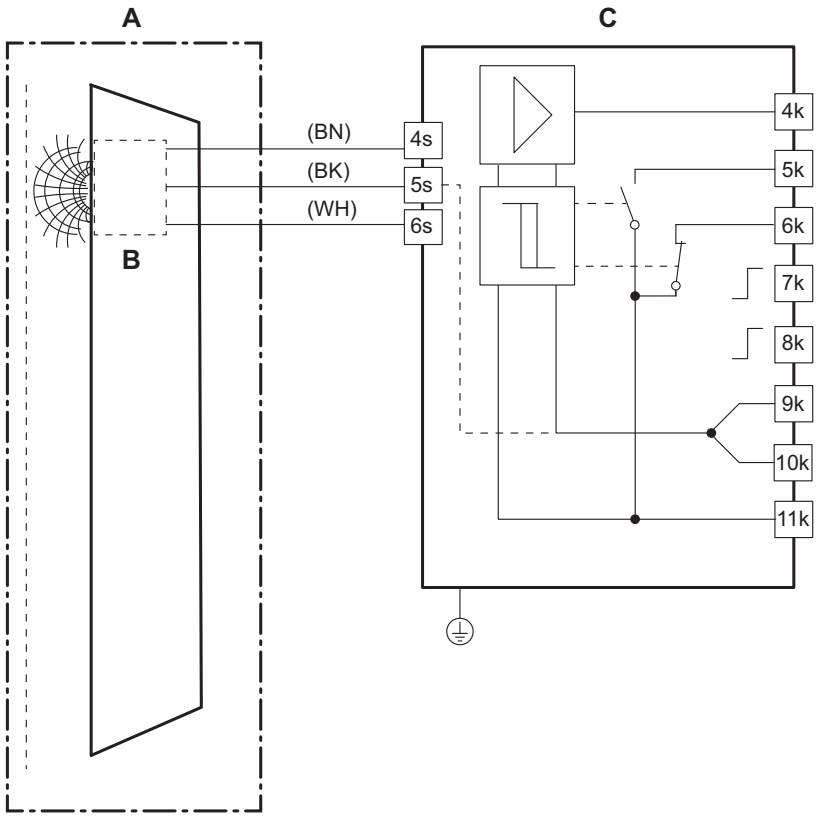
Wiring diagram



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[A]	Brake	[4k]	Analog output wear 1 (air gap)
[B]	Eddy current sensor	[5k]	Digital output function 1 (NO contact)
[C]	Evaluation unit	[6k]	Digital output wear 1 (NC contact)
[4s]	Connection sensor A1 (brown cable)	[7k]	Input calibration zero value
[5s]	Connection sensor GND 1 (black cable)	[8k]	Input calibration infinite value
[6s]	Connection sensor B1 (white cable)	[9k]	Signal ground AGND
		[10k]	Ground potential GND
		[11k]	DC 24 V supply

The evaluation unit is supplied with DC 24 V via the terminals GND [10k] and DC 24 V [11k].

Order information

Type designation /DUE

Available for brakes BE1 – BE122

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7.4 Selection and project planning

The focus of the following sections is the preselection of the brake regarding the mountability and selection of designs and options.

In addition, extensive information is provided regarding the dimensioning of the surrounding structure so that a brakemotor from SEW-EURODRIVE can be installed into the system without difficulties.

For the necessary calculation steps and information as well as characteristic values needed for the correct dimensioning of the brake according to the SEW-EURODRIVE specifications, refer to the following documents:

- "Project Planning for BE.. Brakes" manual – DR.., DRN.., DR2.., EDR.., EDRN.. AC Motors – Standard Brake/Safety Brake"
- Operating Instructions
- Addendum to the operating instructions "Safety Encoders and Safety Brakes, AC Motors DR.., DRN.., DR2.., EDR.., EDRN.. – Functional Safety"

7.4.1 Procedure for selecting brakes and accessories

Both the brakemotor as well as its electrical connections have to be dimensioned according to the conditions of the application.

The following aspects must be taken into account:

Activity	Chapter
Selecting the brake or braking torque	"Pre-selecting the brake size and braking torque" (→ 🗎 318)
Determining the brake control	Selecting the brake voltage and brake control
Selecting the brake control system and connection type	"Selecting the brake control" (→ 🗎 319)
Dimensioning and routing the cable	"Cable selection" (→ 🗎 324)
Selecting the braking contactor	"Selecting the braking contactor" (→ 🗎 325)
Motor protection switch if necessary (protection of the brake coil)	"Motor overload circuit breaker" (→ 🗎 328)
Selecting the diagnostic unit	"Function/wear monitoring of the brake" (→ 🗎 310)

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7.4.2 Pre-selecting the brake size and braking torque

Basic specification	Link/supplement/comment
Motor	Brake/brake control
Braking torque [1)]	Brake springs
Brake application time	Connection type of the brake control (important for creation of wiring diagrams)
Braking time Braking distance Deceleration Braking accuracy	The required data can only be observed if the aforementioned parameters meet the requirements
Braking work Brake service life	Integral time (important for planning service intervals)

1) The braking torque is determined from the requirements of the application with regard to the maximum deceleration and the maximum permitted distance or time.

For detailed information on dimensioning the brakemotor and calculating the braking data, refer to the manual "Project Planning for BE.. Brakes – DR.., DRN.., DR2.., EDR.., EDRN.. AC Motors – Standard Brake/Safety Brake".

7.4.3 Selecting the brake connection voltage

The brake voltage should always be selected on the basis of the available line voltage or the rated motor voltage.

The standard brake voltage corresponds to the specifications in chapter "Supply voltage" (→ 🗎 296). Different brake voltages according to chapter "Operating currents" (→ 🗎 334) can be selected on request.

With multi-voltage motors, the connection voltage of the brake should preferably be specified to the low motor voltage (e.g. motor design 230⅄/460⅄ results in a brake voltage of AC 230 V). For grid operation, the brake can be supplied directly by the motor terminal board independent of the line voltage.

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7.4.4 Selecting the brake control

Installation in the control cabinet

The following tables list the technical data of brake control systems for installation in the control cabinet as well as the assignments to the brake sizes.

Series	Function	Nominal voltage	Nominal output current I_L	Type
BMS..	Half-wave rectifier without electronic switching.	AC 230 – 575 V	DC 1.0 A	BMS1.4
		AC 150 – 500 V	DC 1.5 A	BMS1.5
		AC 24 – 150 V	DC 3.0 A	BMS3.0
BME..	Half-wave rectifier with electronic switching	AC 230 – 575 V	DC 1.0 A	BME1.4
		AC 150 – 500 V	DC 1.5 A	BME1.5
		AC 42 – 150 V	DC 3.0 A	BME3.0
BMH..	Half-wave rectifier with electronic switching and heating function	AC 230 – 575 V	DC 1.0 A	BMH1.4
		AC 150 – 500 V	DC 1.5 A	BMH1.5
		AC 42 – 150 V	DC 3.0 A	BMH3.0
BMP..	Half-wave rectifier with electronic switching, integrated voltage relay for cut-off in the DC circuit	AC 230 – 575 V	DC 1.0 A	BMP1.4
		AC 150 – 500 V	DC 1.5 A	BMP1.5
		AC 230 – 575 V	DC 2.8 A	BMP3.1
		AC 42 – 150 V	DC 3.0 A	BMP3.0
BMK..	Half-wave rectifier with electronic switching, control input (DC 24 V) and cut-off in the DC circuit	AC 230 – 575 V	DC 1.0 A	BMK1.4
		AC 150 – 500 V	DC 1.5 A	BMK1.5
		AC 42 – 150 V	DC 3.0 A	BMK3.0
BMKB..	Half-wave rectifier with electronic switching, control input (DC 24 V), rapid switch-off, and LED status display	AC 150 – 500 V	DC 1.5 A	BMKB1.5
BMV..	Brake control unit with electronic switching, control input (DC 24 V), and rapid switch-off	DC 24 V	DC 5.0 A	BMV5
BST..	Safe brake control with electronic switching, control input (DC 24 V), and safe control input (DC 24 V). Supply via the DC link of the inverter.	AC 460 V	DC 0.6 A	BST0.6S
		AC 400 V	DC 0.7 A	BST0.7S
		AC 230 V	DC 1.2 A	BST1.2S

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Assignment of motor size and connection technology

	BE02	BE03 – BE2	BE5 – BE20	BE30 – BE32	BE60 – BE62	BE120 – BE22
BMS..			–	–	–	–
BME..						–
BMH..					–	–
BMP..					–	–
BMP3.1		–	–	–		
BMK..					–	–
BMV..				–	–	–
BST..					–	–

	Permitted
–	Not permitted

INFORMATION

Brake control systems for installation in the control cabinet with all standard motor plug connectors and cage clamp options.

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Installation in the motor terminal box

The following tables list the technical data of brake control systems for installation in the wiring space of the motor as well as the assignments to the brake sizes.

Series	Function	Voltage	Nominal output current I_L	Type
BG..	Half-wave rectifier without electronic switching	AC 90 – 500 V	DC 1.2 A	BG1.2
		AC 230 – 575 V	DC 1.0 A	BG1.4
		AC 150 – 500 V	DC 1.5 A	BG1.5
		AC 24 – 90 V	DC 2.4 A	BG2.4
		AC 24 – 500 V	DC 2.8 A	Size 3
BGE..	Half-wave rectifier with electronic switching	AC 230 – 575 V	DC 1.0 A	BGE1.4
		AC 150 – 500 V	DC 1.5 A	BGE1.5
		AC 42 – 150 V	DC 2.8 A	BGE3
BS..	Terminal block with varistor protection circuit	DC 24 V	DC 5.0 A	BS24
BSG..	Brake control unit with electronic switching and rapid switch-off	DC 24 V	DC 5.0 A	BSG
BMP..	Half-wave rectifier with electronic switching, integrated voltage relay for cut-off in the DC circuit.	AC 230 – 575 V	DC 2.8 A	BMP3.1

Assignment of motor size and connection technology

	BE02 – BE03	BE05 – BE2	BE5 – BE20	BE30 – BE32	BE60 – BE62	BE120 – BE122
BG..			–	–	–	–
BGE..	1)					–
BS..	1)		–	–	–	–
BSG..	1)			–	–	–
BMP3.1	–	–	–	–	2)	

	Permitted
1)	BGE.., BS.., BSG.. with BE03 possible for DRN71 and DR2S71
2)	Possible with DRN250 – DRN280
–	Not permitted

BG.. and BGE.. are always supplied wired up in the terminal box for cut-off in the AC circuit.

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INFORMATION

Brake control systems for installation in the motor terminal box can be combined with most plug connectors and with cage clamps /KCC. There might be space restrictions when using the /KC1 option and customer-specific plug connectors.

There might also be restrictions in combinations with further electrical additional options (such as motor protection, strip heater, built-in encoder), or a larger terminal box might have to be used.

Additional switching relay for installation on the motor terminal box

The following tables list the technical data of available current relays and voltage relays (SR.. and UR..). These relays are available for implementing cut-off in the DC circuit and in the AC circuit in the drive, see chapter "Particularly short response time at switch-off" (→ 🗎 300).

The two relays are optionally available for BE03 – BE32 brakes for brake control BGE 1.5 and BGE 3. For DRN63.. motors, the two relays can only be used with brake control BG1.2 and BG2.4. The relays are provided for mounting to the motor terminal box.

INFORMATION

When using drives with the BSR.. option, the terminal box contour or size might be different after having mounted the relay.

The option designations are BSR.. (BGE.. with SR..) and BUR.. (BGE.. with UR..). The two options generally differ in the design and in the assignment rules.

BSR.. brake control combination

A combination of brake control and SR.. current relay can be used for motors with the following characteristics:

- Line operation
- Single-speed
- Constant voltage at the terminal board of the motor, see chapter "Brake voltage supply" (→ 🗎 296).

The supply voltage for the brake is tapped directly from the motor terminal board. Consequently, no separate cables are required for the voltage supply of the brake.

The relay is wired in such a way that it monitors the current in the motor winding. The current decreases when the motor is switched off. The relay disconnects the DC circuit of the brake virtually without delay.

The brake voltage usually corresponds to the phase-to-neutral voltage of the motor. For a motor with a nominal voltage of 230 V△/400 V⅄, the brake coil is equipped with a winding for operation at 230 V. As an option, the brake coil can also be configured for phase-to-phase voltage (e.g. motor 400 V, brake 400 V).

BUR.. brake control combination

A combination of brake control and UR.. voltage relay can be used for motors with the following features:

- Pole-changing
- Inverter controlled
- No constant voltage over time present at the motor terminal board

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The combination can also be used for grid-operated, single-speed motors. If the brake is supplied with voltage from the motor terminal board, the remanence voltage of the motor would result in a delayed application of the brake after switching off.

With BUR.., the voltage for the brake must be supplied using a separate supply cable. The relay is wired in such a way that it monitors the AC circuit voltage at the input terminals of the BG../BGE.. brake control system. The relay disconnects the DC circuit of the brake virtually without delay due to the voltage dip that occurs when switching off the brake supply.

Assignment of brake size and connection voltages

The maximum switchable nominal current for holding the brake is DC 1 A (corresponds to about AC 0.77 A for BE.. brakes).

Based on this limit value, the following table lists possible combinations of the various brake sizes depending on common line voltages:

Voltage	Brake sizes			
AC V	BE03 – BE5	BE11 – BE20	BE30 – BE32	BE60 – BE122
120		–	–	–
230			–	–
400				–
460				–
500				–
575	–	–	–	–

SEW-EURODRIVE permanently assigns the BG../BGE.. brake control and the SR.. current relay or UR.. voltage relay depending on the selected combination of brake and motor and connection voltage:

- BG../BGE.. is assigned based on the connection voltage of the brake, see above section.
- The SR.. current relay is assigned depending on the motor size and the rated motor current for ⅄ connection.
- UR.. voltage relays are fixed assigned to BG../BGE.. brake control systems. They are assigned by means of the connection voltage of the brake. UR15 is always assigned to BG1.2/BGE1.5, and UR11 is assigned to BG2.4/BGE3.

Motors	Rated motor current I_N in ⅄ connection	Assigned SR.. current relay
	A	
DRN63 – DRN132S DR2S63 – DR2S80	0.075 – 0.6	SR10
	0.6 – 10	SR11
	10 – 50	SR15
DRN132M – DRN225	10 – 30	SR15
	30 – 90	SR19

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7.4.5 Dimensioning the periphery

Voltage supply/connection type

Connection type

Maintaining certain brake application times can be relevant to safety. The decision to implement cut-off in the AC circuit or cut-off in the DC and AC circuits must be documented clearly and unambiguously and must be adhered to during installation and startup.

The specified brake application times must be observed in particular during project planning (see also the manual "Project Planning for BE.. Brakes – DR.., DRN.., DR2.., EDR.., EDRN.. AC Motors – Standard Brake/Safety Brake").

Cable selection

Dimensioning and routing of the cable

Bear in mind the inrush current of the brake when dimensioning the cross section of the brake cable. When taking into account the voltage drop due to the inrush current, the value must not drop below 90% of the nominal brake voltage. Refer to the "Operating currents" (→ 🗎 334) tables for information about possible connection voltages and the resulting operating currents.

Refer to the table below for dimensioning the cable cross sections with regard to the acceleration currents for cable lengths ≤ 50 m.

BE02 – BE122

<table>
<tr><th rowspan="3">Brake</th><th colspan="6">Minimum cable cross section of the brake cables in mm² for cable lengths ≤ 50 meters and brake voltage</th></tr>
<tr><th>24</th><th>60</th><th>111 – 123</th><th>174 – 193</th><th>194 – 217</th><th>218 – 575</th></tr>
<tr><th>AC V</th><th>DC 24 V</th><th>AC V</th><th>AC V</th><th>AC V</th><th>AC V</th></tr>
<tr><td>BE02</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>BE03</td><td rowspan="4">10</td><td rowspan="3">1.5</td><td rowspan="5">1.5</td><td rowspan="8">1.5</td><td rowspan="9">1.5</td><td rowspan="9">1.5</td></tr>
<tr><td>BE05</td></tr>
<tr><td>BE1</td></tr>
<tr><td>BE2</td><td>2.5</td></tr>
<tr><td>BE5</td><td rowspan="7">1)</td><td>4</td></tr>
<tr><td>BE11</td><td rowspan="3">10</td><td rowspan="4">2.5</td></tr>
<tr><td>BE20</td></tr>
<tr><td>BE30/32</td><td rowspan="3">1)</td></tr>
<tr><td>BE60/62</td><td rowspan="2">1)</td><td>2.5</td></tr>
<tr><td>BE120/122</td><td>1)</td><td>1)</td></tr>
</table>

1) Connection voltage not available for this brake size

Cable cross sections of max. 2.5 mm² can be connected to the terminals of the brake control systems. Intermediate terminals must be used if the cross sections are larger.

Brake cables must always be routed separately from other power cables with phased currents unless they are shielded, see chapter "Brakemotor operation with inverter" (→ 🗎 124).

Provide for a suitable equipotential bonding between drive and control cabinet.

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Power cables with phased currents include:

- Output cables from inverters, soft start units and brake units
- Supply cables to braking resistors.

Selection and protection circuit of switching elements

Selecting the braking contactor

The high electrical load during switching of the brake (inductive load) requires suitable contactors/switch contacts to have the brake function properly.

Depending on the type and design of the brake, the switch contacts for the voltage supply of the brake must meet the following utilization categories:

- Switch contacts for the supply voltage for operation with AC voltage: AC-3 according to EN 60947-4-1, or AC-15 according to EN 60947-5-1.
- Switch contact for the supply voltage for operation with DC voltage: Preferably AC-3 or DC-3 according to EN 60947-4-1. As an alternative, contacts in utilization category DC-13 according to EN 60947-5-1 are also permitted.

For using the faster cut-off in the AC and DC circuits, also the DC circuit of the brake must be switched. The following applies:

- Switch contacts for optional cut-off in the DC circuit: AC-3 according to EN 60947-4-1.

INFORMATION

Semi-conductor relays with RC protection circuits are not suitable for switching brake rectifiers with the exception of BG.. and BMS..

When applications require cut-off in the DC and AC circuits of the brake, electronic switching devices from SEW-EURODRIVE can be used instead of separate switch contacts.

1. The brake rectifiers BMP.., BMV.. and BMK.., which perform the cut-off in the DC circuit internally, have been specially designed for installation in the control cabinet.
2. The additional relays SR.. and UR.. have been installed for mounting to the terminal box in combination with brake control.

Advantages of brake control systems from SEW-EURODRIVE with integrated cut-off in the DC circuit

Switching devices from SEW-EURODRIVE offer the following advantages:

- Special contactors with four AC-3 contacts are not required.
- For the above-mentioned reasons, the contact for cut-off in the DC circuit is subject to high loads and, therefore, a high level of wear. In contrast, the electronic switches from SEW-EURODRIVE operate without any wear at all.
- Customers do not have to perform any additional wiring. The current and voltage relays are wired at the factory. Only the power supply and brake coil have to be connected for the BMP.. and BMK.. rectifiers.
- Two additional conductors between the motor and control cabinet are no longer required.
- No additional interference emission in the control cabinet from contact bounce when the brake is cut-off in the DC circuit.

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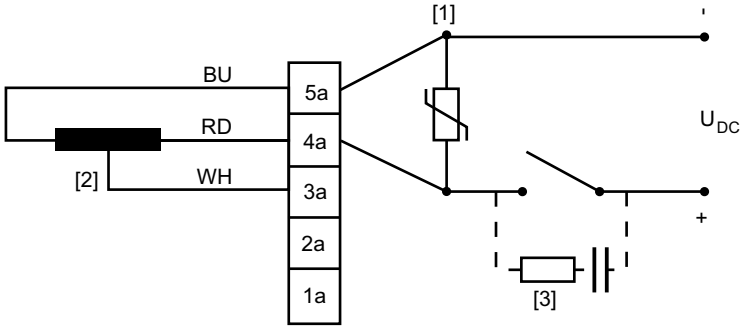
Varistor overvoltage protection with direct DC voltage supply

Brakes of sizes up to BE2 can instead be operated with direct DC voltage supply without brake control.

In this case, a suitable overvoltage protection in the form of a varistor must be installed by the customer to protect the switch contacts and the brake coil. The varistor must be connected in parallel to the coil according to the diagram below.

The following figure shows a varistor for protecting the brake coil.



5463392779

[1]	Varistor	WH	White
[2]	Brake coil	RD	Red
[3]	RC element	BU	Blue

The required varistor is not included in the scope of delivery, which means it has to be selected and dimensioned by the customer.

INFORMATION

Using a freewheeling diode as overvoltage protection instead of a varistor is not permitted, as this can significantly extend brake application times.

If there are still problems with EMC interference in the voltage supply line despite the varistor overvoltage protection, then a suitable RC element can also be connected in parallel to the switch contact.

INFORMATION

SEW-EURODRIVE always recommends using a BS.., BSG.. or BMV.. brake control for brakes with DC 24 V supply. This brake control has a wear-free, electronic switch which prevents in particular contact-breaking sparks when switching off the brake, which could lead to EMC interference. BMV.. controls also have a powerful overvoltage protection for the switch contacts and the brake coil.

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Multi-motor operation of brakemotors

In many applications, several motors are used at the same time to implement a technical function. This is generally also possible for brakemotors. Bear in mind that in the event of a brake failure, all other brakes that are operated at the same time also have to apply to prevent damage to the drive components and the system. In this case, it is advantageous if each brake is operated via its own brake control system.

INFORMATION

In general: In the event of a brake malfunction, all of the brakes must be switched off by disconnecting the supply voltage.

Simultaneous switching can also be achieved by connecting several brakes in parallel to a shared brake control. In this case, the following conditions apply:

- The total of all operating currents of the brakes ("Operating currents" (→ 🗎 334)) must not exceed 0.75 times the nominal output current of the brake control system "Selecting the brake control" (→ 🗎 319).
- It is recommended to connect only brakes of the same size in parallel.
- The faster cut-off in the AC and DC circuits (AC/DC) cannot be implemented in a reliable manner because of the interaction of the brake coils connected in parallel. During the configuration process, the switching times for a pure cut-off in the AC circuit must be taken into account accordingly.

INFORMATION

As a cut-off in the AC and DC circuits cannot be performed reliably when several brakes are connected in parallel to the same brake control, this operating mode is neither suited for hoists or hoist-like applications nor for functional safety applications with BE.. safety brakes.

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7.4.6 Fusing the voltage supply

Like any other electrical operating resource, also a spring-loaded brake must be protected from overvoltage and short circuit. For brakes that are operated with a brake control from SEW-EURODRIVE at an AC voltage system, SEW-EURODRIVE recommends using a motor circuit breaker as protection.

Motor overload circuit breaker

A motor circuit breaker prevents the destruction of the brake coil in the event of the brake coil being connected incorrectly or the brake rectifier being defect.

Electromagnetic motor circuit breakers such as ABB type M25-TM are suitable as short-circuit protection for the brake rectifier and as thermal protection for the brake coil.

INFORMATION

Electronic motor circuit breakers are not suitable for protecting brake rectifiers and brake coils due to their working principle (measuring the effective current value via a current transformer). Contact SEW-EURODRIVE.

The motor circuit breaker must be selected and set based on the nominal holding current of the brake. For holding currents, refer to chapter "Operating currents" (→ 🗎 334).

The following applies to the setting values:

- Brakes with a fixed connection voltage or a 50 Hz voltage range: Setting to 1.1 times the nominal holding current
- Brakes with a combined voltage range of 50/60 Hz: Setting to 1.25 times the nominal holding current

Motor circuit breakers are suitable for all brake rectifiers in the control cabinet and in the terminal box with separate voltage supply.

INFORMATION

Special conditions must be taken into account when using motor circuit breakers in combination with BMH.. brake control because of the heating current. Consult SEW-EURODRIVE in this case.

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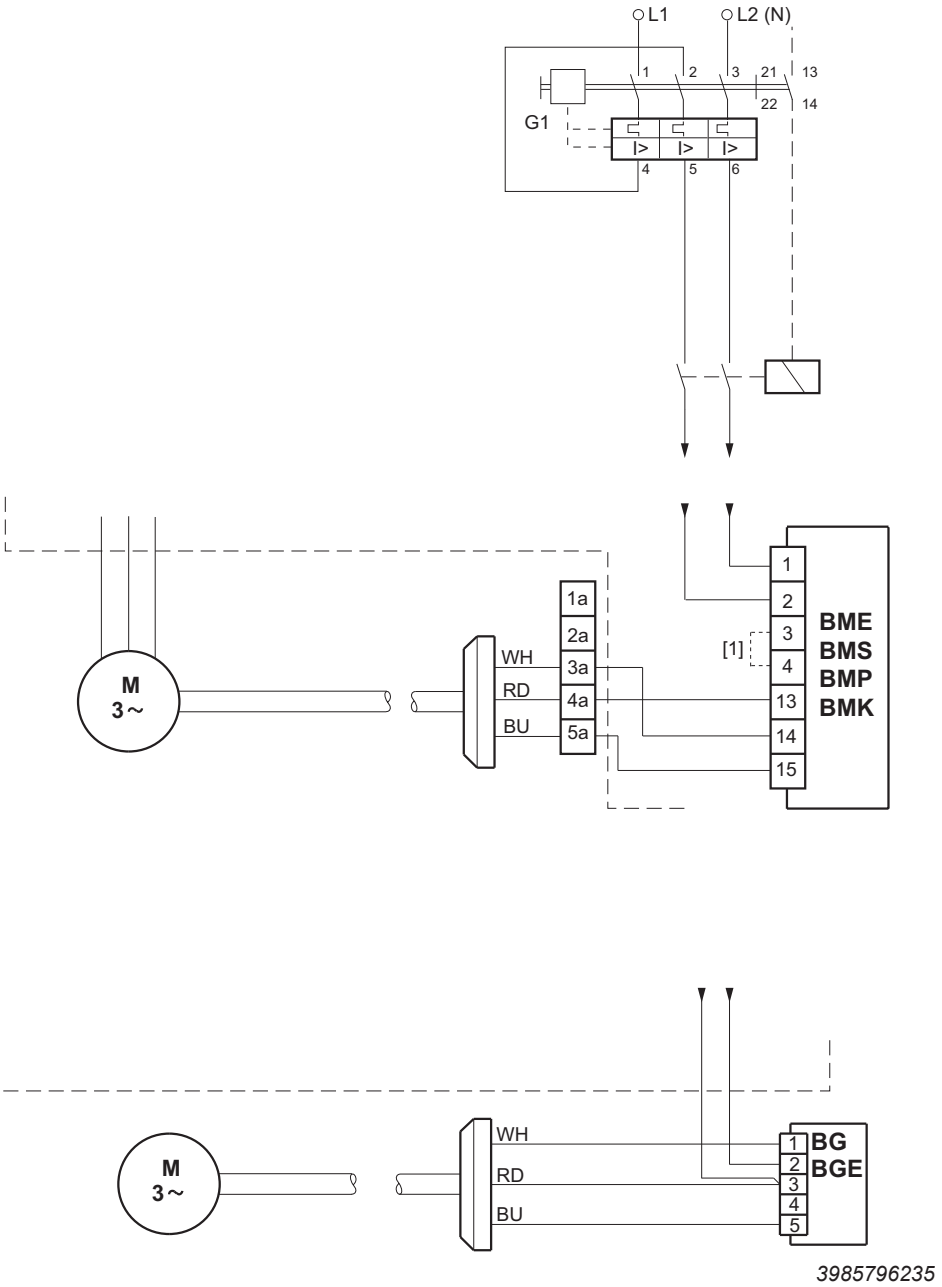

WH White
RD Red
BU Blue
[1] Customers must connect terminals 3 and 4 according to the relevant wiring diagram.

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7.4.7 Brake diagnostics and friction surface activation

In applications with brakes, the braking torque represents an important criterion for the functionality of the brake. In the event of a reduction in or loss of braking torque, the functionality of the application is no longer ensured. As a result, the safety of the machine and/or even the safety of persons may be limited. To prevent this from happening, the brake can optionally be checked using brake diagnostics. Brake diagnostics provides the user with information about the status and performance capability of the brake. The early detection of potential faults or functional limitations is the advantage of the diagnosis. This makes it possible to arrange maintenance or repair in due time.

Brake diagnostics may be required by standards, particularly in safety-related applications in accordance with EN ISO 13849 in which a safety function is implemented using a brake. The diagnostic coverage (DC_{avg}) required by standards must be fulfilled depending on the required Performance Level (PL). The diagnostic coverage is a key figure of the implemented brake diagnostics.

The braking torque that is present, which cannot be detected by conventional diagnostic systems such as a microswitch /DUB or diagnostic unit /DUE, is an essential criterion for checking a brake.

Diagnostic unit /DUE

The diagnostic unit /DUE for function and wear monitoring of the BE.. brake detects the switching status of the brake and its wear status by means of continuous measurement of the air gap. The diagnostic unit /DUE detects whether the magnetic circuit of the brake including the brake control basically works (brake opens and closes). Furthermore, the /DUE option makes it possible to detect a change to the air gap of the brake via a continuous air gap measurement. In this way, wear-related function restrictions can be detected and rectified by means of maintenance.

INFORMATION

The diagnostic unit /DUE detects the switching status and the degree of wear of the brake by interpreting the air gap. However, the /DUE option cannot determine the available braking torque. Additional applicative measures may be needed to check the braking torque.

Brake diagnostics as a functionality of control from SEW-EURODRIVE

At SEW-EURODRIVE, brake diagnostics is available as a software function for controllers of the advanced/power performance classes. This makes it possible to implement safety functions with brakes in horizontal and vertical applications up to the maximum requirement PL e. The functionality can be individually adapted to the applicative requirements during startup.

A considerable advantage of this diagnosis is the automatic load detection that has been implemented. In this way, the brake is reliably checked with the required test torque, even in changing applicative load situations. The provision of an additional test load for carrying out the diagnosis is not required.

For more information, refer to the "Brake Diagnostics for Controllers" manual.

Notes on realizing brake diagnostics

Brake diagnostics can also be implemented by the customer. The customer is responsible for evaluating the diagnostic coverage (DC_{avg}) and correct diagnosis of the brake for such solutions.

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In order to avoid erroneous diagnosis results, particular attention must be paid to the following:

- Software-based brake diagnostics usually cannot determine the braking torque that is present at the brake. In addition to the braking torque, the torque determined by the diagnostics also includes applicative torques, such as friction. Measuring tolerances of the measuring equipment that is used and the temperature-dependent torque characteristics of the motor can also lead to considerable measurement deviations.
- Because of the possible measurement deviations and the different meaning of the nominal braking torque M_B and the static braking torque M_4, brake slippage can and may occur, even significantly outside the tolerance range of the nominal braking torque M_B.

For the above-mentioned reasons, the determination of the test torque to be selected must always be based on the planning requirements. These are requirements such as maximum static load torque of the application and safety factors, where applicable.

INFORMATION

Performing brake diagnostics with a damaged brake or brake control unit can lead to undesirable movement of the unit. During the implementation and performance of these kinds of diagnostics, always ensure that the safety of persons and the system is guaranteed during this process.

In order to perform a static brake diagnosis, attention must be paid to the following in addition to the above-mentioned notes:

- In systems with more than one brake, e.g. a group drive or motor brake in combination with another brake in the system, each brake must be tested separately in accordance with the standards. Any mechanical stress during the separate diagnosis must be taken into consideration in the design of the machine or must be avoided using suitable automation.
- The brake diagnosis must be carried out with the machine in a test position that prevents injuries to persons and damage to the system in the event of possible movement, e.g. in the event of brake slippage.

If you have any queries with regard to the selection, parameterization, and use of diagnosis mechanisms, please contact SEW-EURODRIVE.

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Activating the friction surfaces

When a brake is used as a holding brake, the brake is not usually subjected to dynamic loading. This can cause a gradual reduction in the static friction torque M_4. As compensation, the friction surfaces can be reactivated by a targeted dynamic load. The activation procedure regenerates the top layer of the friction lining in order to compensate for the drop in the static friction torque M_4 caused by a lack of dynamic strain.

SEW-EURODRIVE recommends paying attention to the following during activation procedures such as this:

- Perform friction surface activation as infrequently as possible in order not to reduce the service life of the lining too much.
- The friction surfaces should preferably be activated using dynamic brake application at a significantly reduced motor speed (< 750 min^{-1}).
- Activation of the friction surfaces by means of controlled start-up of the motor against the closed brake is only permissible if the motor speed does not exceed a value of 100 min^{-1} and the activation time does not exceed 5 seconds.

In the event of uncertainty with regard to the design of activation of the friction surfaces, please contact SEW-EURODRIVE.

INFORMATION

Working brakes on line-operated motors (non-controlled operation) do not need activation, since they are sufficiently loaded by the operational braking procedures.

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7.5 Technical data

INFORMATION

For information on the torque-dependent spring pack of BE.. brakes, refer to the operating instructions for AC motors.

Information	Source
Operating currents of the brake	"Operating currents" (→ 🗎 334)
Resistance of brake coils	Operating Instructions
Pulse frequencies	"Project Planning for BE.. Brakes" manual – DR.., DRN.., DR2.., EDR.., EDRN.. AC Motors – Standard Brake/Safety Brake"
Permitted braking work per cycle	"Project Planning for BE.. Brakes" manual – DR.., DRN.., DR2.., EDR.., EDRN.. AC Motors – Standard Brake/Safety Brake"
Permitted braking work until maintenance	"Project Planning for BE.. Brakes" manual – DR.., DRN.., DR2.., EDR.., EDRN.. AC Motors – Standard Brake/Safety Brake"
Permitted working air gaps	Operating Instructions
Spring pack tables	Operating Instructions
Characteristic safety values B_{10D}	"Characteristic safety values" (→ 🗎 338)
Block diagrams	"Brake control block diagrams" (→ 🗎 340)
Dimension drawings of the brake controls	"Dimension drawings" (→ 🗎 355)

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7.5.1 Operating currents

General information on determining operating currents

The tables in this chapter list the operating currents of BE.. brakes at different voltages.

The acceleration current I_B (= inrush current) flows only for a short time (approx. 160 ms for BE02 – BE62, 400 ms for BE60 – BE122 with BMP3.1 brake control) when the brake is released. No increased inrush current occurs when using BG.., BS24 or BMS.. brake control and direct DC voltage supply without control unit (only possible with brake size BE02 – BE2).

The values for the holding currents I_H are rms values. Only use current measurement units that are designed to measure rms values.

INFORMATION

The following operating currents and power consumption values are nominal values. They refer to a coil temperature of +20 °C.

Operating currents and power consumption usually decrease during normal operation due to heating of the brake coil.

Note that the actual operating currents can be higher by up to 25% depending on the ambient temperature and with coil temperatures below +20 °C.

Legend

The following tables list the operating currents of the brakes at different voltages.

The following values are specified:

P_B	Nominal value of the electric power consumption in the brake coil in watt.
U_N	Nominal voltage (rated voltage range) of the brake in V (AC or DC).
I_H	Nominal holding current in A (AC). rms value of the braking current in the supply cable to the SEW-EURODRIVE brake control.
I_{DC}	Nominal holding current in A (DC) in the brake cable with direct DC voltage supply or Nominal holding current in A (DC) in the brake cable with DC 24 V supply via BS24, BSG, or BMV.
I_B	Acceleration current in ampere (AC or DC) when operated with SEW brake control for high-speed excitation.
I_B/I_H	Inrush current ratio ESV.
I_B/I_{DC}	Inrush current ratio ESV for DC 24 V supply with BSG or BMV.

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BE02, BE03, BE05, BE1, BE2 brakes

	BE02	BE03	BE05, BE1	BE2
Nominal power brake coil in W	25	25	30	41
Inrush current ratio ESV	4	4	4	4

Nominal voltage (rated voltage range) V_N		BE02		BE03		BE05, BE1		BE2	
		I_H	I_{DC}	I_H	I_{DC}	I_H	I_{DC}	I_H	I_{DC}
AC V	DC V	AC A	DC A	AC A	DC A	AC A	DC A	AC A	DC A
24 (23–26)	10	-	–	2.20	2.55	2.25	2.90	2.95	3.80
60 (57-63)	24	-	0.72	0.87	1.02	0.90	1.17	1.18	1.53
120 (111-123)	48	-	–	0.44	0.51	0.45	0.59	0.59	0.77
184 (174-193)	80	-	–	0.28	0.32	0.29	0.37	0.38	0.49
208 (194-217)	90	-	–	0.25	0.29	0.26	0.33	0.34	0.43
230 (218-243)	96	0.14	0.18	0.22	0.26	0.23	0.30	0.30	0.39
254 (244-273)	110	-	–	0.19	0.23	0.20	0.27	0.27	0.35
290 (274-306)	125	-	–	0.17	0.21	0.18	0.24	0.24	0.31
330 (307-343)	140	-	–	0.15	0.18	0.16	0.21	0.21	0.28
360 (344-379)	160	-	–	0.14	0.16	0.14	0.19	0.19	0.25
400 (380-431)	180	0.08	0.1	0.12	0.14	0.13	0.17	0.17	0.22
460 (432-484)	200	0.07	0.09	0.11	0.13	0.11	0.15	0.15	0.19
500 (485-542)	220	-	–	0.10	0.11	0.10	0.13	0.14	0.18
575 (543-600)	250	-	–	0.09	0.10	0.09	0.12	0.12	0.16

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Brakes BE5, BE11, BE20, BE30, BE32, BE60, BE62

	BE5	BE11	BE20	BE30, BE32	BE60, BE62
Nominal power brake coil in W	50	70	95	120	195
Inrush current ratio ESV	5.9	6.6	7.5	8.5	9.2

Nominal voltage (rated voltage range) V_N		BE5	BE11	BE20	BE30, BE32	BE60, BE62
		I_H	I_H	I_H	I_H	I_H
AC V	DC V	AC A	AC A	AC A	AC A	AC A
60 (57 – 63)	24	1.28	2.05	2.55	–	–
120 (111 – 123)	–	0.64	1.04	1.28	1.66	–
184 (174 – 193)	–	0.41	0.66	0.81	1.05	–
208 (194 – 217)	–	0.37	0.59	0.72	0.94	1.50
230 (218 – 243)	–	0.33	0.52	0.65	0.84	1.35
254 (244 – 273)	–	0.29	0.47	0.58	0.75	1.20
290 (274 – 306)	–	0.26	0.42	0.51	0.67	1.12
330 (307 – 343)	–	0.23	0.37	0.46	0.59	0.97
360 (344 – 379)	–	0.21	0.33	0.41	0.53	0.86
400 (380 – 431)	–	0.18	0.30	0.37	0.47	0.77
460 (432 – 484)	–	0.16	0.27	0.33	0.42	0.68
500 (485 – 542)	–	0.15	0.24	0.29	0.38	0.60
575 (543 – 600)	–	0.13	0.22	0.26	0.34	0.54

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Brake BE120, BE122

	BE120, BE122
Nominal power brake coil in W	220
Inrush current ratio ESV	6

Nominal voltage (rated voltage range) V_N	BE120, BE122
	I_H
AC V	AC A
230 (218 – 243)	1.45
254 (244 – 273)	1.30
290 (274 – 306)	1.16
360 (344 – 379)	0.92
400 (380 – 431)	0.82
460 (432 – 484)	0.73
500 (485 – 542)	0.65
575 (543 – 600)	0.58

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7.5.2 Characteristic safety values

Characteristic safety values for BE.. brakes

The values specified in the following table apply to BE.. brakes in standard applications.

	Characteristic safety values according to EN ISO 13849-1	
Classification	Category B	
System structure	1-channel (Cat. B)	
$MTTF_D$ value	Calculation via B_{10D} value	
B_{10D} value	BE02	1.5×10^6
	BE03	20×10^6
	BE05	16×10^6
	BE1	12×10^6
	BE2	8×10^6
	BE5	6×10^6
	BE11	3×10^6
	BE20	2×10^6
	BE30	1.5×10^6
	BE32	1.5×10^6
	BE60	1×10^6
	BE62	1×10^6
	BE120	0.25×10^6
	BE122	0.25×10^6

SEW-EURODRIVE offers BE.. brakes also as safety brakes up to size BE32. For more information, consult the addendum to the operating instructions "Safety Encoders and Safety Brakes – AC Motors DR.., DRN.., DR2.., EDR.., EDRN.. – Functional Safety".

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Characteristic safety values for BE.. safety brakes

	Characteristic safety values according to EN ISO 13849-1	
Classification	Category 1	
System structure	1-channel (cat. 1)	
Operating mode	High demand	
Safe state	Brake applied	
Safety functions	Safe brake actuation (SBA) Safe brake hold (SBH)	
Service life	20 years, or T_{10D} value (depending on which value applies first)	
T_{10D} value	$0.1 \times MTTF_D$	
$MTTF_D$ value	Calculation via B_{10D} value	
B_{10D} value	BE03	24×10^6
	BE05	20×10^6
	BE1	16×10^6
	BE2	12×10^6
	BE5	10×10^6
	BE11	8×10^6
	BE20	5×10^6
	BE30	3×10^6
	BE32	3×10^6

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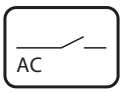
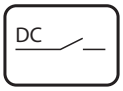
7.5.3 Brake control block diagrams

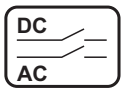
Legend



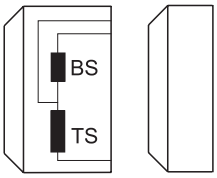
Cut-off in the AC circuit
(standard application of the brake)



Cut-off in the DC circuit
(fast application of the brake)



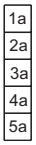
Cut-off in the DC and AC circuits
(fast application of the brake)



Brake

BS = Accelerator coil

TS = Coil section



Auxiliary terminal strip in terminal box

Motor with delta connection

Motor with star connection

Control cabinet limit

WH	White
RD	Red
BU	Blue
BN	Brown
BK	Black

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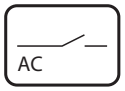
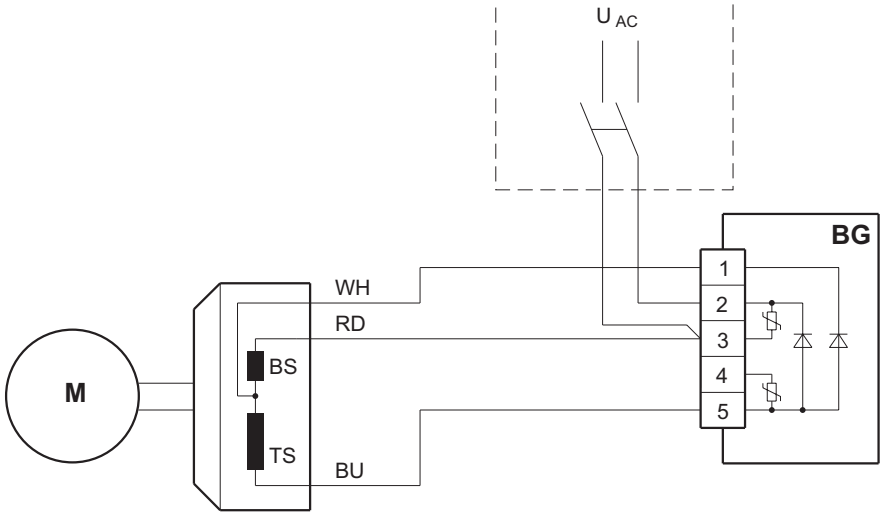
BG.. brake control





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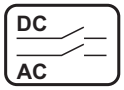
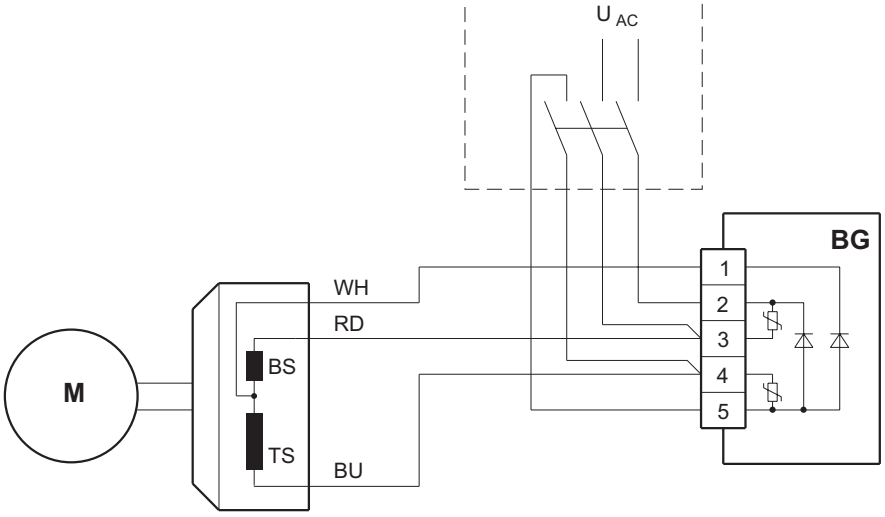
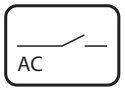
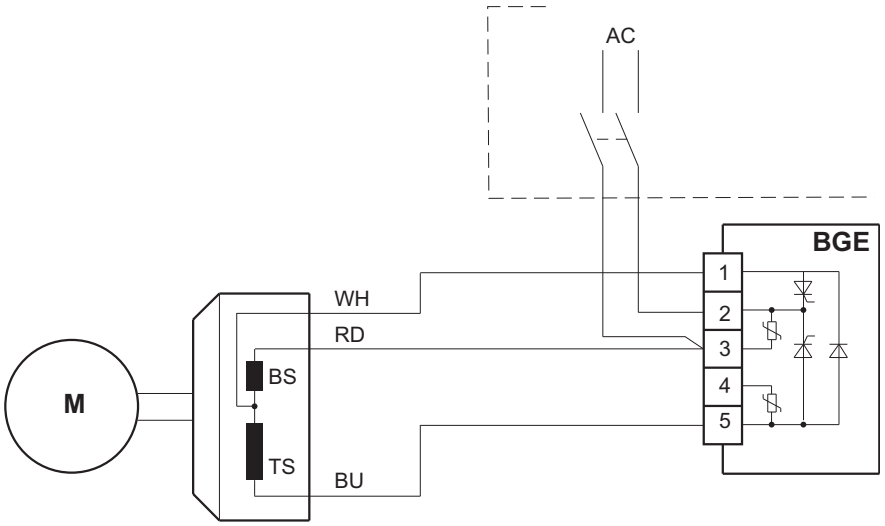




3985842315

BGE.. brake control





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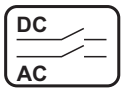

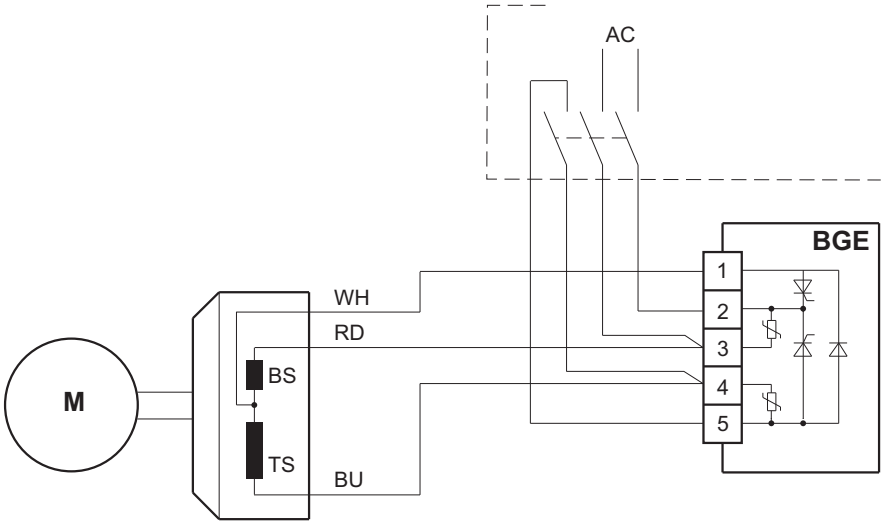

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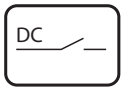
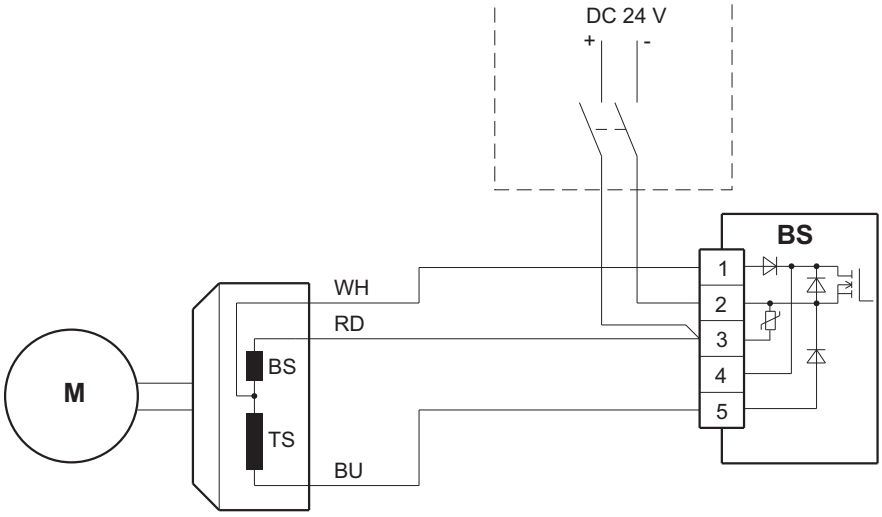
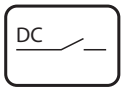
BS.. brake control

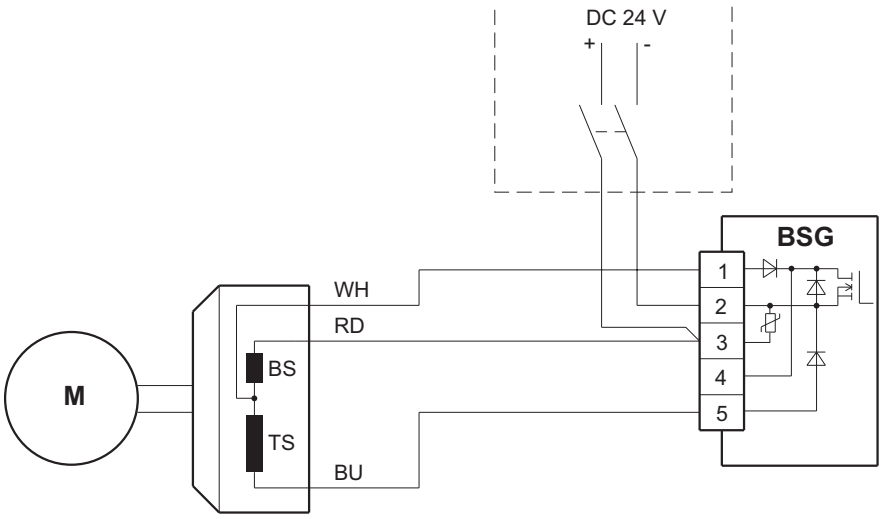




5465000459

BSG.. brake control





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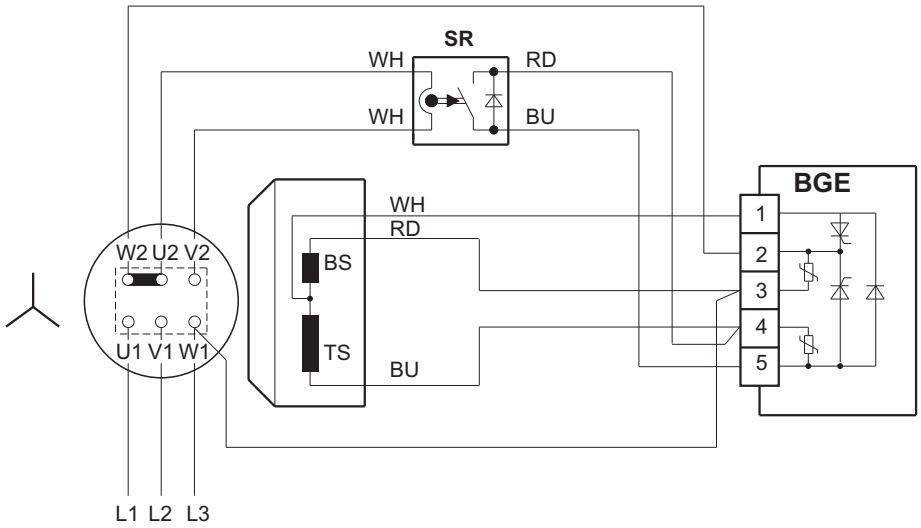
BSR.. brake control

Brake voltage = phase-to-neutral voltage

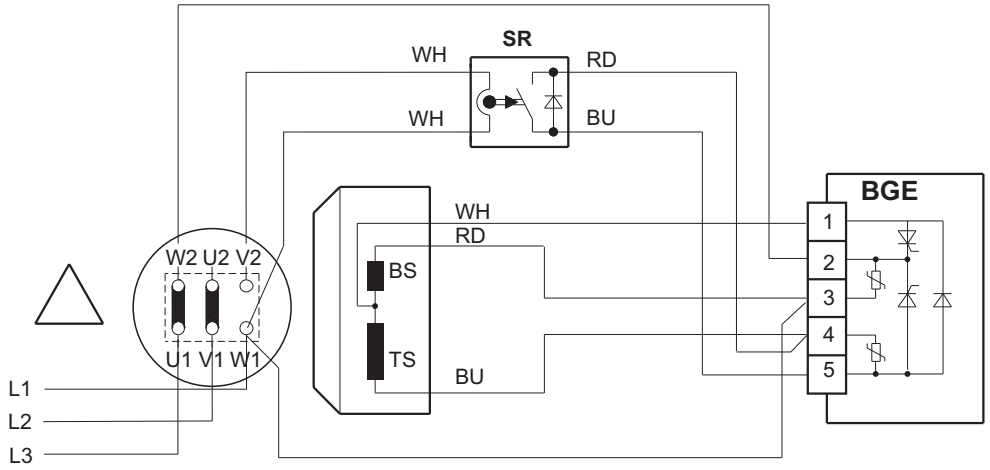
DC
AC



Example: Motor 230 V △/400 V ⅄, brake AC 230 V

3985860747

DC
AC



Example: Motor 400 V △/690 V ⅄ , brake: AC 400 V

3985862411

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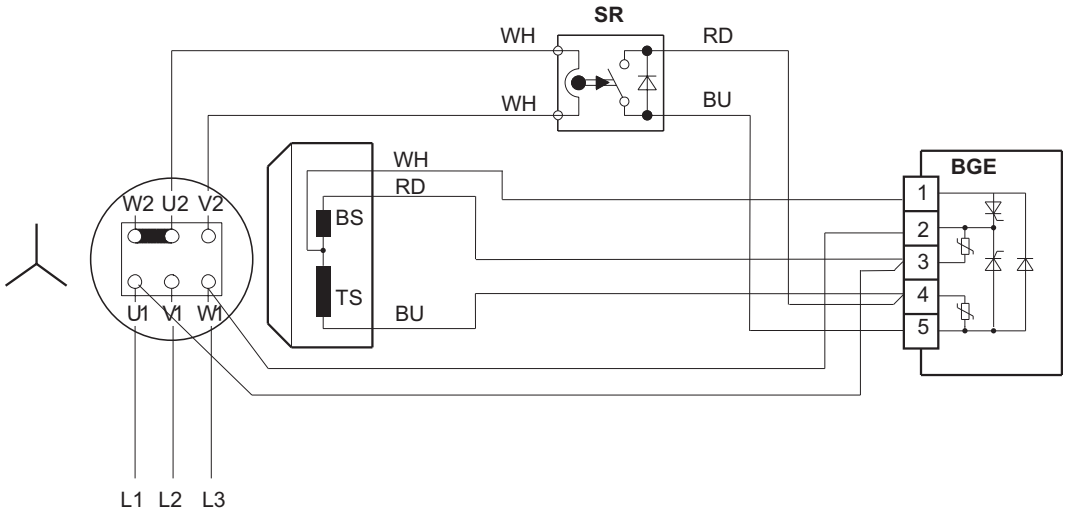
Brake voltage = phase-to-phase voltage

DC
AC

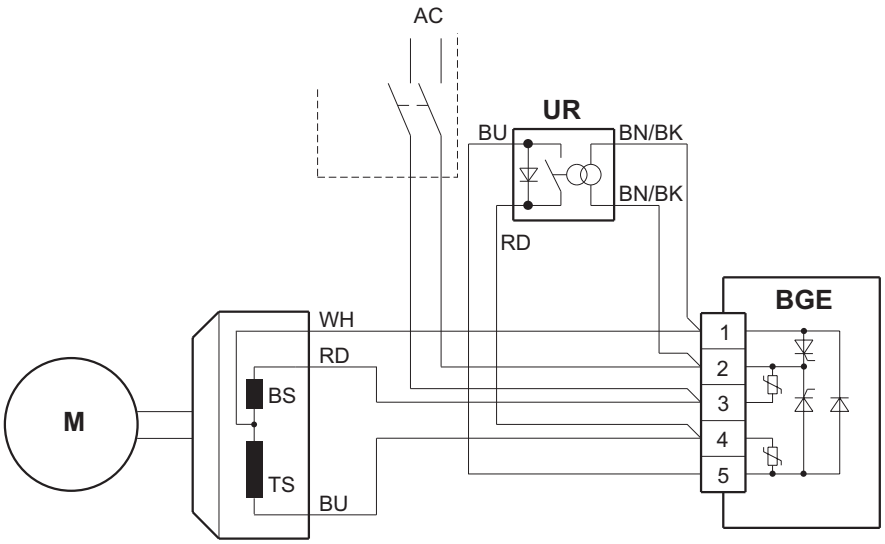


The input voltage of the brake rectifier corresponds to the phase-to-phase voltage of the motor, e.g. motor: 400 V ⅄, brake: AC 400 V

9007203240605067

BUR.. brake control

DC
AC



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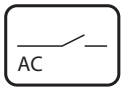
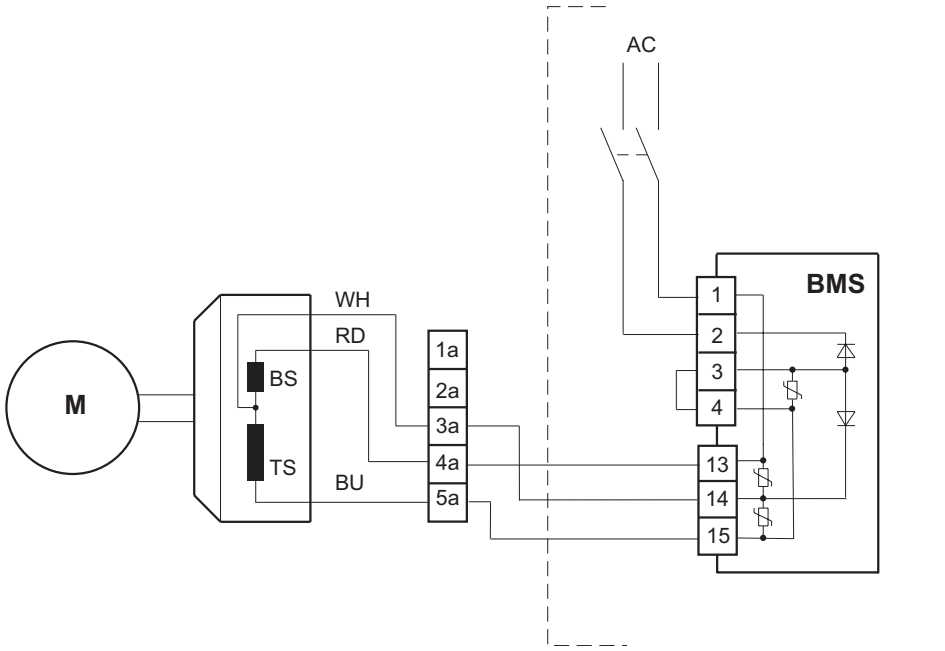
BMS.. brake control





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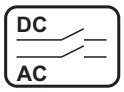

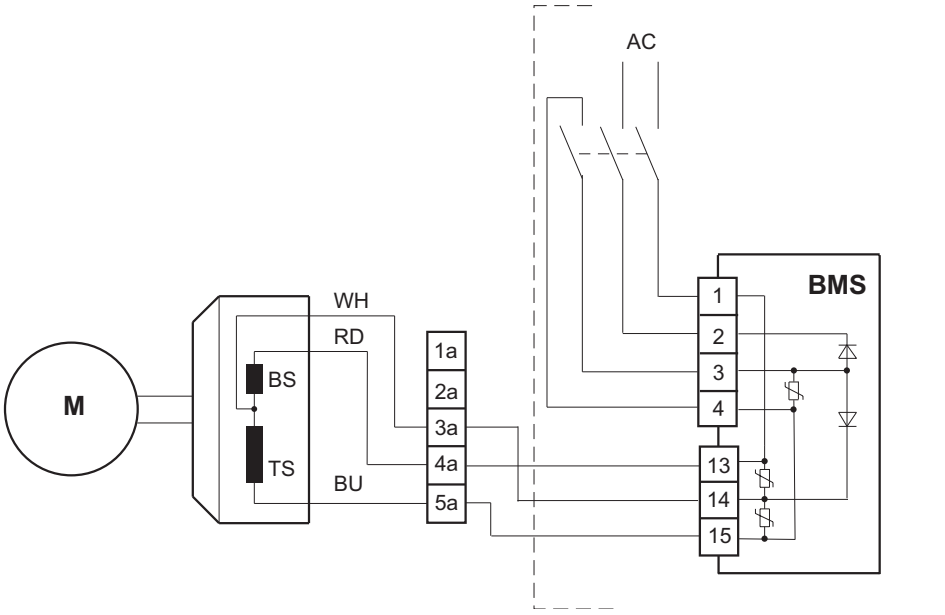

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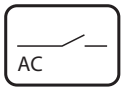
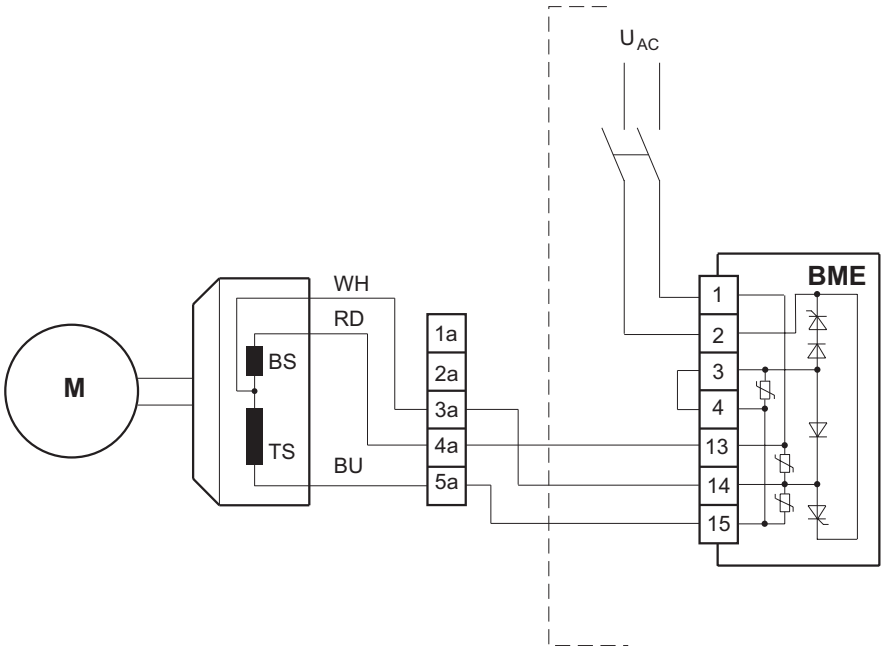
BME.. brake control





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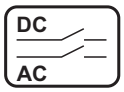

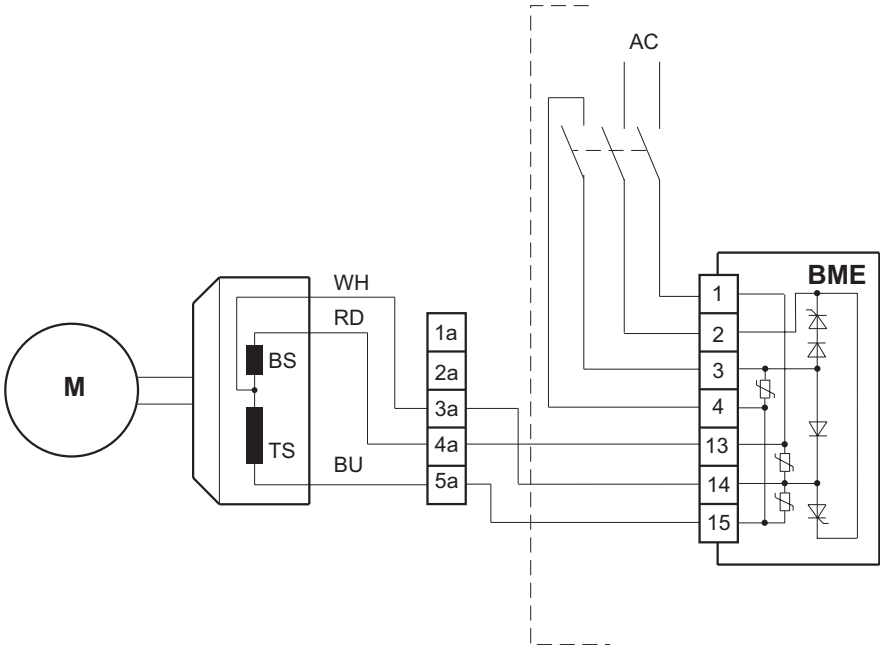

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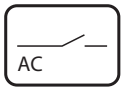
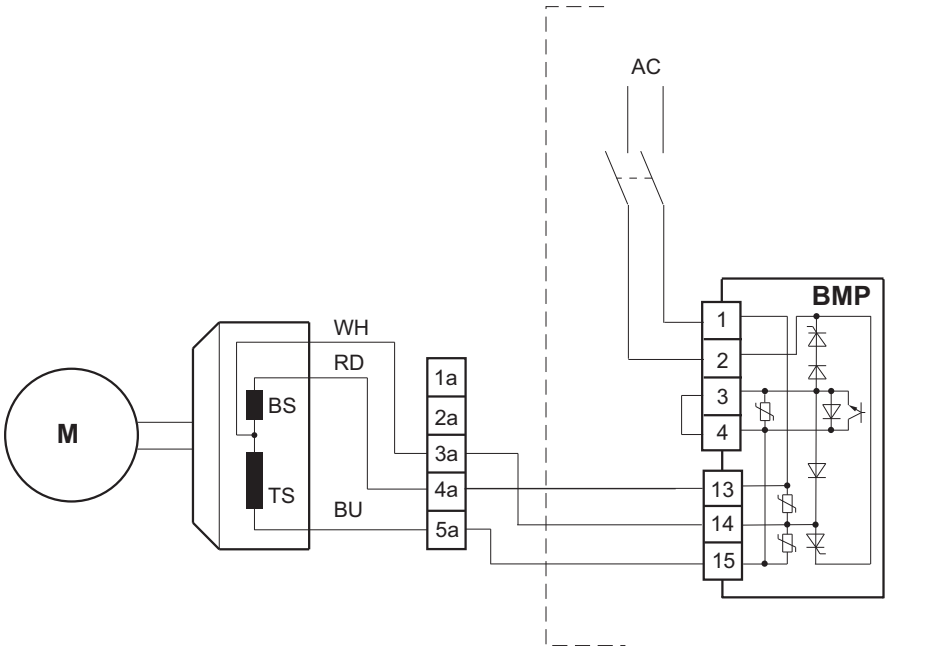
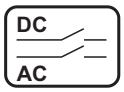
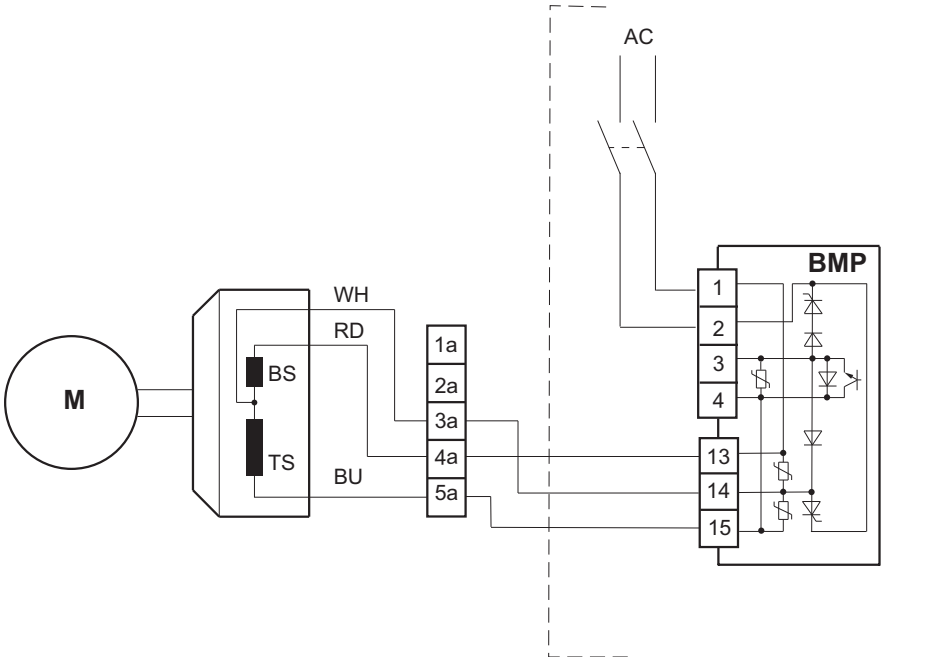
BMP.. brake control





3985873291





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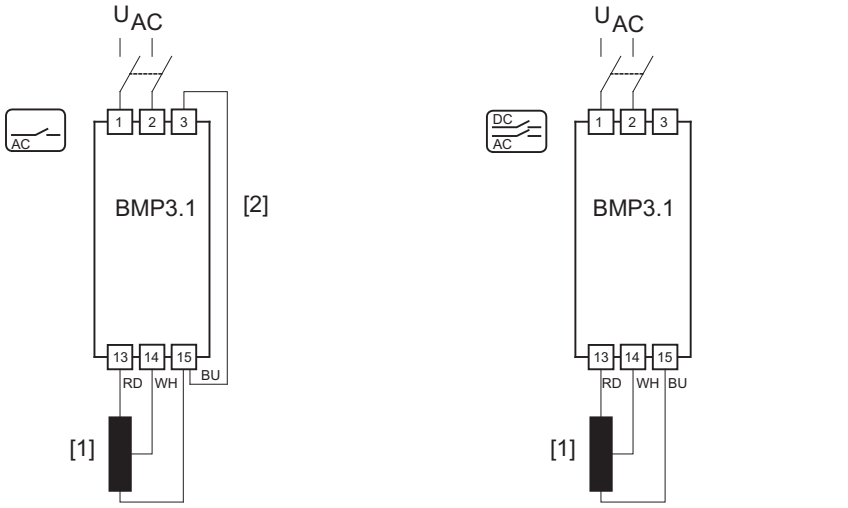
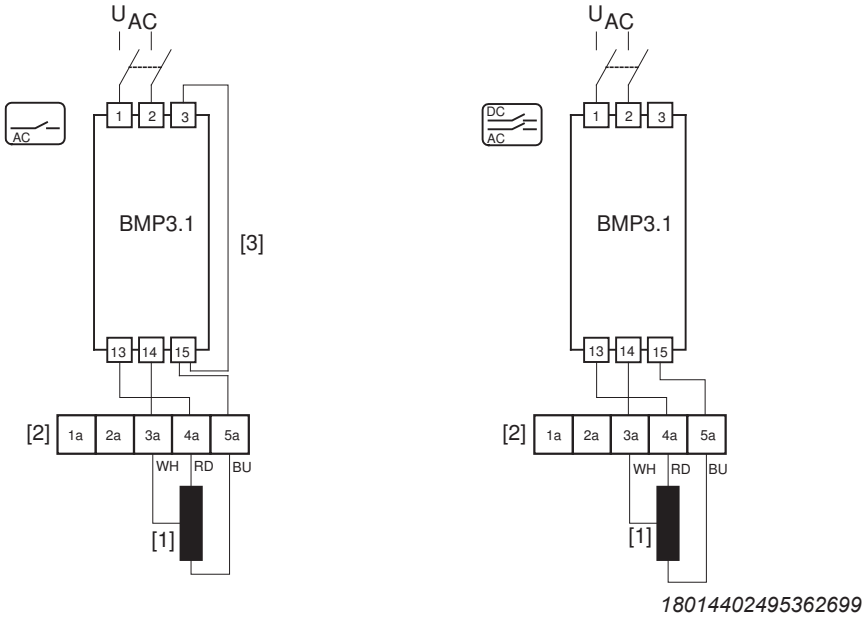
BMP 3.1 brake control (installation in terminal box)



18014402495360011

[1] Brake coil
[2] Wire jumper

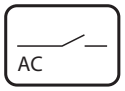
BMP 3.1 brake control (installation in control cabinet)

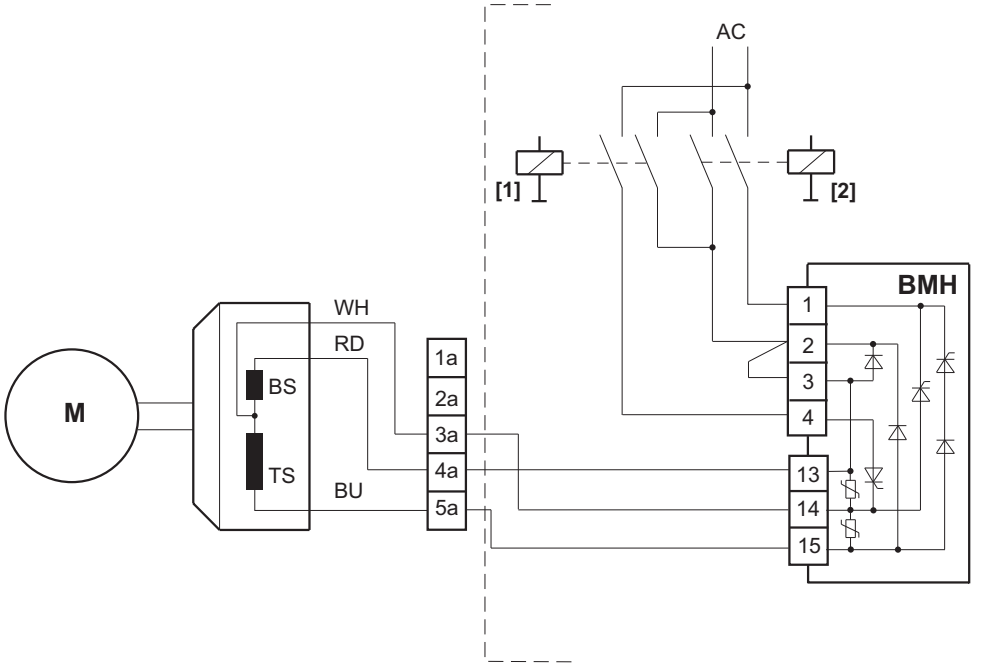


18014402495362699

[1] Brake coil
[2] Terminal strip
[3] Wire jumper

BMH.. brake control





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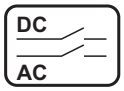
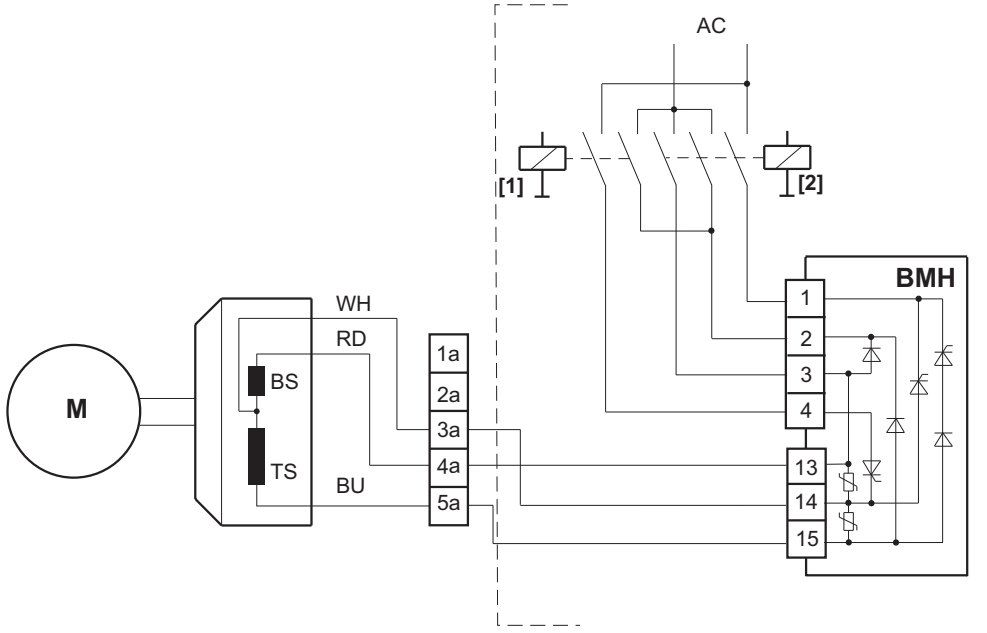
[1] Heating
[2] Releasing





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[1] Heating
[2] Releasing

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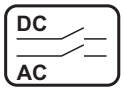
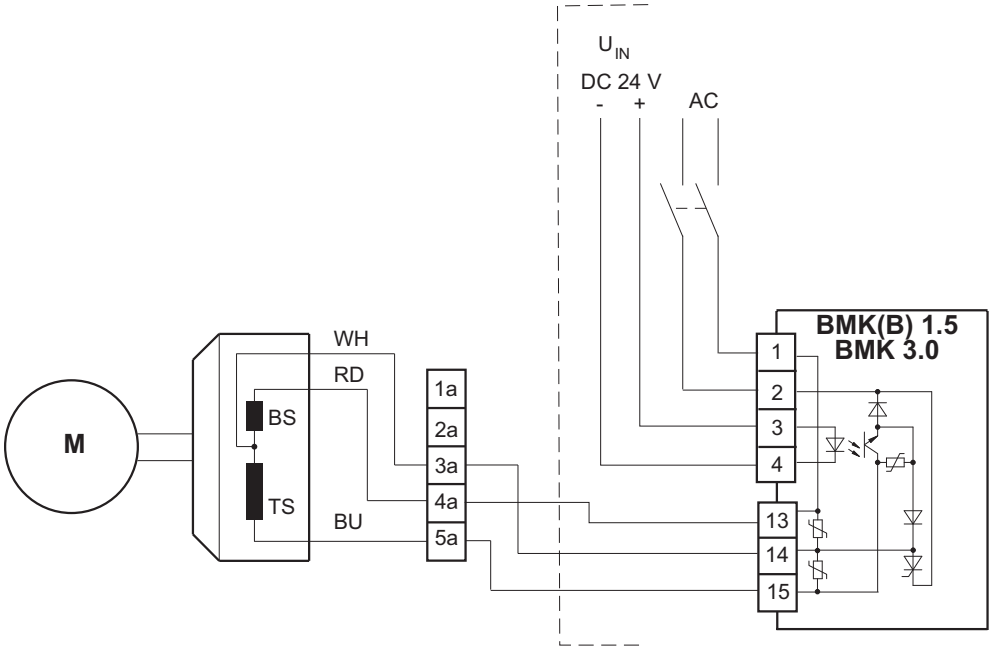
BMK.., BMKB.. brake control





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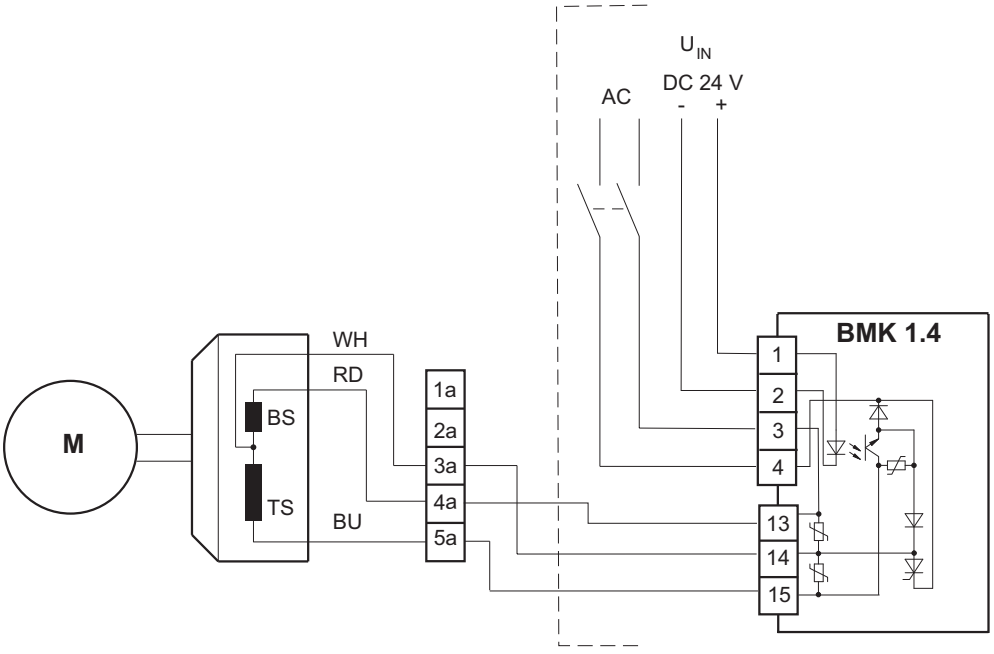

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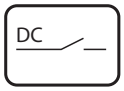
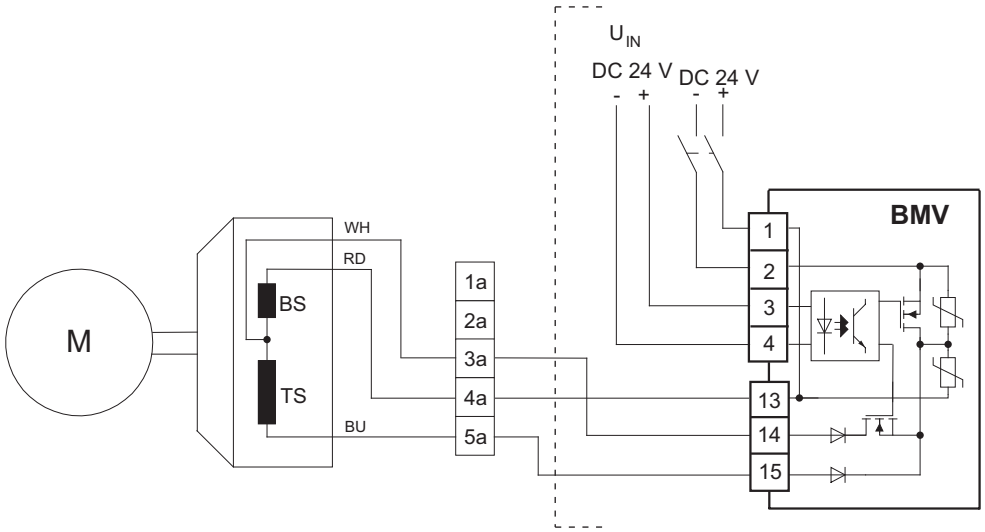
BMV.. brake control





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V_{IN} Control signal

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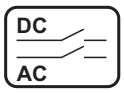
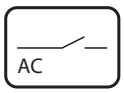
BST.. safe brake control

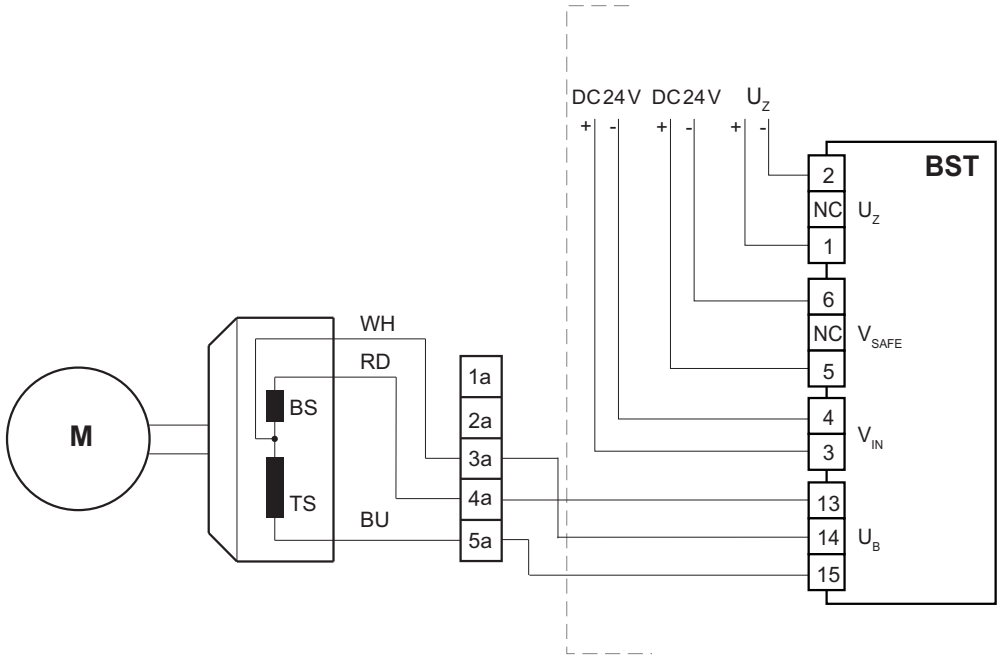
Separate control



With functional control of the brake via V_{IN}.



With functional safe control of the brake via V_{SAFE}.



Separate control of the brake via a functional and a functionally safe control voltage.

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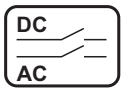
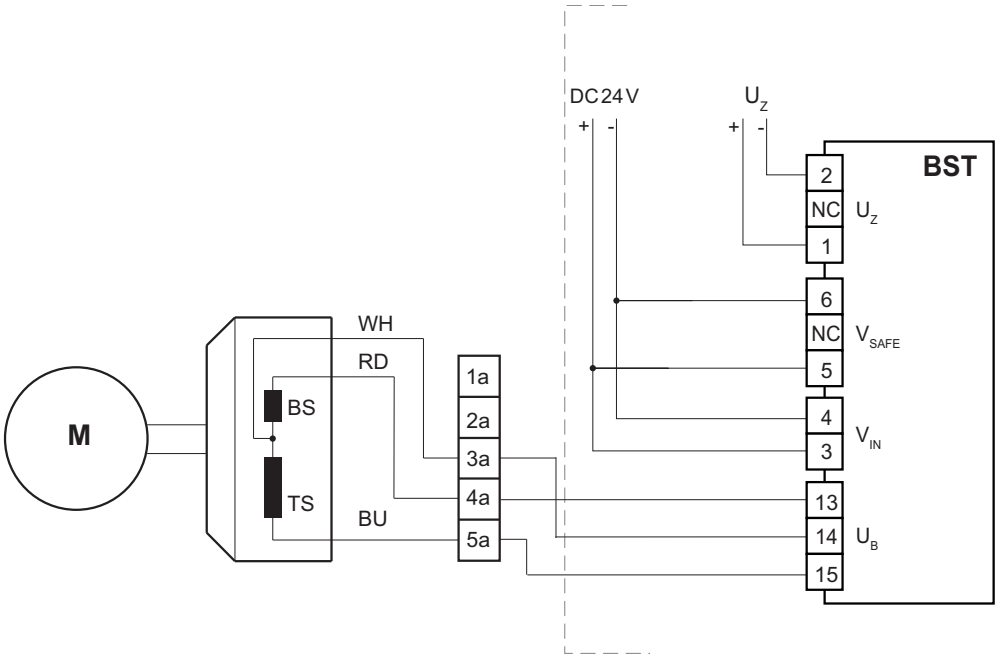
Joint control



With functional control of the brake via V_{IN} and V_{SAFE}.

AC

With functionally safe control of the brake via V_{IN} and V_{SAFE}.



Joint control of the brake via a functional or a functionally safe control voltage.

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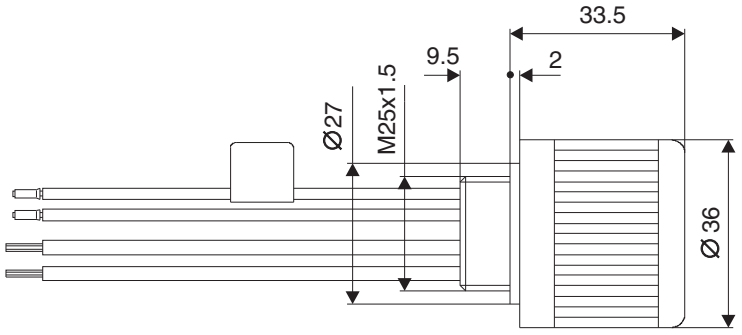
7.5.4 Dimension drawings

Dimension sheets brake controls

SR10, SR11, SR15, UR11, UR15



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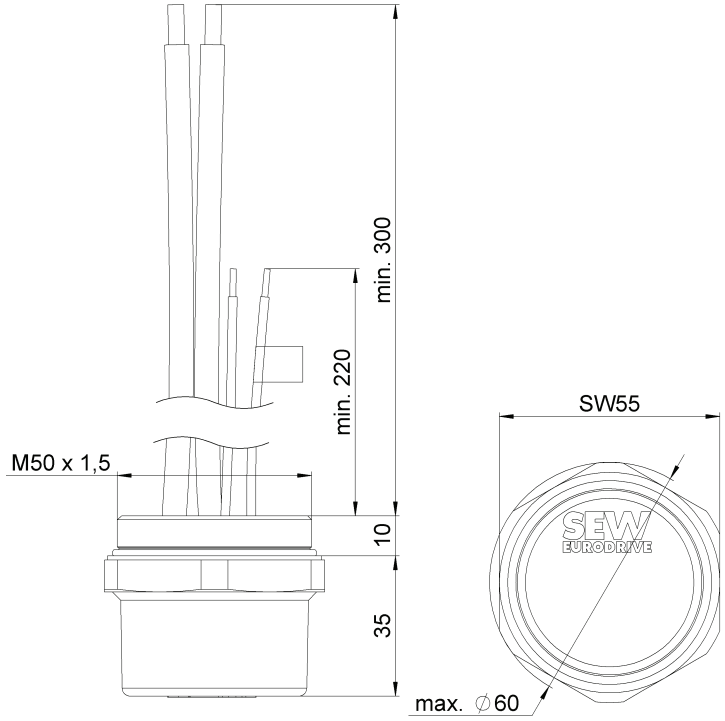
SR19



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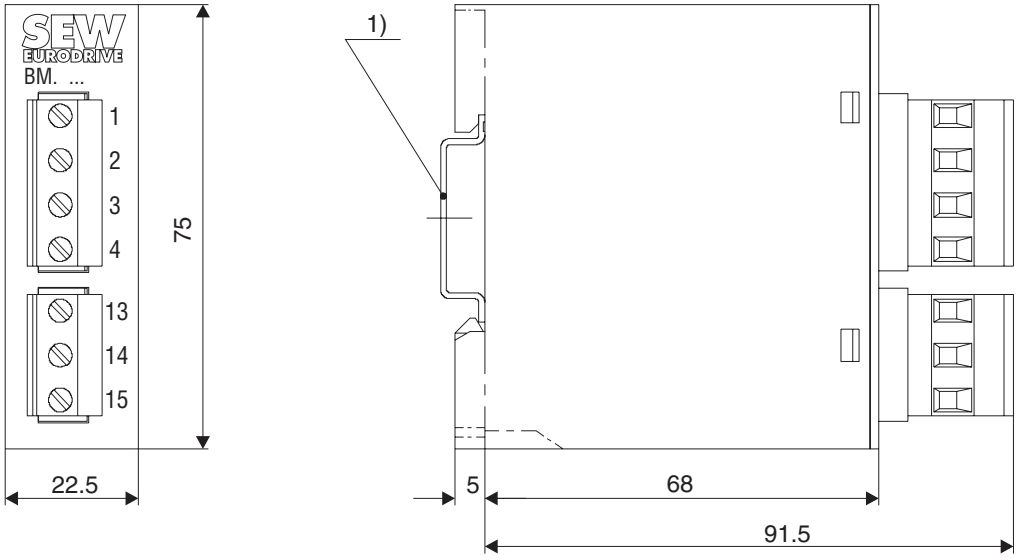
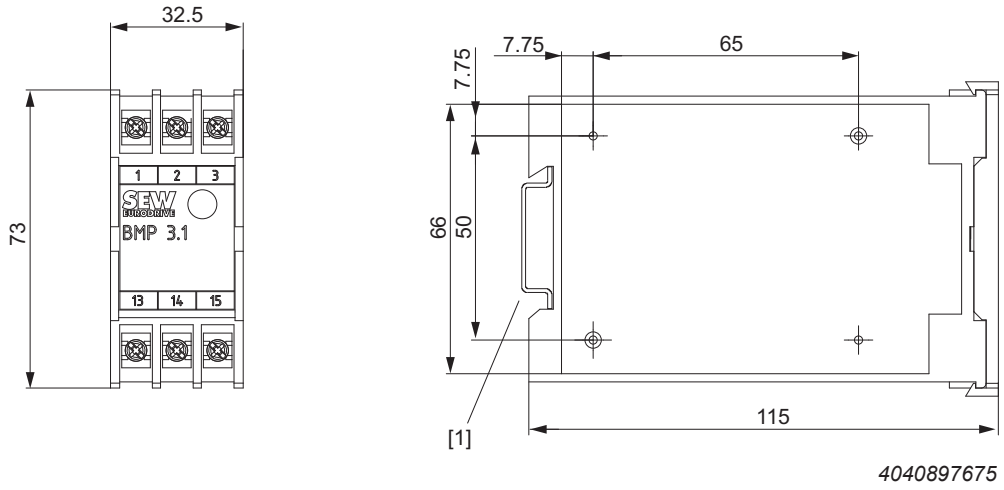
BMS.., BME.., BMH.., BMP.., BMK.., BMKB.., BMV..



[1] Support rail mounting EN 50022-35-7.5

BMP3.1



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8 Encoders

8.1 Description

The task of an encoder is to detect the angular position of the motor shaft or the change of the angular position and to pass on this information to a unit that evaluates this data, such as a PLC or frequency inverter.

This information is used to determine the rotational speed and angular acceleration. The evaluating unit (inverter, encoder card) can then monitor or control the speed and position the drive system accordingly.

Encoders are connected to the inverter and allow for further or improved motor control.

- The motor can be operated in position control.
- The quality of torque control can be improved significantly.
- The quality of speed control can be improved significantly.

Encodes are available in various designs:

- Incremental encoders, single-turn absolute encoders, multi-turn absolute encoders.
- Built-in encoders integrated in the motor and add-on encoders mounted to the motor.
- Different mechanical connections of the motor shaft with the encoder.
- Different electrical connection options, such as terminal strip or plug connector.
- Different output signals: sin/cos, HTL, TTL, SSI + sin/cos, RS485 + sin/cos, HIPERFACE®.
- With or without electronic nameplate for startup on SEW-EURODRIVE inverters.
- Different resolutions and number of counted revolutions.
- Can be ordered ex factory or can be retrofit.
- Various mechanical preparations for mounting encoders subsequently.
- Design as safety encoder for implementing safety functions.

SEW-EURODRIVE offers a wide range of encoders for different applications and different inverters. Before selecting the encoder, check the encoder interface of the inverter.

The modular encoder concept is standardized and improved. Encoders of the type spread shaft (.S7.), plug-in shaft (.G7.), and hollow shaft (.H7.) will be changed to encoder types with cone shaft (.K8.). Main advantages of the improved encoders:

Built-in encoders (EI..)

- Built-in encoders EI7. and EI8.
  - This encoder is integrated in the motor in a particular compact manner without adding extra length to the motor.
  - Brake wear can be measured without removing the encoder.
  - The encoder can be retrofit at any time.
  - The encoder does not have its own bearing. This is why the encoder is wear-free during operation and is suited for rough operating conditions, also with frequent working brake operations.

Cone shaft (.K8.)

- Encoders with cone shaft .K8.
  - This encoder type can be used for all motors of size 71 to 315.
  - The encoders are available as safety encoders for implementing safety functions.

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– The encoders are suited for use in explosion-protected motors.
– Brake wear can be measured without removing the encoder.
– The cone shaft connection is particularly robust and accurate.

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8.2 Type designation for encoders from SEW-EURODRIVE

The type designation of encoders from SEW-EURODRIVE consists of 4 characters, for example ES7C, and is used in the type designation of the motor.

1st character: Encoder design

Identification	Description
E	Incremental encoder
A	Multi-turn absolute encoder
X	Special encoder

2nd character: Mechanical interfaces with the motor

Identification	Description
S	Spread shaft (shaft centered)
G	Plug-in shaft (shaft centered)
V	Solid shaft with coupling (flange centered)
H	Hollow shaft (shaft centered)
K	Cone shaft (shaft centered)
I	Built-in encoder, integrated in the motor without adding extra length

3rd character: Code to identify the geometry of the encoder/encoder mounting adapter

Identification	Description
7	Standard geometry of the motor
8	Standard geometry of the motor, new generation encoder
1 – 6	Various geometric variants
0	Special designs

4th character: Electrical interface of the encoder

Identification	Description
S	sin/cos
R	TTL (RS422) typically with U_B = 9 – 30 V
T	TTL (RS422) for V_B = 5 V
C	HTL
W	sin/cos + RS485 (multi-turn)
H	sin/cos + RS485 HIPERFACE® (multi-turn)
Y	sin/cos or TTL(RS422) + SSI (multi-turn)

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Identification	Description
A	Design of the mounting adapter (see chapter "Encoder mounting adapter" (→ 🗎 377))
1 – 6	Signal periods per revolution

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8.3 Built-in encoders

The built-in encoders from SEW-EURODRIVE are completely integrated into the motor. This means the overall length of the drive remains unchanged. The components of the built-in encoder do not protrude beyond the contour of the drive, which means they are particularly well protected from environmental influences and damage.

Areas of application

EI7. built-in encoders are suited for the following applications:

- Simple positioning with up to 96 increments per revolution
- Speed monitoring
- Direction of rotation monitoring
- The EI7C encoder is also available as EI7C FS safety encoder (not on size DR.63..).

EI.8 built-in encoders are suited for the following applications:

- Speed monitoring
- Direction of rotation monitoring
- Positioning/position control up to a resolution of 12 bits (4096 increments/revolution)
- Speed control
- Torque control

Evaluation

EI7. built-in encoders can be evaluated with the following products from SEW-EURODRIVE:

- MOVI-C®: Can be evaluated in many devices of the modular inverter system. For further information, refer to the respective inverter documentation.
- MOVITRAC® B in the technology version: Evaluation via "Simple positioning" application software.
- MOVIFIT® FC with "technology" function level.
- MOVIMOT® with fieldbus interfaces MQ (with EI71, EI72 and EI76) and MF (with EI71).
- MOVIPRO® with encoder option.
- MOVIDRIVE® B
- MOVIAXIS®

EI7C FS safety encoders can be evaluated with the following products of SEW-EURODRIVE:

- MOVI-C®: Can be evaluated in many devices of the modular inverter system. For further information, refer to the respective inverter documentation.
- MOVIFIT® FC: Functional safety with S12 safety option.

EI8. built-in encoders can be evaluated with the following products from SEW-EURODRIVE:

- MOVI-C®: Can be evaluated in many devices of the modular inverter system. For further information, refer to the respective inverter documentation.
- MOVIPRO® with encoder option. For further information, refer to the respective inverter documentation.
- MOVIDRIVE® B with encoder option. For further information, refer to the respective inverter documentation.
- MOVIAXIS®. For further information, refer to the respective inverter documentation.

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8.3.1 Incremental encoders

Technical details

Technical data

Incremental encoders EI7., EI8.

Encoders		EI71 EI72 EI76 EI7C	EI8R	EI8C
Supply voltage	U_B	DC 9 V – 30 V	DC 7 V – 30 V	
Supply voltage for FS applications	U_{B_FS}	DC 19.2 V – 30 V	–	
Max. current consumption, free of load	I_{in}	120 mA	100 mA	
Max. pulse frequency	f_{pulse_max}	1.44 kHz	102.4 kHz	
Direction of rotation		A before B when looking at the motor output shaft in clockwise rotation		
Incremental tracks, periods per revolution	A, B	1, 2, 6, 24 (size 63: 24 only) (EI7C FS: 24 only)	1024 (10 bits)	
	C	–	1	
Position resolution, increments per revolution	A, B	4, 8, 24, 96 (size 63: 96 only) (EI7C FS: 96 only)	4096 (12 bits)	
Voltage output signal differential (peak-to-peak) (A' = A - $\overline{A}$; B' = B - $\overline{B}$)	U_{t_diff}	–	–	
Voltage output signal non-differential (peak-to-peak)	U_t	$U_{Low} \leq 3$ V $U_{High} \geq U_B - 3.5$ V	$U_{Low} \leq 0.5$ V $U_{High} \geq 2.5$ V	$U_{Low} \leq 3$ V $U_{High} \geq U_B - 3.5$ V
Signal level output, offset nominal against 0 V (A, B, C, $\overline{A}$, $\overline{B}$, $\overline{C}$)V	U_{t_o}	–	–	
Signal output		HTL	TTL (RS422)	HTL
Load resistance/load current differential	R_L/I_L	60 mA	25 mA	60 mA
Resistance between tracks and reference ground	R_{gnd}	–	–	–
Load capacitance, output	C_o	–	–	–
Voltage output signal, differential (C' = C - $\overline{C}$) (peak-to-peak)	U_{t_diff} e[1)]	–	–	–
C track offset	g[1)]	–	–	–
Voltage output signal, non-differential (C,$\overline{C}$) (peak-to-peak)	U_{t_C}	–	$U_{Low} \leq 0.5$ V $U_{High} \geq 2.5$ V	$U_{Low} \leq 3$ V $U_{High} \geq U_B - 2.5$ V
Phase angle track C', n = constant	k, l[1)]	–	–	–
Signal width track C	W_C[1)]	–	90° electrical	
Signal logic track C		–	C = log 1 when A = B = log 1	
Pulse duty factor according to IEC 60469-1, n = constant		50% ± 20%	50% ± 10%	
Phase offset A: B; $\overline{A}$: $\overline{B}$ n = constant	d[1)]	90° ± 20°	90° ± 20°	
Accuracy of the incremental section		3.75° (225 ")	0.2° (720 ")	
Vibration resistance according to EN 60068-2-6		≤ 10 g (f > 18.5 Hz)		
Shock resistance according to EN 60068-2-27		≤ 100 g (t = 6 ms, 18 pulses)		

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Encoders		EI71 EI72 EI76 EI7C	EI8R	EI8C
Maximum permissible external magnetic field (outer contour of motor)		25 mT/20 kA/m		
Maximum speed	n_{max}	3600 min^{-1}	6000 min^{-1}	
Maximum line length		100 m		
Duration until error message (disabled outputs)		–	–	
Activation time of rotary encoder internal diagnostics after switching on		–	–	
Degree of protection in accordance with EN 60529		IP66		
Installation altitude	h	≤ 4000 m above sea level		
Corrosion protection, surface protection		KS, OS1 – OS4, OSG		
Connection		Size 63: M12 (8-pin) Size 71 – 132S: M12 (8- or 4-pin) or connection unit (can be pre-assembled in the field) in a terminal box	M23 or connection unit (can be pre-assembled in the field) in a terminal box	
Ambient temperature of motor	T_{amb}	-30 to +60 °C		
Electronic nameplate		–	–	–
Other technical data		On request		

1) Relating to measurements in figure "Sin/cos signals and phase relationship"

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Increase in inertia when using EI7. built-in encoder.

Motor	$J_{Mot} + J_{EI7} - J_{PA}$	Increase in inertia
	10^{-4} kgm²	%
DRN63MS	3.4	14
DRN63M	4.2	11
DRN71MS	8	48
DRN71M	9.7	36
DRN80MK	19.5	14
DRN80MS	21	14
DRN80M	27.2	10
DRN90S	64.3	19
DRN90L	77.5	15
DRN100LS	91.7	13
DRN100LM	100	11
DRN100L	121.6	9
DRN112M	192	8
DRN132S	255	6

Increase in inertia when using EI8. built-in encoder.

Motor	$J_{Mot} + J_{EI7} - J_{PA}$	Increase in inertia
	10^{-4} kgm²	%
DRN71MS	5.72	6
DRN71M	7.44	4
DRN80MK	17.1	0
DRN80MS	18.5	0
DRN80M	24.7	0
DRN90S	53.9	0
DRN90L	67.1	0
DRN100LS	81.3	0
DRN100LM	89.6	0
DRN100L	111.9	0
DRN112M	179.6	1
DRN132S	242.6	1

INFORMATION

Due to the slight increase in inertia, it is not necessary to reduce the no-load starting frequency Z0.

8.3.2 Order information

Type designation /EI7.

/EI8.

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8.4 Add-on encoders

The add-on encoder is mounted to the motor on the B-side by means of various mechanical interfaces. The interface to be used depends on the motor size or the selected option:

Electronic nameplate

For E.7S, EK8S, A.7W and AK8W encoders, important startup data is stored in an electronic nameplate. This facilitates starting up the drive and ensures that motor parameters are set correctly in the inverter.

During startup, the engineering software checks whether an electronic nameplate is present in the encoder and suggests the use of this data.

Advantages of auto identification of the drive:

- Complete and correct identification of motor and gear unit.
- No manual entry of data is necessary, which considerably saves time during startup.
- Easy startup of drives that are installed in locations that are difficult to access.

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8.4.1 Incremental encoders

Technical details

Technical data

Designation	Value
Storage temperature	-15 °C to +70 °C
Maximum angular acceleration	10^4 rad/s^2

Incremental encoder E.7S – sin/cos

Encoder		ES7S	EV7S	EG7S	EH7S
Supply voltage	U_B	DC 7 V – 30 V			
Max. current consumption	I_{in}	140 mA_{RMS}			
Max. pulse frequency	f_{max}	150 kHz			180 kHz
Incremental tracks, periods per revolution	A, B	1024 (10 bits)			
	C	1			
Position resolution, increments per revolution	A, B				
Output amplitude per track	U_{high}	1 V_{PP}			
	U_{low}				
Signal output		sin/cos			
Output current per track	I_{out}	10 mA_{RMS}			
Pulse duty factor according to IEC 60469-1, n = constant		–			
Phase offset A: B n = constant		90° ± 3°			90° ± 10°
Accuracy[1]		0.0194°	–	0.0194°	–
Vibration resistance according to EN 60088-2-6		≤ 100 m/s^2			
Shock resistance according to EN 60088-2-27		≤ 1000 m/s^2		≤ 2000 m/s^2	
Maximum speed	n_{max}	6000 min^{-1}			
Duration until fault message (disabled outputs)[2]		25 ms	–	25 ms	–
Activation time of rotary encoder internal diagnostics after switching on		–			
Degree of protection in accordance with EN 60529		IP66			IP65
Connection		Terminal box on incremental encoder			12-pin plug connector
Ambient temperature	°C	-30 to +60	-30 to +80	-30 to +60	-40 to +60

1) Due to the stiffness of the torque arm, you have to take into account an automatically resetting ±0.6° twist (depending of the direction of rotation) of the encoder housing compared to the encoder shaft.

2) Sin/cos encoders have a self-diagnostics function. If an error is detected, the sensor reports it by deactivating the output signals to the encoder evaluation unit.

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Incremental encoder E.7R – TTL (RS422), 9 V ≤ U_B ≤ 30 V

Encoder		ES7R	EV7R	EG7R	EH7R
Supply voltage	U_B	DC 7 V – 30 V			DC 10 V – 30 V
Max. current consumption	I_{in}	160 mA_{RMS}			140 mA_{RMS}
Max. pulse frequency	f_{max}	120 kHz			300 kHz
Incremental tracks, periods per revolution	A, B	1024 (10 bits)			
	C	1			
Position resolution, increments per revolution	A, B	4096 (12 bits)			
Output amplitude per track	U_{high}	≥ DC 2.5 V			
	U_{low}	≤ DC 0.5 V			
Signal output		TTL (RS422)			
Output current per track	I_{out}	25 mA_{RMS}			20 mA_{RMS}
Pulse duty factor according to IEC 60469-1, n = constant		50% ± 10%			
Phase offset A: B n = constant		90° ± 20°			
Vibration resistance according to EN 60088-2-6		≤ 100 m/s^2			
Shock resistance according to EN 60088-2-27		≤ 1000 m/s^2		≤ 2000 m/s^2	
Maximum speed	n_{max}	6000 min^{-1}			6000 min^{-1} 2500 min^{-1} at 60 °C
Degree of protection in accordance with EN 60529		IP66			IP65
Connection		Terminal box on incremental encoder			12-pin plug connector
Ambient temperature	°C	-30 to +60	-30 to +60		-40 to +60

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Incremental encoder E.7C – HTL

Encoder		ES7C	EV7C	EG7C	EH7C
Supply voltage	U_B	DC 4.75 V – 30 V			DC 10 V – 30 V
Max. current consumption	I_{in}	240 mA_{RMS}			225 mA_{RMS}
Max. pulse frequency	f_{max}	120 kHz			300 kHz
Incremental tracks, periods per revolution	A, B	1024 (10 bits)			
	C	1			
Position resolution, increments per revolution	A, B	4096 (12 bits)			
Output amplitude per track	U_{high}	V_B -2.5 V		V_B -2.5 V	V_B -2 V
	U_{low}	≤ DC 1.1 V			≤ DC 2.5 V
Signal output		HTL/TTL (RS422)		HTL/TTL (RS422)	HTL
Output current per track	I_{out}	60 mA_{RMS}			30 mA_{RMS}
Pulse duty factor according to IEC 60469-1, n = constant		50% ± 10%			50% ± 20%
Phase offset A: B n = constant		90° ± 20°			
Vibration resistance according to EN 60088-2-6		≤ 100 m/s^2			
Shock resistance according to EN 60088-2-27		≤ 1000 m/s^2		≤ 2000 m/s^2	
Maximum speed	n_{max}	6000 min^{-1}			6000 min^{-1} 2500 min^{-1} at 60 °C
Degree of protection in accordance with EN 60529		IP66			IP65
Connection		Terminal box on incremental encoder			12-pin plug connector
Ambient temperature	°C	-30 to +60		-30 to +60	-40 to +60

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Incremental encoder E.7T – TTL (RS422) at U_B = 5 V

Encoder		EH7T
Supply voltage	U_B	DC 5 V
Max. current consumption	I_{in}	140 mA
Max. pulse frequency f_{max}	kHz	300
Incremental tracks, periods per revolution	A, B	1024 (10 bits)
	C	1
Position resolution, increments per revolution	A, B	4096 (12 bits)
Output amplitude	U_{high}	≥ DC 2.5 V
	U_{low}	≤ DC 0.5 V
Signal output		TTL (RS422)
Output current per track	I_{out}	20 mA
Pulse duty factor according to IEC 60469-1, n = constant		50% ± 20%
Phase offset A: B n = constant		90° ± 20°
Vibration resistance according to EN 60088-2-6 at 10 Hz – 2 kHz		≤ 100 m/s^2
Shock resistance according to EN 60088-2-27		≤ 2000 m/s^2
Maximum speed	n_{max}	6000 min^{-1} 2500 min^{-1} at 60 °C
Degree of protection according to EN 60529		IP65
Connection		12-pin plug connector
Ambient temperature	°C	-40 to +60

Incremental encoder E.8.

Encoder		EK8S EV8S 1)	EK8R EV8R 2)	EK8C EV8C
Supply voltage	U_B	DC 7 V – 30 V		DC 4.75 V – 30 V
Supply voltage for functional safety applications	U_{B_FS}	DC 7 V – 30 V	–	
Maximum current consumption, free of load	I_{in}	100 mA (at U_B = 7 V)		
Max. pulse frequency	f_{pulse_max}	150 kHz	120 kHz	
Direction of rotation		A before B when looking at the motor output shaft in clockwise rotation		
Incremental tracks, periods per revolution	A, B	1024 (10 bits)		
	C	1		
Position resolution, increments per revolution	A, B	4096 (12 bits)		
Voltage output signal differential (peak-to-peak) (A' = A - $\overline{A}$; B' = B - $\overline{B}$)	U_{t_diff}	1 V ± 10%	–	
Voltage output signal non-differential (peak-to-peak)	U_t	0.5 V ± 10%	U_{Low} ≤ 0.5 V U_{High} ≥ 2.5 V	U_B ≤ 6 V: U_{Low} ≤ 0.5 V U_{High} ≥ 2.5 V U_B > 6 V: U_{Low} ≤ 3 V U_{High} ≥ U_B - 2.5 V
Signal level output, offset nominal against 0 V (A, B, C, $\overline{A}$, $\overline{B}$, $\overline{C}$)V	U_{t_o}	2.5 V ± 0.3 V	–	
Signal output		sin/cos	TTL (RS422)	HTL

Encoder		EK8S EV8S 1)	EK8R EV8R 2)	EK8C EV8C
Load resistance/load current differential	R_L/I_L	120 Ω ± 10%		U_B 6 V: 120 Ω ± 10% UB > 6 V: 1 – 3 kΩ
Resistance between tracks and reference ground	R_{gnd}	≥ 1 kΩ	–	
Load capacitance, output	C_o	≤ 20 nF	–	–
Voltage output signal, differential (C' = C - $\overline{C}$) (peak-to-peak)	U_{t_diff} e	0.3 – 1.4 V	–	–
C track offset	g	192 mV ± 5 mV	–	–
Voltage output signal, non-differential (C,$\overline{C}$) (peak-to-peak)	U_{t_C}	–	U_{Low} ≤ 0.5 V U_{High} ≥ 2.5 V	U_B ≤ 6 V: U_{Low} ≤ 0.5 V U_{High} ≥ 2.5 V U_B > 6 V: U_{Low} ≤ 3 V U_{High} ≥ U_B - 2.5 V
Phase angle track C', n = constant	k, l	k = 180° ± 90° l = 180° ± 90°	–	–
Signal width track C	W_C	see figure	90° electrical	
Signal logic track C		see figure	C = log 1, when A = B = log 1	
Pulse duty factor according to IEC 60469-1, n = constant		–	50 % ± 10%	
Phase offset A: B; $\overline{A}$: $\overline{B}$ n = constant	d	90° ± 2°	90° ± 20°	
Accuracy of the incremental section[3)]		0.0194° (70 ")	0.033° (120 ")	
Vibration resistance according to EN 60068-2-6		≤ 10 g (f > 18.5 Hz)		
Shock resistance according to EN 60068-2-27		≤ 100 g (t = 6 ms, 18 pulses)		
Maximum speed	n_{max}	6000 min^{-1}		
Maximum line length		100 m	300 m	100 m
Duration until fault message (disabled outputs)[4)]		≤ 25 ms	–	
Activation time of rotary encoder internal diagnostics after switching on		≤ 200 ms	–	
Degree of protection in accordance with EN 60529		IP66		
Installation altitude	h	≤ 4000 m above sea level		
Corrosion protection, surface protection		KS, OS1 – OS4, OSG		
Connection		Integrated encoder plug connector on the fan guard (can be pre-assembled and plugged in the field)		
Ambient temperature of motor	T_{amb}	-30 to +60 °C		
Electronic nameplate		RS485 (serial, asynchronous); 1920 bytes	–	–

1) see figure "Sin/cos signals and phase relationship"
2) see figure "HTL/TTL signals and phase relationship"
3) Due to the stiffness of the torque arm, you have to take into account an automatically resetting ±0.6° twist (depending of the direction of rotation) of the encoder housing compared to the encoder shaft.
4) Sin/cos encoders have a self-diagnostics function. If an error is detected, the sensor reports it by deactivating the output signals to the encoder evaluation unit.

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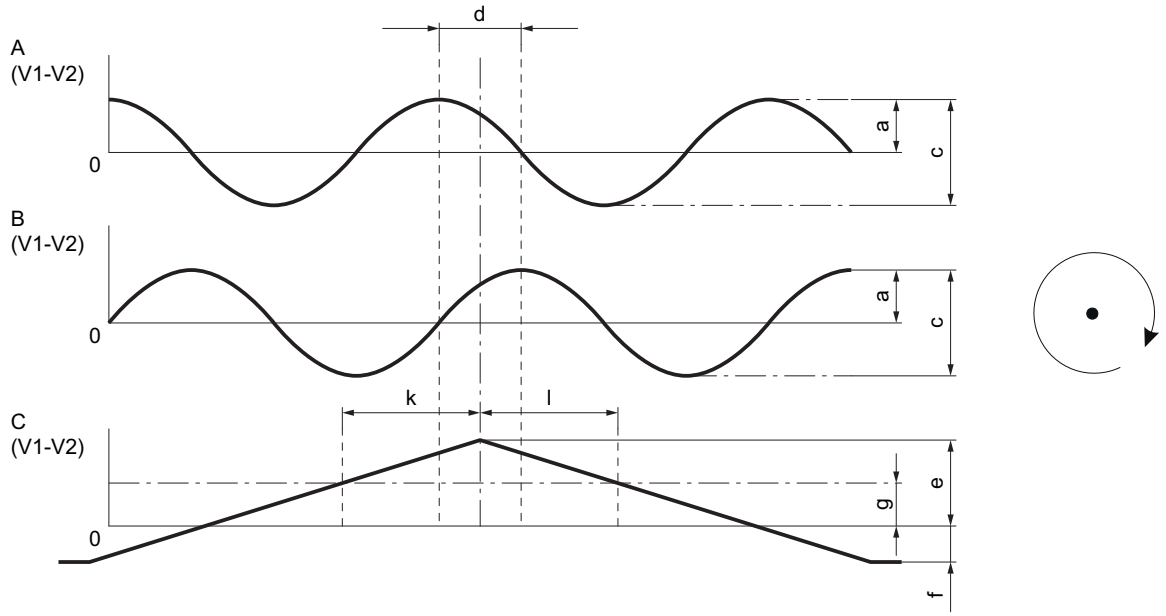
Sin/cos signals and phase relationship



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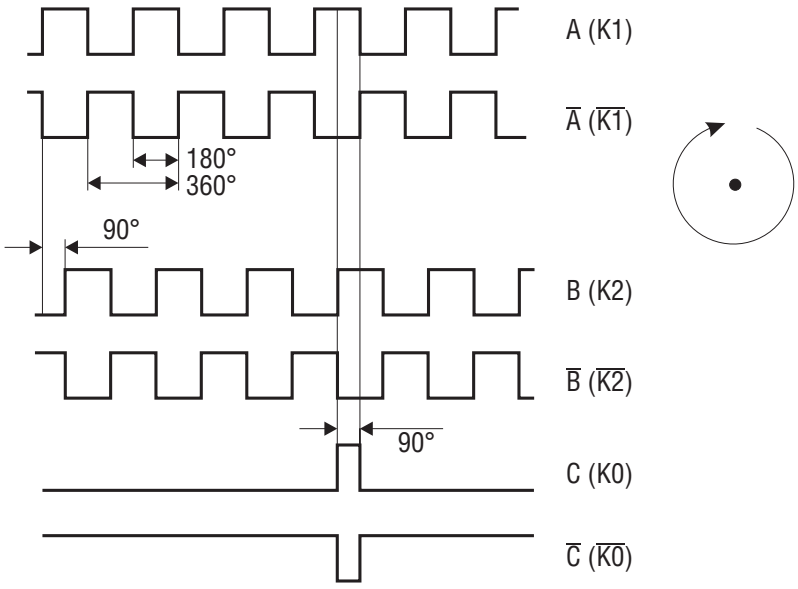
HTL/TTL signals and phase relationship



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8.4.2 Multi-turn absolute encoders

Technical details

Technical data

Multi-turn absolute encoder A.7Y – SSI (multi-turn) + sin/cos or TTL (RS422)

Encoder		AS7Y	AV7Y	AG7Y	AH7Y
Supply voltage	U_B	DC 7 V – 30 V			DC 9 V – 30 V
Max. current consumption	I_{in}	140 mA			150 mA
Max. pulse frequency	f_{limit}	200 kHz			120 kHz
Incremental tracks, periods per revolution	A, B	2048 (11 bits)			
	C	–			–
Output amplitude per track	U_{high}	1 V_{PP}			≥ DC 2.5 V_{PP}
	U_{low}				≤ DC 0.5 V_{PP}
Signal output		sin/cos			TTL (RS422)
Output current per track	I_{out}	10 mA			20 mA
Pulse duty factor according to IEC 60469-1, n = constant		–			50 ± 20%
Phase offset A: B n = constant		90° ± 3°			90° ± 20°
Accuracy of the incremental section[1)]		0.0194°			–
Accuracy of the absolute section		±1 LSB (Least Significant Bit)			–
Scanning code		Gray code			
Position resolution, increments per revolution	A, B	8192 (13 bits)			
Position resolution of the absolute section, increments per revolution		4096 (12 bits)			
Multi-turn resolution		4096 revolutions (12 bits)			
Data transmission		Synchronous, serial (SSI)			
Serial data output		Driver to EIA RS422			Driver to EIA RS485
Serial pulse input		Recommended receiver to EIA RS422			Optocoupler, recommended driver to EIA RS485
Clock frequency		Permitted range: 100 – 2000 kHz (max. 100 m cable length with 300 kHz)			
Clock-pulse space period		12 – 30 µs			
Vibration resistance according to EN 60088-2-6		≤ 100 m/s^2			
Shock resistance according to EN 60088-2-27		≤ 1000 m/s^2			≤ 2000 m/s^2
Maximum speed	n_{max}	6000 min^{-1}		6000 min^{-1} at T_U to 40 °C 4500 min^{-1} at T_U > 40 °C	3500 min^{-1}
Duration until fault message (disabled outputs)[2)]		25 ms + 3/4 revolution			–
Activation time of rotary encoder internal diagnostics after switching on		–			
Degree of protection in accordance with EN 60529		IP66			IP56
Connection		Terminal strip in pluggable connection cover			Terminal strip on encoder
Ambient temperature	°C	-30 to +60			-20 to +40

1) Due to the stiffness of the torque arm, you have to take into account an automatically resetting ±0.6° twist (depending of the direction of rotation) of the encoder housing compared to the encoder shaft.

2) Absolute encoders AS7Y, AV7Y, and AG7Y have a self-diagnostics function. If an error is detected, the sensor reports it by deactivating the output signals to the encoder evaluation unit.

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Multi-turn absolute encoder A.7W – RS485 (multi-turn) + sin/cos

Encoder		AS7W	AV7W	AG7W
Supply voltage	U_B	DC 7 V – 30 V		
Max. current consumption	I_{in}	150 mA		
Max. pulse frequency	f_{max}	200 kHz		
Incremental tracks, periods per revolution	A, B	2048 (11 bits)		
	C	–		
Output amplitude per track	U_{high}	1 V_{PP}		
	U_{low}			
Signal output		sin/cos		
Output current per track	I_{out}	10 mA		
Pulse duty factor according to IEC 60469-1, n = constant		–		
Phase offset A: B n = constant		90° ± 3°		
Accuracy of the incremental section[1)]		0.0194°		
Accuracy of the absolute section		±1 LSB (Least Significant Bit)		
Scanning code		Binary code		
Position resolution, increments per revolution	A, B	8192 (13 bits)		
Multi-turn resolution		65536 revolutions (16 bits)		
Data transmission		RS485		
Serial data output		Driver to EIA RS485		
Serial pulse input		Recommended driver to EIA RS485		
Clock frequency		9600 baud		
Clock-pulse space period		–		
Vibration resistance according to EN 60088-2-6		≤ 100 m/s^2		
Shock resistance according to EN 60088-2-27		≤ 1000 m/s^2		≤ 2000 m/s^2
Maximum speed	n_{max}	6000 min^{-1}	6000 min^{-1} at T_U to 40 °C 4500 min^{-1} at T_U > 40 °C	6000 min^{-1}
Duration until fault message (disabled outputs)[2)]		25 ms + 3/4 revolution		
Activation time of rotary encoder internal diagnostics after switching on		–		
Degree of protection in accordance with EN 60529		IP66		
Connection		Terminal strip in pluggable connection cover		
Ambient temperature	°C	-30 to +60		

1) Due to the stiffness of the torque arm, you have to take into account an automatically resetting ±0.6° twist (depending of the direction of rotation) of the encoder housing compared to the encoder shaft.

2) Absolute encoders AS7W, AV7W, and AG7W have a self-diagnostics function. If an error is detected, the sensor reports it by deactivating the output signals to the encoder evaluation unit.

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Multi-turn absolute encoder A.8.

Encoder		AK8Y AV8Y [1]	AK8W AV8W [1]	AK8H AV8H [1][2]
Supply voltage	U_B	DC 7 V – 30 V		DC 7 V – 12 V
Supply voltage for FS applications	U_{B_FS}	DC 7 V – 30 V		–
Max. current consumption, free of load	I_{in}	100 mA (at U_B = 7 V)		80 mA
Max. pulse frequency	f_{pulse_max}	200 kHz		
Direction of rotation		A before B when looking at the motor output shaft in clockwise rotation		
Incremental tracks, periods per revolution	A, B	2048 (11 bits)		1024 (10 bits)
	C	–		
Position resolution, increments per revolution	A, B	4096 (12 bits) (SSI, RS422)	65536 (16 bits) (RS485)	32768 (15 bits) HIPERFACE®
Voltage output signal differential (peak-to-peak) (A' = A - $\overline{A}$; B' = B - $\overline{B}$	U_{t_diff}	1 V ± 10%		HIPERFACE®
Voltage output signal non-differential (peak-to-peak)	U_t	0.5 V ± 10%		
Signal level output, offset nominal against 0 V (A, B, C, $\overline{A}$, $\overline{B}$, $\overline{C}$)V	U_{t_o}	2.5 V ± 0.3 V		
Signal output		sin/cos + SSI, RS422	sin/cos + RS485	
Load resistance/load current differential	R_L/I_L	120 Ω ± 10%		
Resistance between track and reference ground	R_{gnd}	≥ 1 kΩ		
Load capacitance, output		≤ 20 nF		
Voltage output signal, differential (C' = C - $\overline{C}$) (peak-to-peak)	U_{t_diff} e	–	–	
C track offset	g	–	–	
Voltage output signal, non-differential (C,$\overline{C}$) (peak-to-peak)	U_{t_C}	–	–	
Phase angle track C', n = constant	k, l	–	–	
Signal width track C	W_C	–	–	–
Signal logic track C		–	–	–
Pulse duty factor according to IEC 60469-1, n = constant		–		–
Phase offset A: B; $\overline{A}$: $\overline{B}$ n = constant		90° ± 2°		HIPERFACE®
Accuracy of the incremental section[3]		0.0194° (70 ")		± 0.0144° (± 52 ")
Accuracy of the absolute section		±1 LSB (Least Significant Bit)		
Scanning code/counting direction		Gray code, ascending with the direction of rotation specified above	Binary code, ascending with the direction of rotation specified above	–
Multi-turn resolution		4096 revolutions (12 bits)	65536 revolutions (16 bits)	4096 revolutions (12 bits)
Communication, interface		SSI (synchronous, serial)	RS485 (asynchronous, serial)	HIPERFACE®
Communication, modules		Driver to EIA RS422	Driver to EIA RS485	
Clock frequency/bandwidth		100 – 800 kHz (100 m cable length with maximum 300 kHz)	9600 baud	HIPERFACE®
Clock-pulse space period		12 – 30 µs	–	
Vibration resistance according to EN 60068-2-6		≤ 10 g (f > 18.5 Hz)		

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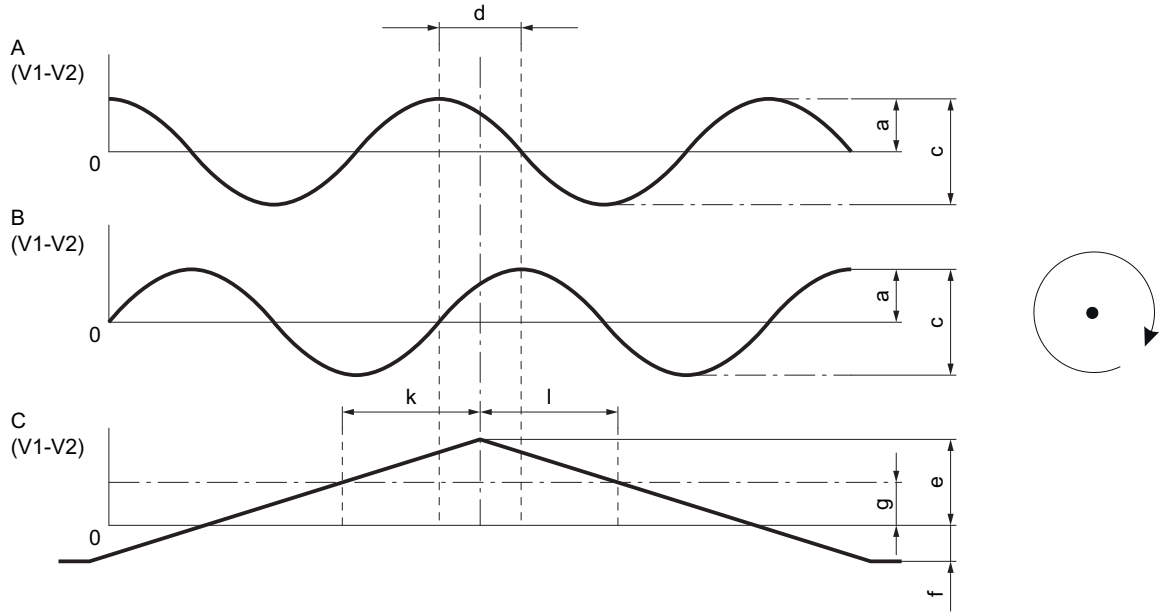
Encoder		AK8Y AV8Y 1)	AK8W AV8W 1)	AK8H AV8H 1)2)
Shock resistance according to EN 60068-2-27		≤ 100 g (t = 6 ms, 18 pulses)		
Maximum speed	n_{max}	6000 min^{-1}		
Maximum line length		100 m		
Duration until fault message (disabled outputs)[4]		≤ 25 ms + 3/4 revolution		HIPERFACE®
Activation time of rotary encoder internal diagnostics after switching on		200 ms		HIPERFACE®
Degree of protection in accordance with EN 60529		IP66		
Installation altitude	h	≤ 4000 m above sea level		≤ 2000 m above sea level
Corrosion protection, surface protection		KS, OS1 – OS4, OSG		
Connection		Integrated encoder plug connector on the fan guard (can be pre-assembled and plugged in the field)		
Ambient temperature of motor	T_{amb}	-30 to +60 °C		
Electronic nameplate		–	RS485 (serial, asynchronous); 1920 bytes	HIPERFACE®; 1792 bytes
Other technical data		On request		

1) see figure "Sin/cos signals and phase relationship"
2) Please observe the specification for the HIPERFACE® interface, Sick AG
3) Due to the stiffness of the torque arm, you have to take into account an automatically resetting ±0.6° twist (depending of the direction of rotation) of the encoder housing compared to the encoder shaft.
4) Absolute encoders A.8. and AG7Y have a self-diagnostics function. If an error is detected, the sensor reports it by deactivating the output signals to the encoder evaluation unit.

Sin/cos signals and phase relationship



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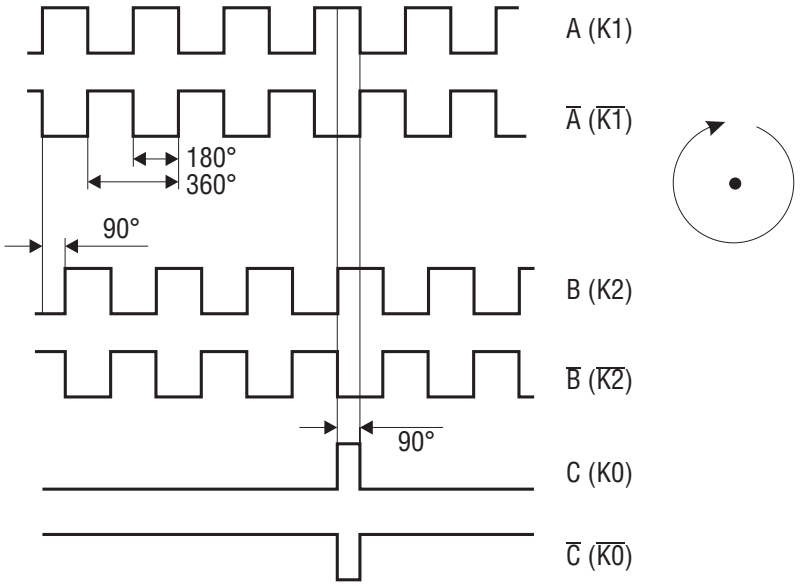
HTL/TTL signals and phase relationship



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8.5 Encoder mounting adapter

An encoder mounting adapter allows for mounting an encoder, which is not part of the standard delivery, at a later time. SEW-EURODRIVE distinguishes between 2 types of encoder mounting adapters:

- Encoder mounting adapters for encoders from SEW-EURODRIVE
- Encoder mounting adapters for encoders of other manufacturers

8.5.1 Encoder mounting adapters for encoders from SEW-EURODRIVE

For the various mechanical interfaces (depending on the size) for an encoder mounting adapter for encoders from SEW-EURODRIVE, refer to chapter "Add-on encoders" (→ 🗎 365).

Encoder mounting adapters are available for all standard encoders from SEW-EURODRIVE:

Identification	Description
EG7A	For plug-in shaft encoders with end thread from SEW-EURODRIVE for sizes 132M – 280
EV7A	For spread-shaft encoders from SEW-EURODRIVE on DRN71 – 225
EH7A	For hollow-shaft encoders from SEW-EURODRIVE for size 315
EK8A	For cone-shaft encoders from SEW-EURODRIVE for sizes 71 to 315
XV8A	For cone-shaft encoders from SEW-EURODRIVE with coupling-attachment for sizes 71 to 280

Notes on selection

For dimensions of mounting adapters of SEW-EURODRIVE encoders, refer to chapter "Dimension sheets for motors/brakemotors" (→ 🗎 180).

INFORMATION

Size 250/280 motors are available with encoder mounting adapter EG7A/EK8A. Size 250/280..BE brakemotors are available with encoder mounting adapter EV7A/EV8A.

Order information

Type designation /EG7A, /EV7A, /EH7A, EK8A, XV8A

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8.5.2 Encoder mounting adapters for XV.A encoders according to customer specifications

With this type of encoder mounting adapter, the AC motor is equipped with a mechanical interface that can be mounted to an encoder specified by the customer. This encoder is not a product of SEW-EURODRIVE and must be purchased separately. Third-party encoders are installed by SEW-EURODRIVE solely by means of special solutions. Contact SEW-EURODRIVE in such cases.

Technical details

Refer to the following table for dimensions of XV.A encoder mounting adapters.

Mounting adapter	Design	
	Encoder shaft	Centering
XV0A	according to customer specification	
XV1A	6 mm	50 mm
XV2A	10 mm	50 mm
XV3A	12 mm	80 mm
XV4A	11 mm	85 mm
XV5A	12 mm	45 mm
XV6A	10 mm	36 mm

A fan guard with encoder mount allows the encoder to be mounted on the motor shaft. These encoders are usually attached using three encoder clamps (bolts with eccentric disks).

The encoder shaft is connected to the motor shaft via coupling.

The dimensions of the customized encoder mounting adapters are not shown in chapter "Motor/brakemotor dimension sheets". Please request the necessary dimension sheets from SEW-EURODRIVE, if required.

INFORMATION

The combinations with forced cooling fan requires knowledge of the installation space of the encoder to be mounted. Several forced cooling fan hoods with different lengths are available. Contact SEW-EURODRIVE for more information.

Order information

Type designation /XV0A, /XV1A, /XV2A, /XV3A, /XV4A, XV5A, XV6A

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8.6 Safety encoders

Safety encoders from SEW-EURODRIVE are characterized by their exceptional reliability as well as electronic and mechanical load capacity.

Safety encoders allow you to increase the safety in your machines by implementing safety functions regarding speed, direction of rotation, idle state and relative position. The safety encoder provides the safety-relevant signals in the intelligent interaction of sensor, control and actuator.

The safety function requires a reliable mechanical connection between encoder and motor. At SEW-EURODRIVE, this connection is dimensioned in such a way that fault exclusion is achieved.

The safety encoders cannot trigger a safe state at the machine autonomously. Therefore, they have to be monitored in the overall system. In case the encoder or the follow-up electronics detects a fault, a fault response is initiated in the overall system, such as safe state.

8.6.1 Available safety encoders

Add-on encoders

Encoder type	Interface
ES7S EG7S EK8S	sin/cos interface
AS7W AG7W AK8W	RS485 interface (multi-turn) + sin/cos interface
AS7Y AG7Y AK8Y	SSI interface (multi-turn) + sin/cos interface

Built-in encoders

Encoder type	Interface
EI7C FS	HTL interface

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8.6.2 Underlying standards for safety encoders

The safety assessment of safe motor options is based on the following standards and safety classes:

Add-on encoders: ES7S, EG7S, EK8S, AS7W, AG7W, AK8W, AS7Y, AG7Y, AK8Y

- Safety Integrity Level (SIL) in accordance with IEC 62061
- Performance Level (PL) in accordance with EN ISO 13849-1

Built-in encoder: EI7C FS

- Safety Integrity Level (SIL) according to EN 61800-5-2
- Performance Level (PL) in accordance with EN ISO 13849-1

Safety class SIL 3 or PL e can be achieved if a suitable safety encoder is integrated into a safety system. The requirements (e.g. on the system architecture, diagnostics and failure probabilities) are to be implemented according to the normative specifications and to the corresponding product documentation.

8.6.3 Safety functions of safety encoders

Add-on encoders ES7S, EG7S, EK8S, AS7W, AG7W, AK8W, AS7Y, AG7Y, AK8Y

The following safety functions in accordance with EN 61800-5-2 regarding speed, direction of rotation, idle state, and relative position can be implemented in functionally safe systems with the sine/cosine interface of the safety encoders, such as:

- SS1, SS2, SOS, SLA, SLS, SDI, SLI, SSR, SAR, SSM

Built-in encoder EI7C FS

The following safety functions regarding speed and direction of rotation can be implemented in functionally safe systems with the HTL interface of the safety encoder:

- SS1, SLS, SDI

8.6.4 Technical details

Operating ambient temperature for the motor

Add-on encoders ES7S, EG7S, EK8S:

Mounted to the motor, safety encoders may be operated up to a maximum ambient operating temperature of the motor of -30 °C to +60 °C.

Add-on encoders AS7W, AG7W, AK8W, AS7Y, AG7Y, AK8Y:

Mounted to the motor, safety encoders may be operated up to a maximum ambient operating temperature of the motor of -30 °C to +60 °C.

Add-on encoders

For technical details on the functionally safe add-on encoders ES7S, EG7S, EK8S, AS7W, AG7W, AK8W, AS7Y and AG7Y, AK8Y, refer to chapter "Incremental encoders" (→ 🗎 366).

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Built-in encoder EI7C FS

Supply		Min.	Typ.	Max.	Unit
Operating voltage[1)]	U_B	19.2	24	30	V
Max. current consumption (with no load)	I_{max} (U_B = 24 V, I_{out} = 0)			120	mA

1) The voltage supply must come from SELV/PELV circuits in accordance with DIN EN 61131-2

Designation		Value
Max. speed	n_{max}	≤ 3600 min^{-1}
HTL periods per revolution	$N_{periods}$	24
Ambient temperature	T_A	0 °C to +60 °C
Vibration resistance	According to EN 60068-2-6:2008	10 g (98.1 m/s^2); 5 – 2000 Hz
Shock resistance	According to EN 60068-2-27:2009	100 g (981 m/s^2); 6 ms
Degree of protection	to EN 60529	IP66
Connection		M12 (8-pin)
Maximum angular acceleration		3000 rad/s^2
Permitted motor-external, magnetic interference field on the outer contour of the motor	B_{extmax}	25 mT
	H_{extmax}	20 kA/m

Signal tracks		Min.	Typ.	Max.	Unit
Output amplitude per track	U_{high} (I_{out} = I_{out_max})	U_B – 3.5		U_B	V
	U_{low} (I_{out} = I_{out_max})	0		+3	V
Max. output current per track	I_{out_max}			±30	mA
Signal period tolerance (corresponds to speed tolerance)	$\varphi_{period.tol}$ (n = constant)	-4		+4	%
Track A:B phase offset	$\varphi_{phase.A:B}$ (n = constant)	70	90	110	Degrees
Pulse duty factor (DIN IEC 60469-1)	$t = t_{log\_1}/(t_{period})$ (n = constant)	30	50	70	%
Pulse frequency for maximum speed (maximum speed × periods)	f_{max}		1.44		kHz
Output leakage current in deactivated state (= error message)[1)]	I_{Error}			+250	µA
Start-up time (undefined outputs)	From U_B > 9 V			300	ms
Duration until error message (disabled outputs)[1)]		100		300	ms

1) The EI7C FS built-in encoder has a self-diagnostics function. If a fault is detected, the system reports it by deactivating the output signals to the encoder evaluation unit.

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Characteristic safety values

INFORMATION

In addition to the documentation, you can also obtain the characteristic safety values of components by SEW-EURODRIVE in the SEW-EURODRIVE library for the SISTEMA software tool. The documentation and the library are available for download from www.sew-eurodrive.com.

Characteristic safety values ES7S, EG7S

	Characteristic safety values according to	
	EN 62061/IEC 61508	**EN ISO 13849-1**
Classification/underlying standards	SIL2	PL d
System structure	HFT = 1	2-channel (Cat. 3)
PFH_D value[1)] (**without** mounting on the motor)	8.5×10^{-9} 1/h = 8.5 FIT ($T_U \leq 45$ °C) 1.3×10^{-8} 1/h = 13 FIT ($T_U \leq 60$ °C)	
$MTTF_D$ value[1)] (**without** mounting on the motor)	–	1306 years ($T_{amb} \leq 45$ °C) 895 years ($T_{amb} \leq 60$ °C)
PFH_d value[1)] (**with** mounting on the motor; takes into account a derating due to motor reheating)	5.0×10^{-8} 1/h = 50 FIT ($T_{amb} \leq 60$ °C)	
$MTTF_d$ value[1)] (**with** mounting on the motor; takes into account a derating due to motor reheating)	–	212 years ($T_{amb} \leq 60$ °C)
Service life/proof test interval	20 years	
Motor/encoder connection (only for drives **with** FS logo)	Fault exclusion according to EN 61800-5-2	

1) The specified values are only applicable if the requirements on the encoder evaluation unit are met according to the amendment of the operating instructions "Safety Encoders and Safety Brakes for AC Motors DR.., DRN.., DR2.., EDR.., EDRN.. Functional Safety"

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Characteristic safety values AS7W, AG7W, AS7Y, AG7Y

	Characteristic safety values according to	
	EN 62061/IEC 61508	**EN ISO 13849-1**
Classification/underlying standards	SIL2	PL d
System structure	HFT = 1	2-channel (Cat. 3)
PFH_D value[1)] (**without** mounting on the motor)	9.3×10^{-9} 1/h = 9.3 FIT ($T_{amb} \leq 45$ °C) 1.4×10^{-8} 1/h = 14 FIT ($T_{amb} \leq 60$ °C)	
$MTTF_d$ value[1)] (**without** mounting on the motor)	–	1155 years ($T_{amb} \leq 45$ °C) 753 years ($T_{amb} \leq 60$ °C)
PFH_d value[1)] (**with** mounting on the motor; takes into account a derating due to motor reheating)	5.0×10^{-8} 1/h = 50 FIT ($T_{amb} \leq 60$ °C)	
$MTTF_d$ value[1)] (**with** mounting on the motor; takes into account a derating due to motor reheating)	–	212 years ($T_{amb} \leq 60$ °C)
Service life/proof test interval	20 years	
Motor/encoder connection (only for drives **with** FS logo)	Fault exclusion according to EN 61800-5-2	

1) The specified values are only applicable if the requirements on the encoder evaluation unit are met according to the amendment of the operating instructions "Safety Encoders and Safety Brakes for AC Motors DR.., DRN.., DR2.., EDR.., EDRN.. Functional Safety"

Characteristic safety values for EI7C FS

	Characteristic safety values according to	
	EN 61800-5-2	**EN ISO 13849-1**
Safety class/underlying standards	SIL 2	PL d
System structure	HFT = 0	Category 2 (cat. 2)
PFH_d value	8.0×10^{-8} 1/h = 80 FIT ($T_{amb} \leq 60$ °C)	
$MTTF_d$ value	–	202 years ($T_{amb} \leq 60$ °C)
Service life/proof test interval	20 years	
Safe fault coverage (SFF)	95%	

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Characteristic safety values of AK8W, AK8Y

	Characteristic safety values according to	
	EN 62061/IEC 61508	**EN ISO 13849-1**
Classification/underlying standards	SIL2	PL d
System structure	HFT = 1	2-channel (Cat. 3)
PFH_D value[1)] (**without** mounting on the motor)	6.97×10^{-9} 1/h = 6.97 FIT ($T_{amb} \leq 45$ °C) 1.04×10^{-8} 1/h = 10.4 FIT ($T_{amb} \leq 60$ °C)	
$MTTF_d$ value[1)] (**without** mounting on the motor)	–	1638 years ($T_{amb} \leq 45$ °C) 1098 years ($T_{amb} \leq 60$ °C)
PFH_d value[1)] (**with** mounting on the motor; takes into account a derating due to motor reheating)	5.0×10^{-8} 1/h = 50 FIT ($T_{amb} \leq 60$ °C)	
$MTTF_d$ value[1)] (**with** mounting on the motor; takes into account a derating due to motor reheating)	–	212 years ($T_{amb} \leq 60$ °C)
Service life/proof test interval	20 years	
Motor/encoder connection (only for drives **with** FS logo)	Fault exclusion according to EN 61800-5-2	

1) The specified values are only applicable if the requirements on the encoder evaluation unit are met according to the amendment of the operating instructions "Safety Encoders and Safety Brakes for AC Motors DR.., DRN.., DR2.., EDR.., EDRN.. Functional Safety"

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Characteristic safety values of EK8S

	Characteristic safety values according to	
	EN 62061/IEC 61508	**EN ISO 13849-1**
Classification/underlying standards	SIL2	PL d
System structure	HFT = 1	2-channel (Cat. 3)
PFH_D value[1)] (**without** mounting on the motor)	8.5×10^{-9} 1/h = 8.5 FIT ($T_U \leq 45$ °C) 1.3×10^{-8} 1/h = 13 FIT ($T_U \leq 60$ °C)	
$MTTF_D$ value[1)] (**without** mounting on the motor)	–	1474 years ($T_{amb} \leq 45$ °C) 1030 years ($T_{amb} \leq 60$ °C)
PFH_d value[1)] (**with** mounting on the motor; takes into account a derating due to motor reheating)	5.0×10^{-8} 1/h = 50 FIT ($T_{amb} \leq 60$ °C)	
$MTTF_d$ value[1)] (**with** mounting on the motor; takes into account a derating due to motor reheating)	–	212 years ($T_{amb} \leq 60$ °C)
Service life/proof test interval	20 years	
Motor/encoder connection (only for drives **with** FS logo)	Fault exclusion according to EN 61800-5-2	

1) The specified values are only applicable if the requirements on the encoder evaluation unit are met according to the amendment of the operating instructions "Safety Encoders and Safety Brakes for AC Motors DR.., DRN.., DR2.., EDR.., EDRN.. Functional Safety"

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8.7 General information on drive selection

8.7.1 Encoders

Sensors, which can be mounted to the motors in series, can be combined with a range of motor designs and options, such as brakes and forced cooling fans.

If you have any questions, please contact SEW-EURODRIVE.

8.7.2 Encoder connection

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

- Maximum cable length (inverter – encoder):
  - 100 m with a capacitance from core to shield ≤ 110 nF/km
  - 100 m with a capacitance from core to core ≤ 70 nF/km

    Capacitances according to DIN VDE 0472 part 504.
- Core cross-section:
  - Supply cores 0.25 mm^2 for cable lengths up to 50 m
  - Supply cores 0.5 mm^2 for cable lengths up to 100 m
  - Signal cores ≥ 0.25 mm^2
- Use shielded cable with twisted pair cores. Connect the shield over a wide area at both ends:
  - Encoder end: in the cable gland of the encoder connection cover, or in the terminal box, or in the encoder connector.
  - Inverter end or evaluation unit end: to the electronics shield clamp and to the housing of the D-sub connector or another connector.
- Install the encoder cables separately from the power cables, maintaining a distance of at least 200 mm.
- When selecting the cabling, observe the technical data of the encoder, in particular regarding operating voltage and operating current.

8.7.3 Connection alternatives

Encoders are available with the following connection options:

/ES7., /EG7., /EV7., /AS7., /AG7., /AV7.	• With connection cover • With connection cover, cable length 0.3 m and M23 connector • Without connection cover
/EK8., /AK8.	• With integrated encoder plug connector with built-on housing • With integrated encoder plug connector without built-on housing
/EI8.	• With a terminal strip inside the terminal box • With an M23 connector on the terminal box

SEW-EURODRIVE recommends to use prefabricated encoder cables.

When using assembled cables from SEW-EURODRIVE, you can order the encoders without a connection cover because this cover is part of the cable.

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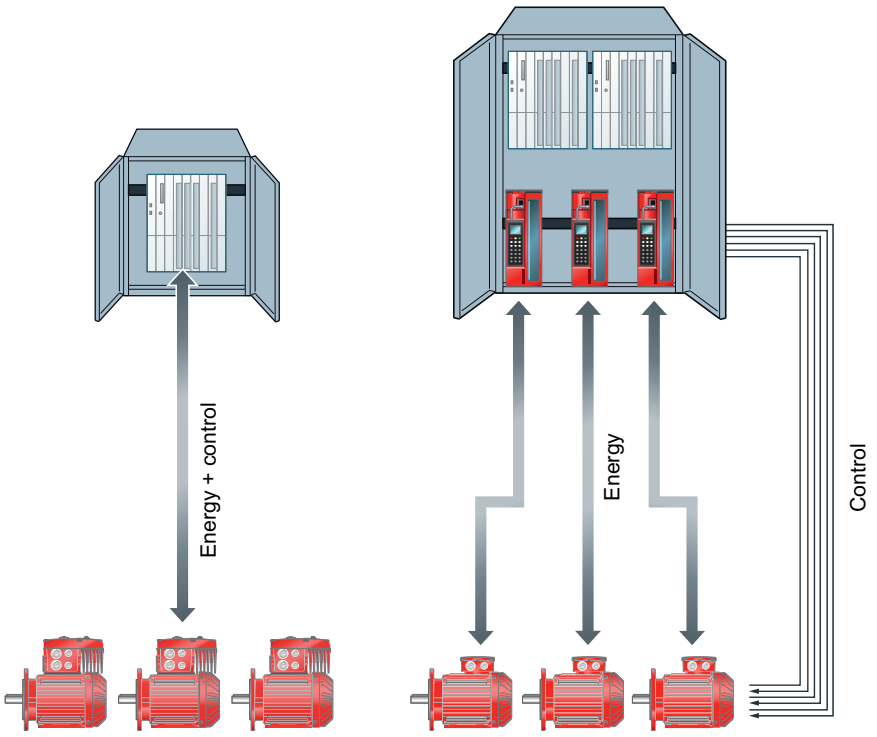
9 AC motors with decentralized technology

The purpose of decentralized installation is to minimize the installation effort for electrical drives in production plants.

The frequency inverter or motor starter of the drive is not installed in the control cabinet but in the field close to the motor. The installation of long cables for distributing power and transferring data can be reduced to a minimum. The sole remaining purpose of the control cabinet is to house control components for signal processing and diagnostics.

The latest generation of drive units is installed in the field, i.e. at specific locations in the plant where functions are implemented. These are mechatronic drive systems with integrated power and signaling electronics for monitoring, actual value acquisition and communication.

The power is distributed to the individual drives by means of specially developed cable systems with pluggable or permanently connected power outputs. A communication link is used for control and diagnosis of the decentralized drive units. Usually, this takes the form of an established fieldbus system or Ethernet-based network.



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9.1 MOVIMOT®

9.1.1 Description

MOVIMOT® is the combination of AC motor and frequency inverter in a power range from 0.37 to 4.0 kW. The frequency inverter can either be mounted directly on the motor or close to the motor (see below figure). Even with integrated frequency inverter, a MOVIMOT® drive is not much larger than a motor without integrated frequency inverter.

A MOVIMOT® inverter can be installed close to the motor using a mounting plate. The inverter is connected to the assigned motor using a prefabricated hybrid cable.

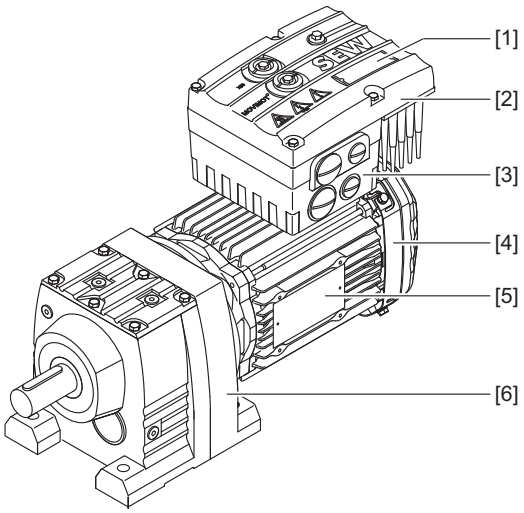
You can use the MOVIMOT® drives to equip extensive plants with a modular system or flexibly integrate them into existing plants. MOVIMOT® is also the electronic replacement for pole-changing motors or mechanical variable-speed gear units.

MOVIMOT® is available as (gear)motor with or without brake. Each MOVIMOT® inverter has a motor identification module (DIM module) for easy and fast startup. The DIM module is included in the delivery of the MOVIMOT® motor.

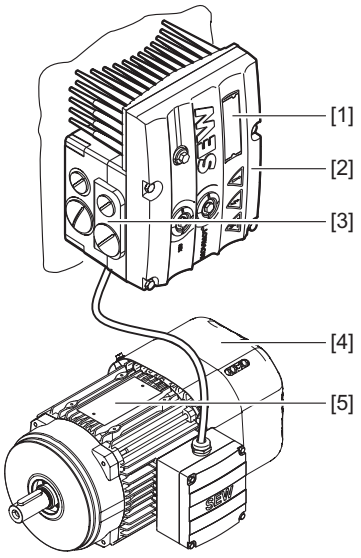
INFORMATION

This catalog provides a brief overview of MOVIMOT® drives to facilitate drive selection. For detailed descriptions, project planning information and dimension drawings, refer to the "MOVIMOT® Gearmotors" catalog.

MOVIMOT® drive
with integrated inverter



MOVIMOT® drive
with mounting close to the motor



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[1] MOVIMOT® inverter identification tag
[2] MOVIMOT® inverter
[3] Connection box
[4] Motor
[5] Drive nameplate
[6] Helical gear unit

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Advantages of MOVIMOT®

- 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
- Preset parameters for expected applications
- Easy installation, startup and maintenance
- Easy to service for retrofitting and replacement

Designs

MOVIMOT® drives are available in various designs so they can be used to implement all kinds of installation topologies.

- MOVIMOT® drive **standard design** (e.g. with binary control)
  - With integrated inverter
  - Mounted close to the motor
- MOVIMOT® drive with **AS-Interface**
  - With integrated inverter
  - Mounted close to the motor

The AS-Interface option is located on the connection board in the connection box.

The following AS-Interface options are available:

- Binary slave MLK30A
- Double slave MLK31A
- Binary slave MLK32A in AB technology

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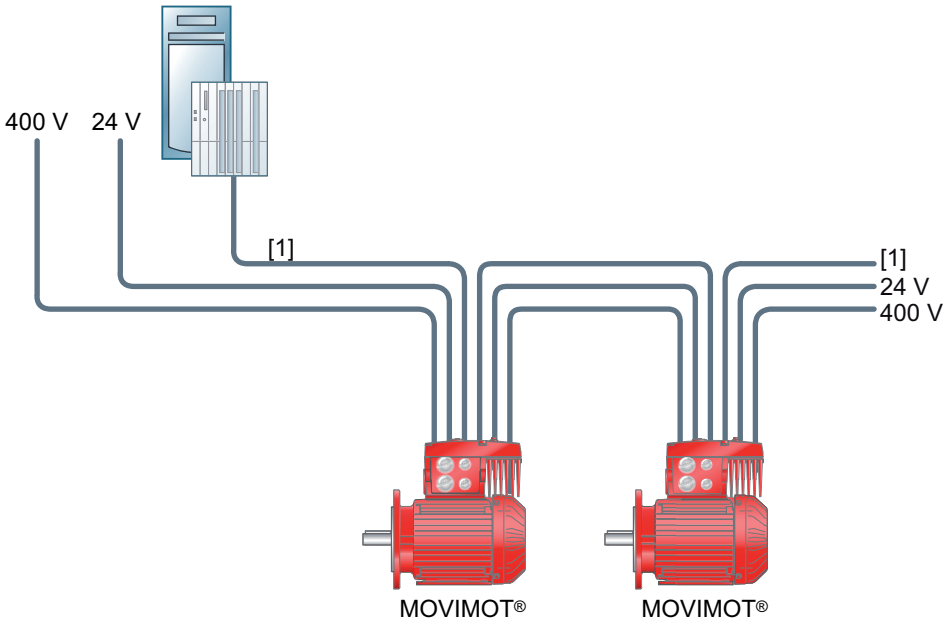
MOVIMOT® installation topology

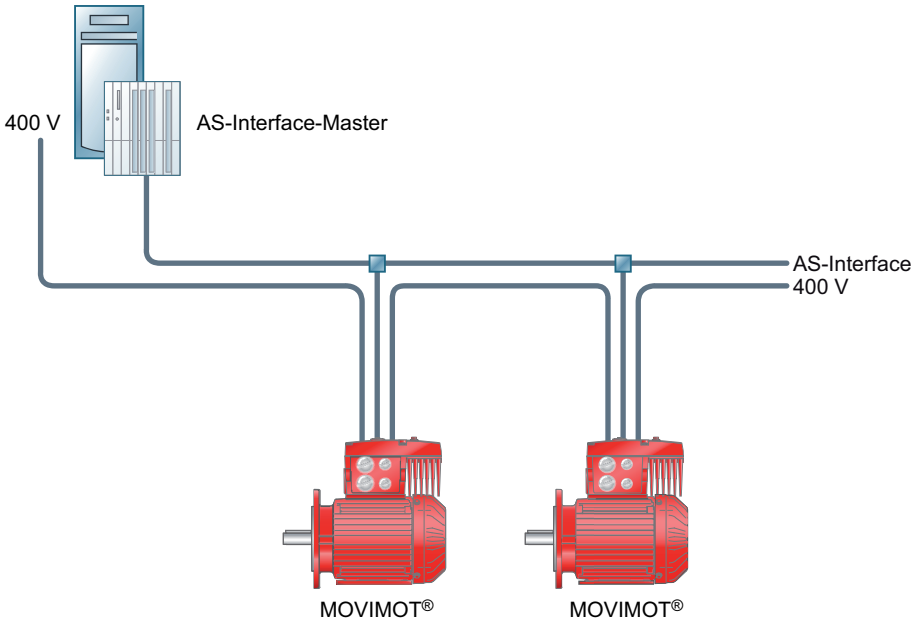
The following figure shows the basic installation topology of the MOVIMOT® drive with binary control:



9007204323709451

[1] Control: binary (+ RS485)

The following figure shows the basic installation topology of the MOVIMOT® drive with AS-Interface (DC 24 V supply via AS-Interface):



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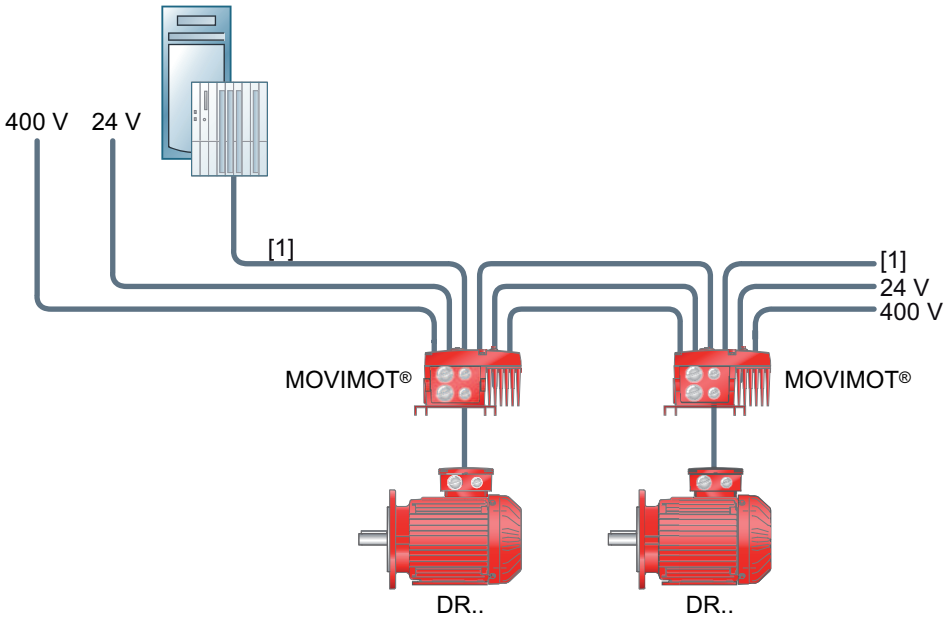
Installation topology of MOVIMOT®, mounted close to the motor

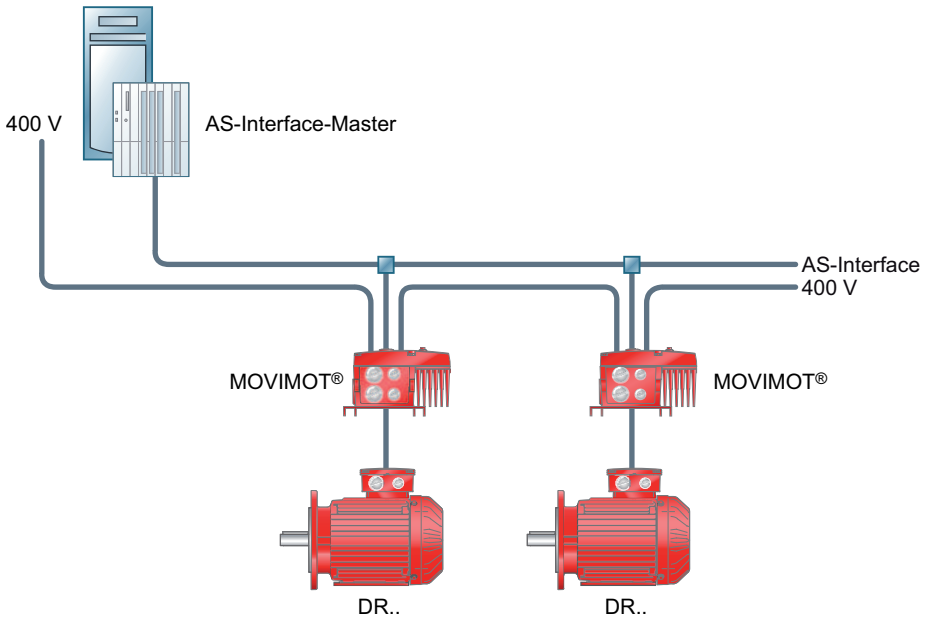
The following figure shows the basic installation topology of the MOVIMOT® drive with binary control when mounted close to the motor:



9007204323666571

[1] Control: binary (+ RS485)

The following figure shows the basic installation topology of the MOVIMOT® drive with AS-Interface when mounted close to the motor (DC 24 V supply via AS-Interface):



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9.1.2 Technical details

MOVIMOT® features

- Frequency inverter with vector-oriented control mode
- Voltage range: 3 × 380 – 500 V, (3 × 200 – 240 V)
- Power range: 0.37 – 4 kW (0.37 – 2.2 kW)
- Rated speeds: 1400, 1700, and 2900 min^{-1}
- Application-specific parameterization is possible
- Pluggable parameter memory for data backup (DIM module)
- Comprehensive protection and monitoring functions
- IP65 degree of protection (when connection box is closed)
- Compliance with EMC interference emission category C2 according to EN 61800-3
- Low-noise thanks to PWM switching frequency 16 kHz
- Status LED for fast diagnostics
- Diagnostics and manual operation using MOVITOOLS® MotionStudio
- 4-quadrant operation (integrated brake management):
  - For motors with mechanical brake, the brake coil is used as braking resistor.
  - For motors without brake, MOVIMOT® is supplied with internal braking resistor as standard.
- The units are controlled either via binary signals, via the serial interface RS485, or optionally via AS-Interface, or all common fieldbus interfaces (PROFIBUS, PROFINET, EtherNet/IP™, EtherCAT® INTERBUS, DeviceNet™).
- MOVIMOT® is available with UL approval on request.

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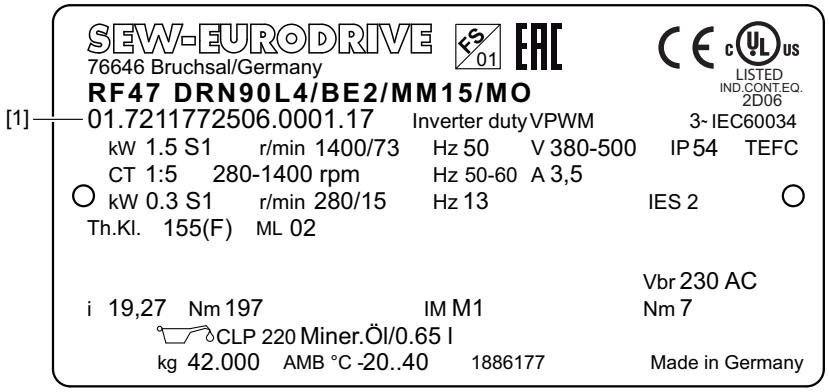
Type designations

Type designation of MOVIMOT® drives in standard design

Nameplate

The following figure depicts an example nameplate of a MOVIMOT® motor with integrated inverter:



20108730123

[1] Part number

Type designation

The following table shows an example of the type designation of the MOVIMOT® drive **RF47 DRN90L4/BE2/MM15/MO**:

RF	**Gear unit series**	
47	**Gear unit size**	
DRN..	**Motor type**	
90L	**Motor size**	
4	**Number of motor poles**	
/		
BE	**Brake option**	
2	**Brake size**	
/		
MM	**Inverter series**	MM = MOVIMOT®
15	**Inverter power**	15 = 1.5 kW
/		
MO	**Inverter options**[1)]	

1) The nameplate only displays options installed at the factory.

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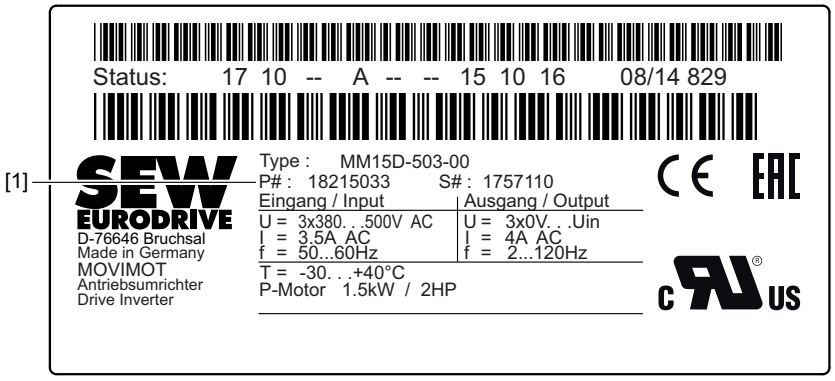
MOVIMOT® inverter type designation

Nameplate

The following figure provides an example of a MOVIMOT® inverter nameplate:



27021599722150283

[1] Part number

Type designation

The following table shows an example of the type designation of the MOVIMOT® inverter **MM15D-503-00**:

MM	**Inverter series**	MM = MOVIMOT®
15	**Inverter power**	15 = 1.5 kW
D	**Version D**	
-		
50	**Connection voltage**	50 = AC 380 – 500 V 23 = AC 200 – 240 V
3	**Connection type**	3 = 3-phase
-		
00	**Design**	00 = Standard

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Type designation of the design "mounted close to the motor"

Nameplate

The following figure provides an example of the nameplate of a MOVIMOT® inverter for mounting close to the motor:

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Type designation

The following table shows the type designation for the MOVIMOT® inverter **MM15D-503-00/0/P21/RO1A/APG4** for mounting close to the motor:

MM	**Inverter series**	MM = MOVIMOT®
15	**Inverter power**	15 = 1.5 kW
D	**Version D**	
-		
50	**Connection voltage**	50 = AC 380 – 500 V 23 = AC 200 – 240 V
3	**Connection type**	3 = 3-phase
-		
00	**Design**	00 = Standard
/		
0	**Connection type**	0 = ⅄ 1 = △
/		
P21A	**Adapter for mounting close to the motor**	
/		
RO1A	**Connection box design**	
/		
APG4	**Plug connector** for connection to the motor	

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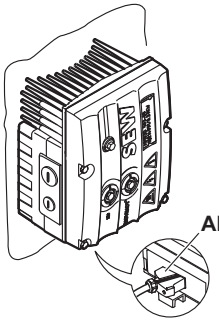
MOVIMOT® installed close to the motor

The following table shows the type designations of available MOVIMOT® drives with P2.A mounting plate for mounting close to the motor:

Connection to the motor	MOVIMOT® size	1)	MOVIMOT® standard design	MOVIMOT® with integrated AS-Interface
APG4 	MM03 to MM15	⅄	MM..D-503-00/0/ P21A/ RO1A/APG4	MM..D-503-00/0/ P21A/ RR3A/AVSK/ APG4/MLK
		△	MM..D-503-00/1/ P21A/ RO1A/APG4	MM..D-503-00/1/ P21A/ RR3A/AVSK/ APG4/MLK
	MM22 to MM40	⅄	MM..D-503-00/0/ P22A/ RO2A/APG4	MM..D-503-00/0/ P22A/ RR4A/AVSK/ APG4/MLK
		△	MM..D-503-00/1/ P22A/ RO2A/APG4	MM..D-503-00/1/ P22A/ RR4A/AVSK/ APG4/MLK

1) Connection type of connected motor

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Motor assignment for mounting close to DRN.. motors

Motor assignment MOVIMOT® (close to the motor) 280 – 1400 min^{-1}

Power kW	Motor (230/400 V, 50 Hz) 人	MOVIMOT® with option P.2A
0.25	DR**2S**63M4/TH DR**N**71MS4/TH.	MM03D-503-00/**0**/**BW1**/P21A..[1)]
	DR**2S**63M4/**BE..**/TH. DR**N**71MS4/**BE.**/TH.	MM03D-503-00/**0**/P21A/..[1)]
0.37	DR**2S**71MS4/TH. DR**N**71M4/TH.	MM03D-503-00/**0**/**BW1**/P21A..
		MM05D-503-00/**0**/**BW1**/P21A..[1)]
	DR**2S**71MS4/**BE.**/TH. DR**N**71M4/**BE.**/TH.	MM03D-503-00/**0**/P21A..
		MM05D-503-00/**0**/P21A..[1)]
0.55	DR**2S**71M4/TH. DR**N**80MK4/TH.	MM05D-503-00/**0**/**BW1**/P21A..
		MM07D-503-00/**0**/**BW1**/P21A..[1)]
	DR**2S**71M4/**BE.**/TH. DR**N**80MK4/**BE.**/TH.	MM05D-503-00/**0**/P21A..
		MM07D-503-00/**0**/P21A..[1)]
0.75	DR**2S**80MK4/TH. DR**N**80M4/TH.	MM07D-503-00/**0**/**BW1**/P21A..
		MM11D-503-00/**0**/**BW1**/P21A..[1)]
	DR**2S**80MK4/**BE.**/TH. DR**N**80M4/**BE.**/TH.	MM07D-503-00/**0**/P21A..
		MM11D-503-00/**0**/P21A..[1)]
1.1	DR**2S**80M4/TH. DR**N**90S4/TH.	MM11D-503-00/**0**/**BW1**/P21A..
		MM15D-503-00/**0**/**BW1**/P21A..[1)]
	DR**2S**80M4/**BE.**/TH. DR**N**90S4/**BE.**/TH.	MM11D-503-00/**0**/P21A..
		MM15D-503-00/**0**/P21A..[1)]
1.5	DR**N**90L4/TH.	MM15D-503-00/**0**/**BW1**/P21A..
		MM22D-503-00/**0**/**BW2**/P22A..[1)]
	DR**N**90L4/**BE.**/TH.	MM15D-503-00/**0**/P21A..
		MM22D-503-00/**0**/P22A..[1)]
2.2	DR**N**100LS4/TH.	MM22D-503-00/**0**/**BW2**/P22A..
		MM30D-503-00/**0**/**BW2**/P22A..[1)]
	DR**N**100LS4/**BE.**/TH.	MM22D-503-00/**0**/P22A..
		MM30D-503-00/**0**/P22A..[1)]
3.0	DR**N**100L4/TH.	MM30D-503-00/**0**/**BW2**/P22A..
		MM40D-503-00/**0**/**BW2**/P22A..[1)]
	DR**N**100L4/**BE.**/TH.	MM30D-503-00/**0**/P22A..
		MM40D-503-00/**0**/P22A..[1)]
4.0	DR**N**112M4/TH.	MM40D-503-00/**0**/**BW2**/P22A..
	DR**N**112M4/**BE.**/TH.	MM40D-503-00/**0**/P22A..

1) Combination with increased short-term torque

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Motor assignment MOVIMOT® (close to the motor) 290 – 2900 min^{-1}

Power kW	Motor (230/400 V, 50 Hz) ▵	MOVIMOT® with option P2A
0.37	DR**2S**63M4/TH	MM03D-503-00/**1**/**BW1**/P21A..
	DR**N**71MS4/TH	MM05D-503-00/**1**/**BW1**/P21A..[1)]
	DR**2S**63M4/**BE..**/TH.	MM03D-503-00/**1**/P21A..
	DR**N**71MS4/**BE..**/TH.	MM05D-503-00/**1**/P21A..[1)]
0.55	DR**2S**71MS4/TH.	MM05D-503-00/**1**/**BW1**/P21A..
	DR**N**71M4/TH.	MM07D-503-00/**1**/**BW1**/P21A..[1)]
	DR**2S**71MS4/**BE.**/TH.	MM05D-503-00/**1**/P21A..
	DR**N**71M4/**BE.**/TH.	MM07D-503-00/**1**/P21A..[1)]
0.75	DR**2S**71M4/TH.	MM07D-503-00/**1**/**BW1**/P21A..
	DR**N**80MK4/TH.	MM11D-503-00/**1**/**BW1**/P21A..[1)]
	DR**2S**71M4/**BE.**/TH.	MM07D-503-00/**1**/P21A..
	DR**N**80MK4/**BE.**/TH.	MM11D-503-00/**1**/P21A..[1)]
1.1	DR**2S**80MK4/TH.	MM11D-503-00/**1**/**BW1**/P21A..
	DR**N**80M4/TH.	MM15D-503-00/**1**/**BW1**/P21A..[1)]
	DR**2S**80MK4/**BE.**/TH.	MM11D-503-00/**1**/P21A..
	DR**N**80M4/**BE.**/TH.	MM15D-503-00/**1**/P21A..[1)]
1.5	DR**2S**80M4/**BE.**/TH.	MM15D-503-00/**1**/**BW1**/P21A..
	DR**N**90S4/TH.	MM22D-503-00/**1**/**BW2**/P22A..[1)]
	DR**2S**80M4/**BE.**/TH.	MM15D-503-00/**1**/P21A..
	DR**N**90S4/**BE.**/TH.	MM22D-503-00/**1**/P22A..[1)]
2.2	DR**N**90L4/TH.	MM22D-503-00/**1**/**BW2**/P22A..
		MM30D-503-00/**1**/**BW2**/P22A..[1)]
	DR**N**90L4/**BE.**/TH.	MM22D-503-00/**1**/P22A..
		MM30D-503-00/**1**/P22A..[1)]
3.0	DR**N**100LS4/TH.	MM30D-503-00/**1**/**BW2**/P22A..
		MM40D-503-00/**1**/**BW2**/P22A..[1)]
	DR**N**100LS4/**BE.**/TH.	MM30D-503-00/**1**/P22A..
		MM40D-503-00/**1**/P22A..[1)]
4.0	DR**N**100L4/TH.	MM40D-503-00/**1**/**BW2**/P22A..
	DR**N**100L4/**BE.**/TH.	MM40D-503-00/**1**/P22A..

1) Combination with increased short-term torque

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Technical data of MOVIMOT® inverters with DRN.. motors

MOVIMOT® drives

280 – 1400 min^{-1} ⅄ 3 × 380 – 500 V (400 V, 50 Hz)

IEC or UL

Type	P_N kW	M_N Nm	M_A/M_N f > 5 Hz	n_N min^{-1}	I_N A	cosφ	J_{Mot} 10^{-4} kgm^2	J_{BMot} 10^{-4} kgm^2	M_B Nm	m_{Mot} kg	m_{BMot} kg
DRN71M4/../MM03	0.37	2.5	1.5	1400	1.3	0.99	7.1	8.4	5	9.6	11.6
DRN80MK4/../MM05	0.55	3.65	1.5	1400	1.6	0.99	17.1	18.6	10	12.6	15.6
DRN80M4/../MM07	0.75	5.1	1.5	1400	1.9	0.99	24.7	26.2	10	15.6	19.6
DRN90S4/../MM11	1.1	7.5	1.5	1400	2.4	0.99	54.0	58.7	20	21.6	26.2
DRN90L4/../MM15	1.5	10.2	1.5	1400	3.5	0.99	67.2	71.9	20	24.6	29.2
DRN100LS4/../MM22	2.2	15.0	1.5	1400	5.0	0.99	81.4	87.4	28	29.3	35.2
DRN100L4/../MM30	3.0	20.5	1.5	1400	6.7	0.99	112	118	40	36.3	42.2
DRN112M4/../MM40	4.0	27.3	1.5	1400	7.3	0.99	178	183	55	48.2	55.4

290 – 2900 min^{-1} △ 3 × 380 – 500 V (400 V, 50 Hz)

IEC or UL

Type	P_N kW	M_N Nm	M_A/M_N f > 5 Hz	n_N min^{-1}	I_N A	cosφ	J_{Mot} 10^{-4} kgm^2	J_{BMot} 10^{-4} kgm^2	M_B Nm	m_{Mot} kg	m_{BMot} kg
DRN71MS4/../MM03	0.37	1.22	1.5	2900	1.3	0.99	5.4	6.1	5	8.4	10.2
DRN71M4/../MM05	0.55	1.81	1.5	2900	1.6	0.99	7.1	8.4	5	9.6	11.6
DRN80MK4/../MM07	0.75	2.47	1.5	2900	1.9	0.99	17.1	18.6	10	12.6	15.6
DRN80M4/../MM11	1.1	3.62	1.5	2900	2.4	0.99	24.7	26.2	10	15.6	19.6
DRN90S4/../MM15	1.5	4.95	1.5	2900	3.5	0.99	54.0	58.7	20	21.6	26.2
DRN90L4/../MM22	2.2	7.25	1.5	2900	5.0	0.99	67.2	71.9	20	25.3	29.9
DRN100LS4/../MM30	3.0	9.9	1.5	2900	6.7	0.99	81.4	87.4	28	29.3	35.2
DRN100L4/../MM40	4.0	13.2	1.5	2900	7.3	0.99	112	118	40	37.2	43.1

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MOVIMOT® drives with increased short-term torque

For implementing MOVIMOT® drives with increased short-term torque, the motor is assigned a MOVIMOT® inverter with one power rating higher.

280 – 1400 min^{-1} ⅄ 3 × 380 – 500 V (400 V, 50 Hz)

IEC or UL

Type	P_N kW	M_N Nm	M_A/M_N f > 5 Hz	n_N min^{-1}	I_N A	cosφ	J_{Mot} 10^{-4} kgm^2	J_{BMot} 10^{-4} kgm^2	M_B Nm	m_{Mot} kg	m_{BMot} kg
DRN71MS4/../MM03	0.25	1.69	2.1	1400	1.0	0.99	5.42	6.72	5	8.4	10.8
DRN71M4/../MM05	0.37	2.5	2.1	1400	1.3	0.99	7.1	8.4	5	9.6	11.6
DRN80MK4/../MM07	0.55	3.65	2.1	1400	1.6	0.99	17.1	18.6	10	12.6	15.6
DRN80M4/../MM11	0.75	5.1	2.1	1400	1.9	0.99	24.7	26.2	10	15.6	19.3
DRN90S4/../MM15	1.1	7.5	2.1	1400	2.4	0.99	54.0	58.7	20	21.6	26.2
DRN90L4/../MM22	1.5	10.2	2.1	1400	3.5	0.99	67.2	71.9	20	25.3	29.9
DRN100LS4/../MM30	2.2	15.0	2.1	1400	5.0	0.99	81.4	87.4	28	29.3	35.2
DRN100L4/../MM40	3.0	20.5	2.1	1400	6.7	0.99	112	118	40	37.2	43.1

290 – 2900 min^{-1} △ 3 × 380 – 500 V (400 V, 50 Hz)

IEC or UL

Type	P_N kW	M_N Nm	M_A/M_N f > 5 Hz	n_N min^{-1}	I_N A	cosφ	J_{Mot} 10^{-4} kgm^2	J_{BMot} 10^{-4} kgm^2	M_B Nm	m_{Mot} kg	m_{BMot} kg
DRN71MS4/../MM05	0.37	1.22	2.2	2900	1.3	0.99	5.4	6.1	5	8.4	10.2
DRN71M4/../MM07	0.55	1.81	2.2	2900	1.6	0.99	7.1	8.4	5	9.6	11.6
DRN80MK4/../MM11	0.75	2.47	2.2	2900	1.9	0.99	17.1	18.6	10	12.6	15.6
DRN80M4/../MM15	1.1	3.62	2.1	2900	2.4	0.99	24.7	26.2	10	15.6	19.3
DRN90S4/../MM22	1.5	4.95	2.1	2900	3.5	0.99	54.0	58.7	20	22.3	26.9
DRN90L4/../MM30	2.2	7.25	2.1	2900	5.0	0.99	67.2	71.9	20	25.3	29.9
DRN100LS4/../MM40	3.0	9.9	2.1	2900	6.7	0.99	81.4	87.4	28	30.2	36.1

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Technical data of MOVIMOT® inverters with DR2S.. motors

MOVIMOT® drives

280 – 1400 min^{-1} ⅄ 3 × 380 – 500 V (400 V)

IEC or UL

Type	P_N kW	M_N Nm	M_A/M_N f > 5 Hz	n_N min^{-1}	I_N A	cosφ	J_{Mot} 10^{-4} kgm^2	J_{BMot} 10^{-4} kgm^2	M_B Nm	m_{Mot} kg	m_{BMot} kg
DR2S71MS4/../MM03	0.37	2.6	1.5	1400	1.3	0.99	5.42	6.72	5	8.4	10.8
DR2S71M4/../MM05	0.55	3.85	1.5	1400	1.6	0.99	7.14	8.44	10	9.6	12.6
DR2S80MK4/../MM07	0.75	5.1	1.5	1400	1.9	0.99	17.1	18.6	10	12.6	15.6
DR2S80M4/../MM11	1.1	7.4	1.5	1400	2.4	0.99	24.7	29.2	14	15.6	19.6

290 – 2900 min^{-1} △ 3 × 380 – 500 V (400 V)

IEC or UL

Type	P_N kW	M_N Nm	M_A/M_N f > 5 Hz	n_N min^{-1}	I_N A	cosφ	J_{Mot} 10^{-4} kgm^2	J_{BMot} 10^{-4} kgm^2	M_B Nm	m_{Mot} kg	m_{BMot} kg
DR2S71MS4/../MM05	0.55	1.81	2	2900	1.6	0.99	5.42	6.72	5	8.4	10.8
DR2S71M4/../MM07	0.75	2.47	2	2900	1.9	0.99	7.14	8.44	10	9.6	12.6
DR2S80MK4/../MM11	1.1	3.62	2	2900	2.4	0.99	17.1	18.6	10	12.6	15.6
DR2S80M4/../MM15	1.5	4.95	1.6	2900	3.5	0.99	24.7	29.2	14	15.6	19.6

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MOVIMOT® drives with increased short-term torque

For implementing MOVIMOT® drives with increased short-term torque, the motor is assigned a MOVIMOT® inverter with one power rating higher.

280 – 1400 min^{-1} ⅄ 3 × 380 – 500 V (400 V)

IEC or UL

Type	P_N kW	M_N Nm	M_A/M_N f > 5 Hz	n_N min^{-1}	I_N A	cosφ	J_{Mot} 10^{-4} kgm^2	J_{BMot} 10^{-4} kgm^2	M_B Nm	m_{Mot} kg	m_{BMot} kg
DR2S71MS4/../MM05	0.37	2.6	2.1	1400	1.3	0.99	5.42	6.72	5	8.4	10.8
DR2S71M4/../MM07	0.55	3.85	2.1	1400	1.6	0.99	7.14	8.44	10	9.6	12.6
DR2S80MK4/../MM11	0.75	5.1	2.1	1400	1.9	0.99	17.1	18.6	10	12.6	15.6
DR2S80M4/../MM15	1.1	7.4	2.1	1400	2.4	0.99	24.7	29.2	14	15.6	19.6

290 – 2900 min^{-1} △ 3 × 380 – 500 V (400 V)

IEC or UL

Type	P_N kW	M_N Nm	M_A/M_N f > 5 Hz	n_N min^{-1}	I_N A	cosφ	J_{Mot} 10^{-4} kgm^2	J_{BMot} 10^{-4} kgm^2	M_B Nm	m_{Mot} kg	m_{BMot} kg
DR2S71MS4/../MM07	0.55	1.81	2.4	2900	1.6	0.99	5.42	6.72	5	8.4	10.8
DR2S71M4/../MM011	0.75	2.47	2.4	2900	1.9	0.99	7.14	8.44	10	9.6	12.6
DR2S80MK4/../MM15	1.1	3.62	2.4	2900	2.4	0.99	17.1	18.6	10	12.6	15.6
DR2S80M4/../MM22	1.5	4.95	2.2	2900	3.5	0.99	24.7	29.2	14	22.3	26.3

Designs with AS-Interface

Overview of AS-Interface options

The following table shows the main differences between the AS-Interface options:

AS-Interface option	Stations at the AS-Interface	Number of speed setpoints	Number of ramps	Can be parameterized via AS-Interface	24 V supply for MOVIMOT®
MLK30A	max. 31	2 (16[1)])	1 x t_{UP} 1 x t_{DOWN}	No	AS-Interface or AUX PWR
MLK31A	max. 31	6	3 x t_{UP} 3 x t_{DOWN}	Yes	AS-Interface or AUX PWR
MLK32A	max. 62	6	3 x t_{UP} 3 x t_{DOWN}	No	AUX PWR

1) Due to the parameterization of scaling factors, 16 fixed setpoints are available.

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MLK30A

Connected to the AS-Interface, the MLK30A slave works like a module with 4 inputs and 4 outputs.

The cyclic output bits control the MOVIMOT® inverter.

The input bits transmit the status of the drive and 2 additional sensor signals to the AS-Interface master.

The acyclic parameter bits are used to select speed scaling factors.

The MLK30A option is compatible with MOVIMOT® MM..C with integrated AS-Interface.

MLK31A

The MLK31A option works as a double slave on the AS-Interface according to AS-Interface specification 3.0.

The serial AS-Interface data transmission (analog profile) allows for MOVIMOT® parameters and display values to be written and read.

The MOVIMOT® inverter is controlled via the cyclic output bits. The coding of the data bits is specified in different function modes. The MOVIMOT® inverter interprets these bits as different control and status codes. With the acyclic parameter bits, you can switch between the function modes.

The input bits transmit the status of the drive and 2 additional sensor signals to the AS-Interface master.

MLK32A

The MLK32A option works as a slave on the AS-Interface according to AS-Interface specification 3.0.

The MOVIMOT® inverter is controlled via the cyclic output bits. The coding of the data bits is specified in different function modules. The MOVIMOT® inverter interprets these bits as different control and status codes. You can switch between the function modules using acyclic parameter bits.

The input bits transmit the status of the drive and 2 additional sensor signals to the AS-Interface master.

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MOVIMOT® options

MOVIMOT® drives can be extended by various options.

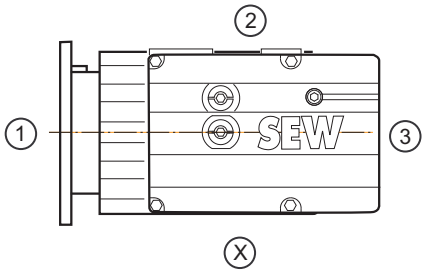
- Internal options are installed in the connection box.
- External options are installed outside the connection box.

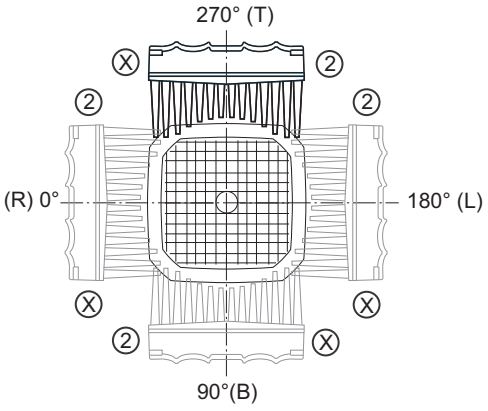
/MO

The type designation contains /MO no matter whether one or several of the following options are used.

Designation	Description of the option for MOVIMOT®	Installation
BEM	Brake control (400 V brake)	Internal
BES	Brake control (24 V brake)	
URM	Voltage relay	
MNF21A	Line filter (MM03 – MM15)	
MLU13A	DC 24 V voltage supply (380 - 500 V)	
MLU11A	DC 24 V voltage supply (380 - 500 V)	External
MLU21A	DC 24 V voltage supply (200 - 240 V)	
MLG11A	Setpoint adjuster with DC 24 V voltage supply (380 – 500 V)	
MLG21A	Setpoint adjuster with DC 24 V voltage supply (200 – 240 V)	
MBG11A	Setpoint adjuster	
MWA21A	Setpoint converter	
MF... MQ...	Fieldbus interface (PROFIBUS, PROFINET IO, EtherCAT® EtherNet/IP™, INTERBUS, DeviceNet™)	

External options can be installed in positions "2" or "X" as standard:





For more information, refer to the "MOVIMOT® Gearmotors" catalog.

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Motor identification for MOVIMOT® (/MI)

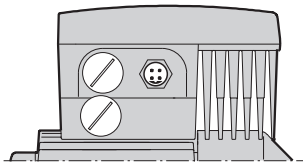
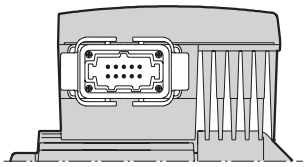
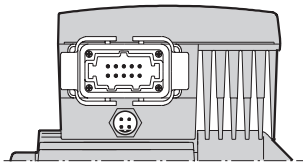
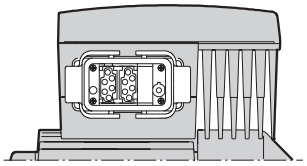
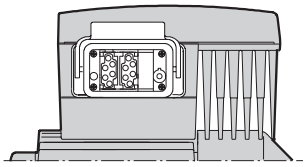
When you order a motor that is suited for combining it with a MOVIMOT® inverter for mounting close to the motor, you can also order the DIM module matching the motor. The DIM module is attached in the terminal box of the motor and is indicated as /MI in the type designation of the motor.

Connection technology

Connection technology of MOVIMOT® standard design

The MOVIMOT® drive is supplied without plug connector if not specified otherwise in the order.

The following table shows the plug connector variants available for MOVIMOT® drives in standard design:

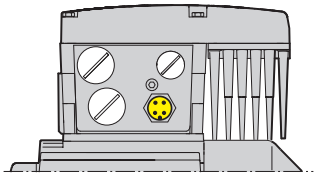
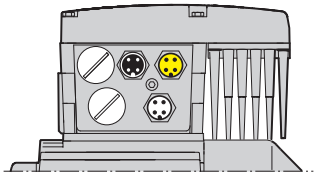
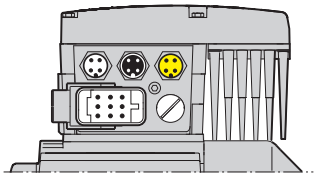
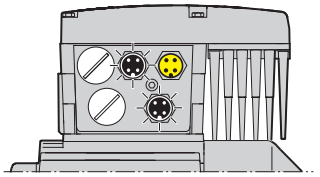
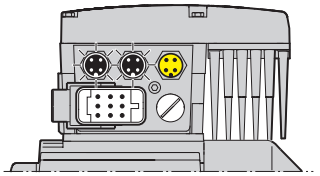
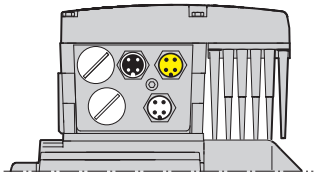
Order designation	Function	Manufacturer's designation
MM../AVT1 	• RS485	Round plug connector M12 x 1
MM../ASA3 	• Power rating	Harting Han® 10 ES pin insert (built-on housing with 2 clips)
MM../ASA3/AVT1 	• Power rating • RS485	Harting Han® 10 ES pin insert (built-on housing with 2 clips) + Round plug connector M12 x 1
MM../AMA6 	• Power/RS485	Harting Han Modular® pin insert (built-on housing with 2 clips)
MM../AMD6 	• Power/RS485	Harting Han Modular® pin insert (built-on housing with 1 clip)

Plug connectors can be installed in positions "2" or "X" as standard.

Connection technology of MOVIMOT® with integrated AS-Interface

MOVIMOT® with integrated AS-Interface is supplied with AVSK plug connector if not specified otherwise in the order.

The following table shows the plug connector variants available for MOVIMOT® drives with integrated AS-Interface:

Order designation	Function	Manufacturer's designation
MM../AVSK 	• AS-Interface	1 x round plug connector M12 x 1
MM../AZSK 	• AS-Interface • AUX PWR • Sensor port	3 x round plug connector M12 x 1
MM../AND3/AZSK 	• Power rating • AS-Interface • AUX PWR • Sensor port	Harting Han® Q8/0 pin insert (built-on housing with 1 clip) + 3 x round plug connector M12 x 1
MM../AZZK 	• AS-Interface/ AUX-PWR • Sensor port • Sensor port	3 x round plug connector M12 x 1
MM../AND3/AZZK 	• Power rating • AS-Interface/ AUX-PWR • Sensor port • Sensor port	Harting Han® Q8/0 pin insert (built-on housing with 1 clip) + 3 x round plug connector M12 x 1
MM../AZFK 	• AS-Interface • 24 V supply of MOVIMOT® • Sensor port	3 x M12 plug connector

Plug connectors can be installed in positions "2" or "X" as standard.

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Functional safety

Safety-rated MOVIMOT® frequency inverter

The safety technology of the MOVIMOT® drive was developed and tested according to the following safety requirements:

- Performance Level d according to EN ISO 13849-1: 2008
- SIL 2 according to IEC 61800-5-2:2007

This was certified by TÜV Nord.

For the safety-related use of MOVIMOT®, "Safe Torque Off" is defined as a safe condition (STO safety function). The safety concept is based on this definition.

Permitted SafetyDRIVE designs

Only the following combinations with MOVIMOT® are permitted for safety-relevant applications:

Permitted designs	MOVIMOT® type designation
MOVIMOT® with binary control (control via terminals)	D../MM.. – SafetyDRIVE MM..D-503-00 – SafetyDRIVE
MOVIMOT® with AS-Interface option MLK32A	
MOVIMOT® with MBG11A option	
MOVIMOT® with MWA 21A option	
MOVIMOT® with MBK11A or MBK12A option	
MOVIMOT® with BEM option	
MOVIMOT® with URM option	
MOVIMOT® with MNF21A option	
MOVIMOT® and MOVIFIT® MC with FS logo and externally switched 24 V supply (STO)	
MOVIMOT® and MOVIFIT® MC with FS logo and PROFIsafe option S11	
MOVIMOT® and MOVIFIT® MC with FS logo and safety option S12	
MOVIMOT® with field distributors Z.6, Z.7, Z.8 or Z.9	

For information on the safety function and the safety-related requirements, refer to the "MOVIMOT® MM..D – Functional Safety" manual.

Order information

INFORMATION

- The SafetyDRIVE design must be ordered explicitly. (Order note: "– SafetyDRIVE").
- In safety applications, only components may be used that were supplied by SEW-EURODRIVE in this design and that are marked with the FS logo for functional safety.

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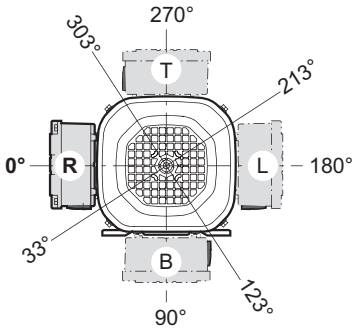
Dimension sheet information

Note the following for the dimension sheets of MOVIMOT® AC motors:

- Foot-mounted motors are available with connection box position 270° only.
- A fan guard represented by a dotted line shows the design with brake.
- Different positions are possible for the manual brake release. The 4 positions 33°, 123°, 213° or 303° are basically possible.



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- The manual brake release is located at an angle of 303° to the connection box as standard. The manual brake release can be turned by 4 × 90°. The forced cooling fan option (/V) limits the possible positions of the manual brake release.
- For brakemotors, do not forget to add the space required for removing the fan guard (= fan guard diameter).
- Leave a clearance of at least half the fan guard diameter to provide unhindered air access.
- The motor dimensions can change when installing motor options. Refer to the dimension drawings of the motor options.

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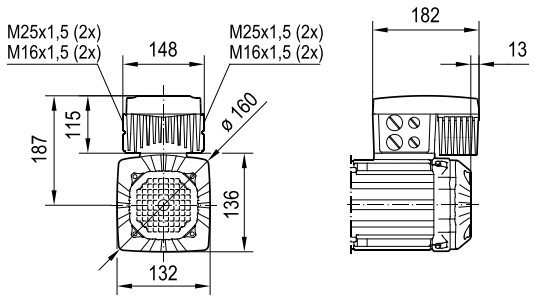
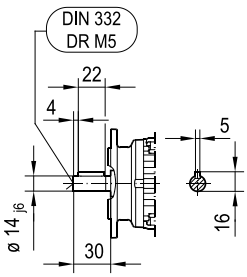
Dimension sheets for MOVIMOT® motors/brakemotors of the DRN.., DR2S.. series

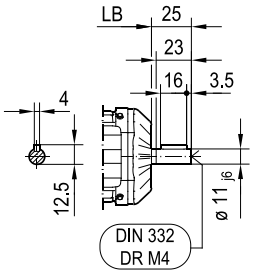
DRN71MS/MM
DR2S71MS/MM
DRN71M/MM

08 098 01 18
1(2)

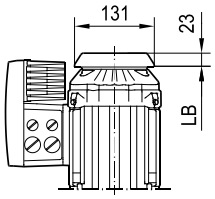




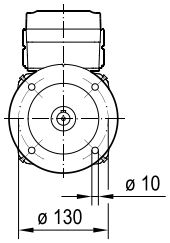
/2W

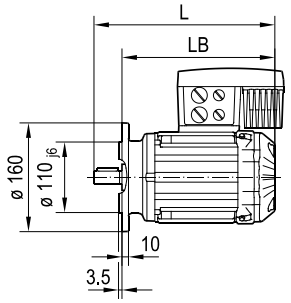


/C

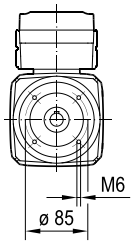


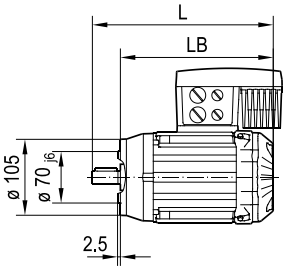
/FF (B5) FF130D160



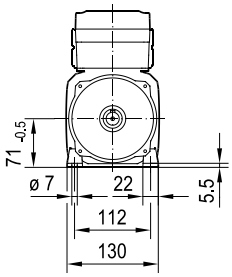


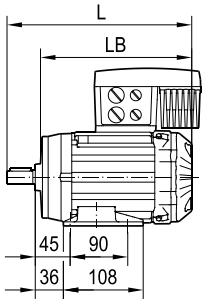
/FT (B14) FT85D105





/FI (B3) FI71M





(→ 📖)	71MS	71M						
L	232	252						
LB (B5/B14)	202	222						
LB (B3)	200	220						

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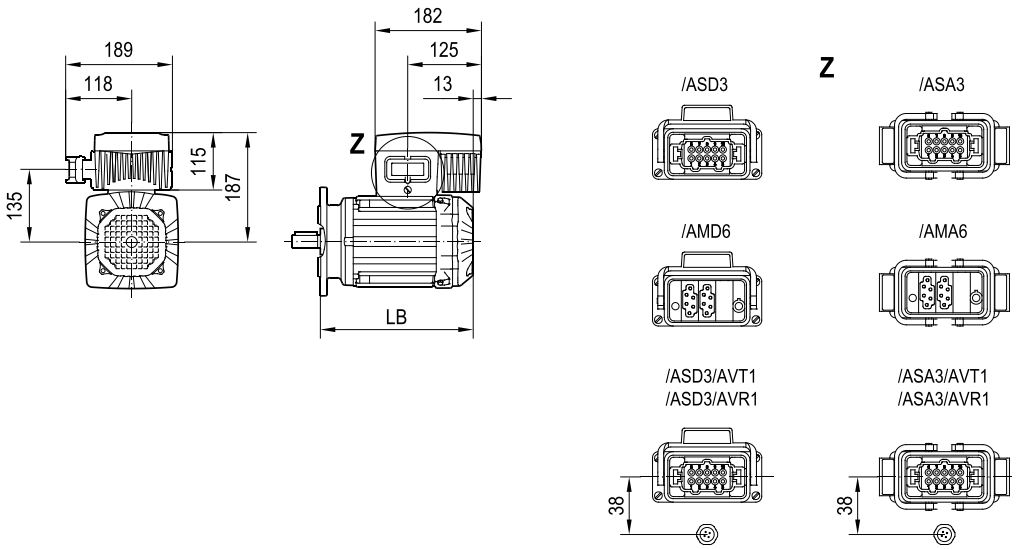
MM03-MM07/IV

08 098 01 18
2(2)



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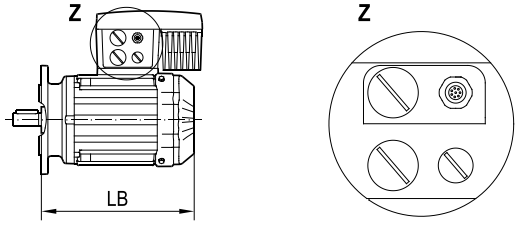

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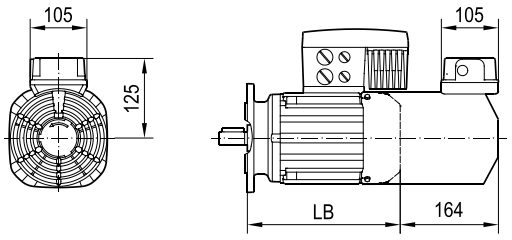

(→ 📖)	71MS	71M						
L	232	252						
LB (B5/B14)	202	222						
LB (B3)	200	220						

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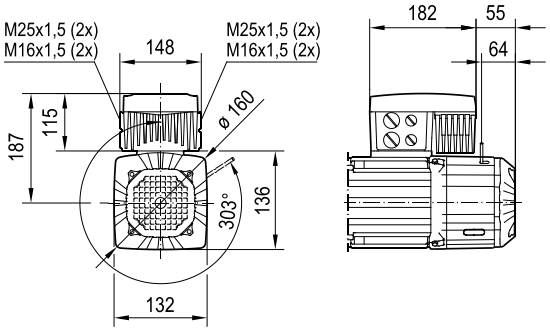
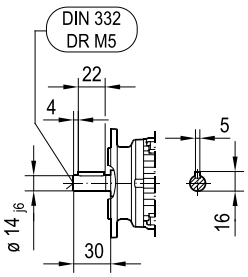
DRN71MS BE/MM
DR2S71MS BE/MM
DRN71M BE/MM

09 116 01 18
1(2)





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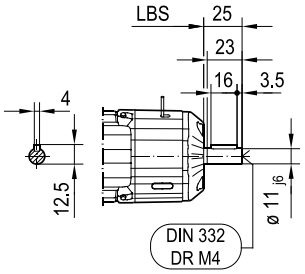
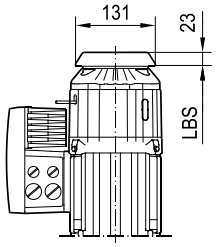


/C



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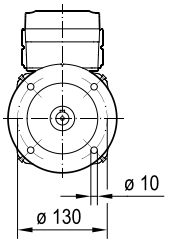

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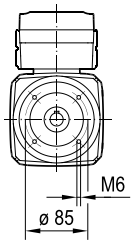

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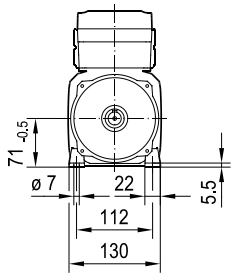
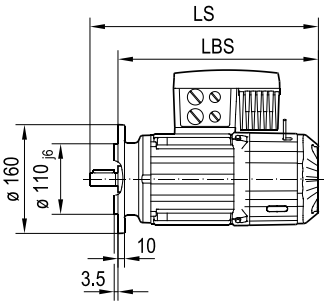
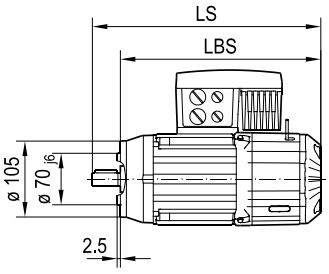
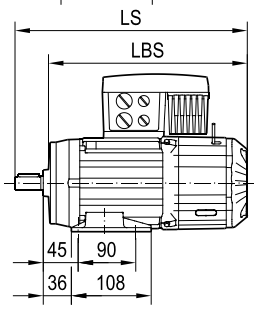




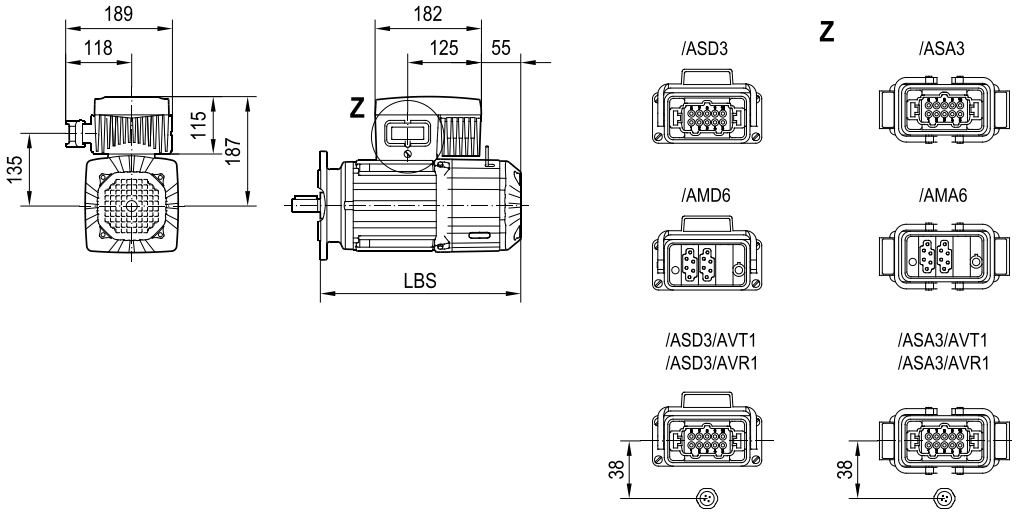




(→ 📖)	71MS	71M						
LS	299	319						
LBS (B5/B14)	269	289						
LBS (B3)	267	287						

MM03-MM07/IV

09 116 01 18
2(2)



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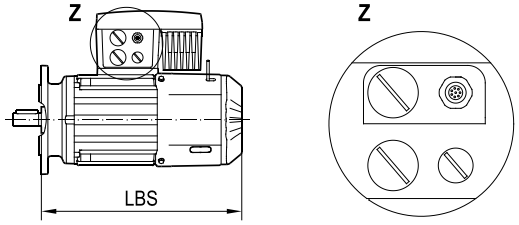
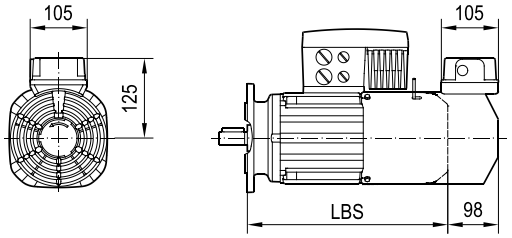


/MM-D../V



(→ 📖)	71MS	71M						
LS	299	319						
LBS (B5/B14)	269	289						
LBS (B3)	267	287						

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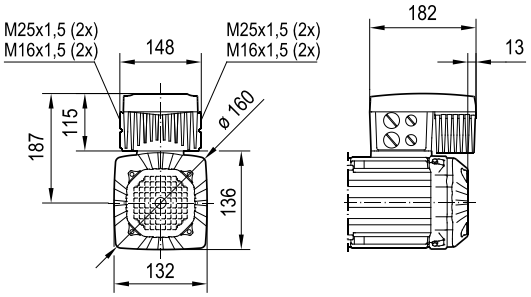
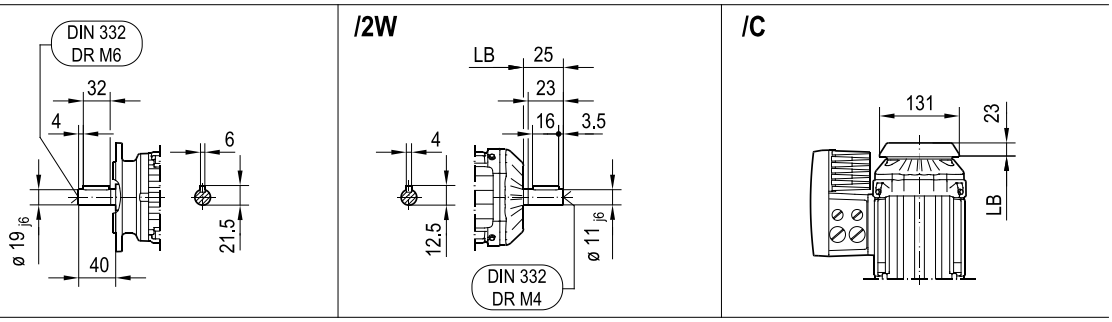
DR2S71M/MM

08 106 01 18
1(2)





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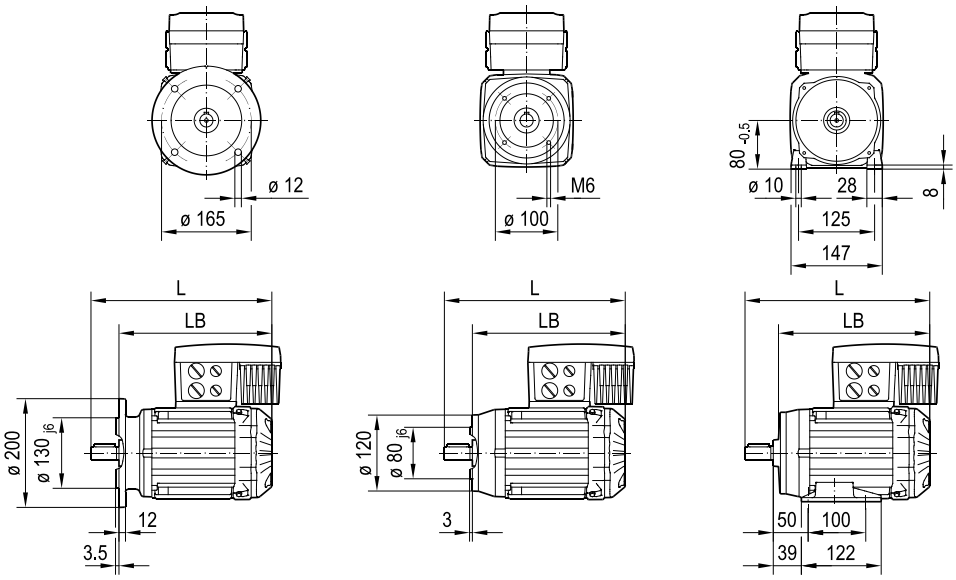

(→ 📖)	71M							
L	262							
LB (B5/B14)	222							
LB (B3)	220							

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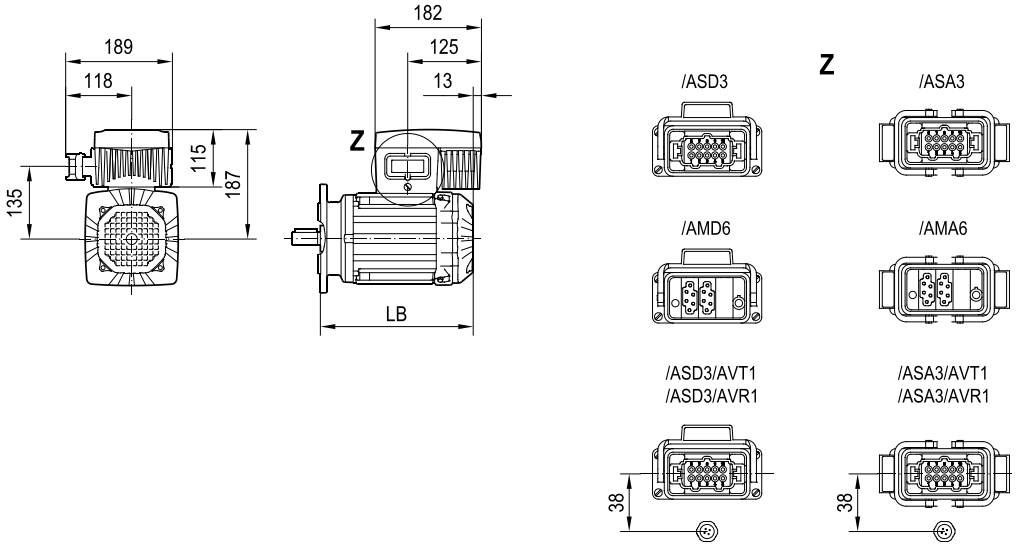
MM05-MM11/IV

08 106 01 18
2(2)



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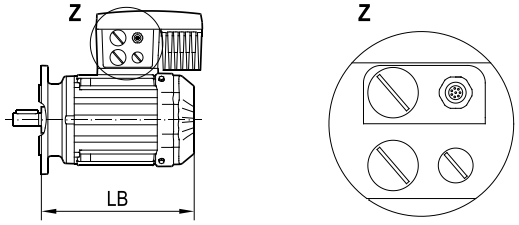

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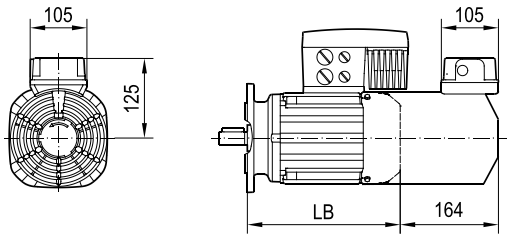

(→ 📖)	71M							
L	262							
LB (B5/B14)	222							
LB (B3)	220							

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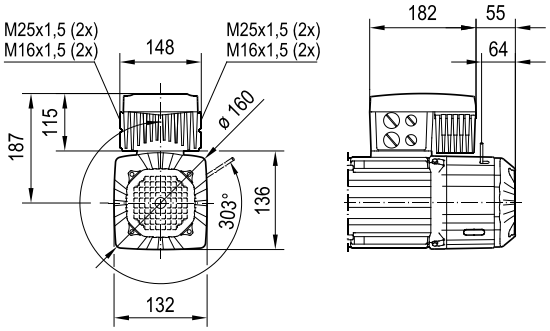
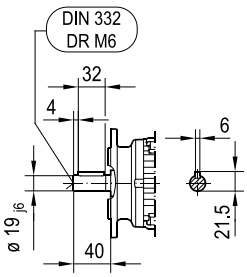
DR2S71M BE/MM

09 121 01 18
1(2)





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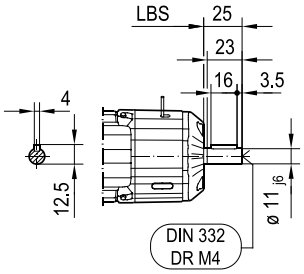

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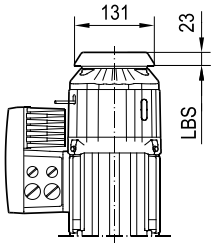

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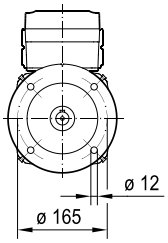

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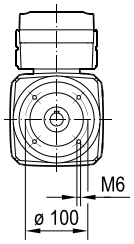
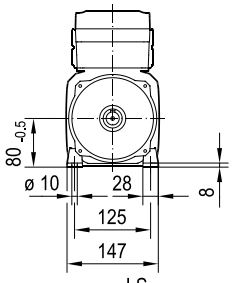
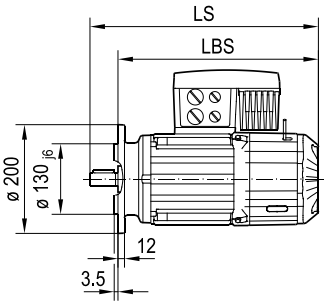
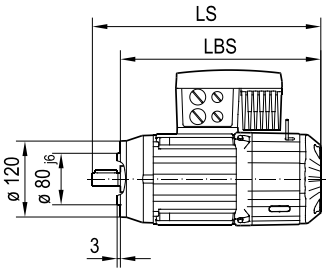
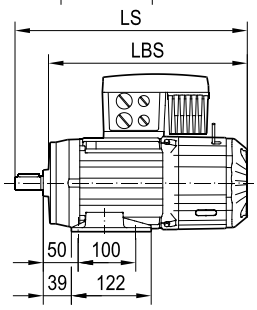


/FI (B3) FI80M









(→ 📖)	71M							
LS	329							
LBS (B5/B14)	289							
LBS (B3)	287							

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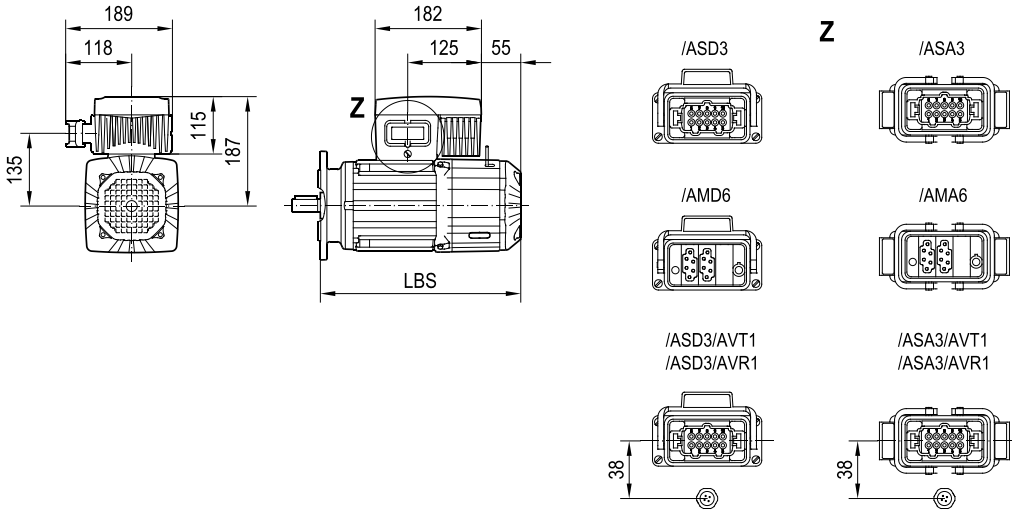
MM05-MM11/IV

09 121 01 18
2(2)



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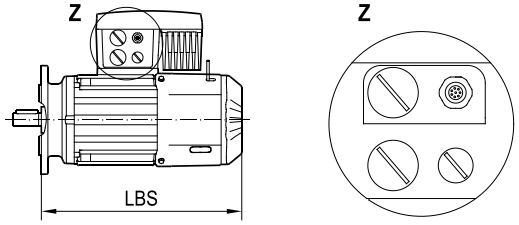
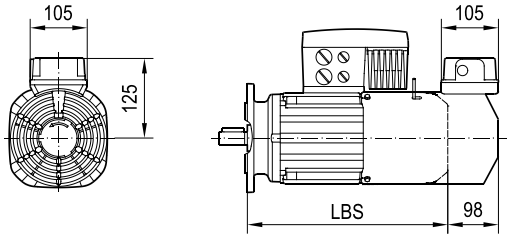


/MM-D../V

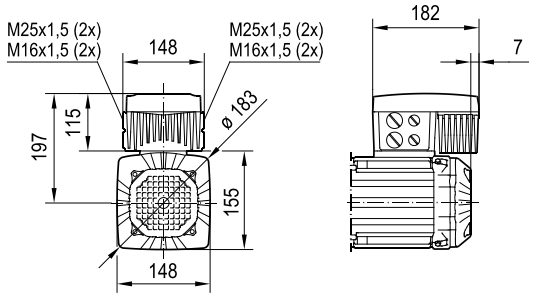


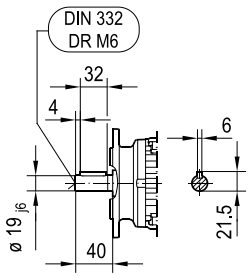
(→ 📖)	71M							
LS	329							
LBS (B5/B14)	289							
LBS (B3)	287							

25880748/EN – 11/2019

DRN80MK/MM
DR2S80MK/MM
DRN80M/MM

08 099 01 18
1(2)





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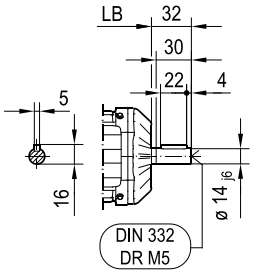
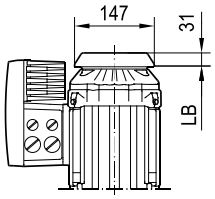


/C



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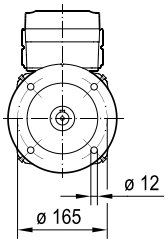
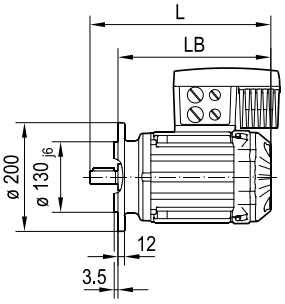
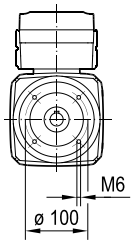
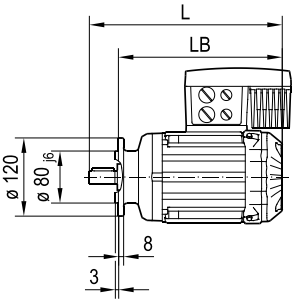




/FT (B14) FT100D120





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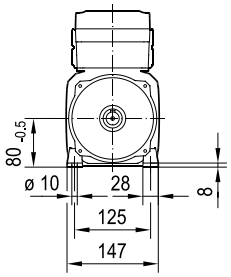

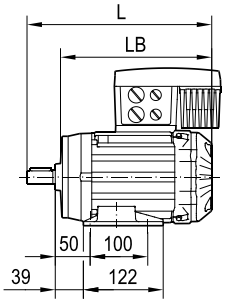

(→ 📖)	80MK	80M						
L	281	327						
LB (B5/B14)	241	287						
LB (B3)	239	285						

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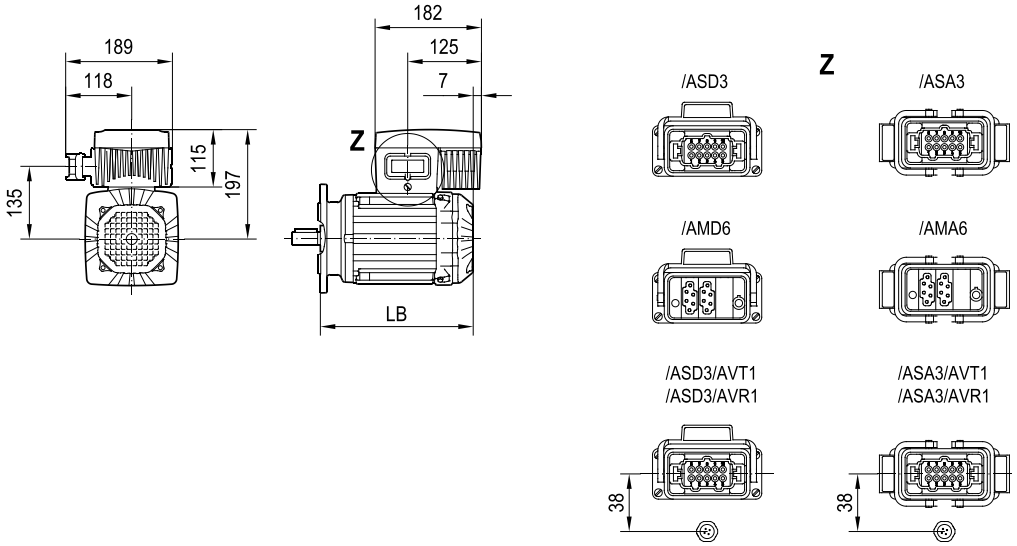
MM05-MM15/IV

08 099 01 18
2(2)



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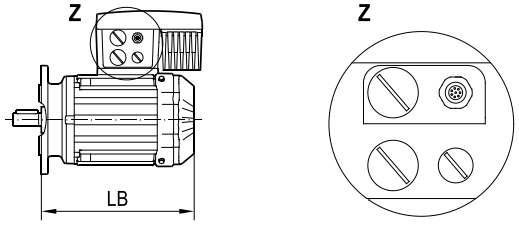

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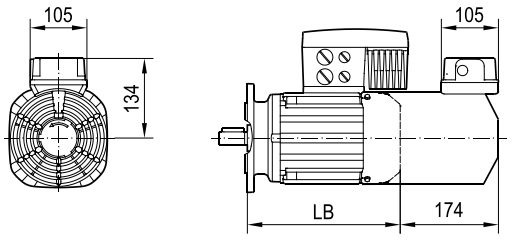

(→ 📖)	80MK	80M						
L	281	327						
LB (B5/B14)	241	287						
LB (B3)	239	285						

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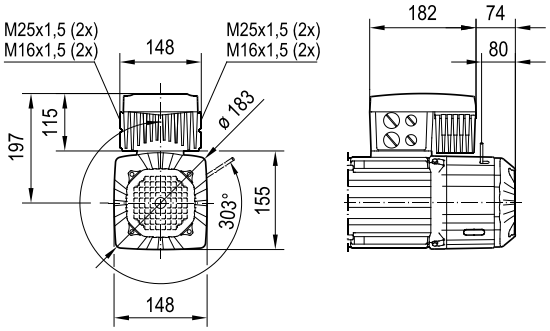
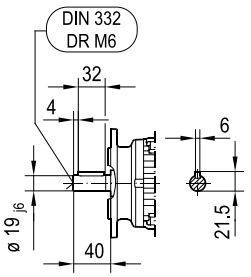
DRN80MK BE/MM
DR2S80MK BE/MM
DRN80M BE/MM

09 117 01 18
1(2)





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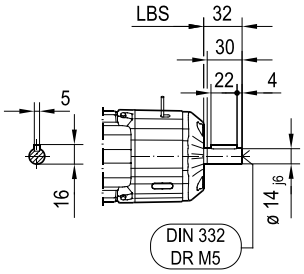

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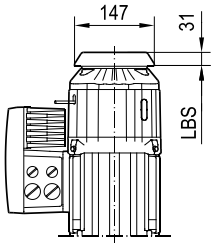

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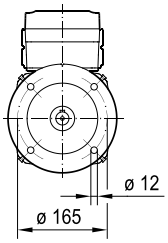

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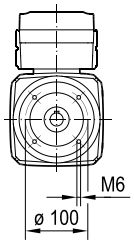

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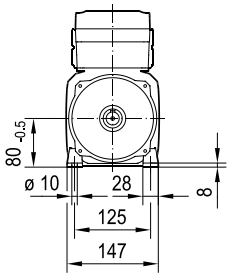

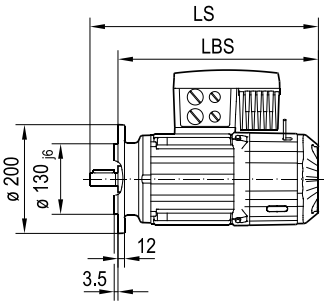

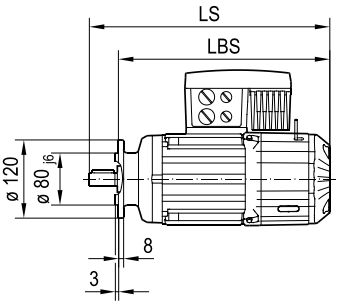

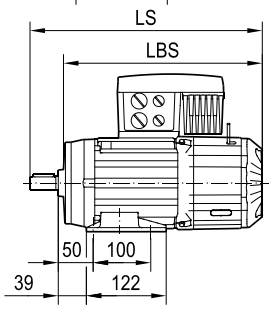

(→ 📖)	80MK	80M						
LS	362	408						
LBS (B5/B14)	322	368						
LBS (B3)	320	366						

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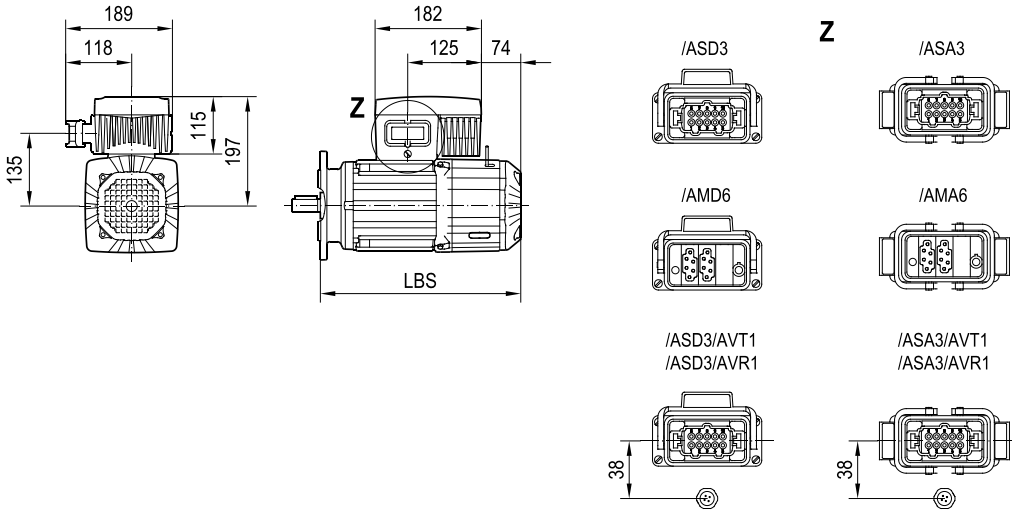
MM05-MM15/IV

09 117 01 18
2(2)



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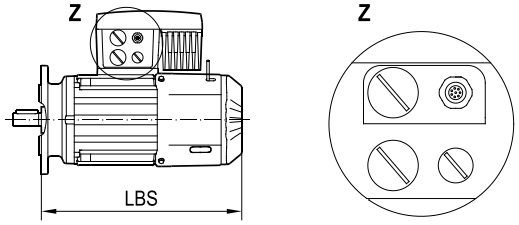
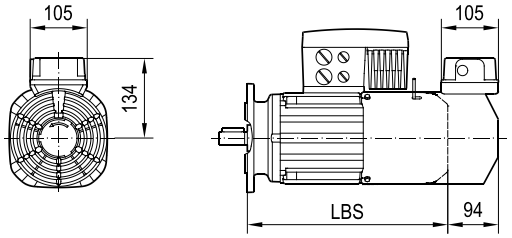


/MM-D../V

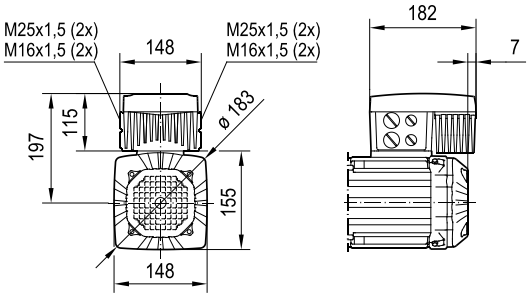


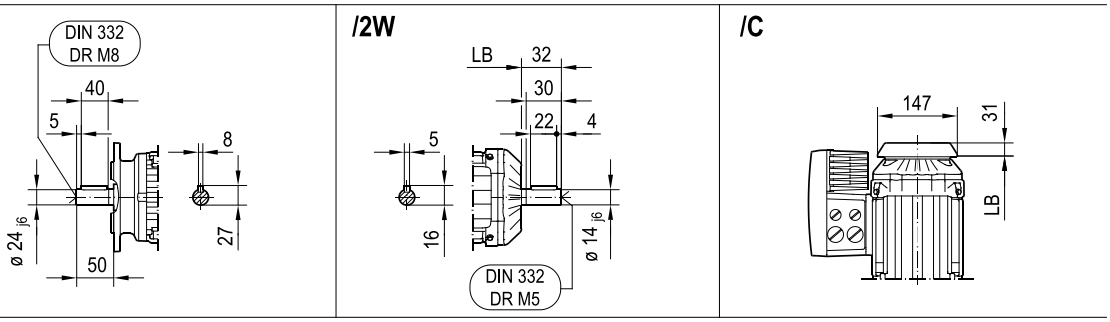
(→ 📖)	80MK	80M						
LS	362	408						
LBS (B5/B14)	322	368						
LBS (B3)	320	366						

25880748/EN – 11/2019

DR2S80M/MM

08 107 01 18
1(2)





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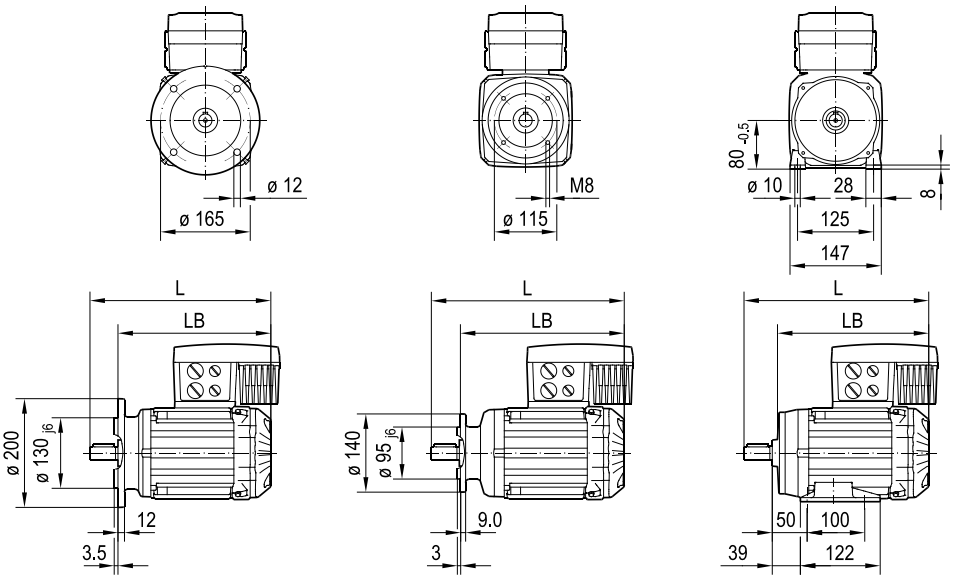

(→ 📖)	80M							
L	337							
LB (B5/B14)	287							
LB (B3)	285							

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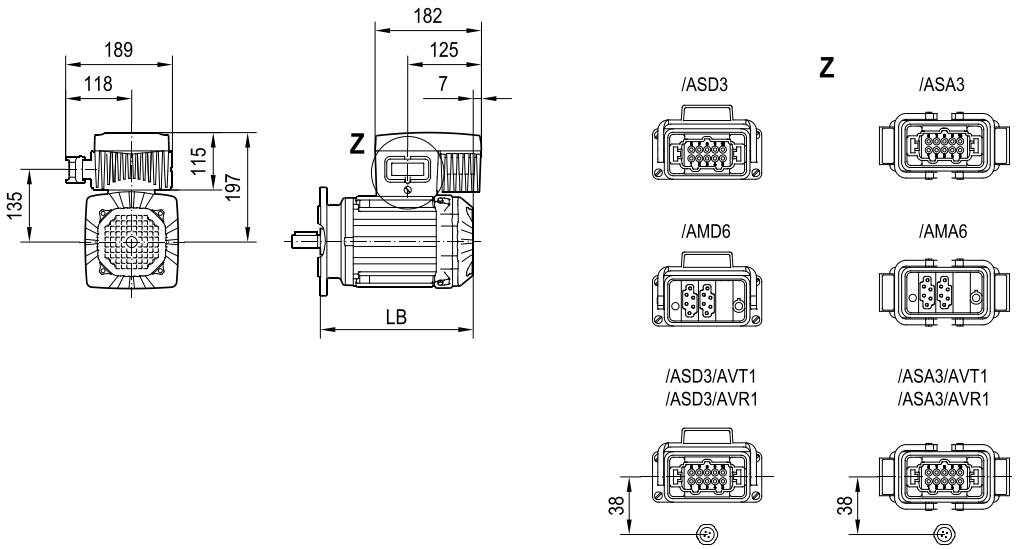
MM11-MM15/IV

08 107 01 18
2(2)



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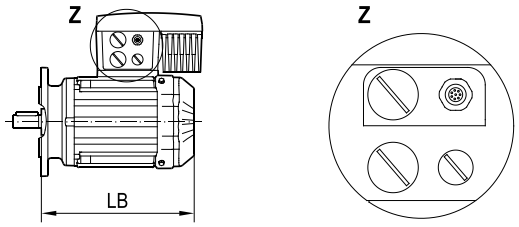
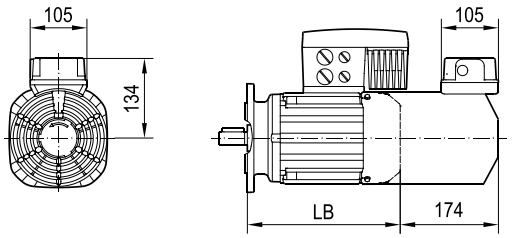


/MM-D../V

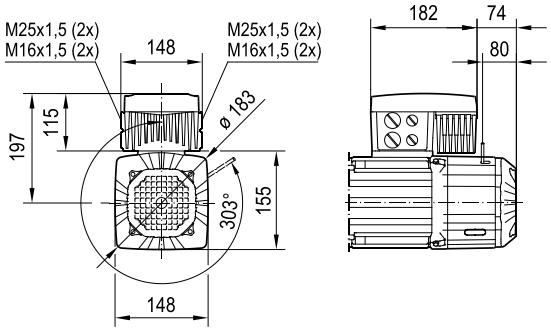


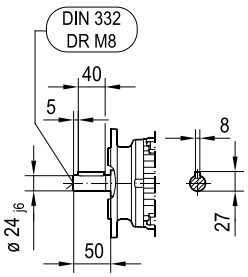
(→ 📖)	80M							
L	337							
LB (B5/B14)	287							
LB (B3)	285							

25880748/EN – 11/2019

DR2S80M BE/MM

09 122 01 18
1(2)





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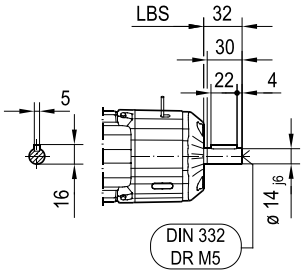

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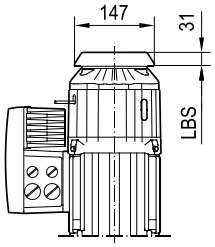

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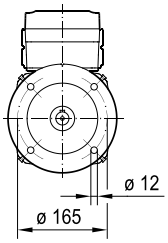

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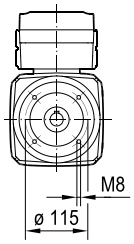

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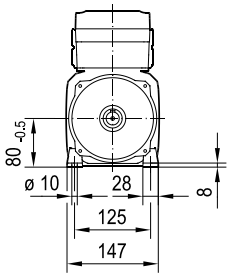

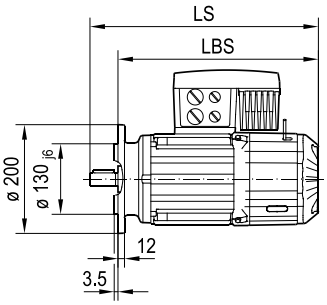

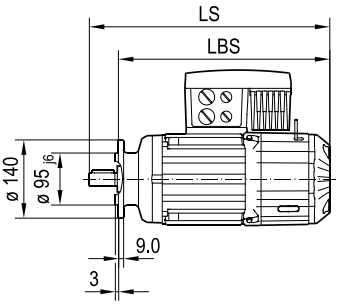

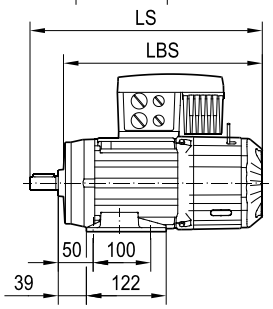

(→ 📖)	80M							
LS	418							
LBS (B5/B14)	368							
LBS (B3)	366							

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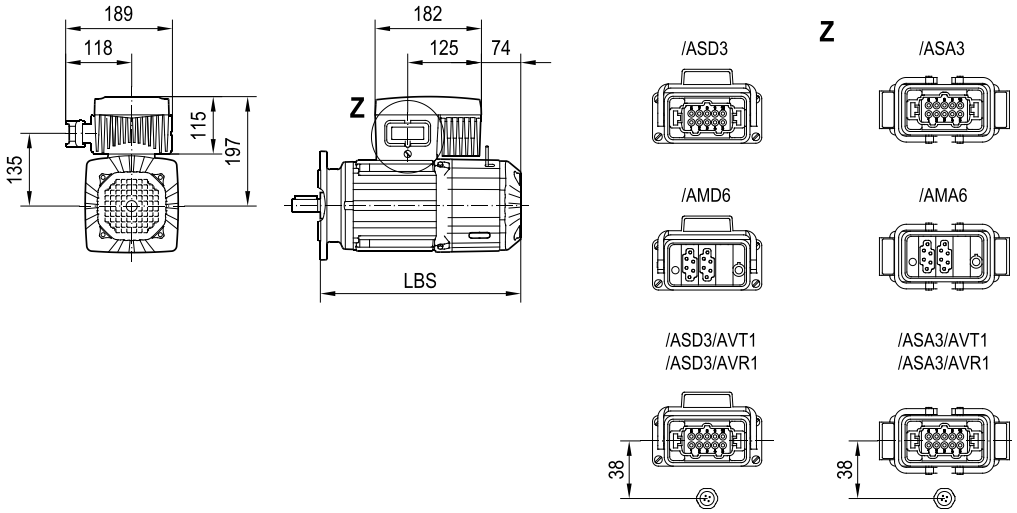
MM11-MM15/IV

09 122 01 18
2(2)



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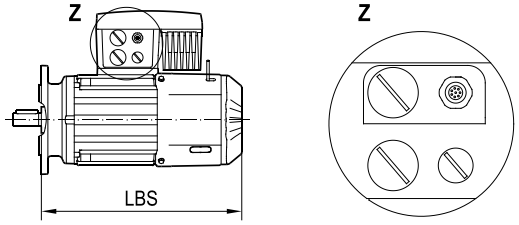

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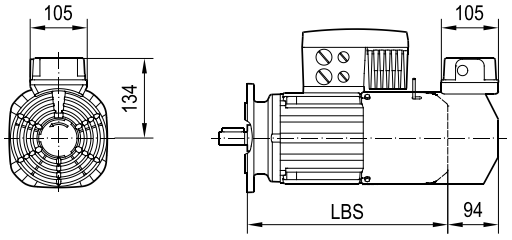
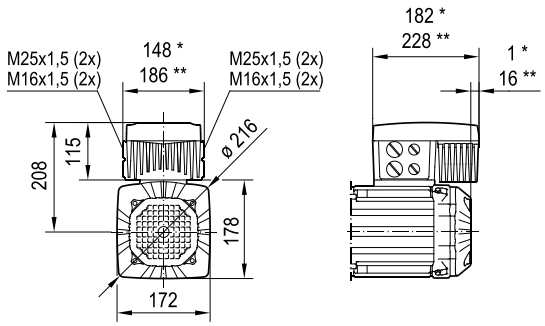


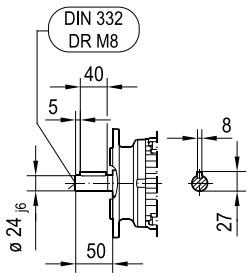
(→ 📖)	80M							
LS	418							
LBS (B5/B14)	368							
LBS (B3)	366							

25880748/EN – 11/2019

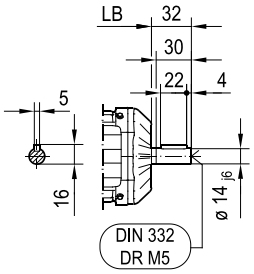
DRN90S/MM
DRN90L/MM

08 640 01 15
1(2)





/2W



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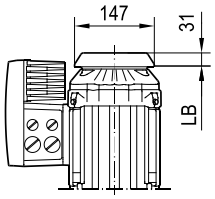

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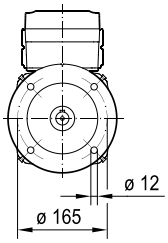

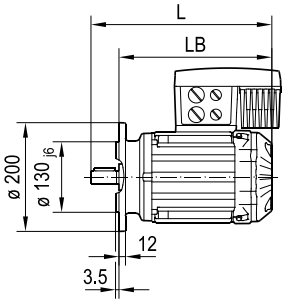

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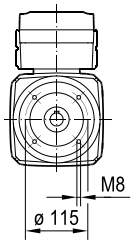

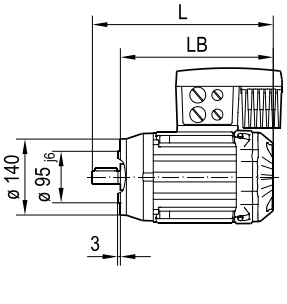

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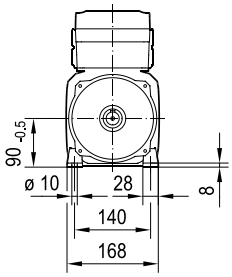
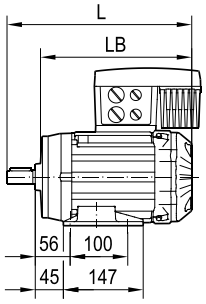
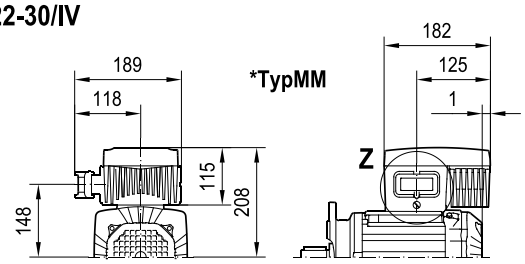


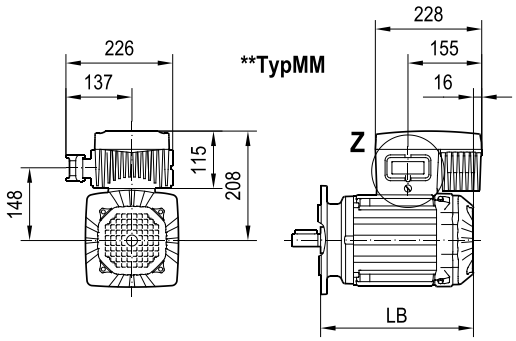


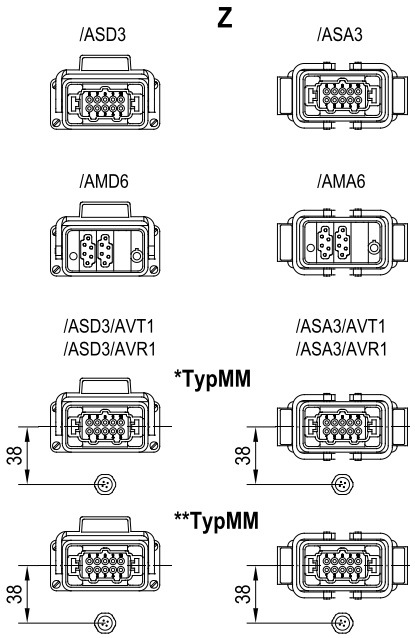
(→ 📖)	90S	90L						
L	331	363						
LB (B5/B14)	281	313						
LB (B3)	279	311						
***Typ MM**	*MM11-15	*MM15						
****Typ MM**	**MM22	**MM22-30						

08 640 01 15
2(2)

MM11-15/IV
MM22-30/IV







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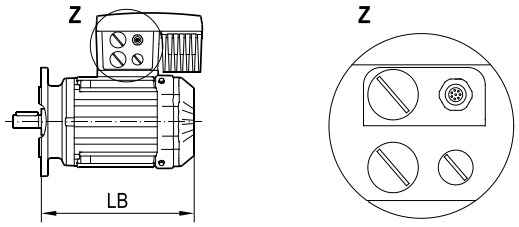
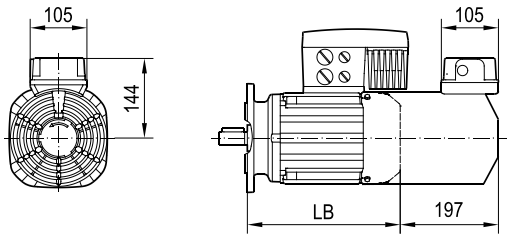


/MM-D../V



(→ 📖)	90S	90L						
L	331	363						
LB (B5/B14)	281	313						
LB (B3)	279	311						
***Typ MM**	*MM11-15	*MM15						
****Typ MM**	**MM22	**MM22-30						

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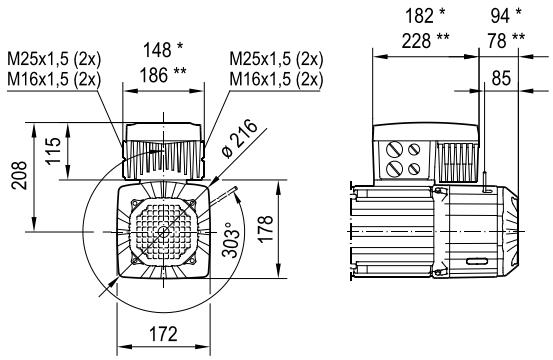
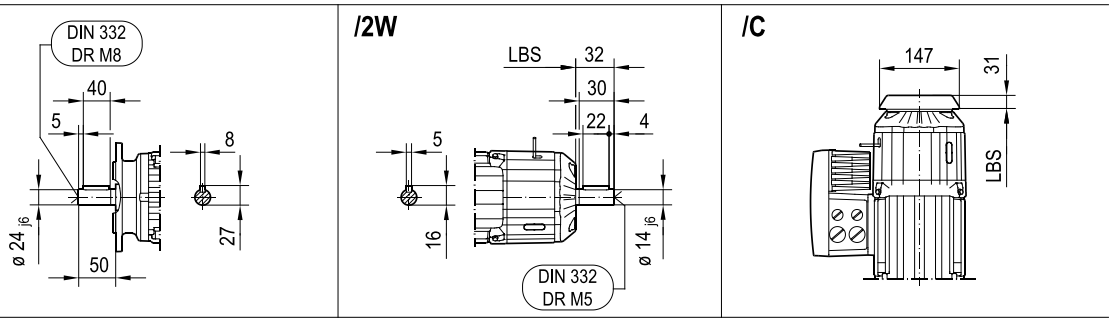
DRN90S BE/MM
DRN90L BE/MM

09 966 01 15
1(2)





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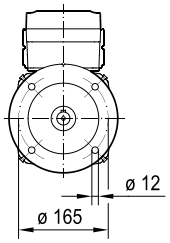

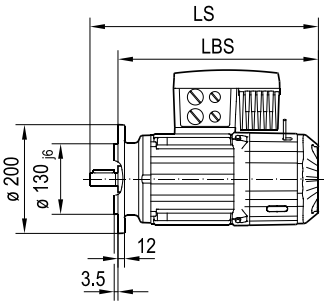

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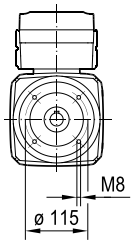

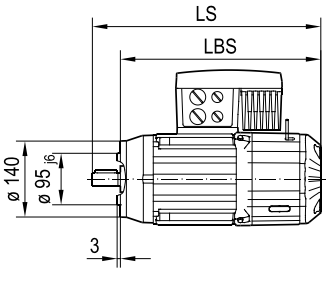

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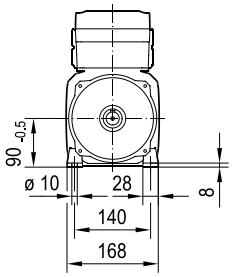

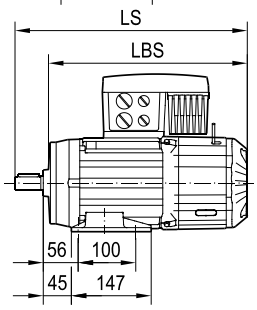

(→ 📖)	90S	90L						
LS	425	457						
LBS (B5/B14)	375	407						
LBS (B3)	373	405						
***Typ MM**	*MM11-15	*MM15						
****Typ MM**	**MM22	**MM22-30						

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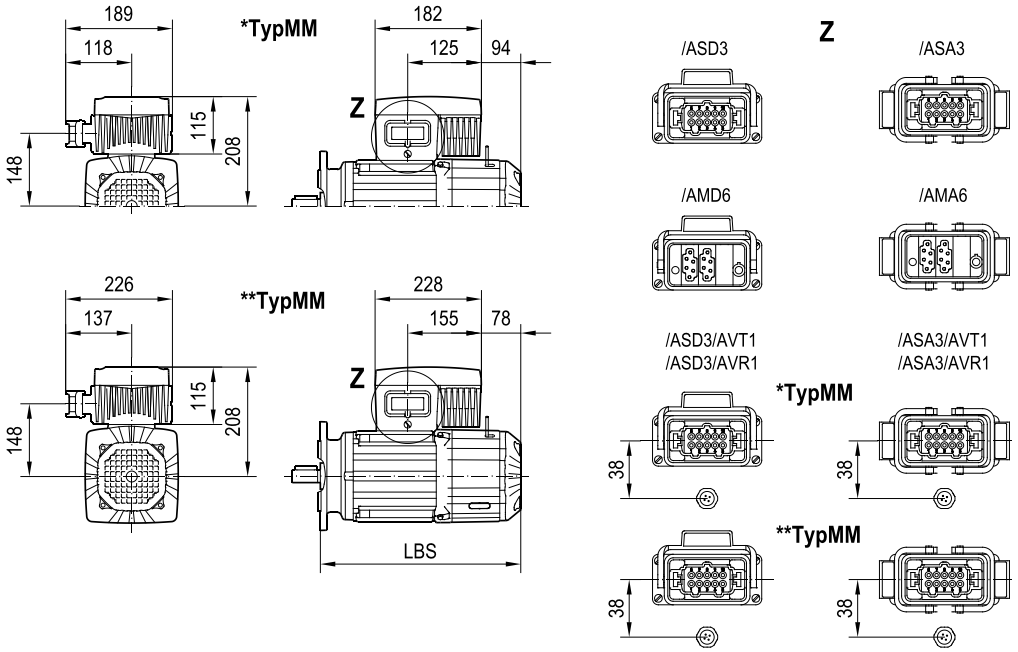
09 966 01 15
2(2)

MM11-15/IV
MM22-30/IV



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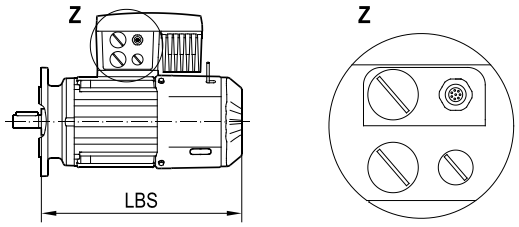
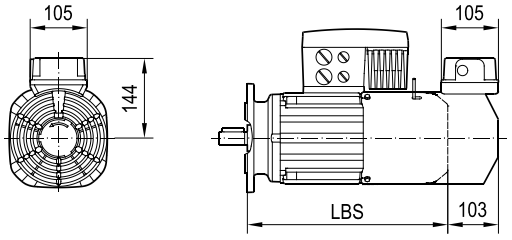


/MM-D../V



(→ 📖)	90S	90L						
LS	425	457						
LBS (B5/B14)	375	407						
LBS (B3)	373	405						
***Typ MM**	*MM11-15	*MM15						
****Typ MM**	**MM22	**MM22-30						

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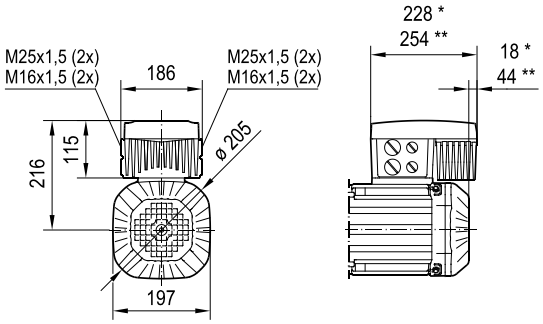
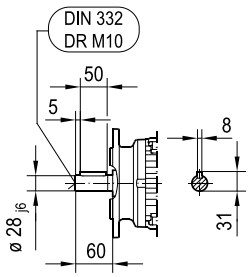
DRN100LS/MM
DRN100LM/MM
DRN100L/MM

08 642 01 15
1(2)





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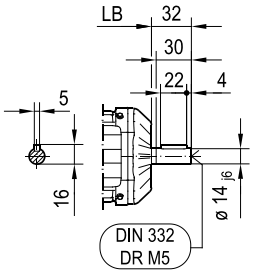
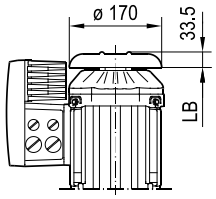


/C



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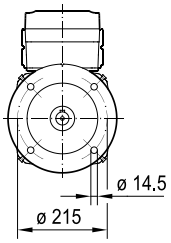
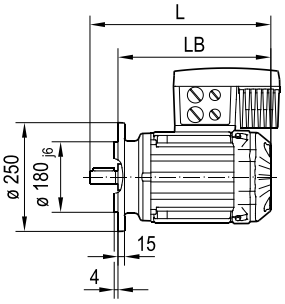
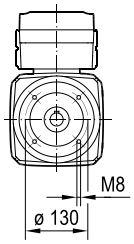
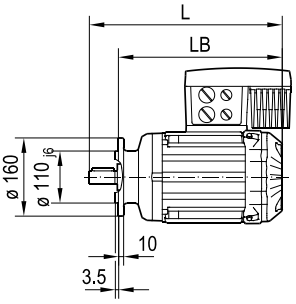


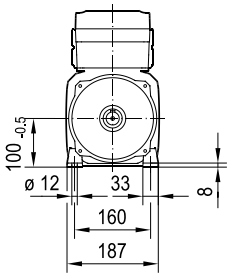


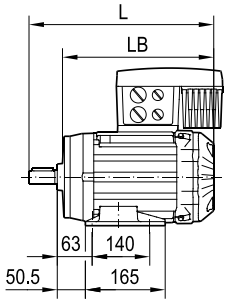
/FT (B14) FT130D160





/FI (B3)





(→ 📖)	100LS	100LM	100L					
L	369	419	419					
LB (B5/B14)	309	359	359					
LB (B3)	307	357	357					
***Typ MM**	*MM22-30	*MM30	*MM30					
****Typ MM**	**MM40	**MM40	**MM40					

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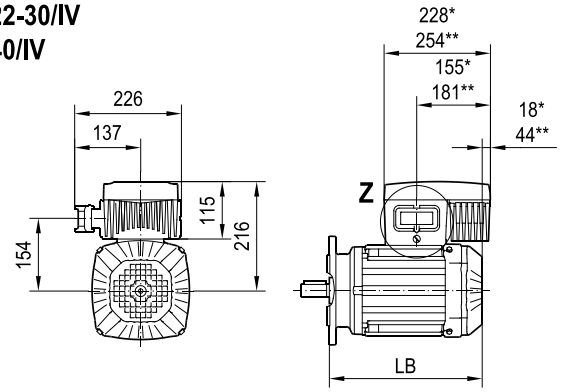
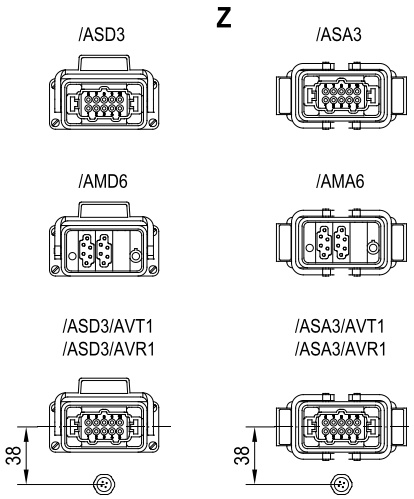
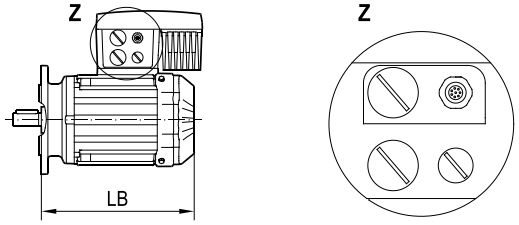
2(2)

MM22-30/IV
MM40/IV

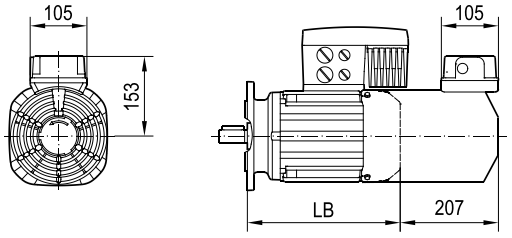




/MM-D../EI7./AV.E



/MM-D../V



(→ 📖)	100LS	100LM	100L					
L	369	419	419					
LB (B5/B14)	309	359	359					
LB (B3)	307	357	357					
***Typ MM**	*MM22-30	*MM30	*MM30					
****Typ MM**	**MM40	**MM40	**MM40					

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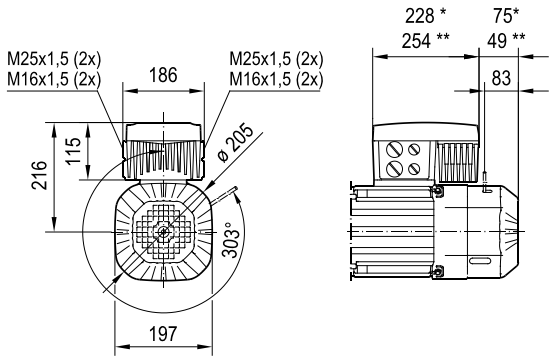
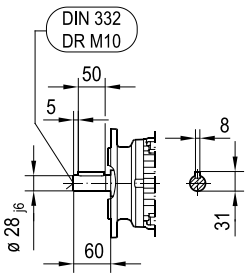
DRN100LS BE/MM
DRN100LM BE/MM
DRN100L BE/MM

09 968 01 15
1(2)





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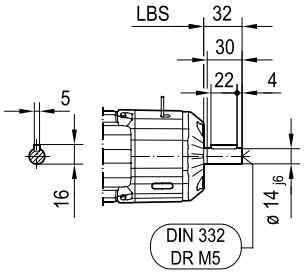
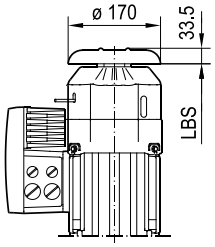
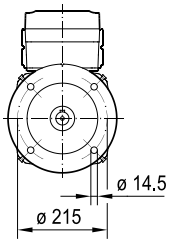


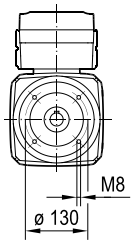
/C



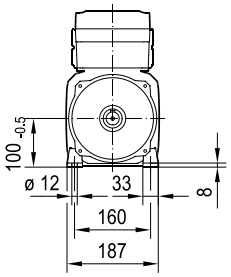
/FF (B5) FF215D250

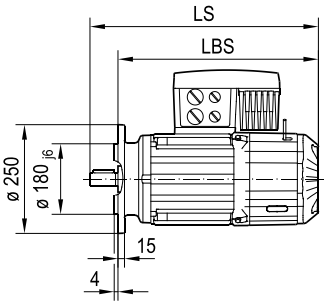


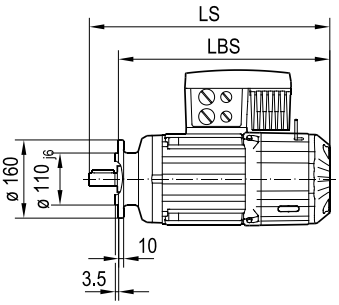
/FT (B14) FT130D160

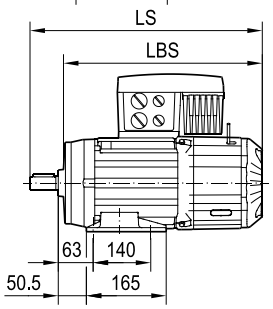


/FI (B3)









(→ 📖)	100LS	100LM	100L					
LS	462	512	512					
LBS (B5/B14)	402	452	452					
LBS (B3)	400	450	450					
***Typ MM**	*MM22-30	*MM30	*MM30					
****Typ MM**	**MM40	**MM40	**MM40					

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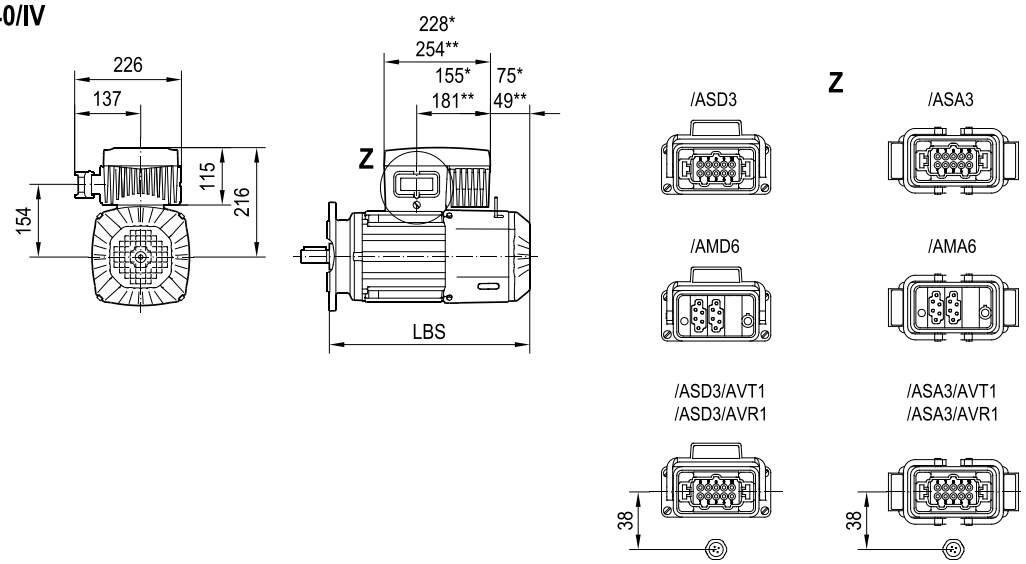
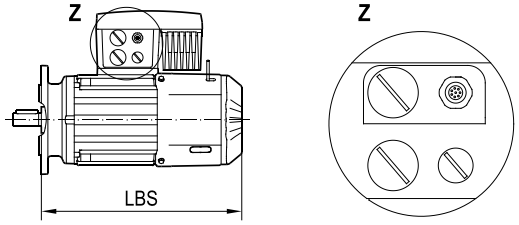
09 968 01 15
2(2)

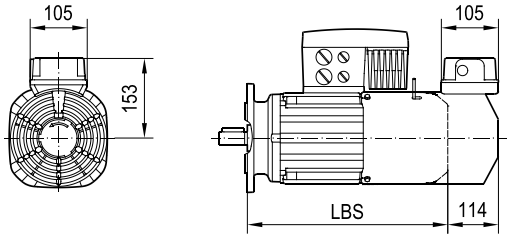
MM22-30/IV
MM40/IV



/MM-D../EI7./AV.E



/MM-D../V



(→ 📖)	100LS	100LM	100L					
LS	462	512	512					
LBS (B5/B14)	402	452	452					
LBS (B3)	400	450	450					
***Typ MM**	*MM22-30	*MM30	*MM30					
****Typ MM**	**MM40	**MM40	**MM40					

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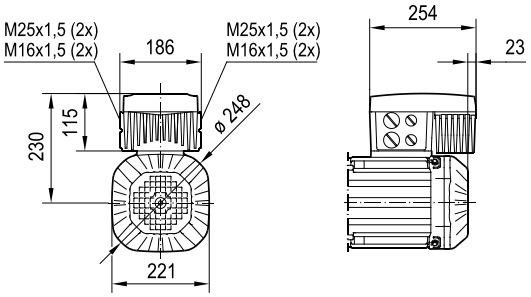
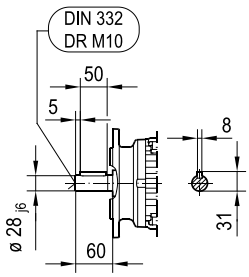
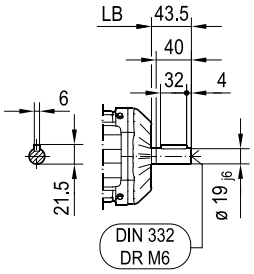
DRN112M/MM

08 644 01 15
1(2)

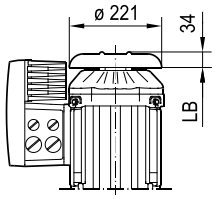




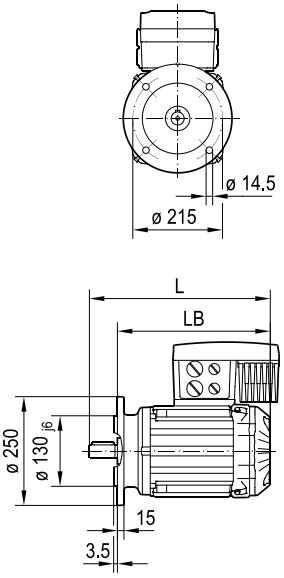
/2W



/C



/FF (B5) FF215D250



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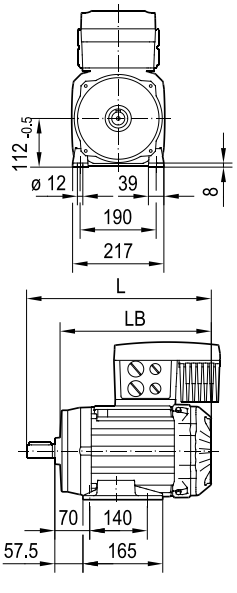
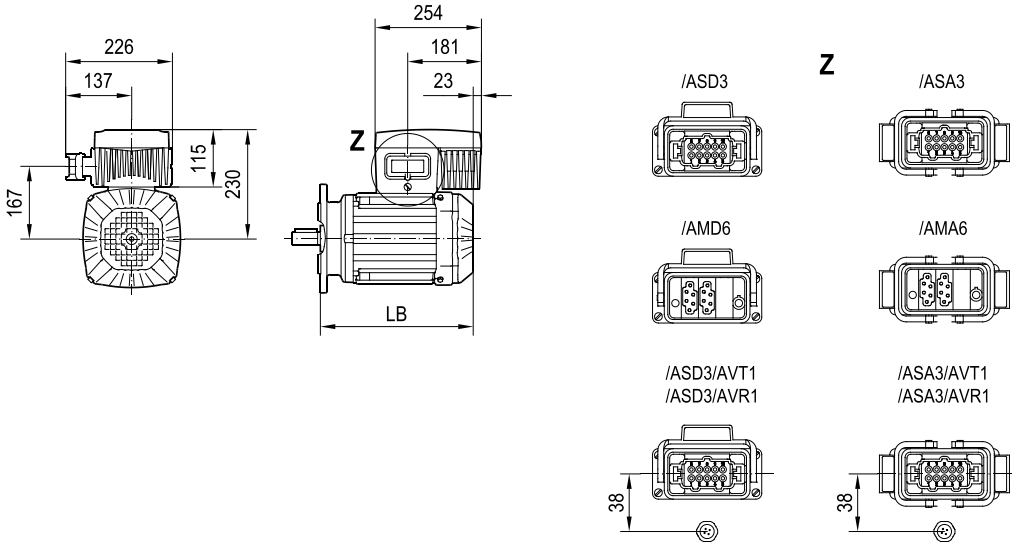


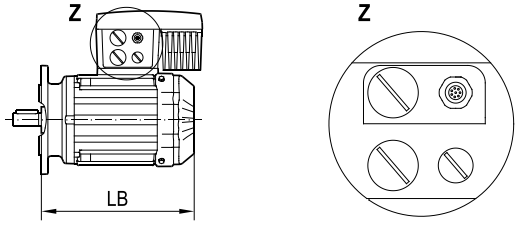
(→ 📖)	112M							
L	447							
LB (B5/B14)	387							
LB (B3)	385							

MM40/IV

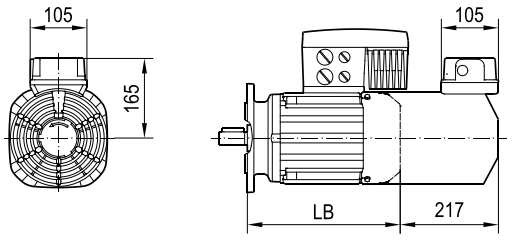
08 644 01 15
2(2)



/MM-D../EI7./AV.E



/MM-D../V



(→ 📖)	112M							
L	447							
LB (B5/B14)	387							
LB (B3)	385							

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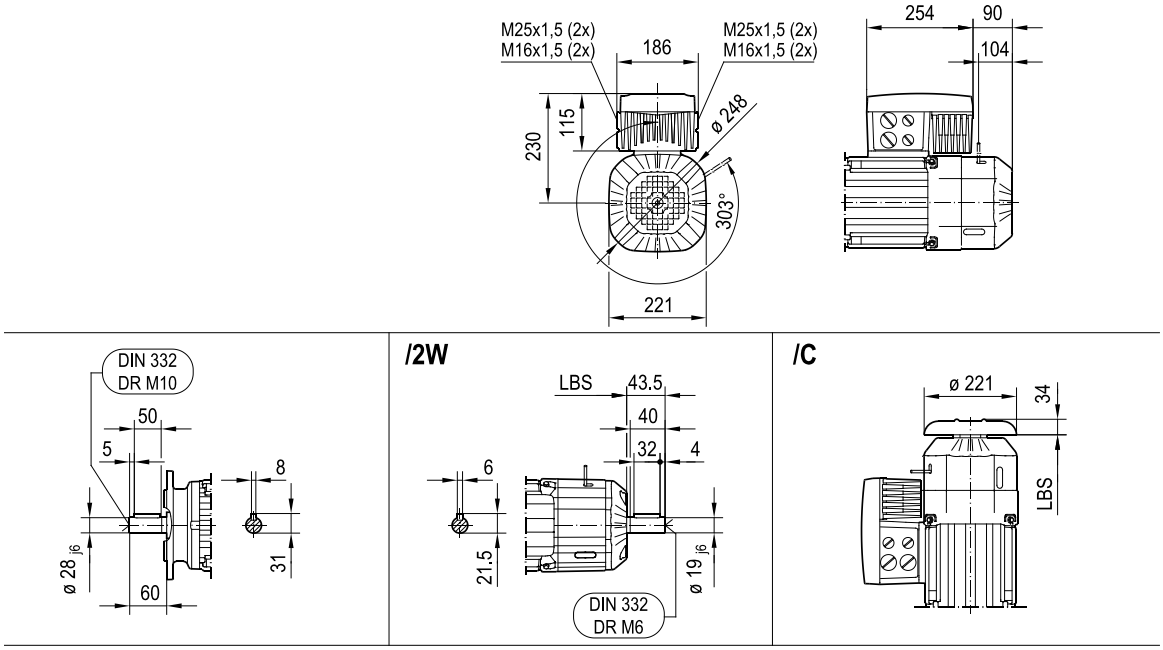
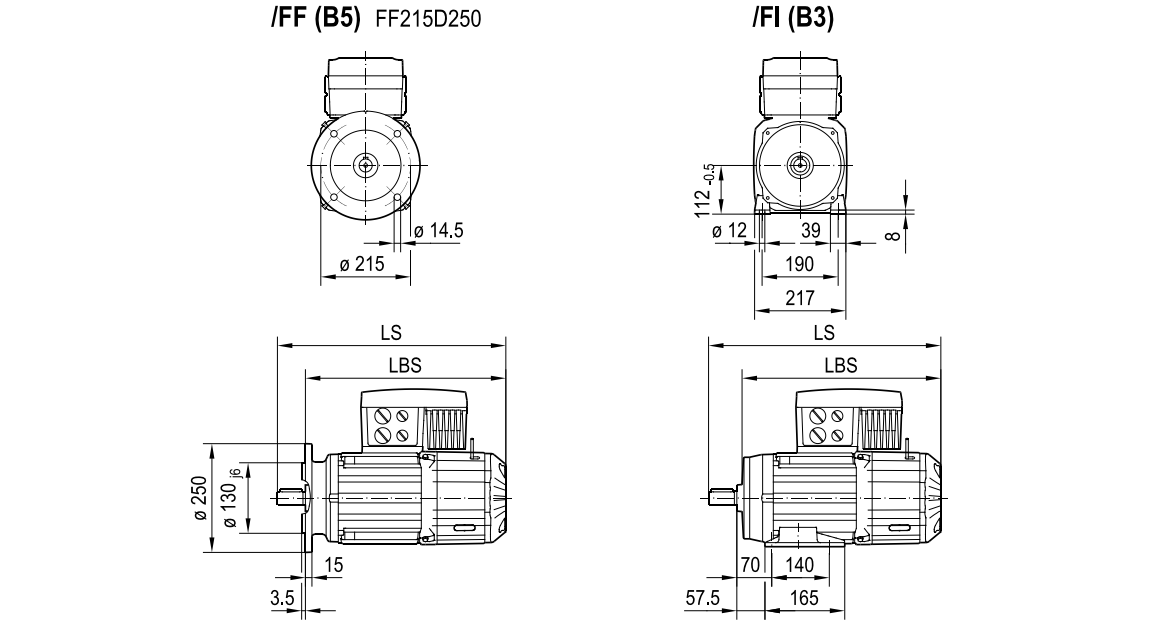
DRN112M BE/MM

09 970 01 15
1(2)

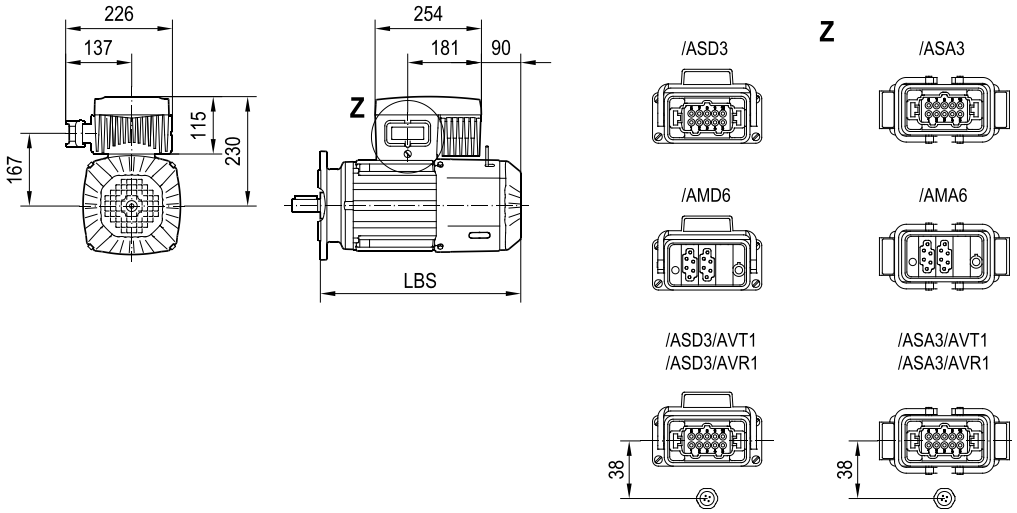




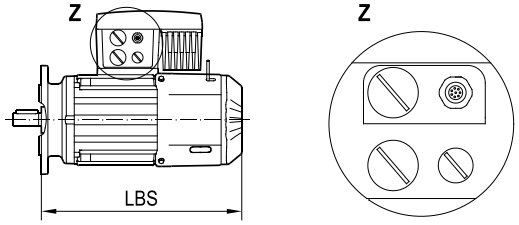
(→ 📖)	112M							
LS	559							
LBS (B5/B14)	499							
LBS (B3)	497							

MM40/IV

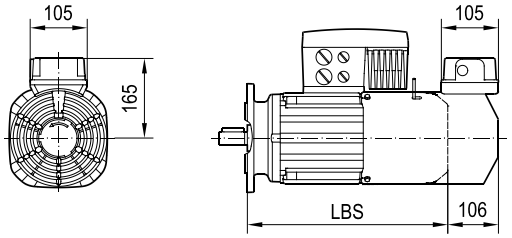
09 970 01 15
2(2)



/MM-D../EI7./AV.E



/MM-D../V



(→ 📖)	112M							
LS	559							
LBS (B5/B14)	499							
LBS (B3)	497							

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9.1.3 Information about drive selection

Project planning

Note the following information for the project planning of MOVIMOT® drives:

- The suitable MOVIMOT® drive is selected with regard to the speed, power, torque, and spatial conditions of the application.

  See selection tables in the "MOVIMOT® Gearmotors" catalog.
- For detailed project planning information, technical data, and information about the communication of MOVIMOT® via fieldbus interfaces, refer to the relevant MOVIMOT® documentation and to the documentation for the associated fieldbus interfaces/field distributors.
- In the next step, the required options are specified.
- MOVIMOT® can be used for hoist applications with restrictions only.

  Please contact SEW-EURODRIVE to inquire about suitable solutions with MOVITRAC®, MOVIFIT®, MOVIPRO® or MOVIDRIVE®.

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9.1.4 Order information

Motor requirements for mounting close to the motor

This chapter describes the main requirements and restrictions that apply to selecting a MOVIMOT® drive. Bear this information in mind when placing the order.

Permitted motors

The only permitted motors are those with nominal voltages of AC 3 x 230/400 V, 50 Hz. These motors are listed in the following chapters:

- Motor assignment MOVIMOT® (close to the motor) 280 – 1400 min^{-1} (→ 🗎 397)
- Motor assignment MOVIMOT® (close to the motor) 290 – 2900 min^{-1} (→ 🗎 398)

SEW-EURODRIVE recommends to always order the motor with **TH thermostat** (bi-metallic switch). Motor protection can also be implemented in the Expert mode of the MOVIMOT® inverter.

Permitted brakes

The following assignment of motors and brakes, which differs from that for standard motors, applies to the combination with MOVIMOT® drives:

Motor type	Standard brake type	Optional brake type
DR2S63M4	BE03	-
DRN71MS4	BE03	BE05
DR2S71MS4	BE05	BE1
DRN71M4	BE05	BE1
DR2S71M4 DR2S80MK4 DRN80M4 DRN80MK4	BE1	BE05
DR2S80M4 DRN90S4	BE2	BE1
DRN90L4	BE2	BE1
DRN100LS4	BE5	BE2
DRN100L4	BE5	BE2
DRN112M4	BE5	BE11

MOVIMOT®, type	**Brake voltage**
MM..D-503, size 1 (MM03.. – MM15..)	230 V
MM..D-503, size 2 (MM22.. – MM40..)	120 V

Brake rectifier

Always order the assigned motor without brake rectifier.

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Plug connectors

Only the following plug connectors are permitted for the motors:

- ASB4 plug connector
- ISU4 plug connector

Braking resistors

For more information on braking resistors available for MOVIMOT® drives, refer to the "Drive System for Decentralized Installation" catalog.

Hybrid cables

For more information on hybrid cables available for connecting the MOVIMOT® drive with the motor, refer to the "Drive System for Decentralized Installation" catalog.

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9.2 MOVI-SWITCH®

9.2.1 Description

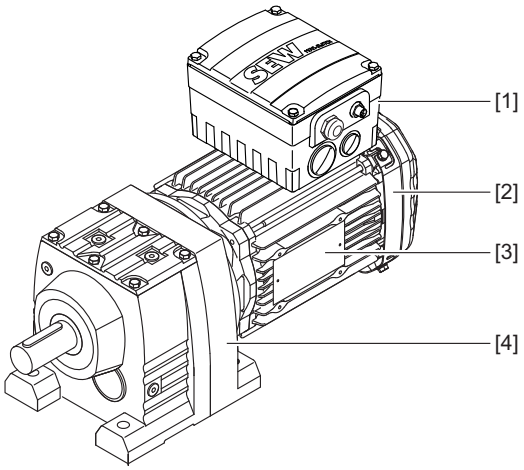
MOVI-SWITCH® is an AC motor with integrated switching and protection functions in the power range between 0.09 and 3.0 kW. The motor starter can either be mounted directly on the motor or close to the motor. Even with integrated motor starter, a MOVI-SWITCH® drive is not much larger than a motor without integrated motor starter.

A MOVI-SWITCH® motor starter can be installed close to the motor using a mounting plate. The motor starter is connected to the assigned motor using a prefabricated hybrid cable.

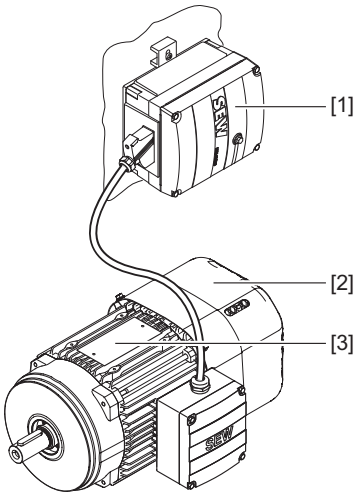
MOVI-SWITCH® is a particularly efficient solution for decentralization with power performance up to 3 kW. As the switching and protection functions are integrated into the motor terminal box, this compact and sturdy gearmotor does not require any additional cables.

MOVI-SWITCH® is available as (gear)motor with or without brake.

MOVI-SWITCH® drive
with integrated motor starter



MOVI-SWITCH® 2S drive
with mounting close to the motor



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[1] MOVI-SWITCH® motor starter
[2] Motor
[3] Drive nameplate
[4] Helical gear unit

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Advantages of MOVI-SWITCH®

MOVI-SWITCH® offers the following advantages:

- The switching and protection functions are completely integrated, saving control cabinet space and cabling.
- Integrated mechatronic solution, robust and compact.

Designs

MOVI-SWITCH® drives are available in various designs so they can be used to implement all kinds of installation topologies.

MOVI-SWITCH® motor starters can be combined with 4-pole DRN.. motor sizes 71MS to 100L (0.25 to 3 kW).

- MOVI-SWITCH® drive **standard design** (e.g. binary control)
  - With integrated motor starter

    MOVI-SWITCH® **1E** (1 direction of rotation)

    MOVI-SWITCH® **2S** (2 directions of rotation)
  - Mounted close to the motor

    MOVI-SWITCH® **2S** (2 directions of rotation)
- MOVI-SWITCH® drive with **AS-Interface**
  - With integrated motor starter

    MOVI-SWITCH® **2S** (2 directions of rotation)
  - Mounted close to the motor

    MOVI-SWITCH® **2S** (2 directions of rotation)

The AS-Interface option is located on the connection board in the connection box.

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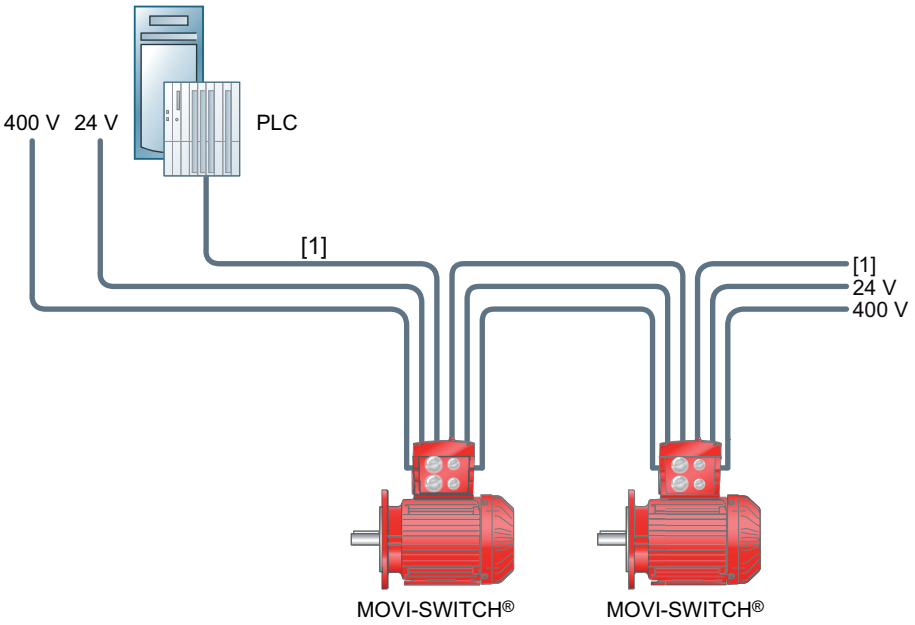
Installation topology of MOVI-SWITCH®

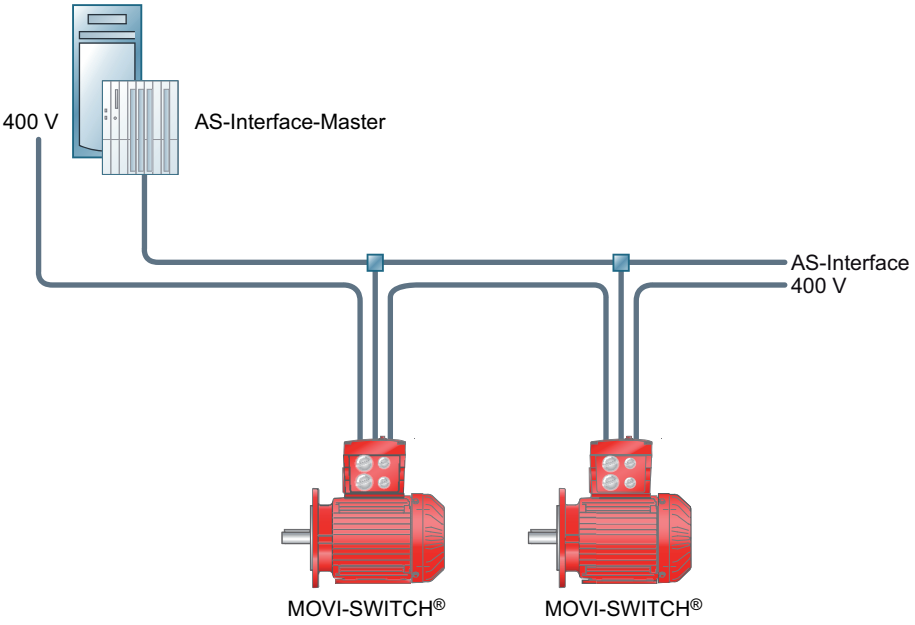
The following figure shows the basic installation topology of the MOVI-SWITCH® drive with binary control:



5069105163

[1] Control: binary

The following figure shows the basic installation topology of the MOVI-SWITCH® drive with AS-Interface (DC 24 V supply via AS-Interface):



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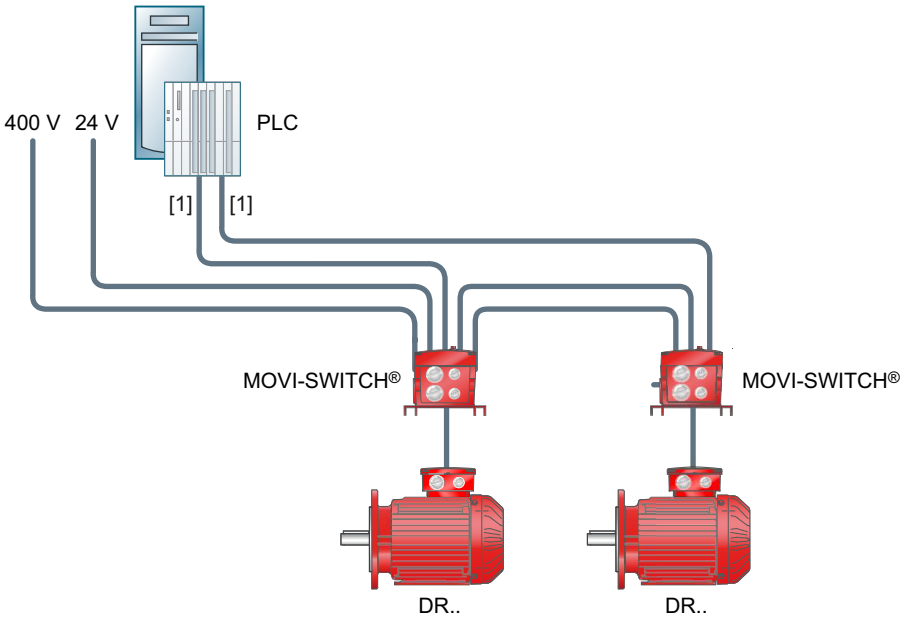
Installation topology of MOVI-SWITCH®, mounted close to the motor

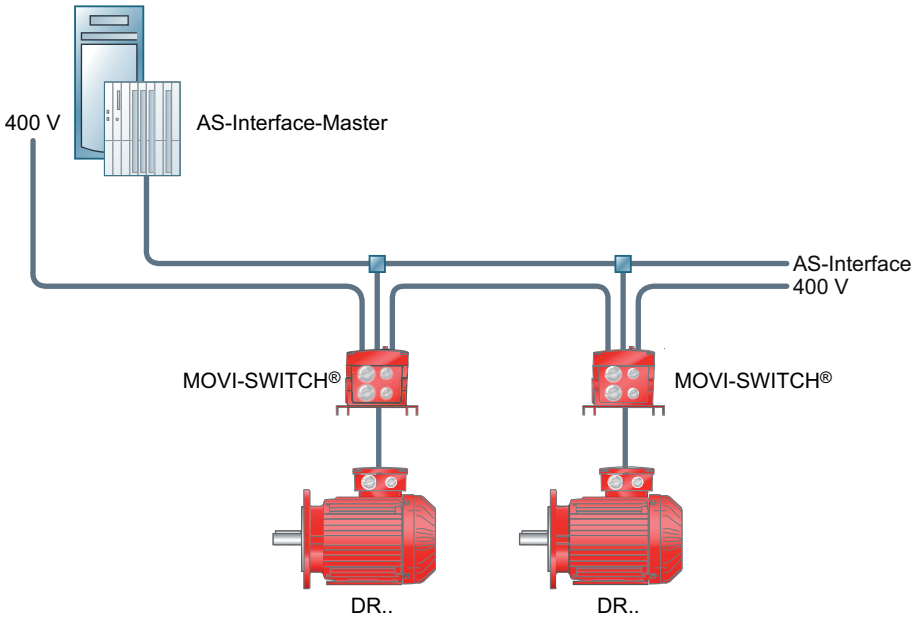
The following figure shows the basic installation topology of the MOVI-SWITCH® drive for mounting close to the motor with binary control:



5068999307

[1] Control: binary

The following figure shows the basic installation topology of the MOVI-SWITCH® drive with AS-Interface when mounted close to the motor (DC 24 V supply via AS-Interface):



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9.2.2 Technical details

Features of MOVI-SWITCH® 1E

- MOVI-SWITCH® 1E is an AC motor with integrated electronic on/off switch for one direction of rotation and integrated full motor protection.
- Switching the star point with power semiconductors connects or disconnects the current flow to the motor.
- The BGW brake control integrated as standard ensures short response times (brake voltage = motor voltage/$\sqrt{3}$, alternatively motor voltage).

Features of MOVI-SWITCH® 2S

- MOVI-SWITCH® 2S is an AC motor with integrated electronic on/off switch for two directions of rotation and integrated full motor protection.
- The direction of rotation is reversed by a reversing contactor combination with a long service life.
- MOVI-SWITCH® 2S is available in two designs:
  - C**B**0: Binary control
  - C**K**0: With integrated AS-Interface
- Supply system monitoring, brake control as well as switching and protection functions are implemented in the controller.
- The various operating states are indicated by a status LED.
- With the CB0 design (binary control), the connection assignment for clockwise direction of rotation (CW) is compatible to MOVI-SWITCH® 1E.
- With the CK0 design (with integrated AS-Interface), the connection assignment is compatible to MOVIMOT® with integrated AS-Interface.

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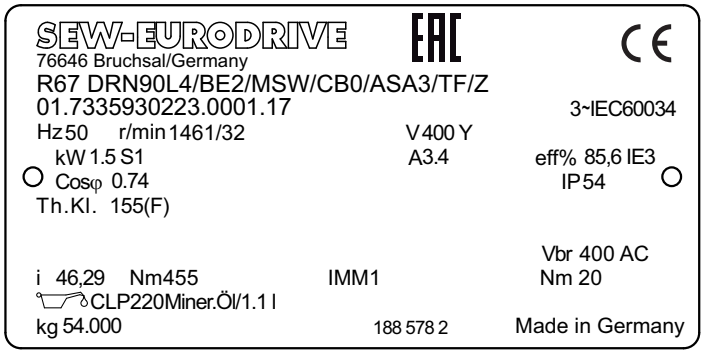
Type designations

Type designation of MOVI-SWITCH®

Nameplate

The following figure gives an example of a MOVI-SWITCH® drive nameplate:



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Type designation

The following table shows an example of the type designation of the MOVI-SWITCH® 2S drive **R67 DRN90L4/BE2/MSW/CB0/ASA3/TF/Z**:

R	**Gear unit series**	
67	**Gear unit size**	
DRN..	**Motor type**	
90L	**Motor size**	
4	**Number of motor poles**	
/		
BE	**Brake option**	
2	**Brake size**	
/		
MSW	**MOVI-SWITCH® motor starter**	
/		
C	**Control**[1)]	
B	**Signal type**[1)]	B = Binary K = AS-Interface
0	**Design**[1)]	0 = Standard
/		
ASA3	**Plug connector option**	
/		
TF	**Temperature sensor (standard)**	
/		
Z	**Motor option flywheel fan**	

1) Only for MOVI-SWITCH® 2S

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Type designation of MOVI-SWITCH®, mounted close to the motor

MOVI-SWITCH® drives with mounting plate for mounting close to the motor are only available in combination with MOVI-SWITCH® 2S.

Nameplate

The following figure gives an example of the nameplate of the MOVI-SWITCH® motor starter for mounting close to the motor:

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Type designation

The following table shows the type designation of the MOVI-SWITCH® motor starter **MSW-2S-07A/CK0/P22A/RI2A/ALA4** for mounting close to the motor:

MSW	**MOVI-SWITCH® motor starter**	
-		
2S	**MOVI-SWITCH® design**	
-		
07	**Rated operating current**	07 = 7.0 A
A	**Version**	
/		
C	**Control**	
K	**Signal type**	B = Binary control K = Control via AS-Interface
0	**Design**	0 = Standard
/		
P22A	**Adapter for mounting close to the motor**	
/		
RI2A	**Connection box design**	
/		
ALA4	**Plug connector** for connection to the motor	

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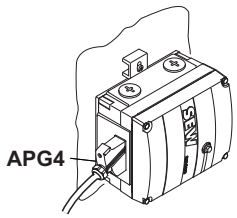
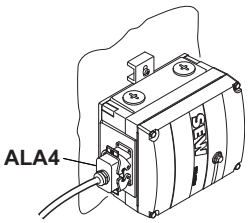
Installation close to the motor MOVI-SWITCH®

The following table shows the type designations of available MOVI-SWITCH® drives with P2.A mounting plate for mounting close to the motor:

Connection to the motor	MOVI-SWITCH® binary control	MOVI-SWITCH® with integrated AS-Interface
APG4  	MSW-2S-07A/CB0/ P22A/RV4A/APG4	MSW-2S-07A/CK0/ P22A/RV4A/APG4
ALA4  	MSW-2S-07A/CB0/ P22A/RI2A/ALA4	MSW-2S-07A/CK0/ P22A/RI2A/ALA4

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Technical data of MOVI-SWITCH® motor starters with DRN.. motors

INFORMATION

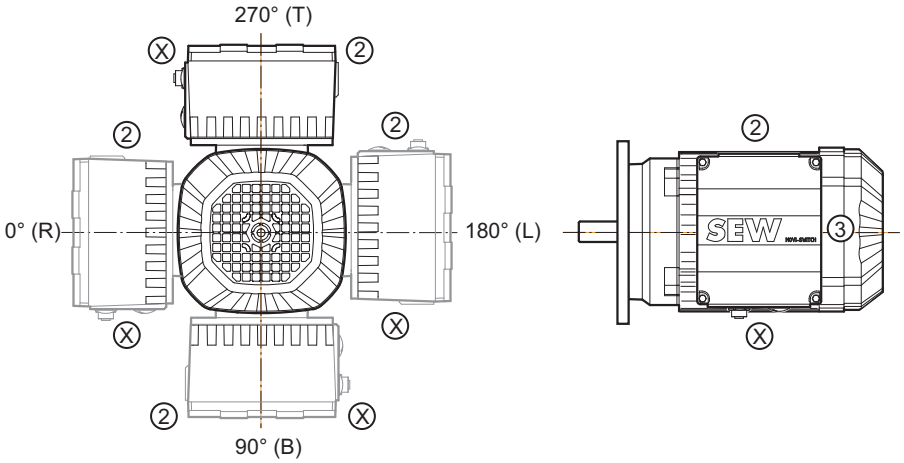
For the technical data of the motors, refer to the "Technical motor data" chapter.

MOVI-SWITCH® fieldbus interfaces

MOVI-SWITCH® drives can be combined with a fieldbus interface.

Designation	Description	Installation
MF...	Fieldbus interface (PROFIBUS, PROFINET IO, EtherCAT® EtherNet/IP™, DeviceNet™)	External

The fieldbus interface can be installed in positions "2" or "X" as standard.



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For more detailed information on fieldbus interfaces, refer to the "Drive System for Decentralized Installation" catalog.

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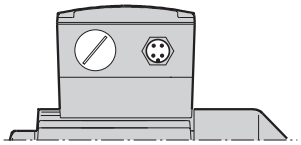
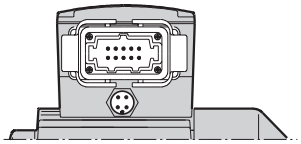
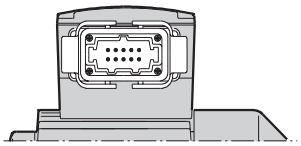
Connection technology

Connection technology of MOVI-SWITCH® 1E

Overview

MOVI-SWITCH® 1E is supplied with AVS1 plug connector for control signals unless specified otherwise in the order.

The plug connectors listed in the following table are available as standard:

Order designation	Function	Manufacturer's designation
MSW../AVS1 	Control signals	1 x round plug connector M12 x 1
MSW../AVS1/ASA3 	Control signals Power rating	1 x round plug connector M12 x 1 + Harting Han® 10 ES pin insert (built-on housing with 2 clips)
MSW../ASAW 	Connection to field distributor Z.3**W** or Z.6**W**	Harting Han® 10 ES pin insert (built-on housing with 2 clips)

For other types, please contact SEW-EURODRIVE.

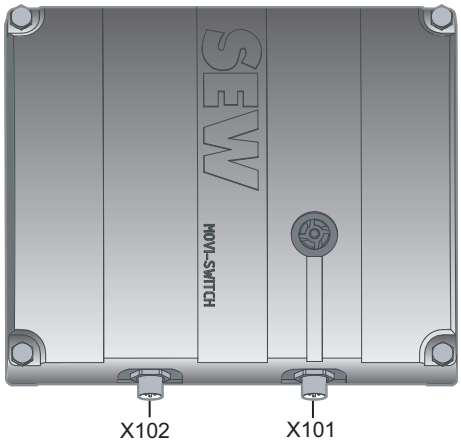
Plug connectors can be installed in positions "2" or "X" as standard.

Connection technology of MOVI-SWITCH® 2S

*Connection technology of C**B**0 design (binary control)*

As standard, MOVI-SWITCH® 2S is equipped with 2 plug connectors for connecting control signals and 24 V supply. The plug connectors are integrated in the control unit, see the following figure.

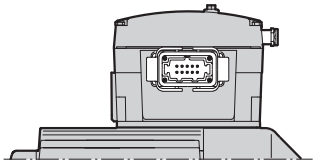
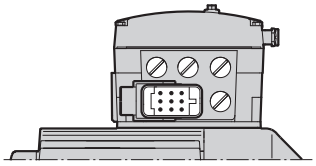
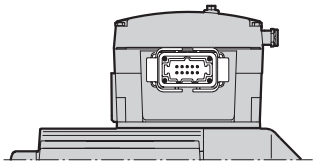
Order designation of the standard design: MSW/C**B**0/RA2A.



X102 = DC 24 V supply voltage + control signal (M12 plug connector, A-coding, male)
X101 = DC 24 V supply voltage + feedback (M12 plug connector, A-coding, male)

Optional plug connectors

The following table shows the plug connectors in the connection box that are additionally available for MOVI-SWITCH® 2S (CB0 version):

Order designation	Function	Manufacturer's designation
MSW/CB0/ASA3 	Power rating	Harting Han® 10 ES pin insert (built-on housing with 2 clips)
MSW/CB0/AND3 	Power rating	Harting Han® Q8/0 pin insert (built-on housing with 1 clip)
MSW/CB0/ASAW 	Connection to field distributor Z.3**W** or Z.6**W**	Harting Han® 10 ES pin insert (built-on housing with 2 clips)

For other types, please contact SEW-EURODRIVE.

Plug connectors can be installed in positions "2" or "X" as standard.

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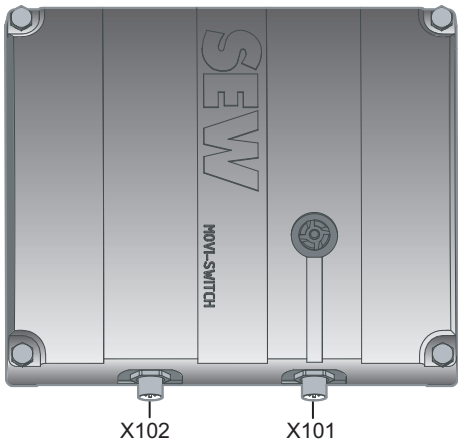
*Connection technology of C**K**0 design (with integrated AS-Interface)*

MOVI-SWITCH® 2S is equipped with 2 plug connectors for AS-Interface and digital inputs as standard. The plug connectors are integrated in the control unit, see the following figure.

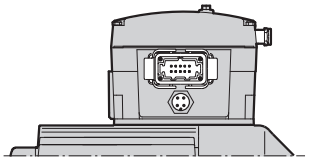
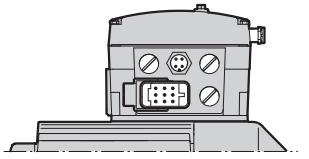
Order designation of the standard design: MSW/C**K**0/RA2A.



X102 = DC 24 V supply voltage + AS-Interface (M12 plug connector, A-coding, male)
X101 = DC 24 V supply voltage + digital inputs (M12 plug connector, A-coding, female)

Optional plug connectors

The following table shows the plug connectors in the connection box that are additionally available for MOVI-SWITCH® 2S (CK0 version):

Order designation	Function	Manufacturer's designation
MSW/CK0/ASA3/AVS0 	Power + AUX PWR	Harting Han® 10 ES pin insert (built-on housing with 2 clips) 1 x round plug connector M12 x 1
MSW/CK0/AND3/AVS0 	Power + AUX PWR	Harting Han® Q8/0 pin insert (built-on housing with 1 clip) 1 x round plug connector M12 x 1

For other types, please contact SEW-EURODRIVE.

Plug connectors can be installed in positions "2" or "X" as standard.

Information about dimension sheets

Observe the notes in chapter "Notes on the dimension sheets" (→ 🗎 180) regarding dimension sheets for motors/brakemotors.

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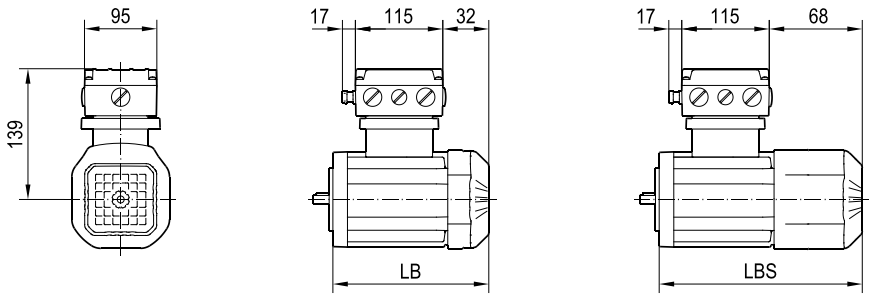
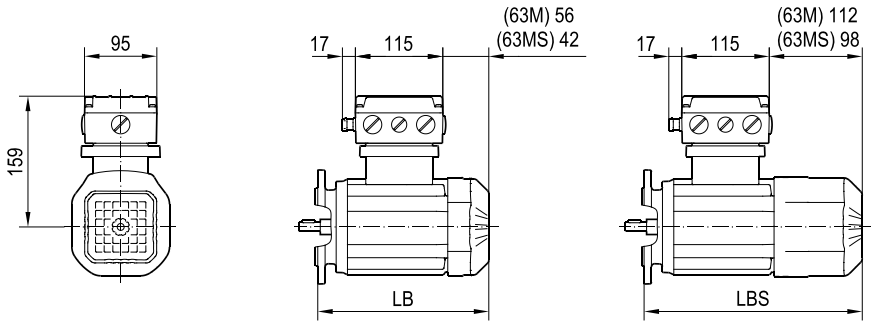
Dimension sheets for MOVI-SWITCH® motors/brakemotors of the DRN.., DR2S.. series

DRN63 /MSW-1EM 08 100 01 18
DR2.56-63 1(1)

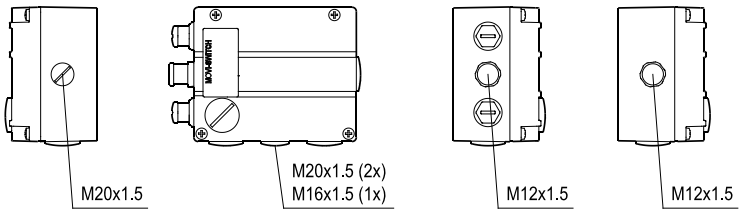
DR2.56.. **DR2.56..BE**



DRN63.. **DRN63..BE**
DR2.63.. **DR2.63..BE**



AZZK **AVS.**



(→ 📖)	56M(R)	63MS	63M					
LB (B5/B14)	161	185	199					
LB (B3)	-	183	197					
LBS (B5/B14)	197	241	255					
LBS (B3)	-	239	253					

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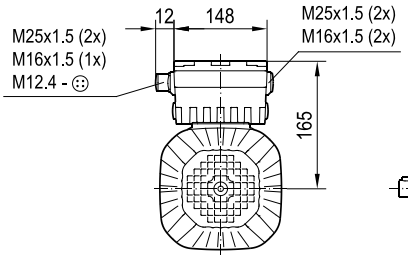
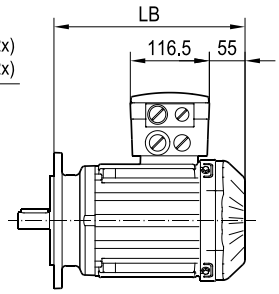
DRN71-90
DR2.71-80

/MSW-1E

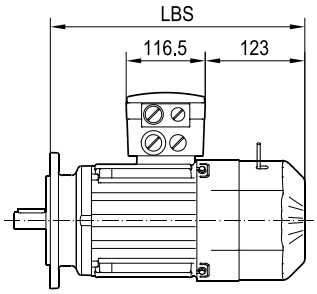
08 597 02 14
1(2)

DRN71..
DR2.71..

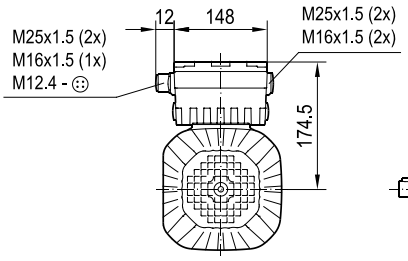


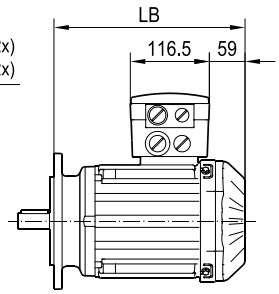


DRN71..BE
DR2.71..BE

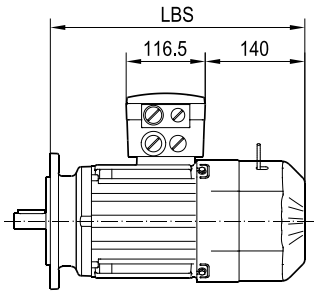


DRN80..
DR2.80..

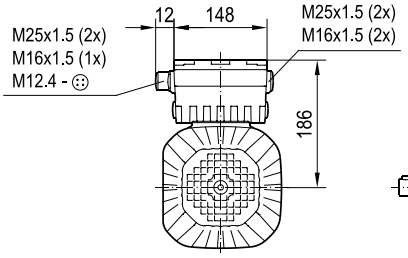


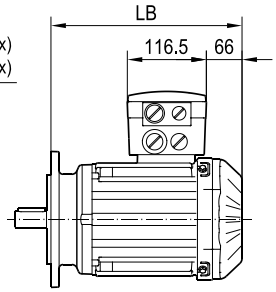


DRN80..BE
DR2.80..BE

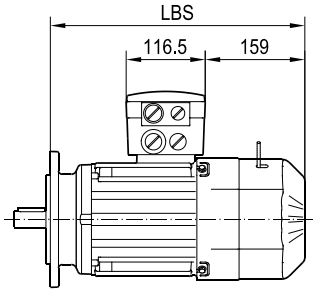


DRN90..





DRN90..BE



(→ 📖)	71MS	71M	80MK	80MS	80M	90S(R)	90L	
LB (B5/B14)	202	222	241	259	287	281	313	
LB (B3)	200	220	239	257	285	279	311	
LBS (B5/B14)	269	289	322	340	368	375	407	
LBS (B3)	267	287	320	338	366	373	405	

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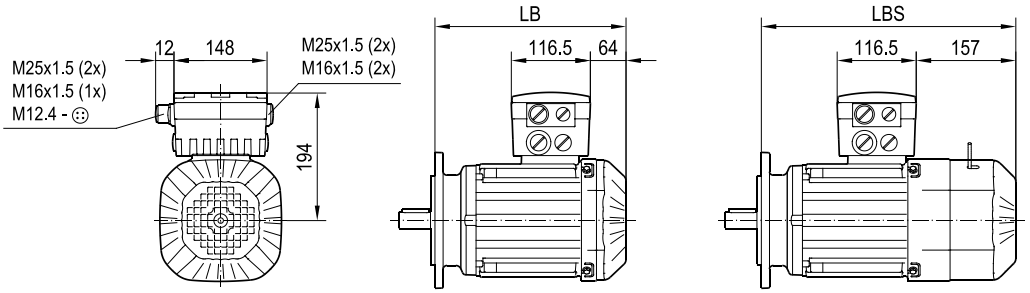
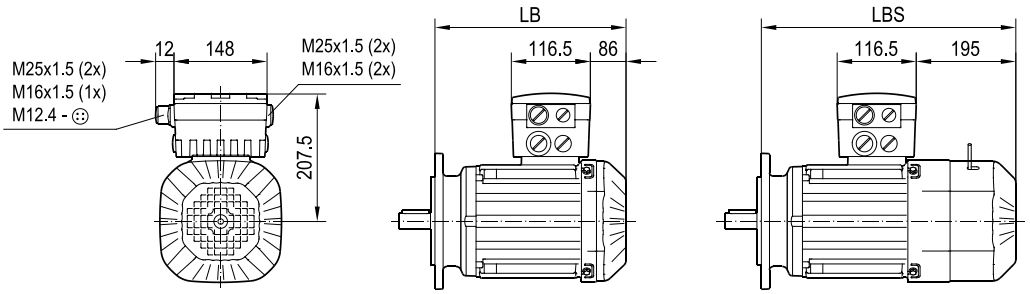
DRN100-132S **/MSW-1E** **08 597 02 14**
2(2)

DRN100.. **DRN100..BE**



DRN112-132S.. **DRN112-132S..BE**



(→ 📖)	100LS	100LM	100L	112M(B)	132S			
LB (B5/B14)	309	359	359	387	437			
LB (B3)	307	357	357	385	435			
LBS (B5/B14)	402	452	452	499	549			
LBS (B3)	400	450	450	497	547			

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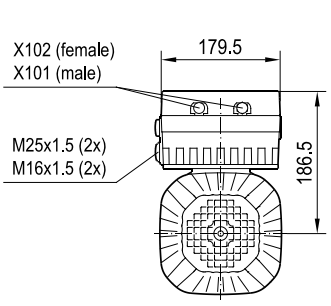
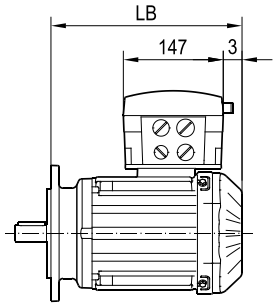
DRN71-90
DR2.71-80

/MSW-2S

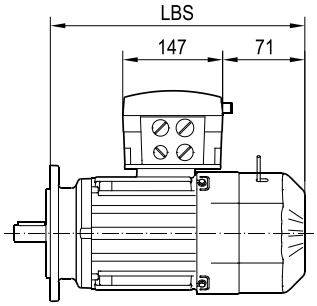
08 598 02 14
1(2)

DRN71..
DR2.71..

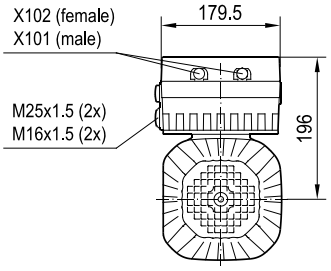


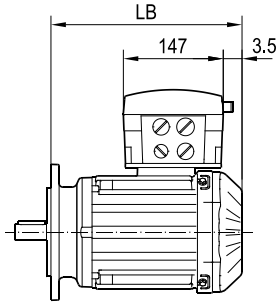


DRN71..BE
DR2.71..BE

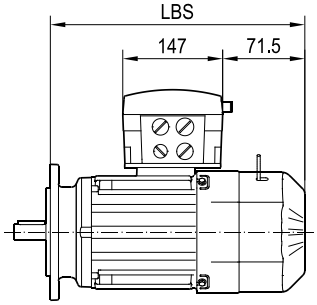


DRN80..
DR2.80..

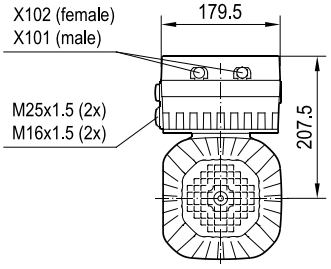


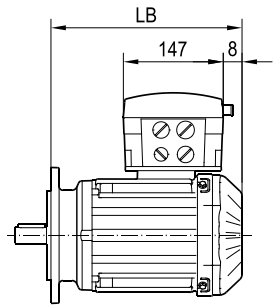


DRN80..BE
DR2.80..BE

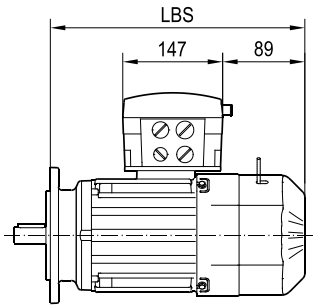


DRN90..





DRN90..BE



(→ 📖)	71MS	71M	80MK	80MS	80M	90S(R)	90L	
LB (B5/B14)	202	222	241	259	287	281	313	
LB (B3)	200	220	239	257	285	279	311	
LBS (B5/B14)	269	289	322	340	368	375	407	
LBS (B3)	267	287	320	338	366	373	405	

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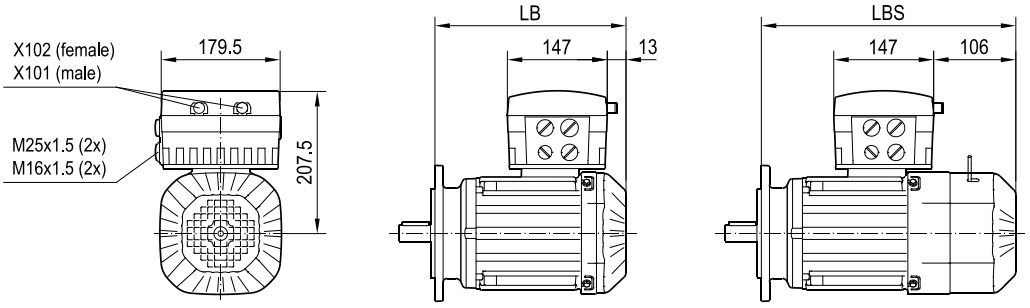
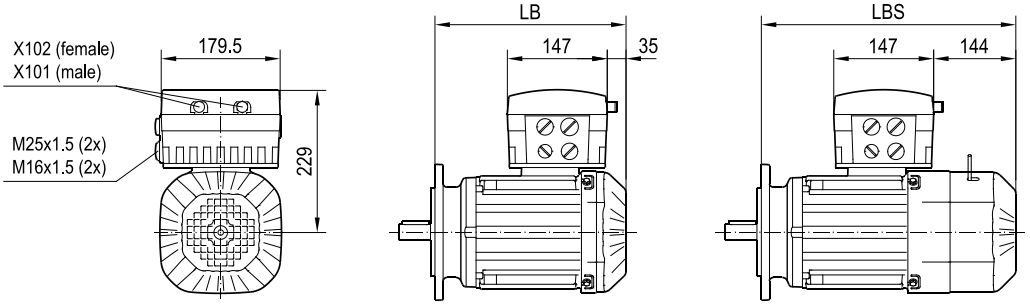
DRN100-132S **/MSW-2S** **08 598 02 14**
1(2)

DRN100.. **DRN100..BE**



DRN112-132S.. **DRN112-132S..BE**



(→ 📖)	100LS	100LM	100L	112M(B)	132S			
LB (B5/B14)	309	359	359	387	437			
LB (B3)	307	357	357	385	435			
LBS (B5/B14)	402	452	452	499	549			
LBS (B3)	400	450	450	497	547			

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9.2.3 Information about drive selection

Project planning

Note the following information for the project planning of MOVI-SWITCH® drives:

- The suitable MOVI-SWITCH® drive is selected like an AC motor with regard to the speed, power, torque, and spatial conditions of the application.

  See the "Drive dimensioning and drive selection" chapter.
- For technical data and information on the communication of MOVI-SWITCH® via fieldbus interfaces, refer to the relevant MOVI-SWITCH® documentation and to the documentation for the associated fieldbus interfaces/field distributors.
- MOVI-SWITCH® drives can be used for typical hoist applications with restrictions only.

  Please contact SEW-EURODRIVE to inquire about suitable solutions with MOVITRAC®, MOVIFIT®, MOVIPRO® or MOVIDRIVE®.

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9.2.4 Order information

Motor requirements for mounting close to the motor

This chapter describes the main requirements and restrictions that apply to selecting a MOVI-SWITCH® drive. Bear this information in mind when placing the order.

Permitted motors

Permitted are only the following motors with nominal voltages of AC 3 x 380 - 500 V, 50 Hz.

- AC motors DRN80M4 to DRN100L4

The assigned motor must always be ordered with /TF option, see chapter "PTC thermistor /TF (PTC)" (→ 🗎 469).

Permitted brakes

The brake assignment does not differ from the standard assignment, see chapter "Accessories overview brake/motor" (→ 🗎 290).

With brakemotors, the brake voltage must correspond to the voltage of the phase voltage (e.g. 400 V supply system = 400 V brake voltage).

Brake rectifier

Always order the assigned motor without brake rectifier.

Plug connectors

For MOVI-SWITCH® 2S../C.0/P22A/RV4A/**APG4**, only the following plug connectors are permitted for the motors:

- ASB4 plug connector
- APG4 plug connector
- ISU4 plug connector

For MOVI-SWITCH® 2S../C.0/P22A/RI2A/**ALA4**, only the following plug connectors are permitted for the motors:

- ASB4 plug connector

Hybrid cables

For more information on hybrid cables available for connecting the MOVI-SWITCH® motor starter with the motor, refer to the "Drive System for Decentralized Installation" catalog.

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10 Other options and design types

10.1 Output

10.1.1 Second shaft end (B-side)

The output end of the motor is optionally available with another shaft end. This so-called second shaft end is designed with a conventional keyway and key in accordance with DIN 6885 Sheet 1 (ISO 773).

A cover can be ordered for configurations that are prone to damage during transport.

For sizes and dimensions, refer to the relevant dimension sheets in chapter "Dimension sheets for motors/brakemotors" (→ 🗎 180).

Technical details

Standard design

The standard design of the second shaft end for motors is generally smaller in dimension than described in EN 50347 for each number of poles and power.

Reinforced design

The reinforced design of the second shaft end was developed as an alternative. Unlike the standard, the selection of brake sizes might be restricted when using the reinforced design. Drives with reinforced second shaft end are not available with /RS backstop option.

DRN.. motors

Motor	Second shaft end: Standard design	Second shaft end: Reinforced design
DRN63MS	11 x 23	–
DRN63M	11 x 23	–
DRN71MS	11 x 23	–
DRN71M	11 x 23	14 x 30
DRN80MK	14 x 30	11 x 23
DRN80MS	14 x 30	11 x 23
DRN80M	14 x 30	19 x 40
DRN90S/L	14 x 30	19 x 40
DRN100LS/LM/L	14 x 30	19 x 40
DRN112M	19 x 40	24 x 50
DRN132S	19 x 40	28 x 60
DRN132M/L	28 x 60	–
DRN160M/L	38 x 80	–
DRN180M/L	38 x 80	–
DRN200L	48 x 110	–
DRN225S/M	48 x 110	–
DRN250M/ME	55 x 110	–
DRN280S/M	55 x 110	–
DRN315S/M/ME/H	70 x 140	–

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DR2S motors

Motor	Second shaft end: Standard design	Second shaft end: Reinforced design
DR2S63MS	11 x 23	–
DR2S63M	11 x 23	–
DR2S71MS	11 x 23	–
DR2S71M	11 x 23	14 x 30
DR2S80MK	11 x 23	14 x 30
DR2S80M	14 x 30	19 x 40

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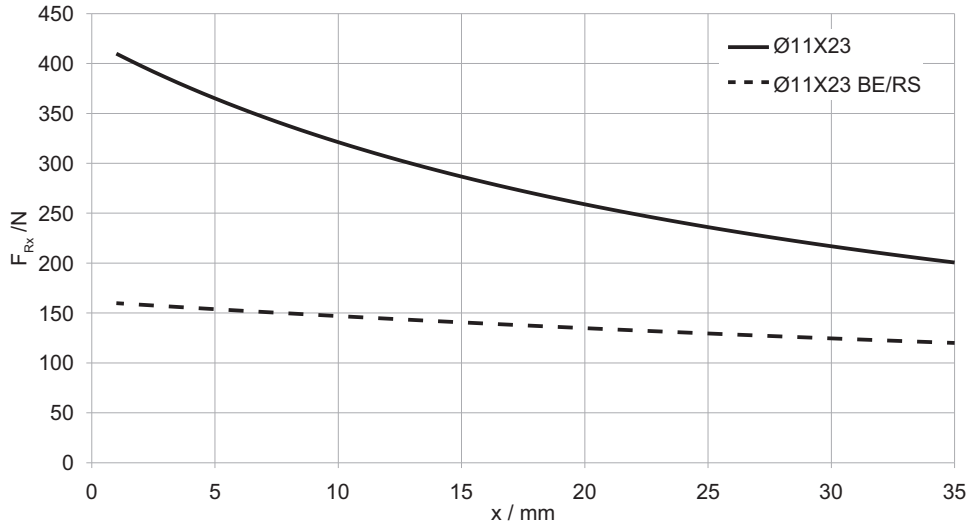
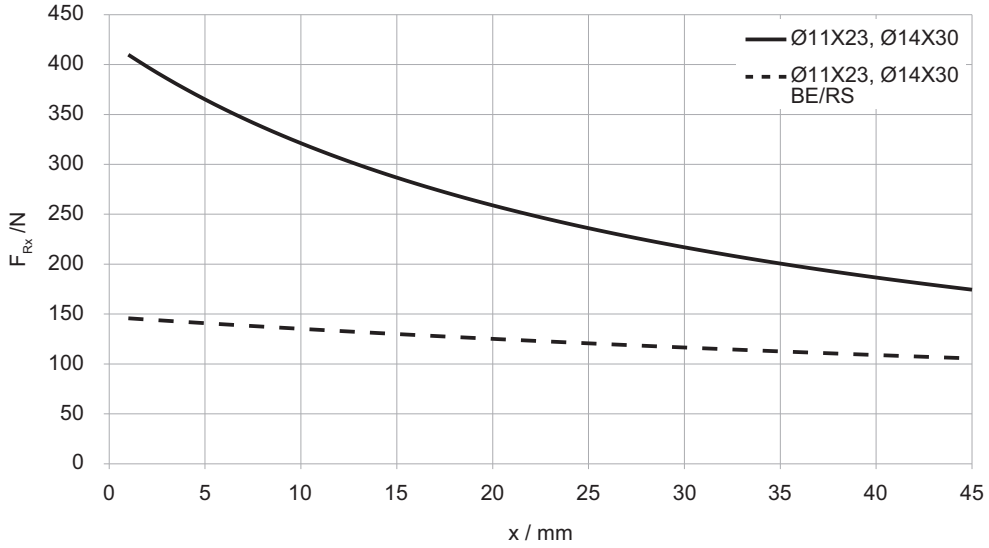
Overhung load diagrams second shaft end option DRN../DR2S..

Overhung load diagrams DRN63, DR2S63 – second shaft end



9007223611897227

Overhung load diagram DRN71, DR2S71 – second shaft end



9007223611902091

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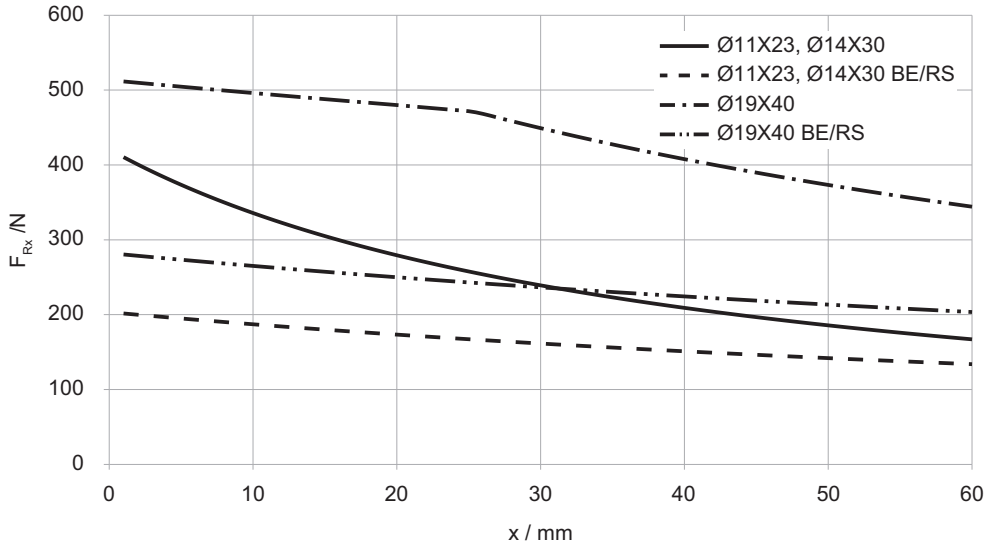
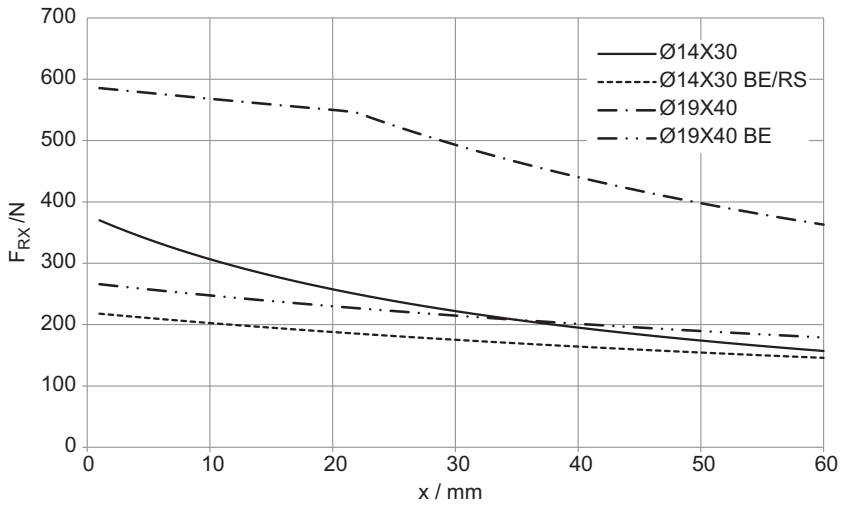
Overhung load diagram DRN80, DR2S80 – second shaft end



9007223611906955

Overhung load diagram DRN90 – second shaft end



27021611226710667

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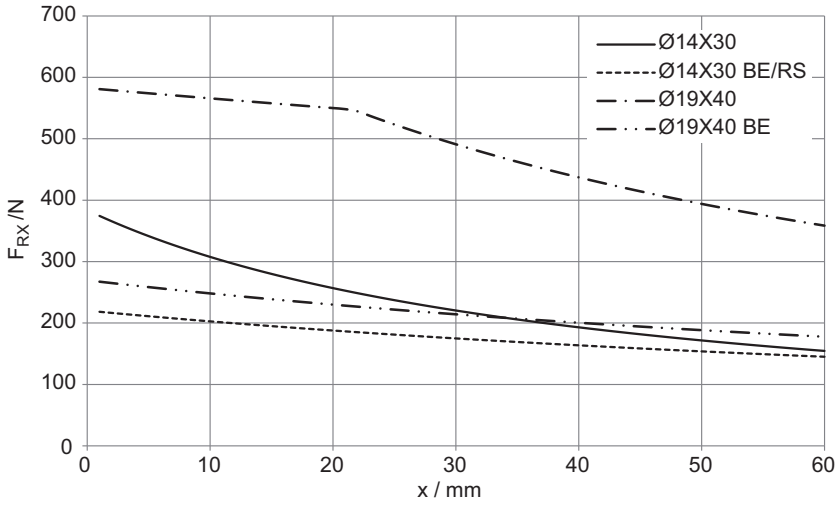
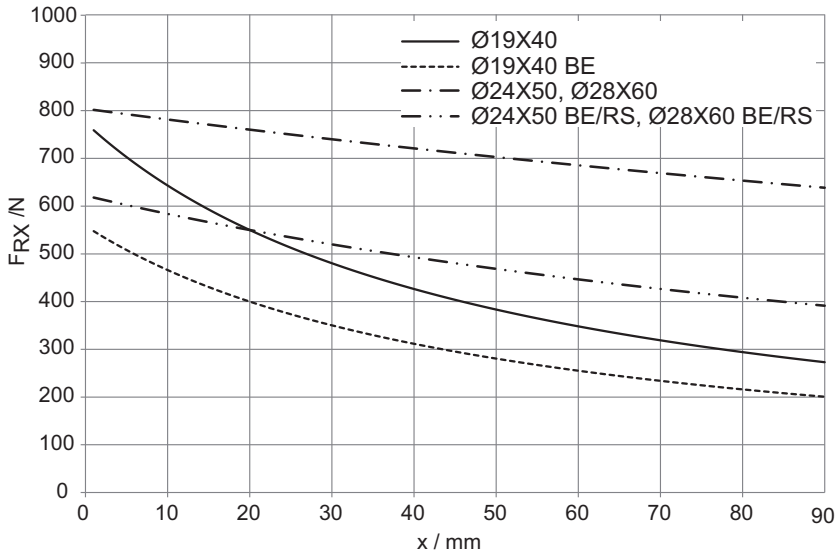
Overhung load diagram DRN100 – second shaft end



27021611226633867

Overhung load diagram DRN112M to DRN132S – second shaft end



27021611226637707

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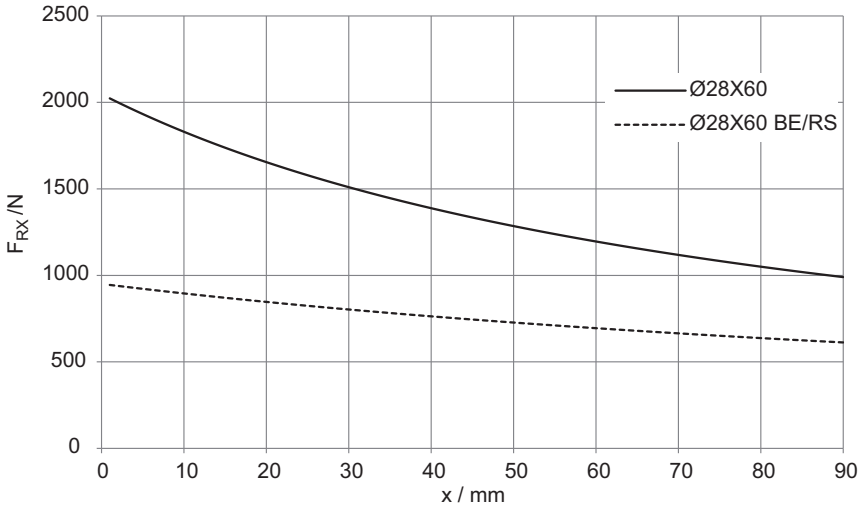
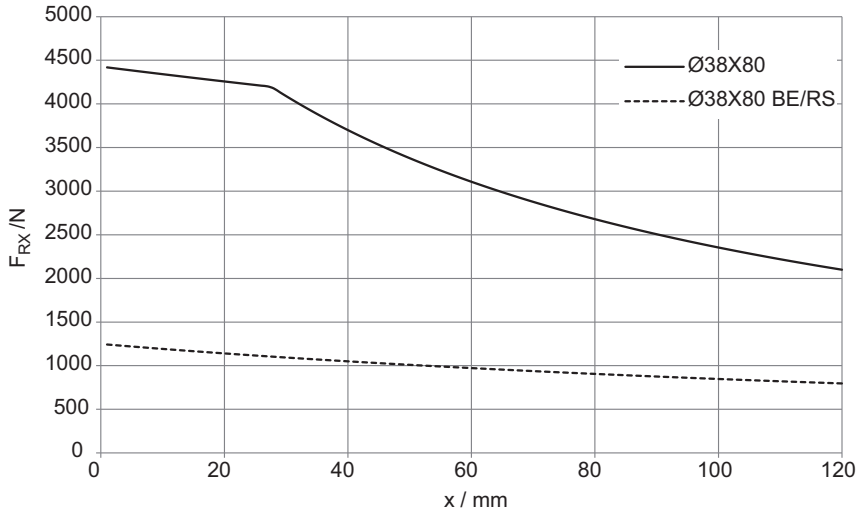
Overhung load diagram DRN132M to DRN132L – second shaft end



27021611226679947

Overhung load diagram DRN160 – second shaft end



27021611226683787

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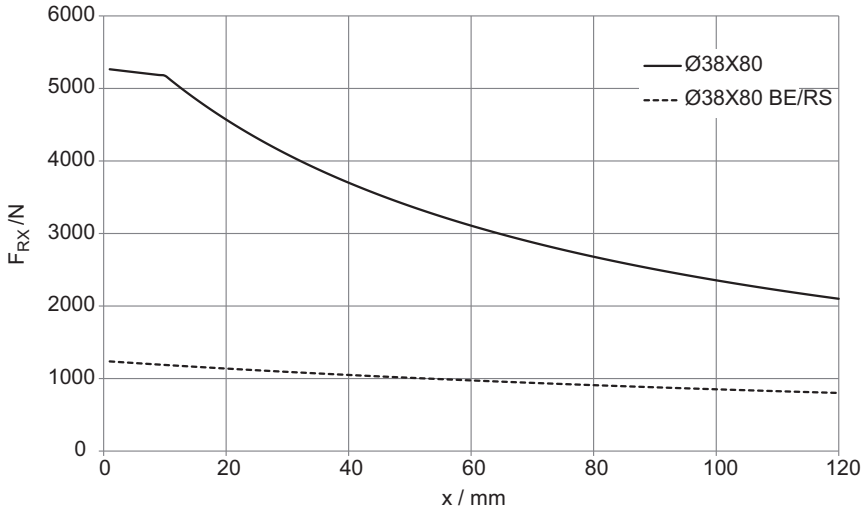
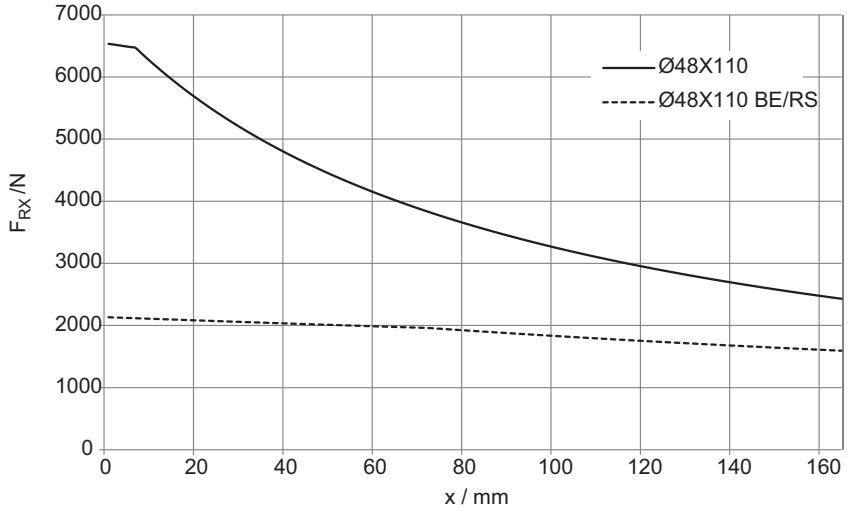
Overhung load diagram DRN180 – second shaft end



18014411971946635

Overhung load diagram DRN200 – second shaft end



18014411971950475

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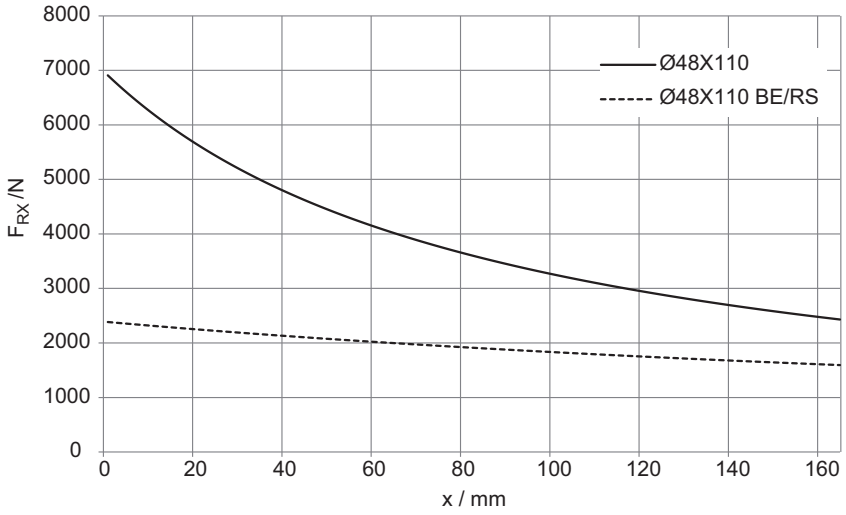
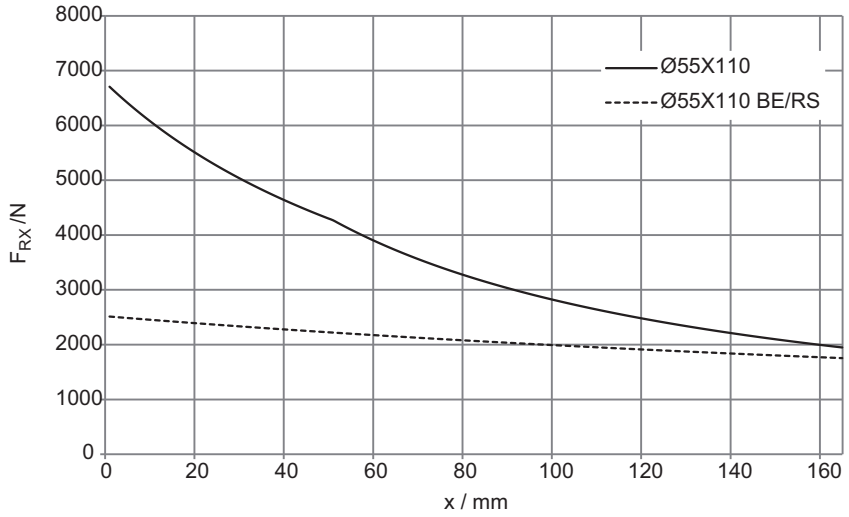
Overhung load diagram DRN225 – second shaft end



18014411971954315

Overhung load diagram DRN250 to DRN280 – second shaft end



18014411971958155

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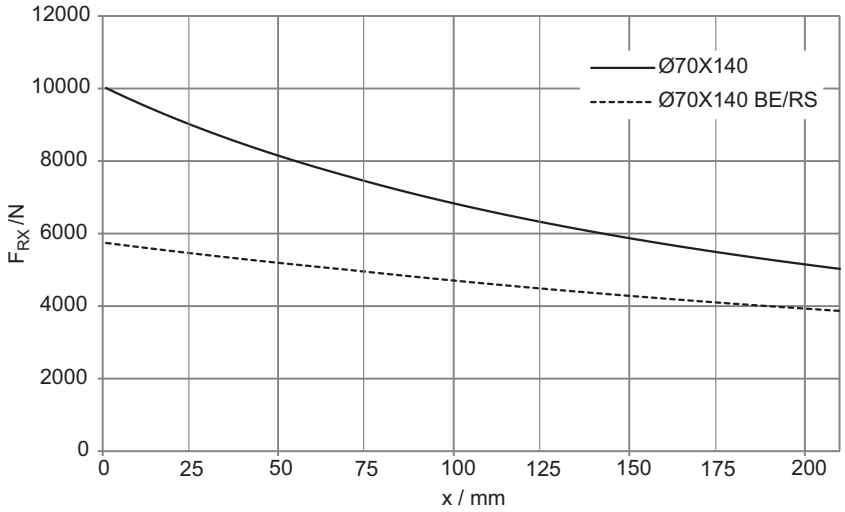
Overhung load diagram DRN315 – second shaft end



18014411971961995

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Information about drive selection

Combination with brakes

- Fields marked with "•": Standard design and reinforced design is possible for the second shaft end.
- Fields marked with "x": Only possible with a standard design of the second shaft end.

Motors	Brakes					
	BE03	BE05	BE1	BE2	BE5	BE11
DRN63.., DR2S63..	•					
DRN71.., DR2S71..	•					
DRN80MS		•	•	•		
DRN80M		X	X	•		
DRN90S			X	X	•	
DRN90L			X	X	•	
DRN100LS				X	•	
DRN100LM				X	•	
DRN100L				X	•	
DRN112M					X	•
DRN132S					X	•

Combination with built-in encoders

Built-in encoders EI71, EI72, EI76 or EI7C can only be combined with the standard design of the second shaft end. For further information, refer to chapter "Built-in encoders" (→ 🗎 361).

Order information

Type designation /2W

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10.2 Thermal motor monitoring

10.2.1 PTC thermistor /TF (PTC)

Thermal motor protection averts overheating and therefore prevents irreparable damage from being caused to the motor.

A PTC thermistor is a resistor with a resistance value that increases when the temperature rises. The resistance value grows significantly when the nominal response temperature is reached.

An evaluation unit is required for interpreting the resistance value of the PTC thermistor. When the nominal response temperature is exceeded, the controller switches off the motor. Frequency inverters of SEW-EURODRIVE are suitable for evaluating PTC thermistors.

Technical details

The thermal monitoring with /TF temperature sensor is performed via PTC thermistors installed in the winding overhang of the motor and connected in series. To achieve maximum motor protection, the trigger temperature is slightly lower than the limit value of the thermal class. Temperature sensors /TF are available for the following nominal response temperatures:

Thermal class	Nominal response temperature /TF
130 (B)	130° C
155 (F)	+150° C
180 (H)	170 °C

Double design

PTC thermistors /TF are also available in double design, for example for warning 130 (B) and shutdown 155 (F). Contact SEW-EURODRIVE if you select such a design.

The PTC thermistors comply with the specifications described in DIN VDE V 0898-1-401.

Resistance measurement (measuring device with U ≤ 2.5 V or I < 1 mA):

- Standard measured values: 20 – 500 Ω
- Hot resistance: > 4000 Ω

When using the temperature sensor for thermal monitoring, the evaluation function must be activated to maintain reliable isolation of the temperature sensor circuit. The thermal protection function must become active in case of overtemperature.

INFORMATION

The temperature sensor /TF may not be subjected to voltages > 30 V.

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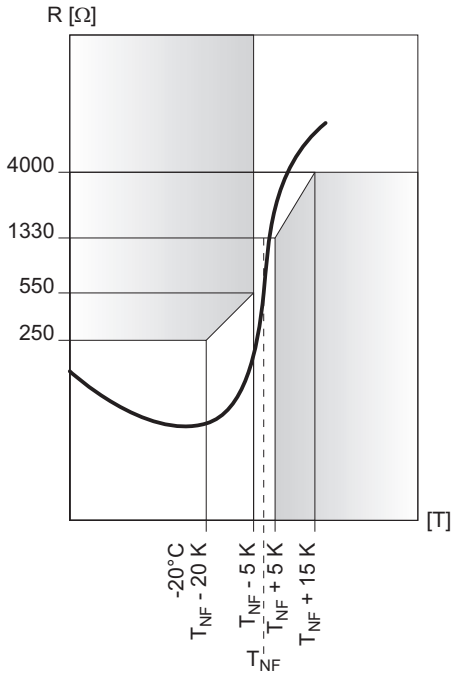
The below figure shows the characteristic curve of a temperature sensor /TF with reference to the nominal response temperature (referred to as T_{NF}).



4151365003

Order information

Type designation	/TF

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10.2.2 Temperature switch /TH

Thermal motor protection avoids overheating and, therefore, prevents irreparable damage from being caused to the motor.

A bimetallic switch is a switching element with contact, which opens the contact when the switching temperature is reached. A higher-level controller or a switching device then disconnects the motor from the voltage supply.

The bimetallic switch does not reengage immediately after tripping, e.g. when the nominal switching temperature is reached. The switch is only closed again after a minimum temperature difference of approximately 40 K to the nominal switching temperature is reached (reset temperature RST); only then can the AC motor be operated again.

The time it takes for the reset temperature to be reached is usually in the high double-digit minute range.

Technical details

The thermal motor protection with bimetallic switch /TH is performed via bimetallic elements installed in the winding overhang of the motor and connected in series. To achieve maximum motor protection, the trigger temperature is slightly lower than the limit value of the thermal class. Bimetallic switches /TH are available for the following nominal response temperatures:

Thermal class	Nominal switching temperature /TH
130 (B)	130 °C
155 (F)	150 °C
180 (H)	170 °C

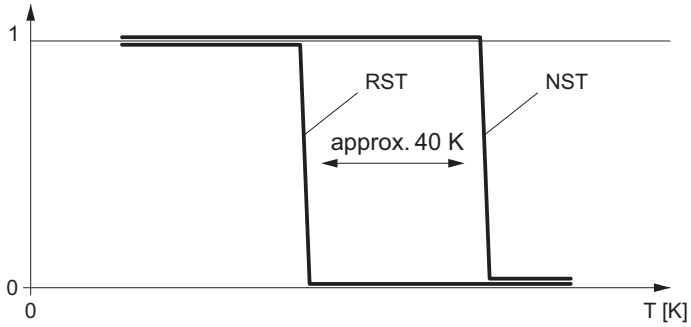
Double design

Bimetallic switches /TH are also available in double design, e.g. for warning 130 (B) and shutdown 155 (F). Contact SEW-EURODRIVE if you select such a design.

Information about drive selection

The thermostats are connected in series and open when the permitted winding temperature is exceeded. They can be connected in the drive monitoring loop.

Type	AC values	DC values	
Voltage in V	250	60	24
Current in A (cosφ = 1.0)	2.5	1.0	1.6
Current in A (cosφ = 0.6)	1.6	–	–



Switching condition of a bimetallic switch "NC contact": *4151368331*

RST Reset temperature
NST Rated switching temperature

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Order information

Type designation	/TH

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10.2.3 Temperature sensor /PT

If the option /PT is selected, a Pt1000 platinum sensor is installed in one of the 3 motor windings. With the option 3 x Pt100, 3 sensors are distributed onto the 3 winding phases and are each connected to separate terminals.

The platinum sensor has a linear characteristic curve and a high level of accuracy. The platinum sensor can take on the function of motor protection when it is used in combination with a control unit or a frequency inverter with the thermal protection model of the motor.

The temperature sensor can also be added to a PTC thermistor or bimetallic switch.

Technical details

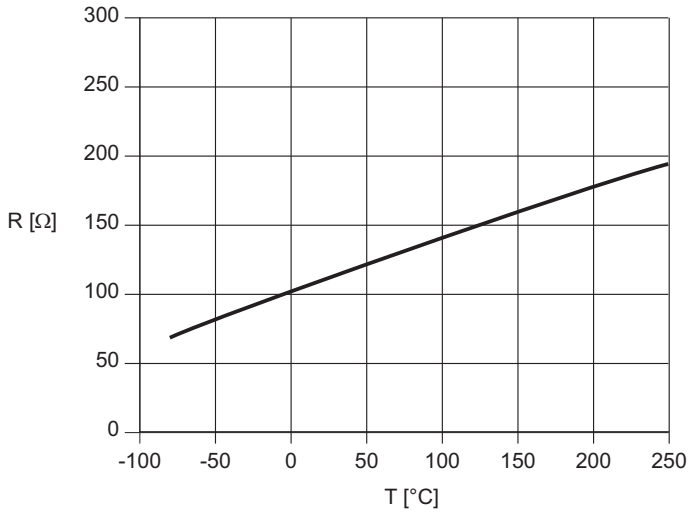
Type	PT100
Connection	Red/white
Total resistance at 20 °C – 25 °C	107 Ω < R < 110 Ω
Test current	< 3 mA

Temperature sensor /PT (Pt100) meets the requirements of IEC 60751.

INFORMATION

Temperature sensors /PT are not polarized; for this reason, swapping the supply cables does not affect the measuring result.

Characteristic curve of a Pt100:



4151378315

Order information

Type designation /PT

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10.2.4 Temperature sensor /PK

If the option /PK is selected, a Pt1000 platinum sensor is installed in one of the 3 motor windings.

The platinum sensor has a linear characteristic curve and a high level of accuracy. The platinum sensor can take on the function of motor protection when it is used in combination with a control unit or a frequency inverter with the thermal protection model of the motor.

A temperature sensor can also be added to a PTC thermistor or bimetallic switch.

The temperature sensor PK (Pt1000) has 10 times the resistance value of a Pt100, and is often used as replacement for the KTY84-130 as these sensors are no longer manufactured and are only available in limited numbers.

Technical details

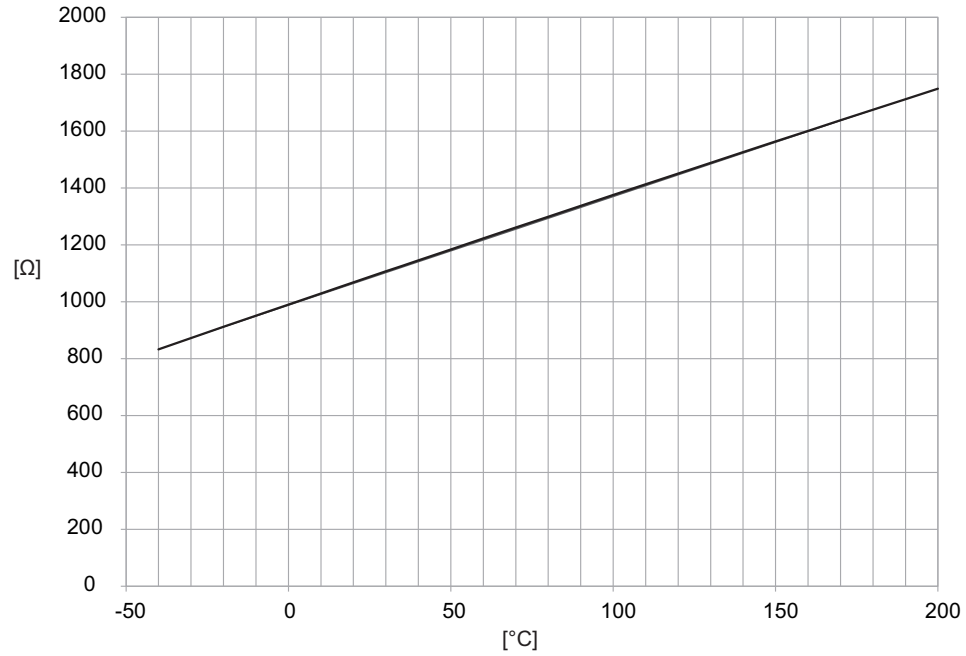
	PT1000
Connection	Red – black
Total resistance at 20 – 25 °C	1050 Ω < R < 1150 Ω
Test current	< 3 mA

Temperature sensors /PK (PT1000) meet the requirements of EN 60751.

INFORMATION

The /PK temperature sensors are not polarized; for this reason, swapping the supply cables does not affect the measuring result.

Characteristic curve of a Pt1000:



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Order information

Type designation /PK

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10.3 Ventilation

10.3.1 Fan guards

As standard, the motors are delivered as fan-cooled design with a plastic fan wheel. The design of the fan guard leads the air flow over the cooling fins of the stator housing. Depending on motor size, motor design, and selected option, the fan guard can be made of plastic or steel. In addition to the standard fan guard or as part of a design, noise-reducing fan guards made from special sheet metal are available as an option.

Technical details – Fan guard

Combinations with DRN..

Type of fan guard	DRN63 – 90	DRN100 – 132S	DRN132M – 315
Plastic	x	–	–
Sheet metal	•	x	x
Noise reducing sheet metal	–	•	–

x Standard design
• Optional
– Not available
With noise-reduction

Combinations with DR2S..

Type of fan guard	DR2S56 – DR2S80
Plastic	x
Sheet metal	•
Noise reducing sheet metal	–

x Standard design
• optional
– Not available
With noise-reduction

Information about drive selection

The type of fan guard only influences the drive dimensioning in exceptional cases. Observe the following:

- Encoders or forced cooling fans cannot be mounted if fan guards made of noise-reducing sheet metal or plastic are used.
- Plastic fan guards may only be used with drives operated at an ambient temperature between -20 °C and +60 °C.
- Plastic fan guards for size 71 to 90 motors can be provided with OS3 or OS4 treatment.

Axial space required to disassemble the fan guard

The fan-cooled motors require adequate space behind the fan guard in order to draw in the air required for cooling. The distance of half the diameter of the fan guard in the axial direction is usually sufficient.

The space required for removing the fan guard depends on the motor configuration.

Order information

Type designation
- Option designation for plastic fan guard: none
- Option designation for steel fan guard: none
- Option designation for fan guard made of noise-reducing sheet metal: /LN

10.3.2 Canopy for fan guard

If a motor in vertical design with fan guard facing up is installed in the system or machine, ensure that foreign bodies cannot penetrate through the fan grille into the fan wheel. This can be avoided either by constructional measures taken by the customer, or by using a canopy above the fan guard.

Technical details

The canopy extends the motor or brakemotor. For dimensions, refer to chapter "Dimension sheets for motors/brakemotors" (→ 🗎 180).

Information about drive selection

If there is still a risk of foreign objects or liquids entering the motor even though a canopy is installed, please contact SEW-EURODRIVE.

Order information

Type designation /C

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10.3.3 Forced cooling fan

A forced cooling fan can be installed upon request to ensure motor cooling independent of the motor speed. The cooling effect for forced air cooling is at least equivalent to the cooling effect of a fan-cooled motor at rated speed.

This means the motor can permanently deliver the full or up to 1.25 times the nominal torque at low speeds without the risk that the motor will overheat.

SEW-EURODRIVE recommends a forced cooling fan in the following applications:

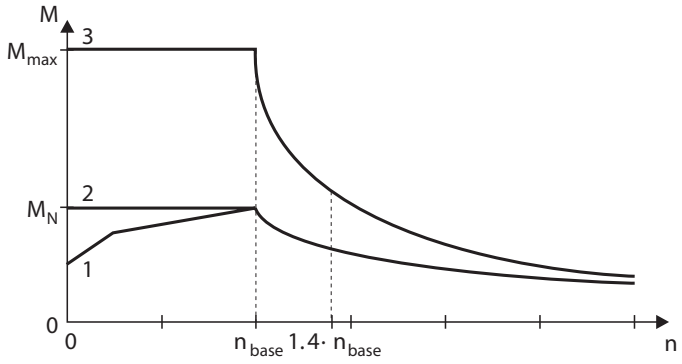
- Mains-operated drives with high switching frequency
- Mains-operated drives with additional flywheel mass Z
- Inverter drives with a setting range ≥ 1:20
- Inverter drives with brakes intended to be released electrically all the time while the motor is at an idle state (position control).
- Inverter drives that have to produce the rated torque at low speeds or even at an idle state.

Technical details

Motor and forced cooling fan are connected via a fan guard dimensioned for this purpose. The length of the forced cooling fan guard varies depending on the desired motor configuration, such as configurations with a brake or encoder.

The following figure shows a typical speed-torque characteristic for a dynamic motor operated at an inverter, for example with MOVIDRIVE® MDX61B with encoder feedback option (DEH11B) in the CFC operating mode.

A forced cooling fan must be used if the effective load torque in the range 0 – n_{base} is above curve 1. If no forced cooling fan is used, the motor could become thermally overloaded and destroyed.



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

Observe the resulting additional length of the overall drive when using a forced cooling fan.

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Technical data

DRN.. motors

Overview of possible operating voltages of the forced cooling fan:

Forced cooling fan			Motors		
			DRN71MS – 132L	DRN160M – 180L	DRN200L – 315H
DC 24 V		+ / -	1 × 24 V	–	–
AC 120 V	50 Hz	1~[1)]	1 × 100 – 127 V	–	–
		△	3 × 100 – 127 V	–	–
		⅄	3 × 175 – 220 V	–	–
	60 Hz	1~[1)]	1 × 100 – 135 V	–	–
		△	3 × 100 – 135 V	–	–
		⅄	3 × 175 – 230 V	–	–
AC 230 V	50 Hz	1~[1)]	1 × 230 – 277 V		–
		△	3 × 200 – 303 V		3 x 200 – 400 V
		⅄	3 × 346 – 525 V		
	60 Hz	1~[1)]	1 × 200 – 277 V		–
		△	3 × 220 – 332 V		3 x 220 – 400 V
		⅄	3 × 380 – 575 V		

1) Delta connection with capacitor

DR2.. motors

Overview of possible operating voltages of the forced cooling fan:

Forced cooling fan			Motors
			DR2S71MS – 80M
DC 24 V		+ / -	1 × 24 V
AC 120 V	50 Hz	1~[1)]	1 × 100 – 127 V
		△	3 × 100 – 127 V
		⅄	3 × 175 – 220 V
	60 Hz	1~[1)]	1 × 100 – 135 V
		△	3 × 100 – 135 V
		⅄	3 × 175 – 230 V
AC 230 V	50 Hz	1~[1)]	1 × 230 – 277 V
		△	3 × 200 – 303 V
		⅄	3 × 346 – 525 V
	60 Hz	1~[1)]	1 × 200 – 277 V
		△	3 × 220 – 332 V
		⅄	3 × 380 – 575 V

1) Delta connection with capacitor

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Technical data of the forced cooling fan depending on motor size

DRN71MS – 132SL/V (AC 120 V, 50 Hz)

Forced cooling fan			**/V**					
Motor sizes			**71**	**80**	**90**	**100**	**112**	**132**
Frequency	Hz		50					
Current consumption	AC A	1~	0.78	0.75	0.74	0.74	0.74	0.74
		Δ	0.78	0.89	0.76	0.75	0.74	0.74
		人	0.45	0.43	0.44	0.43	0.43	0.43
Maximum power consumption	W		99	94	95	94	94	94
Air discharge rate	m^2/h		60	60	170	210	295	295
Ambient temperature	°C		-20 to +60					
Degree of protection			IP66					
Electrical connection			Terminal board in the forced cooling fan's terminal box with 6 M4 bolts. Connection 1~ with included running capacitor CB					
Max. cable cross section	mm^2		4 × 1.5					
Thread for cable gland			1 × M16 × 1.5					
Additional weight	kg		1.9	1.9	2.1	2.1	2.35	2.35
Certificates			CSA, UR					

DR2S71MS – DR2S80M4 (AC 120 V, 50 Hz)

Forced cooling fan			**/V**	
Motor sizes			**71**	**80**
Frequency	Hz		50	
Current consumption	AC A	1~	0.78	0.75
		Δ	0.78	0.89
		人	0.45	0.43
Maximum power consumption	W		99	94
Air discharge rate	m^2/h		60	60
Ambient temperature	°C		-20 to +60	
Degree of protection			IP66	
Electrical connection			Terminal board in the forced cooling fan's terminal box with 6 M4 bolts. Connection 1~ with included running capacitor CB	
Max. cable cross section	mm^2		4 × 1.5	
Thread for cable gland			1 × M16 × 1.5	
Additional weight	kg		1.9	1.9
Certificates			CSA, UR	

DRN80M – DRN132L/V (AC 230 V, 50 Hz)

Forced cooling fan			**/V**					
Motor sizes			**71**	**80**	**90**	**100**	**112**	**132**
Frequency	Hz		50					
Current consumption	AC A	1~	0.18	0.19	0.29	0.29	0.28	0.28
		Δ	0.15	0.16	0.39	0.37	0.35	0.35
		人	0.09	0.09	0.22	0.21	0.20	0.20
Maximum power consumption	W		48	48	91	91	97	97
Air discharge rate	m^2/h		60	60	170	210	295	295
Ambient temperature	°C		-20 to +60					
Degree of protection			IP66					
Electrical connection			Terminal board in the forced cooling fan's terminal box with 6 M4 bolts. Connection 1~ with included running capacitor CB					
Max. cable cross section	mm^2		4 × 1.5					
Thread for cable gland			1 × M16 × 1.5					
Additional weight	kg		1.9	1.9	2.1	2.1	2.35	2.35
Certificates			CSA, UR					

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DRN160M – DRN315/V (AC 230 V, 50 Hz)

Forced cooling fan			/V				
Motor sizes			**160**	**180**	**200/225**	**250/280**	**315**
Frequency	Hz		50				
Current consumption	AC A	1~	0,34	0.34	–	–	–
		Δ	0.43	0.43	0.96	1.64	1.64
		人	0.25	0.25	0.32	0.58	0.58
Maximum power consumption	W		84	84	285	454	454
Air discharge rate	m^2/h		780	780	1350	1600	2500
Ambient temperature	°C		-20 to +60				
Degree of protection			IP66				
Electrical connection			Terminal board in the forced cooling fan's terminal box with 6 M4 bolts. Connection 1~ with included running capacitor CB				
Max. cable cross section	mm^2		4 × 1.5				
Thread for cable gland			1 × M16 × 1.5				
Additional weight	kg		7.1	7.1	8.6	15	19.3
Certificates			CSA, UR				
Identification[1)]			–	–	Yes		

1) According to VO327/2011

DRN80M – DRN132L/V (DC 24 V)

Forced cooling fan			/V					
Motor sizes			**71**	**80**	**90**	**100**	**112**	**132**
Voltage	VDC		24					
Current consumption	AC A	1~	0.44	0.52	0.79	1.15	1.62	1.62
Performance	W		10.5	12.5	19	28.6	38.8	38.8
Air discharge rate	m^2/h		60	60	170	210	295	295
Ambient temperature	°C		-20 to +60					
Degree of protection			IP66					
Electrical connection			Terminal board in terminal box of forced cooling fan					
Max. cable cross section	mm^2		3 × 1.5					
Thread for cable gland			1 × M16 × 1.5					
Additional weight	kg		1.9	1.9	2.1	2.1	2.35	2.35
Certificates			CSA, UR					

Order information

Type designation /V

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10.3.4 Aluminum fan

An aluminum fan is used instead of the standard PVC fan if the expected ambient temperature exceeds +60 °C or drops below -20 °C.

The permitted temperature range for using an aluminum fan is -40 °C to +100 °C.

Information about drive selection

Observe the following notes:

- The aluminum fan decreasingly influences the inertia of the rotor the higher the motor size is selected, see the following table.
- Note the aluminum fan inertia when determining the permitted switching frequency Z.
- The no-load starting frequency Z_0 does not need to be reduced.

Motors[1]	J_{AL}	J_{Mot_AL}	Increase in inertia compared to standard design
	10^{-4} kgm²	10^{-4} kgm²	%
DRN63MS	0.3	3.2	8
DRN63M	0.3	4	6
DRN71MS	2.8	7.9	46
DRN71M	2.8	9.6	35
DRN80MK	4.3	20.4	19
DRN80MS	4	21.6	17
DRN80M	4	27.8	13
DRN80M2	1.7	25.4	5
DRN90S	7	59.7	11
DRN90S2	1.6	54.4	2
DRN90L	7	72.9	8
DRN90L2	1.6	67.5	2
DRN100LS	7	87.1	7
DRN100L	7	117.7	5
DRN100LM2	1.6	90.9	1
DRN112M	7	183	3
DRN132S	7	246	2
DRN132S6	16	255	4
DRN132M	26	405	5
DRN132L	26	463	5
DRN160M	27	839	3
DRN160L	27	1061	2
DRN180M	27	1651	1
DRN180L	27	1971	1
DRN200L	160	2804	5
DRN225S	160	4490	3
DRN225M	160	4490	3
DRN250M	160	7500	2
DRN280S	160	9070	2
DRN280M	160	12136	1
DRN315S	370	23706	1
DRN315M	370	25070	1
DRN315L	370	28870	1
DRN315H	370	35470	1

1) The values for all motors independent of the number of poles apply to motors with no specified number of poles.

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Order information

Type designation /AL

10.3.5 Additional flywheel mass

The motor can optionally be equipped with an additional flywheel mass to achieve a smoother startup and braking behavior of line-operated motors.

The additional flywheel mass is implemented as a fan made of gray cast iron, and is used instead of a plastic or aluminum fan.

Information about drive selection

Observe the following notes:

- Note the additional flywheel mass inertia when determining the permitted switching frequency. The switching frequency is calculated from the permitted no-load starting frequency Z_0 of a motor without additional flywheel mass multiplied by the factor 0.8.
- Observe the resulting additional weight and increased inertia.
- Counter-current braking and running against a mechanical stop are no longer permitted.
- Not available in vibration grade "B".

Additional flywheel mass inertia:

Motors	J_z	J_{mot_z}	Increase in inertia compared to standard design
	10^{-4} kgm²	10^{-4} kgm²	%
DRN63MS	5.3	8.2	178
DRN63M	5.3	9	140
DRN71MS	21	26.4	387
DRN71M	21	28.1	294
DRN80MK	38	54	216
DRN80MS	37.9	55.5	200
DRN80M	37.9	61.7	150
DRN90S	100	152.7	183
DRN90L	100	165.9	147
DRN100LS	150	230.1	183
DRN100L	150	260.7	133
DRN112M	200	376	111
DRN132S	200	439	82
DRN132M	470	849	121
DRN132L	470	907	105

Order information

Type designation /Z

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10.3.6 Non-ventilated motors

Asynchronous motors by SEW-EURODRIVE are also available in non-ventilated design. Non-ventilated motors can only be operated at reduced power compared to self-cooled motors of the same size due to the lack of cooling a fan would provide.

Two designs are available for non-ventilated motors:

- /OL

  These motors are designed with a closed B-side endshield, a shortened rotor shaft on the B-side without fan wheel, and without a fan guard. Brakemotors of size DRN71 – 132M with brake size BE05 – BE11 are equipped with a shortened fan guard.

- /U

  This motor design is not equipped with a fan. All other mount-on components correspond to those in standard design.

Order information

Type designation	Non-ventilated (closed B-side): /OL
Type designation	Non-ventilated (without fan): /U

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10.4 Bearings

10.4.1 Current-insulated rolling bearings

AC motors in size 225 and larger can be equipped with a current-insulated bearing on the B-side to prevent damage to the bearing caused by indulatory currents during inverter operation.

Order information

Type designation /NIB

10.4.2 Reinforced bearings

SEW-EURODRIVE offers a design with reinforced bearing for applications where the statistic bearing service life is not expected to be achieved because of excessive loads. In this case, A-side cylindrical roller bearings are installed (/ERF design). This option is only available in combination with a relubrication device (/NS design).

Technical details

Bearing assignment in /ERF design

<table>
<tr><th rowspan="2">Sizes</th><th rowspan="2">A-side bearing</th><th colspan="2">B-side bearing</th></tr>
<tr><th>IEC motor</th><th>Gearmotor</th></tr>
<tr><td>250 – 280</td><td>NU317E-C3</td><td colspan="2">6315-C3</td></tr>
<tr><td>315S</td><td rowspan="4">NU319E</td><td rowspan="4">6319-C3</td><td rowspan="2">6319-C3</td></tr>
<tr><td>315M/ME</td></tr>
<tr><td>315L</td><td rowspan="2">6322-C3</td></tr>
<tr><td>315H</td></tr>
</table>

Order information

Type designation /ERF

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10.4.3 Relubrication device

The installation of the relubrication device is optional for motor sizes 225, 250, 280, and 315. Externally accessible grease nipples can be used to relubricate the A-side and B-side bearings. When the design"Reinforced bearings" (→ 🗎 484) is selected, the option "relubrication device" is automatically assigned and cannot be deselected.

The use of a relubrication device is recommended for the following operating conditions:

- Motors in vertical mounting position
- At continuous speeds above 1800 min^{-1}
- For ambient temperatures above 60 °C.

Technical details

The following greases are used on-site, depending on the ambient temperature.

Ambient temperature	Manufacturer	Type	DIN designation
-20 °C to +80 °C	Mobil	Polyrex EM	K2P-20
-40 °C to +60 °C	SKF	GXN	K2N-40

The greases can also be purchased separately from SEW-EURODRIVE in 400 g packaging units.

Information about drive selection

The relubrication intervals must be individually adapted to the conditions of the application. The motor generally has to be inspected and the used grease removed after 6 to 8 relubrications.

Order information

Type designation /NS

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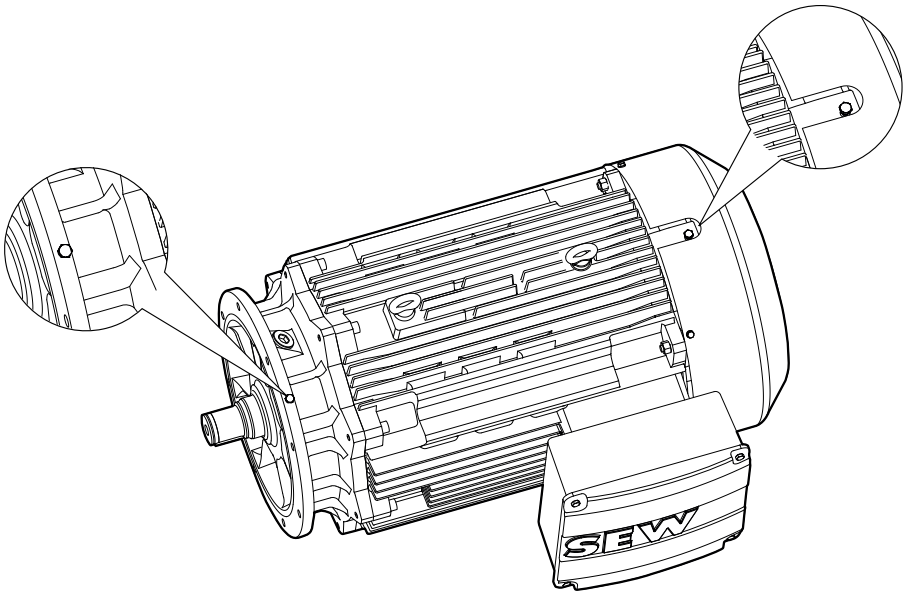
10.4.4 Preparation for accommodating SPM measuring nipples

Increased strain, e.g. caused by vibrations, can slowly lead to failure of important motor functions, such as defective bearings. Using a vibration monitoring device is a possible measure for early detection of when the wear limit is reached.

SEW-EURODRIVE offers a vibration transducer mounting adapter for sizes 132M – 315. This is realized using tapped holes for accommodating SPM measuring nipples.



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[1] Tapped hole for vibration transducer

The components of the mounting adapter are loosely included in the delivery. Vibration transducers are not included in the delivery.

Technical details

The A-side and B-side bores feature metrical threads (M8) in the flanges or covers and are closed with a closing plug. The closing plug is pregreased at the factory for easy disassembly.

Order information

Type designation: None

This option is available for size 112 to 315 motors, other sizes are available on request.

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10.5 Winding

10.5.1 Reinforced winding insulation

A reinforced insulation of the copper wires provides a higher electric strength of the winding insulation.

Technical details

The motor winding with reinforced insulation can withstand the following voltage peaks:

- Line-to-line voltages U_{LL} = 1800 V
- Line-to-ground voltages U_{LG} = 1250 V

Also refer to chapter "AC motors on third-party inverters" (→ 🗎 133).

Order information

Type designation	/RI

10.5.2 Reinforced winding insulation with increased resistance against partial discharge

If the voltage peaks exceed the 1800 V threshold, windings with higher resistance against partial discharge must be used.

To protect against these very high voltages, thicker surface insulating materials and enhanced impregnation must be used.

Technical details

The motor winding with reinforced insulation with increased resistance against partial discharge can withstand the following voltage peaks:

- Line-to-line voltages U_{LL} = 2150 V
- Line-to-ground voltages U_{LG} = 1800 V

Order information

Type designation	/RI2

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10.5.3 Encapsulated stator winding

If the ingress of water into the motor cannot be ruled out, a drive solution with the following properties could be useful:

- Degree of protection IP56
- Combination with encapsulation
  - for the stator winding

    and
  - the terminal box opening at the stator

    and
- permanently open /DH condensation drain hole
- KS corrosion protection

  and
- surface protection, at least OS1.

This design is available for 4-pole asynchronous motors by SEW-EURODRIVE in size 63 – 132S without brake. Contact SEW-EURODRIVE for information on additional options.

Order information

Type designation None

10.5.4 Humidity and acid protection

This option uses stators that have a resin-impregnated winding. The resins allow the motors to be used in high humidity conditions. The impregnation leads to an increased resistance to solvents and solvent vapors.

Order information

Type designation None

10.5.5 Tropicalization

This option uses stators that are impregnated with highly hydrolysis-resistant resins. This allows the motors to be used in areas with increased air humidity, such as in tropical climate conditions.

The used wiring insulation materials and the impregnating resin protect the motor against termite-related damage.

Order information

Type designation None

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10.6 Terminal box

The terminal box of the motor is attached to the stator housing. The terminal box contains the ports used to connect the motor and options via separate power cables and control cables. The terminal box protects the motor from potential damage and persons from injury caused by current-carrying components.

The terminal box is available in aluminum or gray cast iron design, depending on the motor size and the selected options, see chapter "Overview of materials used for the motors" (→ 🗎 44).

10.6.1 Technical details

As standard, the terminal boxes of motors are supplied with tapped holes in the terminal box wall so that the appropriate supply cables can be connected, and cable glands affixed.

For motor sizes 56 and 63, an insert nut with metric thread is used instead of the tapped hole.

AC motors from SEW-EURODRIVE have threads in metric dimensions as standard. With motors intended for operation in North America, terminal boxes with Anglo-American pipe threads (NPT, geometric dimensions in inch) are assigned to the order as standard.

In case the drive is ordered with additional features or options connected in the terminal box, a larger terminal box may be required in some cases. The individual standard designs of the terminal boxes for motors are depicted on the dimension sheets.

Metric plastic cable glands (PA) from SEW-EURODRIVE can be preinstalled on request.

10.6.2 Information about drive selection

The terminal boxes made from gray cast iron have different dimensions from those specified in the chapter "Dimension sheets for motors/brakemotors" (→ 🗎 180).

10.6.3 Order information

Type designation: None

When the order is created, a suitable terminal box is automatically assigned to the motor depending on the selected option.

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10.6.4 Gray cast iron terminal box with connection piece

Larger, gray cast iron terminal boxes with a connection piece are available as an option for some sizes.

The connection piece can be removed from the terminal box to enable the initial fitting of the supply cables. This facilitates the motor connection especially if there is little space available.

Technical details

Combinations

The following connection pieces are available depending on the motor size:

Thread	DRN132M – DRN225	DRN250 – DRN280	DRN315
2 × M32 × 1.5 2 × M16 × 1.5	X	–	–
2 × M50 × 1.5 2 × M16 × 1.5	X	–	–
2 × M40 × 1.5 2 × M16 × 1.5	X	–	–
2 × M63 × 1.5 2 × M16 × 1.5	X	X	X
2 × M63 × 2 2 × M72 × 1.5	–	–	X
1 × NPT 1¼" 2 × NPT ½"	X	–	–
2 × NPT 1½" 2 × NPT ½"	X	X	–
2 × NPT 3" 2 × NPT ½"	–	–	X

X Combination possible
– Combination not possible

Information about drive selection

The gray cast iron terminal boxes with connection piece have different dimensions from those specified in the chapter "Dimension sheets for motors/brakemotors" (→ 🗎 180).

Order information

Type designation None

Please specify the required thread size for the cable glands with your order. In the case of restricted installation space, please request the terminal box dimensions separately.

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10.6.5 Anti-condensation heating

Asynchronous motors from SEW-EURODRIVE can also be equipped with an anti-condensation heating.

The anti-condensation heating consist of strip heaters installed in the winding overhang(s). It serves for heating the switched-off motor in case of low ambient temperatures, so that condensation in the winding is avoided.

Technical details

The anti-condensation heating connection voltage is AC 115 V or AC 230 V.

The following differences arise depending on the motor size:

They are connected to an auxiliary terminal strip in the terminal box.

Motors	Power in W
DRN63 – DRN71, DR2S63 – DR2S71	28
DRN80 – DRN100, DR2S80	
DRN112 – DRN132S	42
DRN132M – DRN225M	56
DRN250 – DRN315	150

Information about drive selection

Depending on the ambient conditions, using an anti-condensation heating is recommended or mandatory.

- The use of an anti-condensation heating is recommended at ambient temperatures below 0 °C.
- The use of an anti-condensation heating is mandatory at ambient temperatures below -20 °C, and if the motor is exposed to possible condensation.

The anti-condensation heating must be activated as long as the motor is switched off.

Order information

Type designation None

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10.6.6 Condensation drain hole

Depending on ambient conditions, condensation can form in the motor or water infiltration cannot always be prevented despite a high degree of protection. In order to ensure that ingressing water can drain safely, one or more condensation drain holes can be installed upon request.

Technical details

The number and position of required condensation drain holes is based on the relevant mounting position.

The condensation drain holes are sealed at the factory with a closing plug made of NBR. The plug has a labyrinth seal from which condensation can drain off. If contaminated, the condensation drain holes must be checked for proper functioning on a regular basis and cleaned if required.

Closed screw plugs can be selected instead. This type of screw plug must be removed on a regular basis so that the condensation can drain off.

The interval for doing so must be determined by the customer depending on the application and environmental conditions. Observe that condensation must not remain inside the motor over an extended period of time.

The closing plug must not be removed permanently, otherwise the IP degree of protection for the motor cannot be guaranteed.

Condensation drain holes on the fan guard

With inclined or moving mounting positions, humidity can accumulate in the fan guard. SEW-EURODRIVE offers an optional fan guard with condensation drain hole as option.

Order information

Type designation	/DH

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10.7 Surface and corrosion protection

To optimally protect motors that are subject to severe environmental influences, SEW-EURODRIVE offers measures to increase the resistance of highly stressed surfaces.

- Surface protection option /OS
- Corrosion protection option /KS

Additional optional protective measures for the output shafts are also available.

10.7.1 Surface protection

As an option for standard surface protection, motors and gear units are also available with surface protection /OS.

The special measure "Z" is also available. During this procedure, large contour recesses are filled with rubber before the coat is applied.

Technical details

Surface protection		Ambient conditions	Sample applications
Standard		Suitable for machines and systems in buildings and rooms indoors with neutral atmospheres. Based on corrosivity category: • C1 (negligible)	• Machines and systems in the automotive industry • Transport systems in logistics • Conveyor belts at airports
OS1		Suitable for environments prone to condensation and atmospheres with low humidity or contamination, such as applications outdoors under roof or with protection device. Based on corrosivity category: • C2 (low)	• Systems in saw mills • Hall gates • Agitators and mixers
OS2		Suitable for environments with high humidity or moderate atmospheric contamination, such as applications outdoors subject to direct weathering. Based on corrosivity category: • C3 (moderate)	• Applications in amusement parks • Cable cars and chairlifts • Applications in gravel plants • Systems in nuclear power plants
OS3		Suitable for environments with high humidity and occasionally severe atmospheric and chemical contamination. Occasional acidic or caustic wet cleaning. Also for applications in coastal areas with moderate salt load. Based on corrosivity category: • C4 (high)	• Sewage treatment plants • Port cranes • Mining applications

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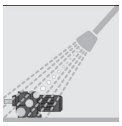
Surface protection		Ambient conditions	Sample applications
OS4		Suitable for environments with permanent humidity or severe atmospheric or chemical contamination. Regular acidic and caustic wet cleaning, also with chemical cleaning agents. Based on corrosivity category: • C5-1 (very high)	• Drives in malting plants • Wet areas in the beverage industry • Conveyor belts in the food industry

- Drives with surface protection OS2 – OS4 are always equipped with /KS corrosion protection.
- Drives in degree of protection IPX6 are always equipped with /KS corrosion protection.
- Drives with surface protection OS4 are always additionally equipped with preventive measure "Z". "Z" = All surface recesses sprayed with elastic rubber compound.
- Corrosivity category: To ISO 12944-2 classification of ambient conditions

Order information

Type designation None

10.7.2 Corrosion protection

The option description "Corrosion protection" lists all measures to increase the corrosion resistance that refer to treatment of outer surfaces.

A label with the word "KORROSIONSSCHUTZ" (corrosion protection) on the fan guard indicates that special treatment has been applied.

Technical details

The corrosion protection measures are described in the brochure "We have the very thing against corrosion: Surface and corrosion protection". If you have any questions, contact SEW-EURODRIVE.

Order information

Type designation None

10.7.3 Paint

As standard, the motors are painted with "blue/gray"/RAL 7031. Special coatings and other colors are available on request.

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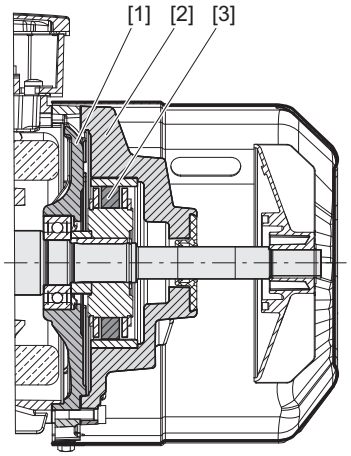
10.8 Mechanical backstop

The backstop is mounted to the motor B-side on the brake endshield [1] instead of a brake. The backstop mechanism consists of a fixed backstop housing [2] with hardened contact surface and the sprag ring [3] that is positively connected to the motor shaft and rotates with the shaft.



4153178379

1 Brake endshield
2 Backstop housing
3 Sprag ring

10.8.1 Technical details

Motors	Nominal locking torque	Lift-off speed	Additional weight m_{RS}	Inertia increased by value J_{RS}
	Nm	min^{-1}	kg	10^{-4} kgm^2
DRN63, DRN71 DR2S63, DR2S71	95	890	1.45	0.25
DRN80 DR2S80	130	860	2.1	0.42
DRN90 DRN100	370	750	2.8	1.65
DRN112 DRN132S	490	730	5.5	1.50
DRN132M DRN132L	700	700	8	4.5
DRN160 DRN180	1400	610	15.5	38.0
DRN200 DRN225	2500	400	25	45.0
DRN250 DRN280	2500	400	30	63.0
DRN315	6300	320	48	75.0

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10.8.2 Information about drive selection

The backstop is designed for motors in grid operation. The backstop operates maintenance-free above the lift-off speed. Contact SEW-EURODRIVE when operating a motor with backstop on an inverter below lift-off speed.

For the mechanical limit speeds applicable for operating a motor with backstop at an inverter, refer to chapter "Maximum speeds" (→ 🗎 175).

The dimensions of motors with backstop are equal to motors with mounted BE.. brake. Observe the deviating dimensions of the terminal box for sizes 71 to 132S, see the chapter "Dimension sheets for motors/brakemotors" (→ 🗎 180).

Backstops can be used with motors designed for ambient temperatures of -40 °C to +60 °C.

10.8.3 Order information

Type designation	/RS
Blocking direction specification	The required motor direction of rotation must be specified in the order. The blocking direction is defined as looking onto the fan guard. CW: Clockwise CCW: Counterclockwise

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10.9 Plug connectors

SEW-EURODRIVE offers AC motors with plug connector as an alternative to motors with conventional motor connection via cables with fixed wiring. This option allows for easier installation without wiring effort by using prefabricated mating connectors (plug-and-play).

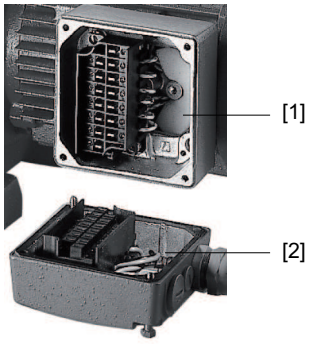
Two types of plug connectors can be selected as standard design:

- Integrated plug connector /IS from SEW-EURODRIVE
- Mounted industrial plug connector /IV with HARTING connector system

SEW-EURODRIVE also offers customer-specific connector solutions from other manufacturers on request.

10.9.1 Integrated plug connector

The integrated plug connector option consists of 2 interconnected terminal blocks that are integrated in the terminal box instead of the motor terminal board. The advantage of an integrated plug connector is the compact design and the robust, completely enclosed housing.



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[1] Terminal box lower part
[2] Terminal box cover

Technical details

With the /IS standard design, the integrated plug connector is delivered with 2 terminal blocks (pins/bushings) and a terminal box cover with tapped holes. The terminal block (bushings) mounted in the terminal box cover includes a variable terminal link for easy wiring of the motor connection type.

An alternative is the /ISU design where only the terminal block on the motor side (pins) and a transport protection cover are included in the delivery.

This design can be used, for example, when prefabricated cables are used to install the drive, see chapter "Prefabricated cables" (→ 🗎 512).

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Technical data

	Integrated plug connector /IS
Motors	DRN63 – 132S DR2S63 – DR2S80
Limit value for effective current carrying capacity	AC 16 A
Number of contacts	12 contacts for typical use: 6 contacts for motor winding 4 contacts for brake connection 2 contacts for motor option (e.g. thermal motor protection)
Maximum voltage (IEC)	AC 690 V
Maximum voltage (CSA)	AC 600 V
Maximum core cross section	2.5 mm^2 with variable terminal link 4 mm^2 without variable terminal link
Connection technology	Screw connection
Contact type	Pin (terminal box lower part)
	Bushing (terminal box cover)
Grounding (PE)	2 additional contacts in the terminal block insulator
Degree of protection	Up to IP66, depending on motor degree of protection
Ambient temperature	-40 °C to +40 °C For temperatures above +40 °C (reduces contact load according to derating curve)

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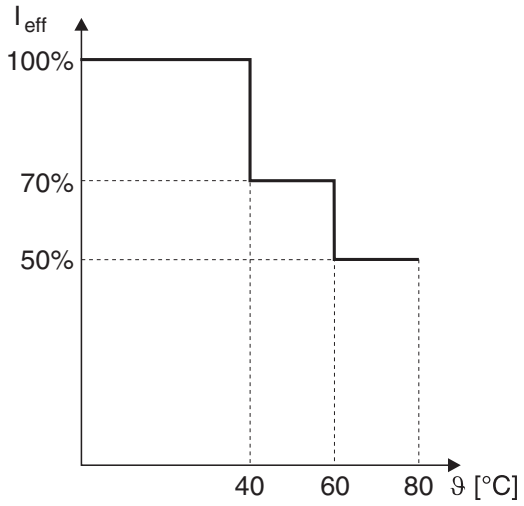
Contact load at ambient temperatures +40 °C and higher

The permitted effective current carrying capacity of the contacts is reduced for ambient temperatures above +40 °C. The following figure shows the permitted contact load depending on the ambient temperature.



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Order information

Description	Designation
Complete design with 2 terminal blocks and variable terminal link	/IS
Design only with terminal block on the motor side, and transport protection cover.	/ISU

- The desired motor connection type (⅄/△) must be specified when the design /IS is ordered. The variable terminal link in the terminal box cover is preinstalled accordingly at the factory.
- The position of the cable entry is decided by the customer during startup. Upon delivery, the position is always "X" and must not be specified in the order.
- The connection of the winding and optional connections of the brake and motor options are performed on the male connector in the factory.

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10.9.2 Installed plug connectors

The installed plug connectors are compatible to common industry standards. The motor can be quickly connected to the power supply using the plug connectors.

Three different HARTING connector systems can be selected:

• Han® 10 ES/E.

• Han-Modular®

• Han-Compact®

The mating connectors are not included in the delivery. Mating connectors must be ordered separately from the relevant manufacturer. As an alternative, prefabricated cables with mating connector are available from SEW-EURODRIVE on request.

Information about drive selection

The following chapters provide an overview of technical properties and differences of the individual designs.

Observe the following points:

- Motor sizes specified in the tables describe possible mechanical combinations. What is crucial for implementing these combinations is that the nominal current of the selected motor must not exceed the limit value for the effective current carrying capacity of the plug connector.
- The stated limit values for the effective current carrying capacity refer to ambient temperatures from -40 °C to +40 °C. Observe the derating curve for temperatures up to a maximum of +80 °C.
- The specified motor connection types refer without exceptions to single-speed motors with fixed voltage combinations (e.g. 230 V△/400 V⅄). Contact SEW-EURODRIVE if you require a plug connector for a multi-voltage motor (e.g. 230 V⅄/460 V⅄).
- Mounting the plug connectors results in deviating terminal box dimensions. For the designs AS./AC./AM./AD./AB./AK., the dimensions are marked with the abbreviation IV in the relevant dimension sheet, see chapter "Dimension sheets for motors/brakemotors" (→ 🗎 180). The dimensions for the design AND. are available on request.
- Connector contact pins reserved for motor protection are slightly shorter, with exception of the AS. types. Observe the wiring diagram. Contact SEW-EURODRIVE for further information.

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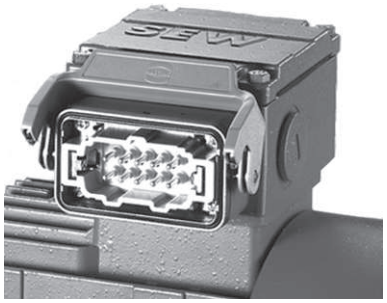
Technical details of Han®10 ES/E



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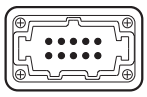
Technical data

/AS.., /AC..

	/ASB..	/ASE..	/ACB..	/ACE..
Motors	DRN63 – 132M	DRN63 – 132M	DRN63 – 132S	DRN63 – 132S
	DR2S63 – DR2S80			
Possible types of motor connection	⅄ / △fixed prewiring set at the factory[1)] ⅄ / △can be wired by the customer			
Connector system	Han®10ES		Han®10E	
Housing	EMC housing, cast or screwed onto the terminal box Harting housing size 10B			
Degree of protection	According to the motor degree of protection up to IP66[2)]			
Interlocking	Han Easy-Lock® Double-clip Transverse interlocking	Han Easy-Lock® Single-clip Lengthwise interlocking	Han Easy-Lock® Double-clip Transverse interlocking	Han Easy-Lock® Single-clip Lengthwise interlocking
Connector viewed from motor end				
Contact insert	Insulator with cage clamp contacts on the motor side		Insulator with crimp contacts on the motor side	
Number of contacts	10 (+ PE)			
Contact type	Pin (male) on the motor side Bushing (female) in mating connector			
Grounding (PE)	Via two housing pins on insulator			
Maximum voltage	AC 500 V (standard) AC 600 V (CSA)			
Limit value for effective current carrying capacity per contact	AC 16 A			

1) With fixed connection type, also available as design for decentralized MOVIMOT®/MOVI-SWITCH® inverters mounted close to the motor.

2) With plugged-in and locked mating connector.

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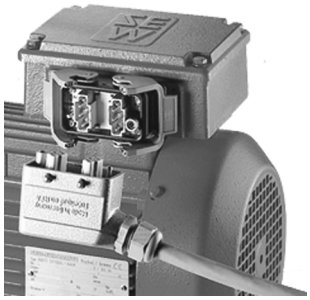
Technical details of Han-Modular®



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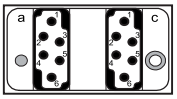
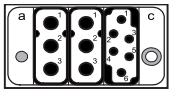
Technical data

/AM.., /AD..

	/AMB..	/AME..	/ADB..	/ADE..
Motors	DRN63 – 132M	DRN63 – 132M	DRN71 – 225	
	DR2S63 – DR2S80		DR2S71 – DR2S80	
Possible types of motor connection	⅄ / △fixed prewiring set at the factory[1)] ⅄ / △ can be wired by the customer		⅄ / △ can be wired by the customer	
Connector system	Han-Modular®			
Housing	EMC housing, cast or screwed onto the terminal box Harting housing size 10B			
Degree of protection	According to the motor degree of protection up to IP66[2)]			
Interlocking	Han Easy-Lock® Double-clip Transverse interlocking	Han Easy-Lock® Single-clip Lengthwise interlocking	Han Easy-Lock® Double-clip Transverse interlocking	Han Easy-Lock® single-clip Lengthwise interlocking
Connector viewed from motor end				
Contact insert	Articulated frame a/b/c assembled with • a: E module • b: Empty module • c: E module		Articulated frame a/b/c assembled with • a: C module (crimp) • b: C module (crimp) • c: E module	
Number of contacts	6 + 6 (+ PE)		3 + 3 + 6 (+ PE)	
Contact type	Pin (male) on the motor side Bushing (female) in mating connector			
Grounding (PE)	Via 2 housing pins on articulated frame			
Maximum voltage	AC 500 V (standard) AC 600 V (CSA)			

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	/AMB..	/AME..	/ADB..	/ADE..
Limit value for effective current carrying capacity per contact	AC 16 A		AC 36 A (C modules) AC 16 A (E module)	

1) With fixed connection type, also available as design for decentralized inverters mounted close to the motor MOVIMOT®/ MOVI-SWITCH®.

2) With plugged-in and locked mating connector.

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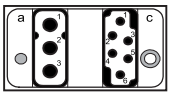
/AB.., /AK..

	/ABB..	/ABE..	/AKB..	/AKE..
Motors	DRN71 – 225 DR2S71 – DR2S80		DRN132M – 225	
Possible types of motor connection	⅄ / △ fixed prewiring set at the factory			
Connector system	Han-Modular®			
Housing	EMC housing, cast or screwed onto the terminal box Harting housing size 10 B			
Degree of protection	According to the motor degree of protection up to IP66[1)]			
Interlocking	Han Easy-Lock® Double-clip Transverse interlocking	Han Easy-Lock® Single-clip Lengthwise interlocking	Han Easy-Lock® Double-clip Transverse interlocking	Han Easy-Lock® Single-clip Lengthwise interlocking
Connector viewed from motor end				
Contact insert	Articulated frame a/b/c assembled with • a: C module (crimp) • b: Empty module • c: E module		Articulated frame a/b/c assembled with • a: C module (axial screw module) • b: Empty module • c: E module	
Number of contacts	3 + 6 (+ PE)			
Contact type	Pin (male) on the motor side Bushing (female) in mating connector			
Grounding (PE)	Via 2 housing pins on articulated frame			
Maximum voltage	AC 500 V (standard) AC 600 V (CSA)			
Limit value for effective current carrying capacity per contact	AC 36 A (C module) AC 16 A (E module)		AC 60 A (C module) AC 16 A (E module)	

1) With plugged-in and locked mating connector.

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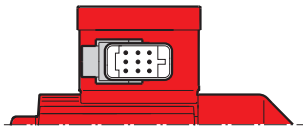
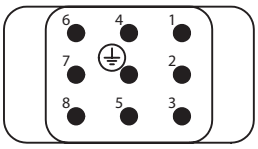
Technical details of Han-Compact®



Technical data

	/AND..
Motors	DRN63 – 132M DR2S63 – DR2S80
Possible types of motor connection	⅄ / △ fixed prewiring set at the factory
Connector system	Han-Compact®
Housing	Metal housing, mounted to terminal box Harting housing size Q8/0
Degree of protection	According to the motor degree of protection up to IP66[1)]
Interlocking	Single-clip transverse closure (metal clip)
Connector viewed from motor end	
Contact insert	Insulator with Crimp contact on the motor side
Number of contacts	8 (+ PE)
Contact type	Pin (male) on the motor side Bushing (female) in mating connector
Grounding (PE)	Via 1 advancing PE contact In the insulator
Maximum voltage	AC 500 V (standard) AC 600 V (CSA)
Limit value for effective current carrying capacity per contact	AC 16 A

1) With plugged-in and locked mating connector.

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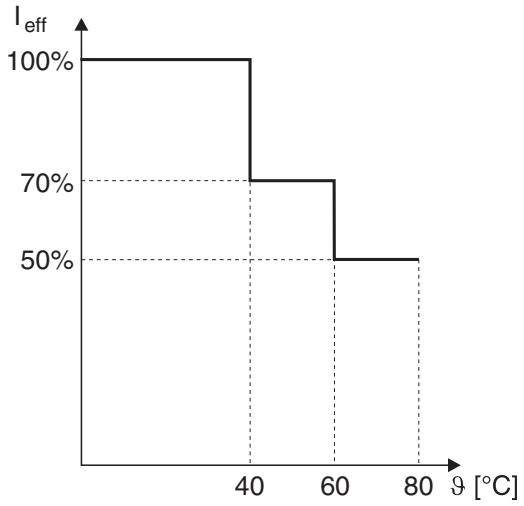
Contact load at ambient temperatures +40 °C and higher

The permitted effective current carrying capacity of the contacts is reduced for ambient temperatures above +40 °C. The following figure shows the permitted contact load depending on the ambient temperature.



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Order information

Connector system	Design	Interlocking	Motor connection type ⅄/△	For inverters close to the motor decentralized
Han® 10ES	/ASB..	Double-clip	Fixed prewiring	Available
	/ASE..	Single-clip	Can be wired by the customer	Available
Han® 10E	/ACB..	Double-clip	Fixed prewiring	Not available
	/ACE..	Single-clip	Can be wired by the customer	Not available
Han-Modular®	/AMB..	Double-clip	Fixed prewiring	Available
	/AME..	Single-clip	Can be wired by the customer	Available
	/ADB..	Double-clip	Can be wired by the customer	Not available
	/ADE..	Single-clip	Can be wired by the customer	Not available
	/ABB..	Double-clip	Fixed prewiring	Not available
	/ABE..	Single-clip	Fixed prewiring	Not available
	/AKB..	Double-clip	Fixed prewiring	Not available
	/AKE..	Single-clip	Fixed prewiring	Not available
Han-Compact®	/AND..	Single-clip	Fixed prewiring	Not available

The last position of the type designation (1, 2, 4, 8, 9 as in ASB8) is assigned by SEW-EURODRIVE depending on the desired motor design and options, and does not need to be specified in the order.

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10.10 Cage clamp terminals

As standard, the motor winding is connected to the power supply via a terminal board with threaded bolts. If the customer requests a quicker and easier connection alternative, AC motors can be configured using a power connection via cage clamp terminals. With this option, the power cable connection is replaced by a terminal strip with cage clamp connections.

10.10.1 Terminal strip /KCC

This design contains 6 terminals, plus a grounding terminal (PE).

The star or delta connection is implemented in the middle of the terminal strip as follows:

- Using one jumper for the star connection
- Using 3 jumpers for the delta connection.

The 4 jumpers are included in the delivery.

Technical details

Technical data

Type	/KCC
Cage clamp for motor size	DRN71 – 132S DR2S71 – DR2S80
Number of terminals	6
Grounding (PE)	1 additional terminal
Connection to terminals	Cage clamp
Maximum core cross section	Rigid conductors: 4 mm^2 Flexible conductors: 4 mm^2 With conductor end sleeve: 2.5 mm^2
Maximum voltage (IEC)	AC 720 V
Maximum load (IEC)	AC 28 A
Maximum voltage (CSA)	AC 600 V
Maximum load (CSA)	AC 20 A
Degree of protection	Corresponding to motor degree of protection
Ambient temperature	-40 °C to +60 °C

Information on drive selection

Additional motor options, e.g. for thermal motor protection, are generally connected separately via screw terminals and not via the terminal strip.

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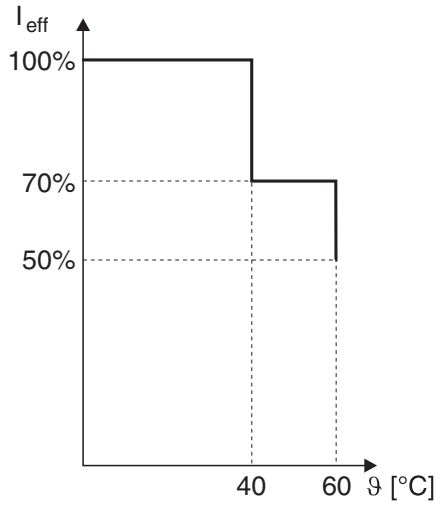
Load of /KCC at ambient temperatures +40 °C and higher

The permitted effective current carrying capacity of the contacts is reduced for ambient temperatures above +40 °C. The following figure shows the permitted load depending on the ambient temperature.



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Order information

Type designation	/KCC

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10.10.2 Terminal box in compact design /KC1

For applications where a standard terminal box would create a too large interfering contour, terminal boxes in a compact design can be selected. The terminal box in compact design has smaller dimensions, see chapter Motors with /KCC or /KC1.

With this design, a compact terminal box cover with 3 tapped holes for the cable glands is screwed directly onto the motor housing instead of the terminal box lower part in the standard size. The internal motor terminal board is replaced by a compact terminal strip.

VDI guideline 3643 contains a profile for electrified monorail systems, the C1 profile. The DRN71/80 motors also meet this guideline with the /KC1 option in terminal box positions R (0°), L (180°) and T (270°), for all cable entry directions (X, 1, 2, 3).

The option /KC1 remains available for motors in size DRN90 – 132S. But these motors do not comply with the clearance profile according to VDI guideline 3643.

Technical details

Technical data

Type	KC1
Cage clamp for motor size	DRN71 – 132S C1 profile with DRN71/80 DR2S71 – DR2S80 C1 profile with DR2S71/80
Number of terminals	8 for motor/brakemotor
Grounding (PE)	1 additional terminal
Connection to terminals	Cage clamp
Maximum core cross section	Rigid conductors: 2.5 mm^2 Flexible conductors: 2.5 mm^2 With conductor end sleeve: 1.5 mm^2
Maximum voltage (IEC)	AC 500 V
Maximum load (IEC)	AC 24 A
Maximum voltage (CSA)	AC 600 V
Maximum load (CSA)	AC 5 A
Degree of protection	Corresponding to motor degree of protection
Ambient temperature	-40 °C to +60 °C

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Information on drive selection

The terminal strip consists of the following:

- 3 dual-chamber terminals for power connection of the 3 motor cables.
- 3 single-chamber terminals for connecting the brake. The brake control must be installed in the control cabinet.
- 2 single-chamber terminals for connecting a motor option, e.g., a temperature sensor, temperature switch, or anti-condensation heating.
- A grounding terminal (PE).

The following 3 cable entries are integrated in the cover of design /KC1:

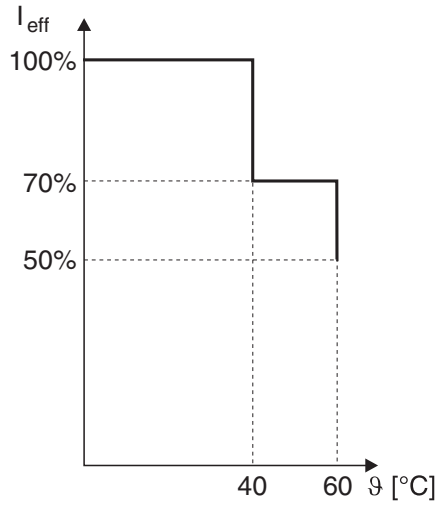
- M20 × 1.5
- M16 × 1.5
- M12 × 1.5

The motor in design /KC1 is supplied with factory-fitted wiring. Unless specified otherwise by the customer, a star connection is provided for 2-, 4-, and 6-pole motors according to wiring diagram R13.

The customer can change the connection type by altering the assignment of the 3 dual-chambers.

Load of /KC1 at ambient temperatures +40 °C and higher

The permitted effective current carrying capacity of the contacts is reduced for ambient temperatures above +40 °C. The following figure shows the permitted load depending on the ambient temperature.



8961109259

Order information

Type designation /KC1

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10.11 Functional safety (FS)

Motors from SEW-EURODRIVE are optionally available with functionally safe motor options. These are designed for implementing safety functions.

The motors are available with the following functional safety options on request:

- Safety brake
- Safety encoder
- MOVIMOT® inverter

SEW-EURODRIVE labels a functionally safe motor option at the drive with an FS logo and a 2-digit number on the motor nameplate. The number is a code that indicates which components in the drive are safety-related. This allows to uniquely identify an available functionally safe motor option via the motor nameplate.

FS logo	Available functionally safe motor option		
	Decentralized inverters	Safety brake	Safety encoder
FS 01	X		
FS 02		X	
FS 04			X
FS 07	X		X
FS 11		X	X

If the FS logo, e.g. with the code "FS 11" is present on the motor nameplate, the combination of safety encoder and safety brake is available at the motor. If an FS logo is available, adhere to the information specified in the corresponding documentation.

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11 Prefabricated cables

SEW-EURODRIVE offers prefabricated cables with plugs for straightforward and reliable motor connection.

Prefabricated cables are divided as follows:

- Power cables such as motor cables, brakemotor cables, extension cables
- Encoder cables and their extension cables.

Cable and contact are connected using the crimp technique. Cables are available by the meter.

11.1 Preselection of cables

Prefabricated cables were preselected by SEW-EURODRIVE according to the standard EN 60204. The routing types "fixed installation" and "cable carrier installation" were considered.

Using other standards for the machine construction can result in diverging cross sections.

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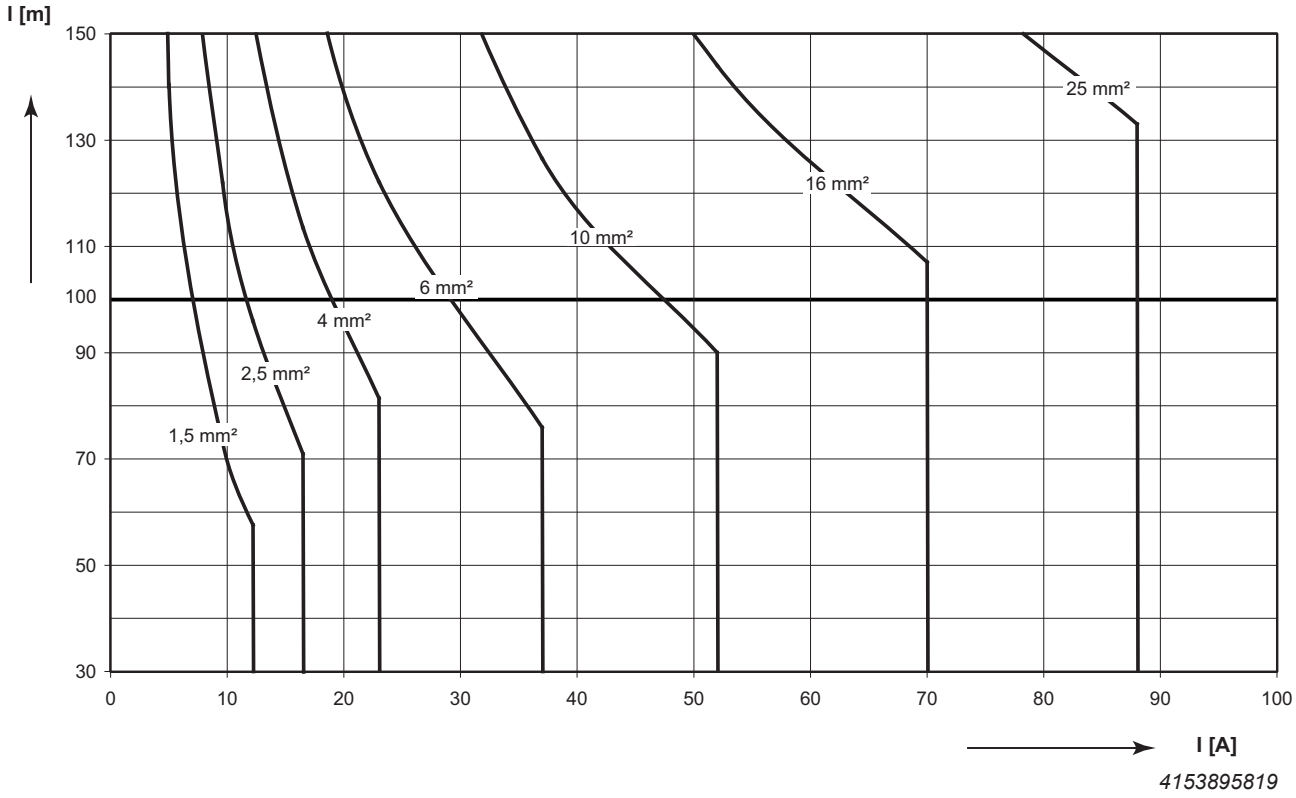
11.2 Project planning

11.2.1 Project planning for cable cross section

The following figure shows the minimum required cable cross section depending on cable length and current.



Prefabricated cables with cross sections of 1.5 mm^2 to 10 mm^2 can be ordered from SEW-EURODRIVE.

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11.2.2 Cable dimensioning to EN 60204

Cable load table

Cable load through current I according to EN 60204-1:2006 table 6, ambient temperature 40 °C.

Cable cross section	Three-core sheathed cable in pipe or cable	Triple-core, plastic-sheathed cable on top of each other on wall	Three-core sheathed cable lined up horizontally
mm²	A	A	A
1.5	13.1	15.2	16.1
2.5	17.4	21	22
4	23	28	30
6	30	36	37
10	40	50	52
16	54	66	70
25	70	84	88
35	86	104	114

These data are merely recommended values and are no substitute for the detailed project planning of the incoming cables depending on the concrete application considering the applicable regulations.

Observe the voltage drop that occurs along the cable in particular with the DC 24 V brake coil when dimensioning the cross sections for the brake cable. The acceleration current is decisive for the calculation.

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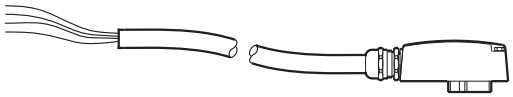
11.3 Key

Icon	
	Cables also suitable for cable carriers

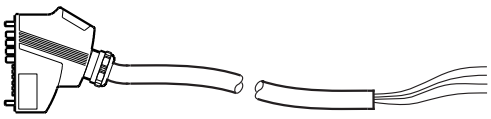
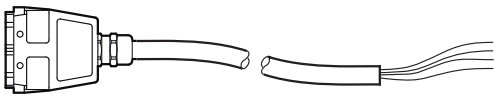
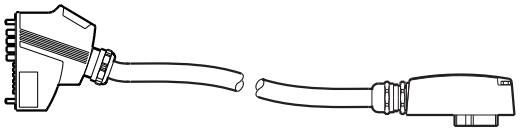
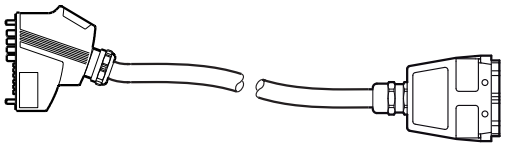
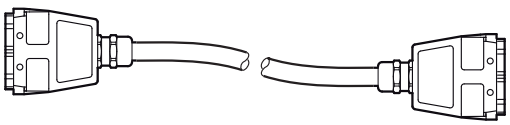
Abbreviation	
CL	Ring cable lug
CES	Conductor end sleeve

11.4 Overview of power cables for asynchronous motors

11.4.1 Brakemotor cable with option /IS

Connection cable			Length/installation type	Specification
Motor side				
			Fixed length Variable length	On the motor end, all 12 contacts of the integrated plug connector are used for connecting motor, brake, and motor protection. The cables are available with variable terminal link in star or delta connection. For wiring in the control cabinet and field distributors, the cores are fitted with ring-type cable lugs or conductor end sleeves. "Brakemotor cables with /IS" (→ 532)
Open (conductor end sleeve and ring cable lug)		/IS		

11.4.2 Brakemotor cable for decentralized MOVI-SWITCH®

Connection cable			Length/installation type	Specification
Motor side				
			Fixed length Variable length	"Cable drawing and assignment – PLUSCON VC – open" (→ 🗎 533)
PLUSCON VC		Open (conductor end sleeve and ring cable lug)		
			Fixed length Variable length	"Cable drawing and assignment – Han 10E – open" (→ 🗎 534)
Han® 10E		Open (conductor end sleeve and ring cable lug)		
			Fixed length Variable length	"Cable drawing and assignment – PLUSCON VC – /IS" (→ 🗎 535)
PLUSCON VC		/IS		
			Fixed length Variable length	"Cable drawing and assignment – PLUSCON VC – Han 10E" (→ 🗎 536)
PLUSCON VC		Han® 10E		
			Fixed length Variable length	"Cable drawing and assignment – Han 10E – Han 10E" (→ 🗎 537)
Han® 10E		Han® 10E		

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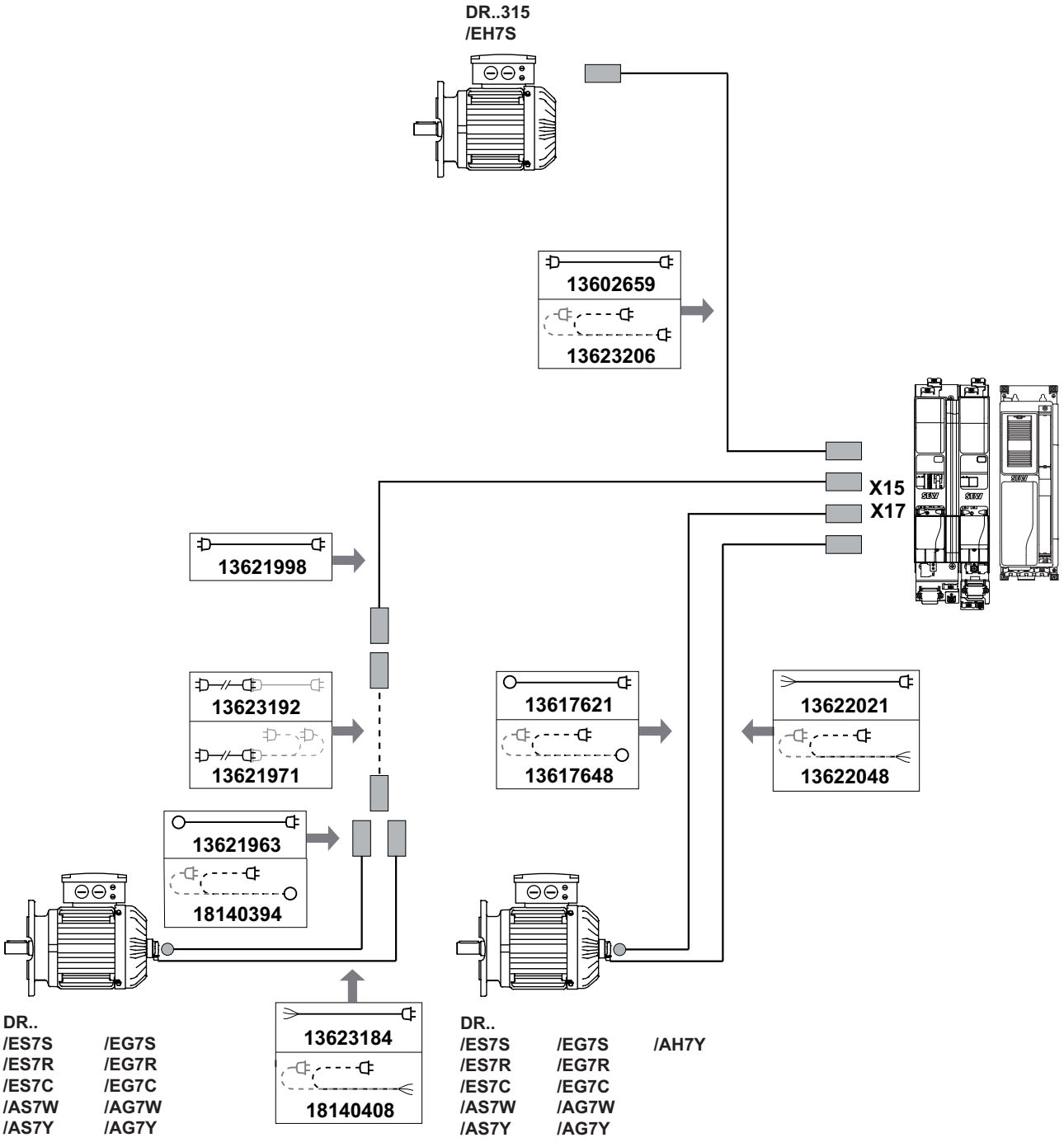
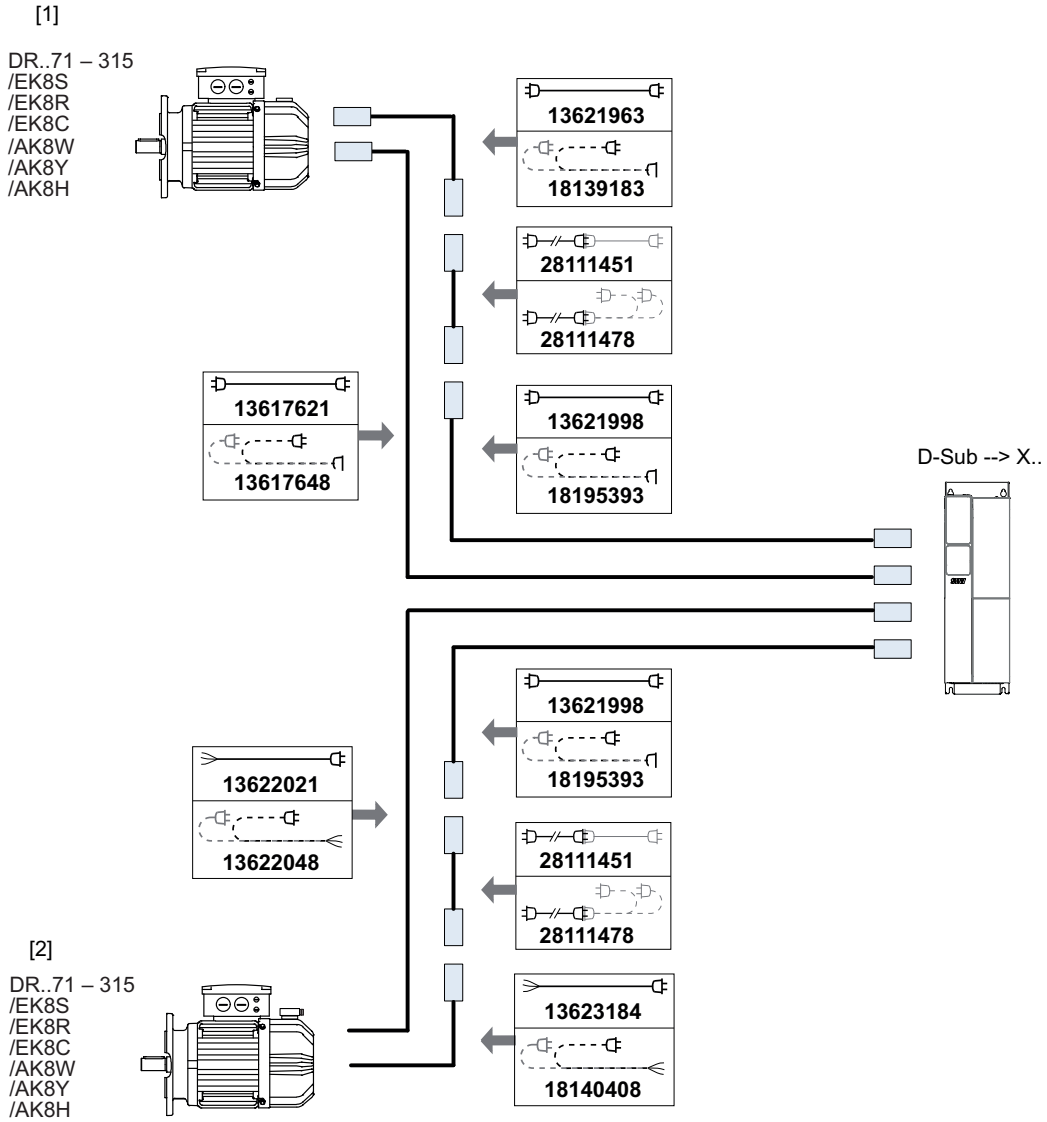
11.5 Encoder cables for DR.. motors

11.5.1 Overview



36028811835273611

A.7Y encoders can be connected only to the CES11A (X17) multi-encoder card.



18014422992771723

D-Sub --> X.. MOVIDRIVE® modular/system/technology
Basic device: X15
CES11A multi-encoder card: X17
AK8Y encoders can be connected only to the CES11A multi-encoder card.

[1] Motors with an integrated plug connector for encoder signals without connection cover, connection type A2GA.
The signals for thermal monitoring of the motor are not located in the encoder cable.

[2] Motors with integrated plug connector for encoder signals with connection cover, connection type A1GA.
The signals for thermal monitoring of the motor are not located in the encoder cable.

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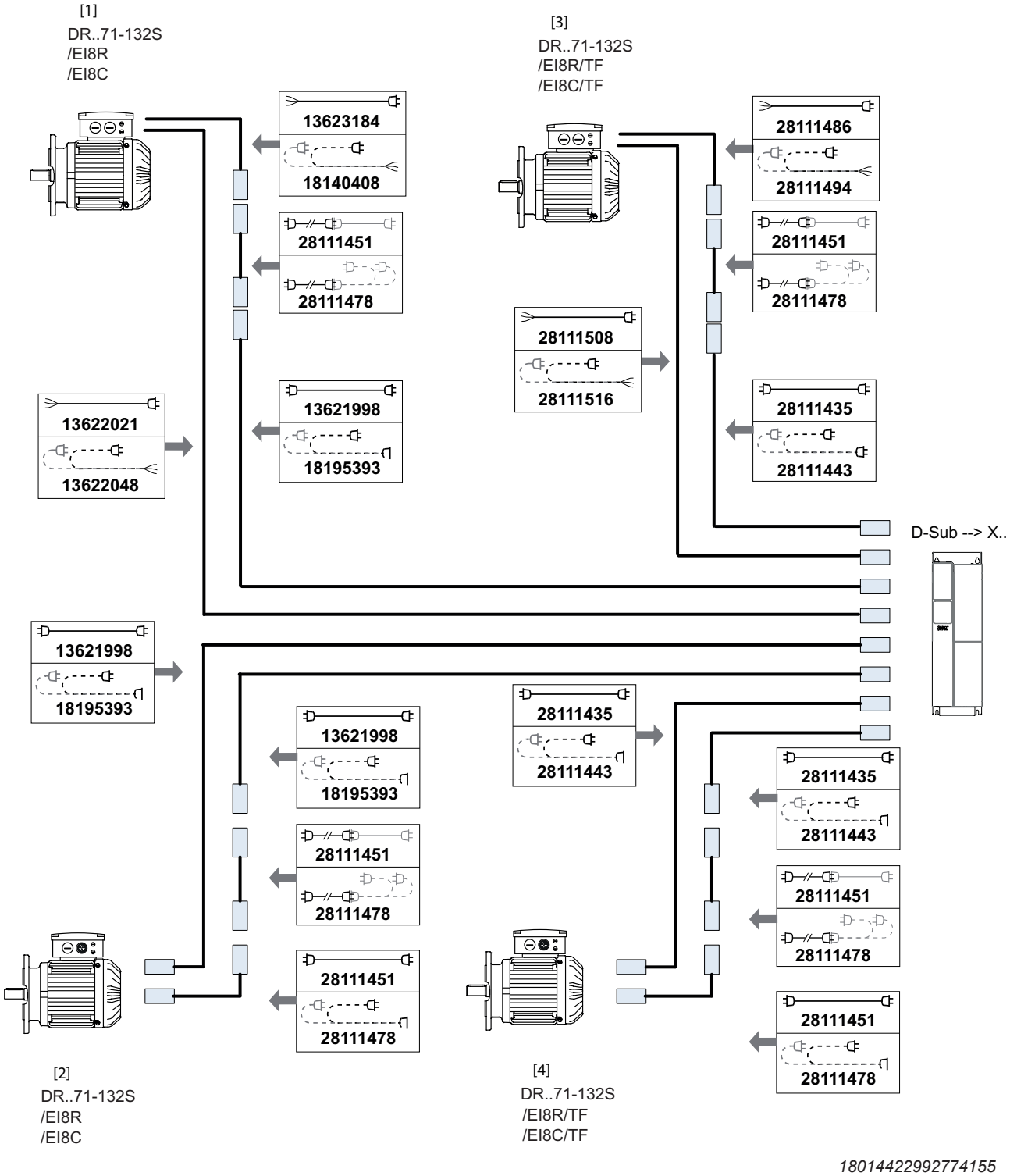

18014422992774155

D-Sub --> X.. MOVIDRIVE® modular/system/technology
Basic device: X15
CES11A multi-encoder card: X17
AK8Y encoders can be connected only to the CES11A multi-encoder card.

[1] Motors with terminal strip in the terminal box for encoder signals and thermal monitoring.
The signals for thermal monitoring of the motor are not located in the encoder cable.

[2] Motors with an M23 plug connector at the terminal box for encoder signals, connection type AIGA.
The signals for thermal monitoring of the motor are not located in the encoder cable.

[3] Motors with terminal strip in the terminal box for encoder signals and thermal monitoring.
The signals for thermal monitoring of the motor are located in the encoder cable.

[4] Motors with an M23 plug connector at the terminal box for encoder signals and thermal monitoring, connection type AIGB.
The signals for thermal monitoring of the motor are located in the encoder cable.

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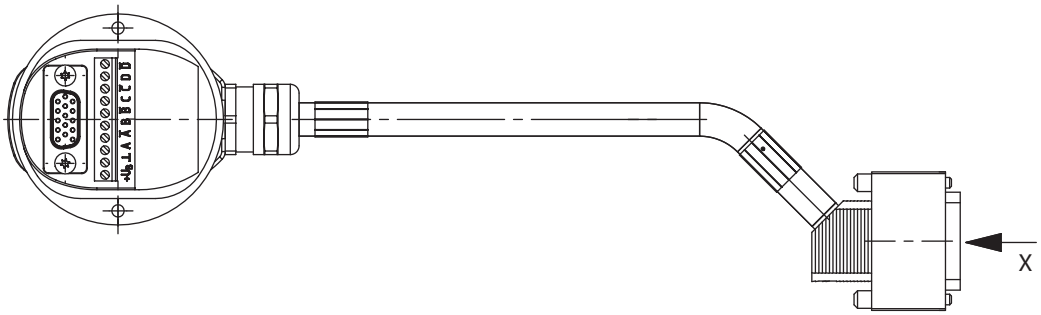
11.5.2 Encoder cable with connection cover and D-sub

Illustration of encoder cable



14818281099

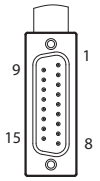
Types of encoder cables

Number of cores and cable cross section	Part number	Installation type
6 × 2 × 0.25 mm²	13617621	Fixed installation
6 × 2 × 0.25 mm²	13617648	Cable carrier installation

Pin assignment of encoder cables

Motor connection side					X15 terminal
Contact	**Signal**	**Cable/core color**	**Signal**	**Contact**	**Plug connector view X**
A	cos+	Red (RD)	A	1	
$\overline{A}$	cos-	Blue (BU)	$\overline{A}$	9	
B	sin+	Yellow (YE)	B	2	
$\overline{B}$	sin-	Green (GN)	$\overline{B}$	10	
C	C+	Brown (BN)	C	3	
$\overline{C}$	C-	White (WH)	$\overline{C}$	11	
D	Data+	Black (BK)	D	4	
$\overline{D}$	Data-	Violet (VT)	$\overline{D}$	12	
+UB	UB	Red/blue + gray (RD-BU + GY) optionally: Gray (GY)	UB	15	
GND	DGND	Gray-pink+pink (GY-PK +PK) optionally: Pink (PK)	DGND	8	

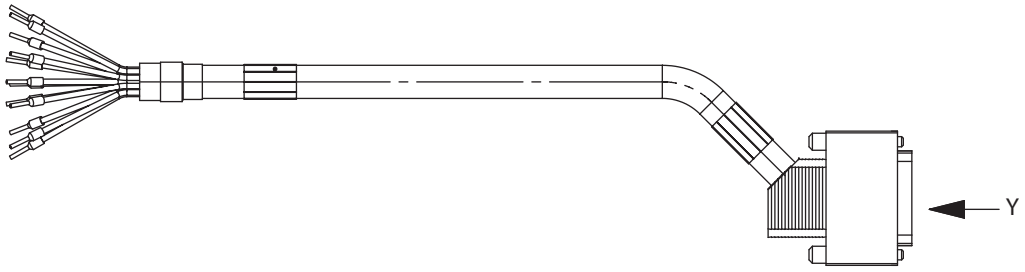
D-sub



15-pin

11.5.3 Encoder cable with conductor end sleeves and D-sub

Illustration of encoder cable

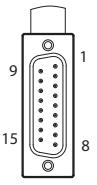


14818291467

Types of encoder cables

Number of cores and cable cross section	Part number	Installation type
6 × 2 × 0.25 mm²	13622021	Fixed installation
6 × 2 × 0.25 mm²	13622048	Cable carrier installation
5 × 2 × 0.25 mm² + 2 × 0.5 mm²	28111508	Fixed installation
5 × 2 × 0.25 mm² + 2 × 0.5 mm²	28111516	Cable carrier installation

Pin assignment of encoder cables

Motor connection side				X15 terminal
	Contact	Description	Conductor color	Plug connector View Y
	1	A (cos+)	Red (RD)	
	9	$\overline{A}$ (cos-)	Blue (BU)	
	2	B (sin+)	Yellow (YE)	
	10	$\overline{B}$ (sin-)	Green (GN)	
	3	C+	Brown (BN)	
	11	C-	White (WH)	
	4	Data+	Black (BK)	
	12	Data-	Violet (VT)	
	15	UB	Red/blue + gray (RDBU + GY) optionally: Gray (GY)	
	8	GND	Gray/pink + pink (GYPK + PK) optionally: Pink (PK)	
	14	TF+	Gray/pink (GYPK)	
	6	TF-	Red blue (RDBU)	

TF+ and TF-: assigned, if present

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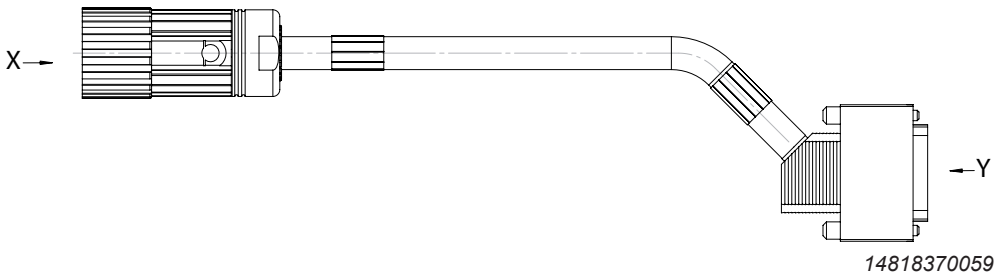
11.5.4 Encoder cable with M23 and D-sub

Illustration of encoder cable

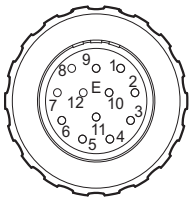
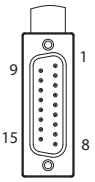


14818370059

Types of encoder cables

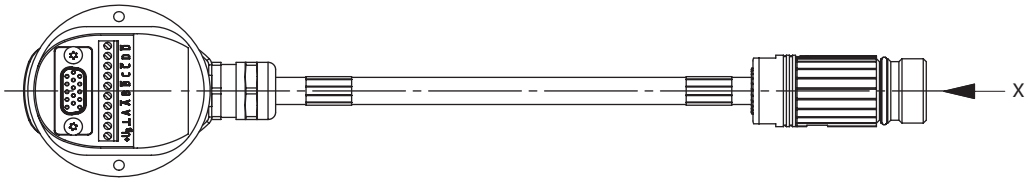
Number of cores and cable cross section	Part number	Installation type
5 × 2 × 0.25 mm²	13602659	Fixed installation
5 × 2 × 0.25 mm²	13623206	Cable carrier installation

Pin assignment of encoder cables

Motor connection side					X15 terminal	
Plug connector View X	Contact	Signal	Cable/core color	Signal	Contact	Plug connector View Y
	5	A cos+	Red (RD)	A cos+	1	 D-sub 15-pin
	6	$\overline{A}$ cos-	Blue (BU)	$\overline{A}$ cos-	9	
	8	B sin+	Yellow (YE)	B sin+	2	
	1	$\overline{B}$ sin-	Green (GN)	$\overline{B}$ sin-	10	
	3	C+	Brown (BN)	C	3	
	4	C-	White (WH)	$\overline{C}$	11	
	-	Data+	-	D	4	
	-	Data-	-	$\overline{D}$	12	
	12	UB	Black + gray (BK +GY)	UB	15	
	10	GND	Pink + violet (PK+VT)	GND	8	

11.5.5 Encoder extension cable with connection cover and M23

Illustration of encoder extension cable



14818380043

Types of encoder extension cables

Number of cores and cable cross section	Part number	Installation type
6 × 2 × 0.25 mm²	13621963	Fixed installation
6 × 2 × 0.25 mm²	18139183	Cable carrier installation
6 × 2 × 0.25 mm²	18140394	Cable carrier installation

Pin assignment of encoder extension cables

Motor connection side					X15 terminal
Contact	Signal	Cable/core color	Signal	Contact	Plug connector View X
A	A cos+	Red (RD)	A cos+	3	
$\overline{A}$	$\overline{A}$ cos-	Blue (BU)	$\overline{A}$ cos-	4	
B	B sin+	Yellow (YE)	B sin+	5	
$\overline{B}$	$\overline{B}$ sin-	Green (GN)	$\overline{B}$ sin-	6	**AKUA 020**
C	C+	Brown (BN)	C+	1	
$\overline{C}$	C-	White (WH)	C-	2	
D	Data+	Black (BK)	Data+	8	
$\overline{D}$	Data-	Violet (VT)	Data-	7	
+UB	UB	Red/blue + gray (RD-BU + GY)	UB	12	
GND	GND	Gray-pink+pink (GY-PK+PK)	GND	11	

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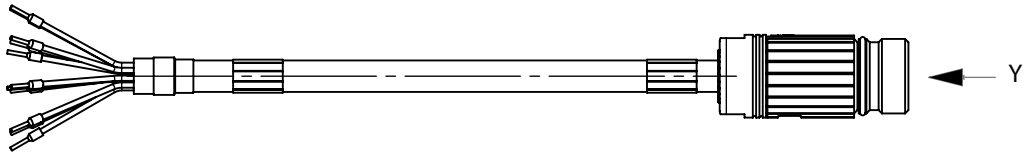
11.5.6 Encoder extension cable with conductor end sleeves and M23

Illustration of encoder extension cable

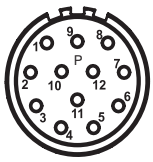


14818388875

Types of encoder extension cables

Number of cores and cable cross section	Part number	Installation type
6 × 2 × 0.25 mm²	13623184	Fixed installation
6 × 2 × 0.25 mm²	18140408	Cable carrier installation
5 × 2 × 0.25 mm² + 2 × 0.5 mm²	28111486	Fixed installation
5 × 2 × 0.25 mm² + 2 × 0.5 mm²	28111494	Cable carrier installation

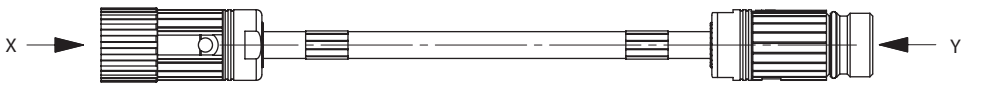
Pin assignment of encoder extension cables

Motor connection side				X15 terminal
	Contact	Description	Conductor color	Plug connector View Y
	3	A cos+	Red (RD)	
	4	$\overline{A}$ cos-	Blue (BU)	
	5	B sin+	Yellow (YE)	
	6	$\overline{B}$ sin-	Green (GN)	
	1	C+	Brown (BN)	
	2	C-	White (WH)	
	8	Data+	Black (BK)	
	7	Data-	Violet (VT)	
	12	UB	Red/blue + gray (RDBU + GY) optionally: Gray (GY)	
	11	GND	Gray/pink + pink (GYPK + PK) optionally: Pink (PK)	
	9	TF+	Gray/pink (GYPK)	
	10	TF-	Red blue (RDBU)	

TF+ and TF-: assigned, if present

11.5.7 Encoder extension cable with two M23

Illustration of encoder extension cable

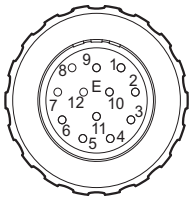
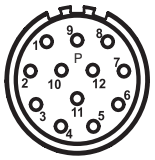


14818397963

Types of encoder extension cables

Number of cores and cable cross section	Part number	Installation type
6 × 2 × 0.25 mm²	13623192	Fixed installation
6 × 2 × 0.25 mm²	13621971	Cable carrier installation
5 × 2 × 0.25 mm² + 2 × 0.5 mm²	28111451	Fixed installation
5 × 2 × 0.25 mm² + 2 × 0.5 mm²	28111478	Cable carrier installation

Pin assignment of encoder extension cables

Motor connection side					X15 terminal	
Plug connector View X	Contact	Signal	Cable/core color	Signal	Contact	Plug connector View Y
ASTA 021FR 	3	A cos+	Red (RD)	A cos+	3	AKUA 020 
	4	$\overline{A}$ cos-	Blue (BU)	$\overline{A}$ cos-	4	
	5	B sin+	Yellow (YE)	B sin+	5	
	6	$\overline{B}$ sin-	Green (GN)	$\overline{B}$ sin-	6	
	1	C+	Brown (BN)	C+	1	
	2	C-	White (WH)	C-	2	
	8	Data+	Black (BK)	Data+	8	
	7	Data-	Violet (VT)	Data-	7	
	12	UB	Red/blue + gray (RD-BU + GY) optionally: Gray (GY)	UB	12	
	11	GND	Gray-pink+pink (GY-PK+PK) optionally: Pink (PK)	GND	11	
	9	TF+	Gray/pink (GYPK)	TF+	9	
	10	TF-	Red blue (RDBU)	TF-	10	

TF+ and TF-: assigned, if present

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11.5.8 Encoder extension cable with M23 and D-sub

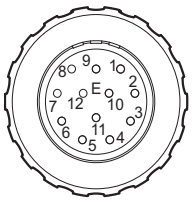
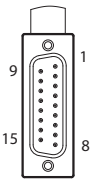
Illustration of encoder extension cable

14818406795

Types of encoder extension cables

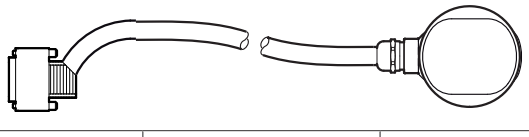
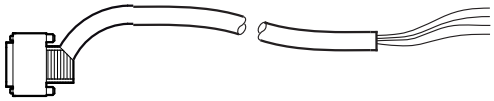
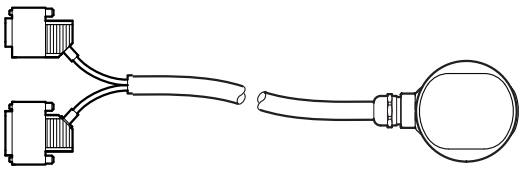
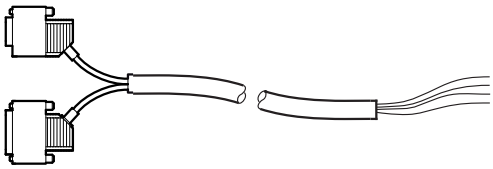
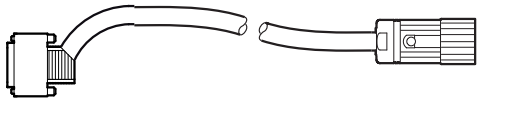
Number of cores and cable cross section	Part number	Installation type
6 × 2 × 0.25 mm²	13621998	Fixed installation
4 × 2 × 0.25 mm² + 2 × 0.5 mm²	18195393	Cable carrier installation
5 × 2 × 0.25 mm² + 2 × 0.5 mm²	28111435	Fixed installation
5 × 2 × 0.25 mm² + 2 × 0.5 mm²	28111443	Cable carrier installation

Pin assignment of encoder extension cables

Motor connection side					X15 terminal	
Plug connector View X	Contact	Signal	Cable/core color	Signal	Contact	Plug connector View Y
ASTA 021FR 	3	A cos+	Red (RD)	A cos+	1	
	4	$\overline{A}$ cos-	Blue (BU)	$\overline{A}$ cos-	9	
	5	B sin+	Yellow (YE)	B sin+	2	
	6	$\overline{B}$ sin-	Green (GN)	$\overline{B}$ sin-	10	
	1	C+	Brown (BN)	C+	3	
	2	C-	White (WH)	C-	11	
	8	Data+	Black (BK)	Data+	4	
	7	Data-	Violet (VT)	Data-	12	
	12	UB	Red/blue + gray (RD-BU + GY) optionally: Gray (GY)	UB	15	
	11	GND	Gray-pink+pink (GY-PK +PK) optionally: Pink (PK)	GND	8	
	9	TF+	Gray/pink (GYPK)	TF+	14	
	10	TF-	Red blue (RDBU)	TF-	6	

TF+ and TF-: assigned, if present

11.6 Overview of add-on encoder cables for DRN..motors – MOVIDRIVE® B

Connection cable			Length/installation type	Specification
Motor side				
			Fixed length Variable length	If the encoder on the motor is ordered and delivered without encoder connection cover, the prefabricated cable can be fitted with an encoder connection cover on the encoder end. "Encoder cable with D-sub – encoder connection cover" (→ 🗎 538)
D-Sub (15-pin)		Encoder connection cover		
			Fixed length Variable length	The customer is responsible for connecting the terminal strip in the encoder connection cover. The cable gland in the encoder connection cover is included in the encoder delivery. Connection to MOVIDRIVE®: A 15-pin plug is available that matches the interface on the inverter. "Encoder cable with D-sub – open" (→ 🗎 539)
D-Sub (15-pin)		Open (conductor end sleeve and ring cable lug)		
			Fixed length Variable length	If the encoder on the motor is ordered and delivered without encoder connection cover, the prefabricated cable can be fitted with an encoder connection cover on the encoder end. "Encoder cable with 2 x D-sub – connection cover" (→ 🗎 540)
D-sub (1 × 9-pin and 1 × 15-pin)		Encoder connection cover		
			Fixed length Variable length	The customer is responsible for connecting the terminal strip in the encoder connection cover. The cable gland in the encoder connection cover is included in the encoder delivery. Connection to MOVIDRIVE®: A 9-pin or 15-pin plug is available to match the inverter in the interface. "Encoder cable with 2 x D-sub – open" (→ 🗎 541)
D-sub (1 × 9-pin and 1 × 15-pin)		Open (conductor end sleeve and ring cable lug)		
			Fixed length Variable length	Connection to MOVIDRIVE®: A 15-pin plug is available that matches the interface on the inverter. "Encoder cable with D-sub – M23 connector" (→ 🗎 542)
D-Sub (15-pin)		M23 connector		

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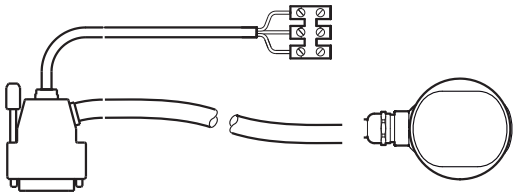
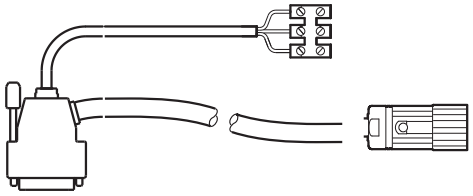
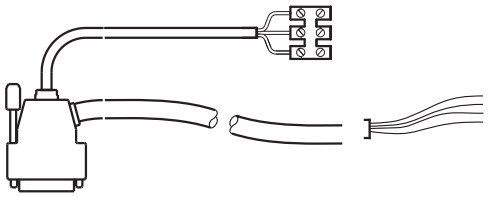
11.7 Overview of add-on encoder cables for DRN..motors – MOVIAXIS®

Connection cable			Length/installation type	Specification
Motor side				
			Fixed length Variable length	If the encoder on the motor is ordered and delivered without encoder connection cover, the prefabricated cable can be fitted with an encoder connection cover on the encoder end. Connection with MOVIAXIS®: A 15-pin plug is available that matches the interface on the inverter. "Encoder cable with D-sub – encoder connection cover/terminal" (→ 🗎 543)
D-Sub (15-pin)		Encoder connection cover		
			Fixed length Variable length	Connection with MOVIAXIS®: A 15-pin plug is available that matches the interface on the inverter. The motor protection is routed from the D-sub connector. "Encoder cable with D-sub – M23 connector/terminal" (→ 🗎 544)
D-Sub (15-pin)		M23 connector		
			Fixed length Variable length	The customer is responsible for connecting the terminal strip in the encoder connection cover. The cable gland in the encoder connection cover is included in the encoder delivery. Connection with MOVIAXIS®: A 15-pin plug is available that matches the interface on the inverter. The motor protection is routed from the D-sub connector. "Encoder cable with D-sub – open/terminal" (→ 🗎 545)
D-Sub (15-pin)		Open (conductor end sleeve and ring cable lug)		

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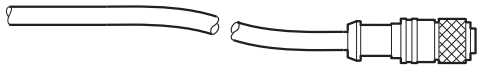
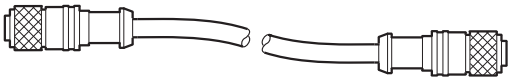
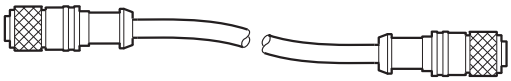
11.8 Overview of built-in encoder cables for asynchronous motors

The cable types used for fixed and cable carrier installation are listed in chapter "Cable specifications".

Connection cable			Length/installation type	Specification
Motor side				
		M12 connector	Fixed length Variable length	4-pin, 8-pin. Cable is suitable for E17 encoder. "Encoder cable with M12 connector and open end" (→ 🗎 546)
		M12 connector	Fixed length Variable length	4-pin, 8-pin. Cable is suitable for E17 encoder. "Encoder cable with 2 x M12 connector" (→ 🗎 548)
		M12	Fixed length Variable length	8-pin. Cable can also be used for E17-FS encoders. "Detailed information:" (→ 🗎 548)

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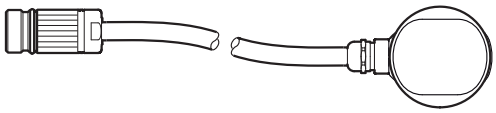
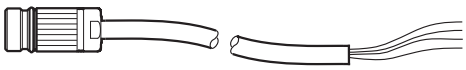
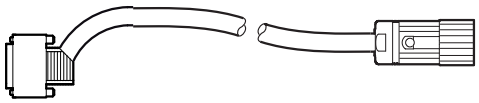
11.9 Overview of extensions for add-on encoder cables for asynchronous motors

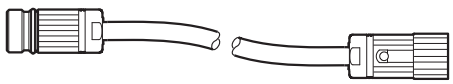
11.9.1 Intermediate sockets and extensions

Intermediate sockets are used whenever part of the wiring is routed in a cable carrier, or if connecting several cable sections is easier for very long distances. The encoder cables are available with intermediate sockets for this purpose.

The cable types used for fixed and cable carrier installation are listed in chapter "Cable specifications".

Connection cable			Length/installation type	Specification
Motor side				
			Fixed length Variable length	"Encoder extension cable with M23 connector – encoder connection cover" (→ 🗎 550)
M23 connector		Connection cover		
			Fixed length Variable length	The customer is responsible for connecting the terminal strip in the connection cover. The cable gland in the connection cover is included in the delivery of the encoder. "Encoder extension cable with M23 connector – open" (→ 🗎 551)
M23 connector		Open (conductor end sleeve and ring cable lug)		
			Fixed length Variable length	Connection to MOVIDRIVE®: A 15-pin plug is available that matches the interface on the inverter. "Encoder extension cable with D-sub – M23 connector" (→ 🗎 553)
D-Sub (15-pin)		M23 connector		

Extension

Connection cable			Length/ Installation type	Specification
Motor side				
			Fixed length Variable length	"Encoder extension cable with M23 connector – M23 connector" (→ 🗎 552)
M23 connector		M23 connector		

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11.10 Power cables

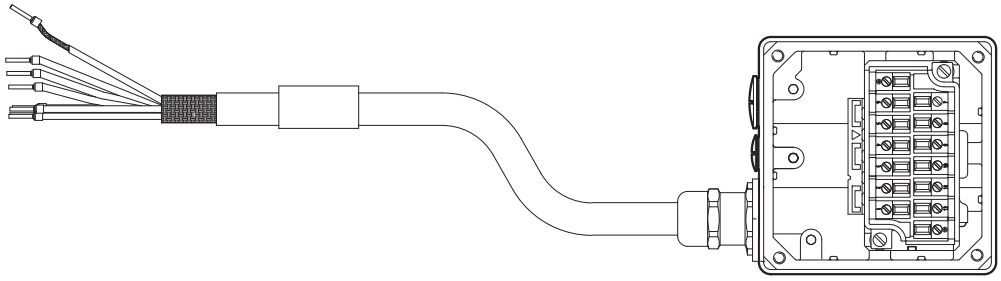
11.10.1 Brakemotor cables with /IS

Brakemotors

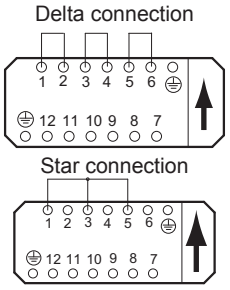
Motors	Brakes	Connector
DR.63	BE03	/IS
DR.71	BE03, BE05	
DR.80	BE05, BE1, BE2	
DRN90	BE1, BE2, BE5	
DRN100	BE2, BE5	
DRN112	BE5, BE11	
DRN132S	BE5, BE11	

Cable drawing and assignment: Open – /IS

/IS brakemotor cable with motor protection: Open (conductor end sleeve) – /IS, cable type A



4154025099

	Cable core color	Signal	Contact	Motor connection side
		nc	1	
CES	Black (BK)	U1	2	
		nc	3	
CES	Black (BK)	V1	4	
		nc	5	
CES	Black (BK)	W1	6	
	Black (BK)	TH/TF	7	
		nc	8	
CES	White (WH)	Brake 14	9	
CES	Red (RD)	Brake 13	10	
CES	Blue (BU)	Brake 15	11	
CES	Black (BK)	TH/TF	12	
CES	Green/yellow (GN/YE)	nc	PE	
CES	Shield	Shielding	Cable gland	

Part numbers

Star connection	Delta connection	Installation type
08185336	08178178	Fixed installation

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11.10.2 Brakemotor cables for decentralized MOVI-SWITCH®

Brakemotors

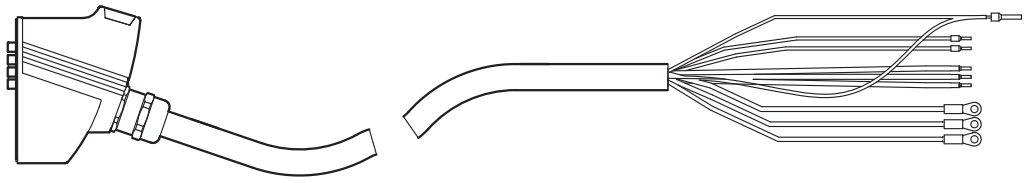
Motors	Brakes	Connector
DR.63	BE03	Without connector /ISU /ASB4
DR.71	BE03, BE05	
DR.80	BE05, BE1, BE2	
DRN90	BE1, BE2, BE5	
DRN100	BE2, BE5	

MOVISWITCH®

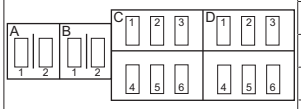
MOVISWITCH®	PLUSCON VC	Han® 10E
MSW-2S	.../APG4	.../ALA4

Cable drawing and assignment – PLUSCON VC – open

Brakemotor cable with motor protection: PLUSCON VC – open (conductor end sleeves/ring cable lugs), cable type C



4154155531

				Motor connection side
	Contact	Signal	Cable core color	Contact
 PLUSCON VC	A1	U1	Black (BK)	CL
	A2	V1	Black (BK)	CL
	B1	W1	Black (BK)	CL
	B2	PE	Green/yellow (GN/YE)	CES
	C1	Brake 15	Blue (BU)	CES
	C3	Brake 13	Red (RD)	CES
	C5	Brake 14	White (WH)	CES
	D2		Shielding	
	D3	TH/TF	Black (BK)	CES
	D6	TH/TF	Black (BK)	CES

Part numbers

Installation type	PLUSCON VC
Fixed installation	08178879

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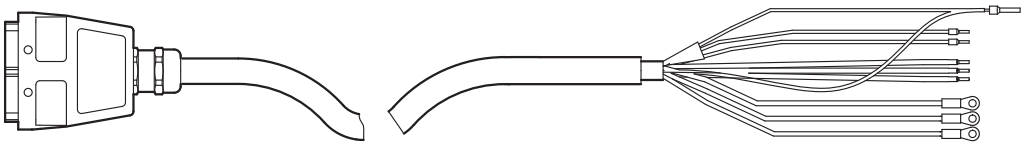
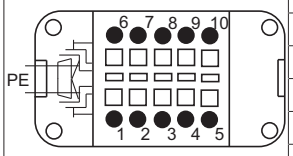
Cable drawing and assignment – Han® 10E – open

Brakemotor cable with motor protection: Han® 10E – open (conductor end sleeves/ring cable lugs), cable type C



4154157963

				Motor connection side
	Contact	**Signal**	**Cable core color**	**Contact**
	1	U1	Black (BK) \7	CL
	2	V1	Black (BK) \8	CL
	3	W1	Black (BK) \3	CL
	4	Brake 13	Black (BK) \5	CES
	5	Brake 15	Black (BK) \6	CES
	6	Brake 14	Black (BK) \4	CES
	7	nc		
	8	nc		
	9	TH/TF	Black (BK) \1	CES
	10	TH/TF	Black (BK) \2	CES
	PE		Shielding	
	PE		Green/yellow (GN/YE)	CES

Part numbers

Installation type	Han® 10E
Fixed installation	08178860

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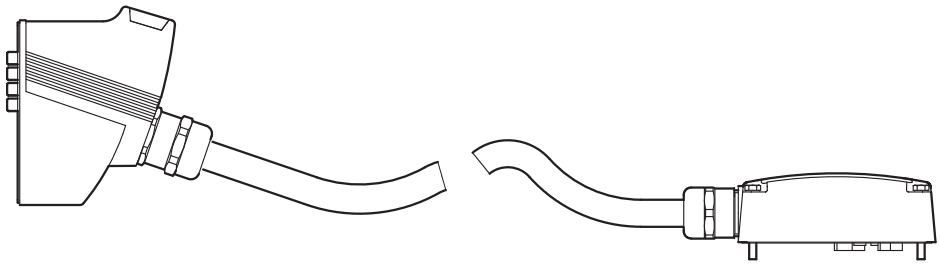
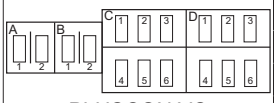
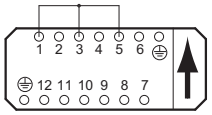
Cable drawing and assignment – PLUSCON VC – /IS

Brakemotor cable with motor protection: PLUSCON VC – /IS, cable type A



4154160395

	Contact	Cable core color	Signal	Contact	Motor connection side
 PLUSCON VC	A1	Black (BK)	U1	2	
	A2	Black (BK)	V1	4	
	B1	Black (BK)	W1	6	
	B2	Green/yellow (GN/YE)	PE	PI1	
	C1	Blue (BU)	Brake 15	11	
	C3	Red (RD)	Brake 13	10	
	C5	White (WH)	Brake 14	9	
	C2		Variable terminal link	1	
	C4			3	
	C6			5	
	D2	Shielding		PI2	
	D3	Black (BK)	TH/TF	7	
	D6	Black (BK)	TH/TF	12	
		Shielding			

Part numbers

Installation type	PLUSCON VC
Fixed installation	05937558

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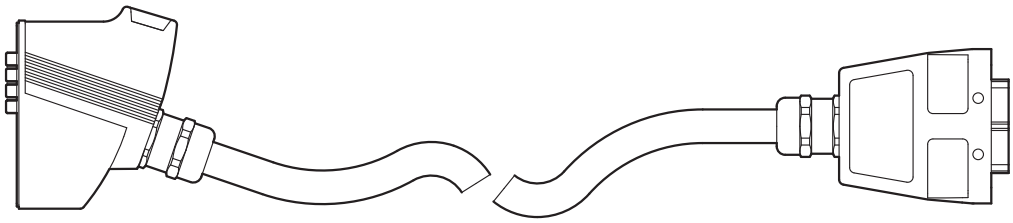
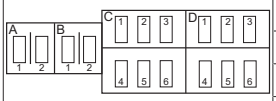
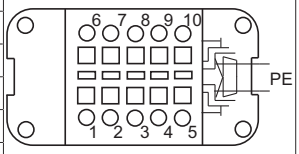
Cable drawing and assignment – PLUSCON VC – Han® 10E

Brakemotor cable with motor protection: PLUSCON VC – Han® 10E, cable type C



4154162827

	Contact	Cable core color	Signal	Contact	Motor connection side
 PLUSCON VC	A1	Black (BK) \7	U1	1	
	A2	Black (BK) \8	V1	2	
	B1	Black (BK) \3	W1	3	
	B2	Green/yellow (GN/YE)	PE	PE	
	C1	Black (BK) \6	Brake 15	5	
	C3	Black (BK) \5	Brake 13	4	
	C5	Black (BK) \4	Brake 14	6	
	D2	Shielding		PE	
	D3	Black (BK) \1	TH/TF	10	
	D6	Black (BK) \2	TH/TF	9	

Part numbers

Installation type	PLUSCON VC
Fixed installation	08178895

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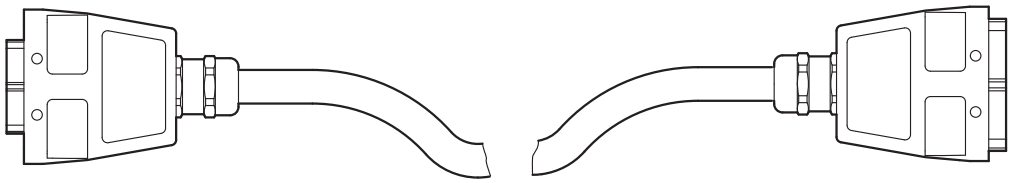
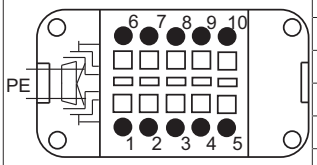
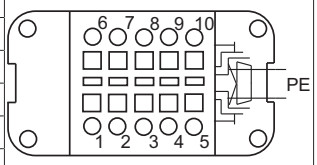
Cable drawing and assignment – Han® 10E – Han® 10E

Brakemotor cable with motor protection: Han® 10E – Han® 10E, cable type C



4154165259

	Contact	Signal	Cable core color	Contact	Motor connection side
	1	U1	Black (BK) \7	1	
	2	V1	Black (BK) \8	2	
	3	W1	Black (BK) \3	3	
	4	Brake 13	Black (BK) \5	4	
	5	Brake 15	Black (BK) \6	5	
	6	Brake 14	Black (BK) \4	6	
	7	nc		7	
	8	nc		8	
	9	TH/TF	Black (BK) \1	9	
	10	TH/TF	Black (BK) \2	10	
	PE		Shielding	PE	
	PE		Green/yellow (GN/YE)	PE	

Part numbers

Installation type	Han® 10E
Fixed installation	08178887

11.11 Add-on encoder cables for MOVIDRIVE®

11.11.1 Encoder cable with D-sub – encoder connection cover

Prefabricated cables for encoders

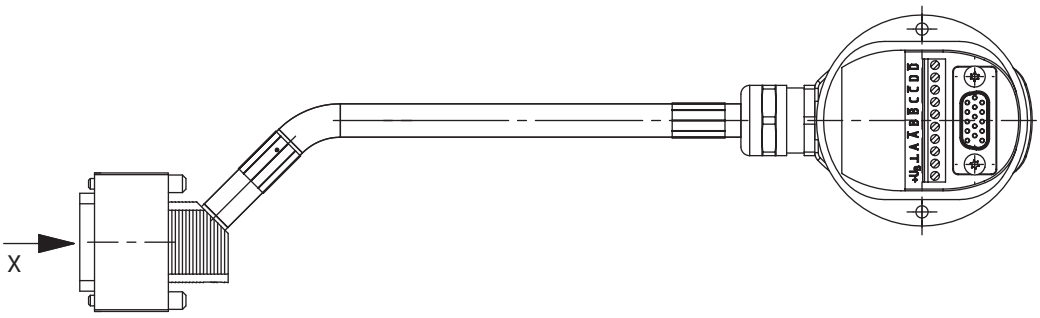
DRN.. motors

Encoder	DRN71 – 132S	DRN132M – 280
Sine encoder	ES7S	EG7S
TTL (V_B = DC 9 – 30 V)	ES7R	EG7R
RS485	AS7W	AG7W

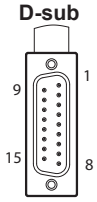
DR2S.. motors

Encoder	DR2S71 – 80
Sine encoder	ES7S
TTL (V_B = DC 9 – 30 V)	ES7R
RS485	AS7W

Cable drawing and assignment: D-Sub – encoder connection cover



4158198411

Connection MOVIDRIVE® B					Motor connection side
Plug connector view X	Contact	Signal	Cable core color	Signal	Contact
D-sub  15-pin	1	A	Red (RD)	cos+	A
	9	$\overline{A}$	Blue (BU)	cos-	$\overline{A}$
	2	B	Yellow (YE)	sin+	B
	10	$\overline{B}$	Green (GN)	sin-	$\overline{B}$
	3	C	Brown (BN)	C+	C
	11	$\overline{C}$	White (WH)	C	$\overline{C}$
	4	D	Black (BK)	Data+	D
	12	$\overline{D}$	Violet (VT)	Data-	$\overline{D}$
	15	UB	Red/blue + gray (RD-BU + GY)	UB	+UB
	8		Gray/pink + pink (GY-PK + PK)	DGND	GND

Part numbers

Installation type	D-sub – connection cover
Fixed installation	13617621
Cable carrier installation	13617648

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11.11.2 Encoder cable with D-sub – open

Prefabricated cables for encoders

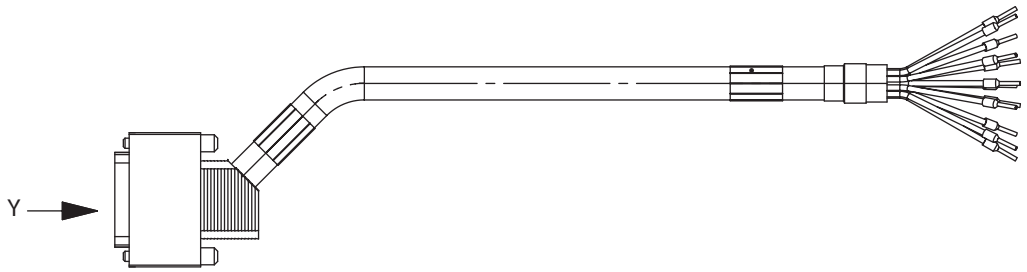
DRN.. motors

Encoder	DRN71 – 132S	DRN132M – 280
Sine encoder	ES7S	EG7S
TTL (V_B = DC 9 – 30 V)	ES7R	EG7R
RS485	AS7W	AG7W

DR2S.. motors

Encoder	DR2S71 – 80
Sine encoder	ES7S
TTL (V_B = DC 9 – 30 V)	ES7R
RS485	AS7W

Cable drawing and assignment: D-Sub – open



4158303499

Connection MOVIDRIVE® B					Motor connection side
Plug connector view Y	Contact	Signal	Cable core color	Signal	Contact
D-sub 9 1 15 8 15-pin	1	A	Red (RD)	cos+	A
	9	$\overline{A}$	Blue (BU)	cos-	$\overline{A}$
	2	B	Yellow (YE)	sin+	B
	10	$\overline{B}$	Green (GN)	sin-	$\overline{B}$
	3	C	Brown (BN)	C+	C
	11	$\overline{C}$	White (WH)	C	$\overline{C}$
	4	D	Black (BK)	Data+	D
	12	$\overline{D}$	Violet (VT)	Data-	$\overline{D}$
	15	UB	Red/blue + gray (RD-BU + GY)	UB	+UB
	8	GND	Gray/pink + pink (GY-PK + PK)	GND	GND

Part numbers

Installation type	D-Sub – conductor end sleeve
Fixed installation	13622021
Cable carrier installation	13622048

11.11.3 Encoder cable with 2 x D-sub – connection cover

Prefabricated cables for encoders

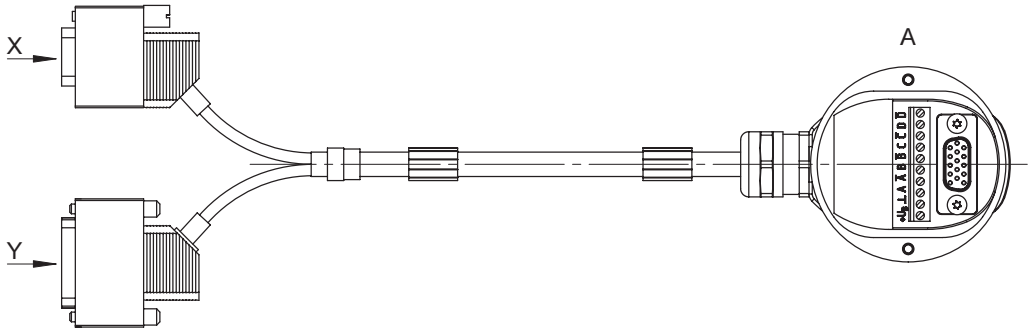
DRN.. motors

Encoder	DRN71 – 132S	DRN132M – 280	DRN315
M-SSI	AS7Y	AG7Y	AH7Y

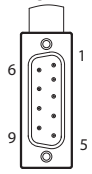
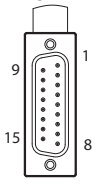
DR2S.. motors

Encoder	DR2S71 – 80
M-SSI	AS7Y

Cable drawing and assignment: 2 x D-Sub – encoder connection cover



9007203413047819

Connection MOVIDRIVE® B					Motor connection side
Plug connector	Contact	Signal	Cable core color	Signal	Contact
D-sub View X  9-pin	3	C	Brown (BN)	C+	C
	8	$\overline{C}$	White (WH)	C	$\overline{C}$
	1	D	Black (BK)	Data+	D
	6	$\overline{D}$	Violet (VT)	Data-	$\overline{D}$
	9	UB	Red/blue + gray (RD-BU + GY)	UB	+UB
	5	GND	Gray/pink + pink (GY-PK + PK)	GND	GND
D-sub View Y  15-pin	1	A	Red (RD)	cos+	A
	9	$\overline{A}$	Blue (BU)	cos-	$\overline{A}$
	2	B	Yellow (YE)	sin+	B
	10	$\overline{B}$	Green (GN)	sin-	$\overline{B}$

Part numbers

Installation type	2 × D-Sub – connection cover
Fixed installation	13626299
Cable carrier installation	13626302

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11.11.4 Encoder cable with 2 x D-sub – open

Prefabricated cables for encoders

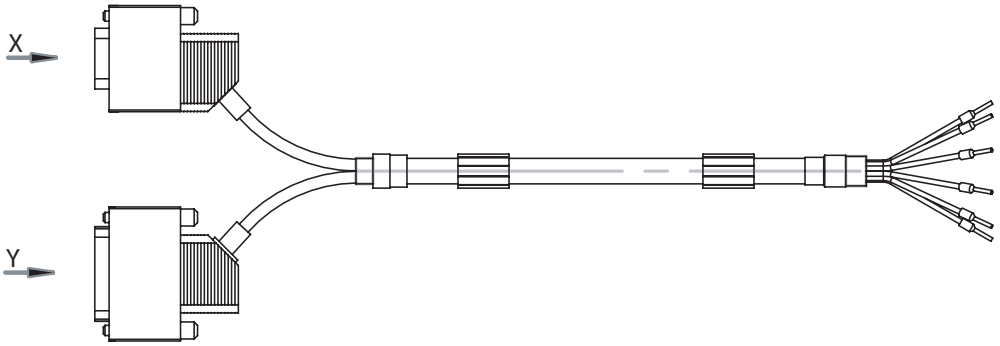
DRN.. motors

Encoder	DRN71 – 132S	DRN132M – 280	DRN315
M-SSI	AS7Y	AG7Y	AH7Y

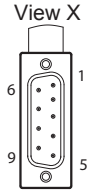
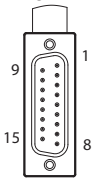
DR2S.. motors

Encoder	DR2S71 – 80
M-SSI	AS7Y

Cable drawing and assignment: 2 x D-Sub – open



4158310795

Connection MOVIDRIVE® B					Motor connection side
Plug connector	Contact	Signal	Cable core color	Signal	Contact
D-sub View X  9-pin	1	Data+	Black (BK)	Data+	D
	6	Data-	Violet (VT)	Data-	$\overline{D}$
	3	C+	Brown (BN)	C+	C
	8	C	White (WH)	C	$\overline{C}$
	5	GND	Pink (PK)	GND	GND
	9	UB	Gray (GY)	UB	+UB
D-sub View Y  15-pin	1	cos+	Red (RD)	cos+	A
	9	cos-	Blue (BU)	cos-	$\overline{A}$
	2	sin+	Yellow (YE)	sin+	B
	10	sin-	Green (GN)	sin-	$\overline{B}$

Part numbers

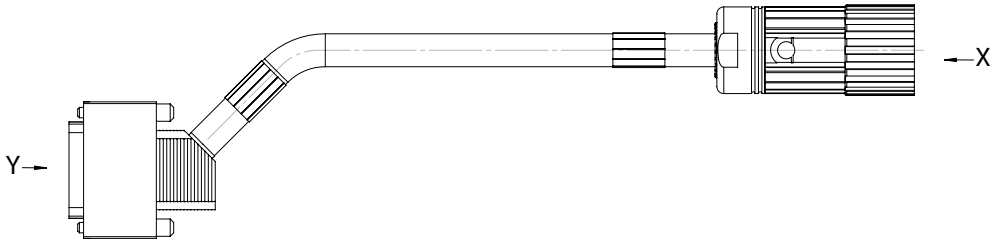
Installation type	2 × D-Sub – connection cover
Fixed installation	13602640
Cable carrier installation	13623265

11.11.5 Encoder cable with D-sub – M23 connector

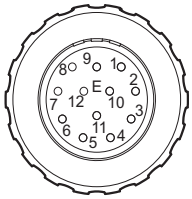
Prefabricated cables for encoders

Encoder types	DR.315
Sine encoder	EH7S

Cable drawing and assignment: D-sub – M23 connector



4158314507

Connection MOVIDRIVE® B					Motor connection side	
Plug connector View Y	Contact	Signal	Cable core color	Signal	Contact	Plug connector View X
D-sub 9 1 15 8 15-pin	1	A cos+	Red (RD)	A cos+	5	
	9	$\overline{A}$ cos-	Blue (BU)	$\overline{A}$ cos-	6	
	2	B sin+	Yellow (YE)	B sin+	8	
	10	$\overline{B}$ sin-	Green (GN)	$\overline{B}$ sin-	1	
	3	C	Brown (BN)	C+	3	
	11	$\overline{C}$	White (WH)	C	4	
	4	D	-	Data+	-	
	12	$\overline{D}$	-	Data-	-	
	15	UB	Black+gray (BK+GY)	UB	12	
	8	GND	Pink+violet (PK+VT)	GND	10	

Part numbers

Installation type	D-sub15 – M23 connector
Fixed installation	13602659
Cable carrier installation	13623206

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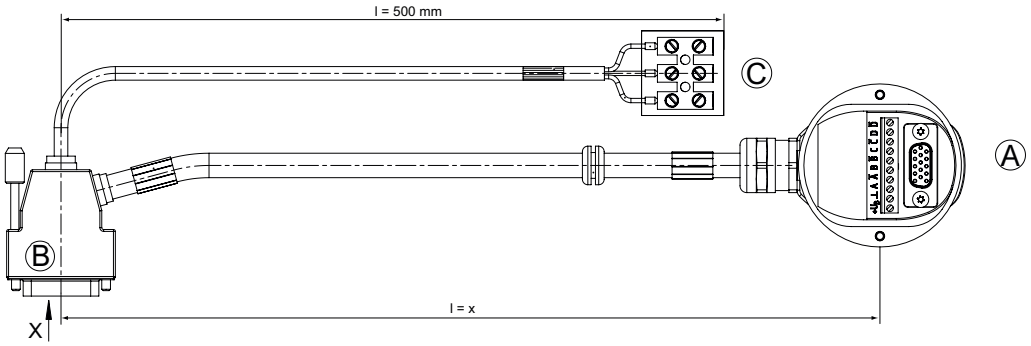
11.12 Add-on encoder cables for MOVIAXIS®

11.12.1 Encoder cable with D-sub – encoder connection cover/terminal

Prefabricated cables for encoders

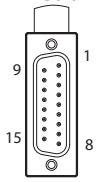
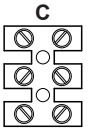
Encoder
ES7S, EG7S, ES7R, EG7R, AS7W, AG7W

Cable drawing and assignment: D-sub – encoder connection cover/terminal



27021600761130507

l = x: Length that can be ordered

MOVIAXIS®connection					Motor connection side	
Plug connector View X	Contact B	Signal	Cable core color	Signal	Contact A	
D-sub  15-pin	1	A	Red (RD)	cos+	A	
	9	$\overline{A}$	Blue (BU)	cos-	$\overline{A}$	
	2	B	Yellow (YE)	sin+	B	
	10	$\overline{B}$	Green (GN)	sin-	$\overline{B}$	
	3	C	Brown (BN)	C+	C	
	11	$\overline{C}$	White (WH)	C	$\overline{C}$	
	4	D	Black (BK)	Data+	D	
	12	$\overline{D}$	Violet (VT)	Data-	$\overline{D}$	
	15	UB	Gray (GY)	UB	+UB	
	15	UB	Red/blue (RD/BU)	UB	+UB	
	8	GND	Pink (PK)	GND	GND	
	8	GND	Gray/pink (GY/PK)	GND	GND	
	14	TF/TH/KTY+	Brown (BN)	TF/TH/KTY+	1	C 
	6	TF/TH/KTY-	White (WH)	TF/TH/KTY-	2	
				Shielding	3	

Part numbers

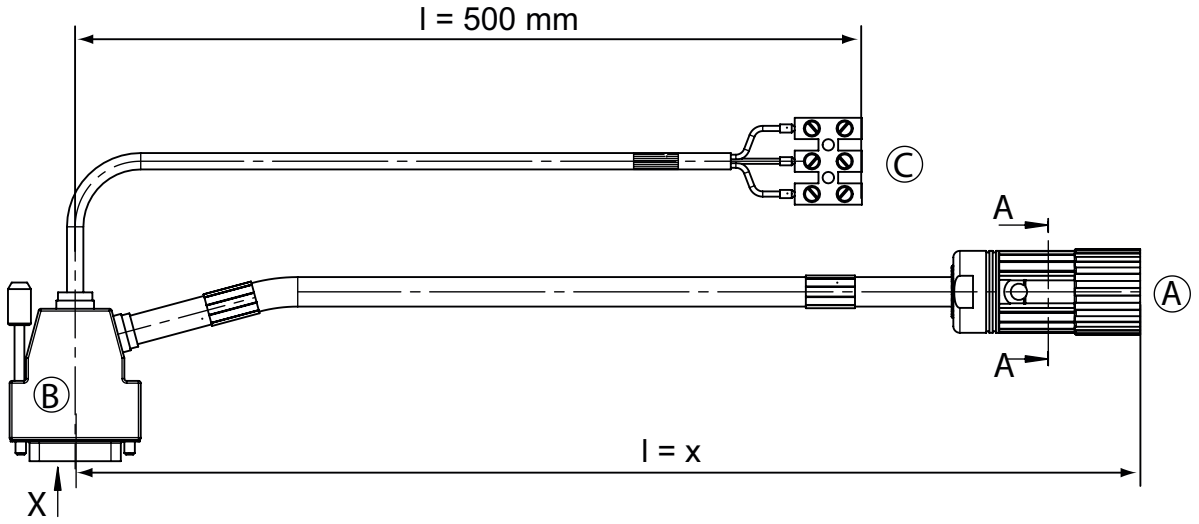
Installation type	D-sub 15 – connection cover
Fixed installation	13631632
Cable carrier installation	13631640

11.12.2 Encoder cable with D-sub – M23 connector/terminal

Prefabricated cables for encoders

Encoder
ES7S, EG7S, ES7R, EG7R, AS7W, AG7W

Cable drawing and assignment: D-sub – M23 connector/terminal



18014401506392843

l = x: Length that can be ordered

MOVIAXIS®connection					Motor connection side	
Plug connector View X	Contact B	Signal	Cable core color	Signal	Contact A	
D-sub 9 1 15 8 15-pin	1	A	Red (RD)	A cos+	3	ASTA 021 FR
	9	$\overline{A}$	Blue (BU)	$\overline{A}$ cos-	4	
	2	B	Yellow (YE)	B sin+	5	
	10	$\overline{B}$	Green (GN)	$\overline{B}$ sin-	6	
	3	C	Brown (BN)	C+	1	
	11	$\overline{C}$	White (WH)	C	2	
	4	D	Black (BK)	Data+	8	
	12	$\overline{D}$	Violet (VT)	Data–	7	
	15	UB	Gray (GY)	UB	12	
	15	UB	Red/blue (RD/BU)	UB	12	
	8	GND	Pink (PK)	GND	11	
	8	GND	Gray/pink (GY/PK)	GND	11	
	14	/TF, /TH, /KTY+	Brown (BN)	/TF, /TH, /KTY+	1	C
	6	/TF, /TH, /KTY-	White (WH)	/TF, /TH, /KTY-	2	
				Shielding	3	

Part numbers

Cable	D-sub15 – M23 connector
Fixed installation	13631691
Cable carrier installation	13631705

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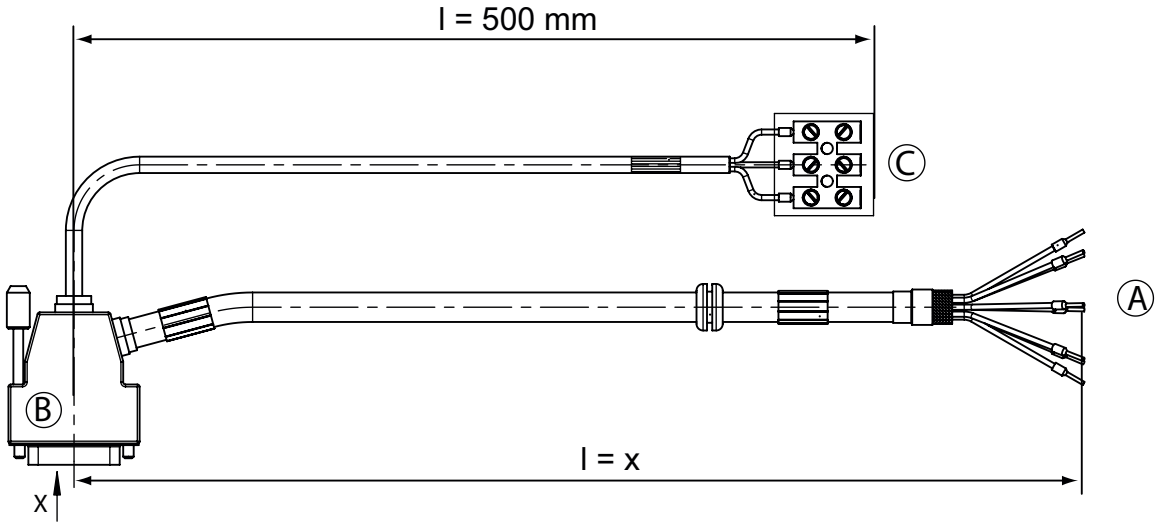
11.12.3 Encoder cable with D-sub – open/terminal

Prefabricated cables for encoders

Encoder
E.7., A.7.

Cable drawing and assignment: D-sub – open/terminal



18014401506396555

l = x: Length that can be ordered

MOVIAXIS® connection					Motor connection side	
Plug connector View X	Contact B	Signal	Cable core color	Signal	Contact A	
D-sub 9 1 15 8 15-pin	1	A	Red (RD)	A cos+	A	
	9	$\overline{A}$	Blue (BU)	$\overline{A}$ cos-	$\overline{A}$	
	2	B	Yellow (YE)	B sin+	B	
	10	$\overline{B}$	Green (GN)	$\overline{B}$ sin-	$\overline{B}$	
	3	C	Brown (BN)	C+	C	
	11	$\overline{C}$	White (WH)	C	$\overline{C}$	
	4	D	Black (BK)	Data+	D	
	12	$\overline{D}$	Violet (VT)	Data–	$\overline{D}$	
	15	UB	Gray (GY)	UB	+UB	
	15	UB	Red/blue (RD/BU)	UB	+UB	
	8	GND	Pink (PK)	GND	GND	
	8	GND	Gray/pink (GY/PK)	GND	GND	
	14	/TF, /TH, /KTY+	Brown (BN)	/TF, /TH, /KTY+	1	C
	6	/TF, /TH, /KTY-	White (WH)	/TF, /TH, /KTY-	2	
				Shielding	3	

Part numbers

Installation type	D-sub15 – open
Fixed installation	13631659
Cable carrier installation	13631667

11.13 Built-in encoder cables

11.13.1 Encoder cable with M12 connector and open end

Prefabricated cables

DRN.. motors

Encoder	DRN63 – 132S
HTL	EI7C, EI76, EI72, EI71

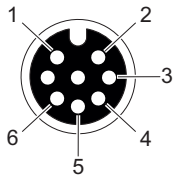
DR2S.. motors

Encoder	DR2S63 – 80
HTL	EI7C, EI76, EI72, EI71

Cable drawing and assignment: M12 connector

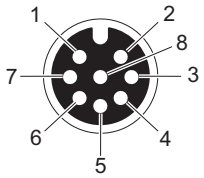
9735112587

8-pin without /TF

Connection of evaluation unit[1] of encoder				Motor connection side	
Contact B	Signal	Cable core color	Signal	Contact A	
	A cos+	Brown (BN)	A cos+	3	
	$\overline{A}$ cos	White (WH)	$\overline{A}$ cos	4	
	B sin+	Yellow (YE)	B sin+	5	
	$\overline{B}$ sin	Green (GN)	$\overline{B}$ sin	6	
	n.c.	-	n.c.	7	
	n.c.	-	n.c.	8	
	UB	Gray (GY)	UB	1	
	GND	Pink (PK)	GND	2	

1) Assignment depends on evaluation unit

8-pin with /TF

Connection of evaluation unit[1]				Motor connection side	
Contact B	Signal	Cable core color	Signal	Contact A	
	A cos+	Brown (BN)	A cos+	3	
	$\overline{A}$ cos	White (WH)	$\overline{A}$ cos	4	
	B sin+	Yellow (YE)	B sin+	5	
	$\overline{B}$ sin	Green (GN)	$\overline{B}$ sin	6	
	TF	Red (RD)	TF	7	
	TF-	Blue (BU)	TF-	8	
	UB	Gray (GY)	UB	1	
	GND	Pink (PK)	GND	2	

1) Assignment depends on evaluation unit

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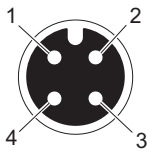
4-pin

Connection of evaluation unit[1]				Motor connection side	
Contact B	Signal	Cable core color	Signal	Contact A	
	UB	Gray (GY)	UB	1	
	B sin+	Yellow (YE)	B sin+	2	
	GND	Pink (PK)	GND	3	
	A cos+	Brown (BN)	A cos+	4	

1) Assignment depends on evaluation unit

Part numbers

Installation type	Number of poles	Connection side evaluation unit (B)	Connection side motor (A)	Part number
Fixed installation	4-pin	Cut off	M12 connector, 4-pin, A-coded	18156746
	8-pin - with TF	Conductor end sleeves	M12 connector, 8-pin, A-coded	13623273
Cable carrier installation	8-pin - without TF	Cut off		18156754
	8-pin - with TF	Cut off		18156770
		Conductor end sleeves		13623281

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11.13.2 Encoder cable with 2 x M12 connector

Prefabricated cables

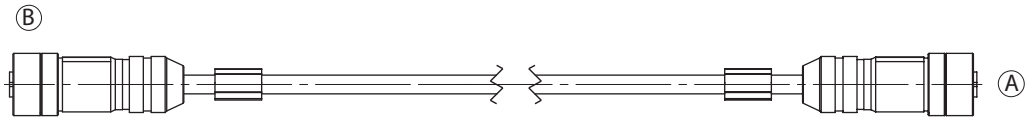
DRN.. motors

Encoder	DRN71 – 132S
HTL	EI7C, EI7C FS, EI76, EI72, EI71

DR2S.. motors

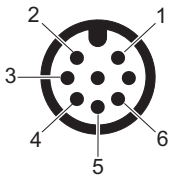
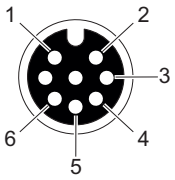
Encoder	DR2S71 – 80
HTL	EI7C, EI7C FS, EI76, EI72, EI71

Cable drawing and assignment with M12 connector – M12 connector

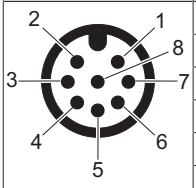
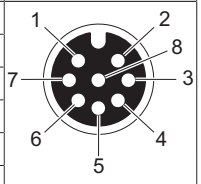


9610008459

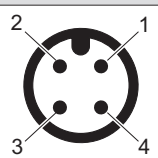
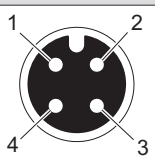
Customer end/motor end 8-pole without /TF (EI7C, EI76, EI72, EI71 and EI7C FS)

Evaluation unit connection					Motor connection side	
	Contact B	Signal	Cable core color	Signal	Contact A	
	3	A cos+	Brown (BN)	A cos+	3	
	4	$\overline{A}$ cos	White (WH)	$\overline{A}$ cos	4	
	5	B sin+	Yellow (YE)	B sin+	5	
	6	$\overline{B}$ sin	Green (GN)	$\overline{B}$ sin	6	
	7	n.c.	-	n.c.	7	
	8	n.c.	-	n.c.	8	
	1	UB	Gray (GY)	UB	1	
	2	GND	Pink (PK)	GND	2	

Customer end/motor end 8-pole with /TF (EI7C, EI76, EI72, EI71)

Evaluation unit connection					Motor connection side	
	Contact B	Signal	Cable core color	Signal	Contact A	
	3	A cos+	Brown (BN)	A cos+	3	
	4	$\overline{A}$ cos	White (WH)	$\overline{A}$ cos	4	
	5	B sin+	Yellow (YE)	B sin+	5	
	6	$\overline{B}$ sin	Green (GN)	$\overline{B}$ sin	6	
	7	TF	Red (RD)	TF	7	
	8	TF-	Blue (BU)	TF-	8	
	1	UB	Gray (GY)	UB	1	
	2	GND	Pink (PK)	GND	2	

Customer end/motor end 4-pole without /TF (EI7C, EI76, EI72, EI71)

Evaluation unit connection					Motor connection side	
	Contact B	Signal	Cable core color	Signal	Contact A	
	1	UB	Gray (GY)	UB	1	
	2	B sin+	Yellow (YE)	B sin+	2	
	3	GND	Pink (PK)	GND	3	
	4	A cos+	Brown (BN)	A cos+	4	

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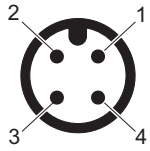
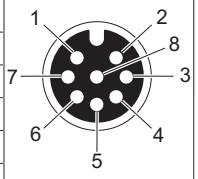
Customer end 4-pole/motor end 8-pole without /TF (EI7C, EI76, EI72, EI71)

Evaluation unit connection					Motor connection side	
	Contact B	Signal	Cable core color	Signal	Contact A	
	3	A cos+	Brown (BN)	A cos+	3	
	4				4	
	5	B sin+	Yellow (YE)	B sin+	5	
	6				6	
	7				7	
	8				8	
	1	UB	Gray (GY)	UB	1	
	2	GND	Pink (PK)	GND	2	

Part numbers

Encoders EI7C, EI76, EI72, EI71		
Installation type	**Number of poles**	**Part number**
Fixed installation	Customer end/motor end 8-pole	18156762
	Customer end/motor end 4-pole	18156738
Cable carrier installation	Customer end 4-pole/motor end 8-pole	28111591

Safety-rated EI7C FS encoder

Installation type	Number of poles	Part number
Fixed installation	Customer end/motor end 8-pole	18148670
Cable carrier installation		18158013

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11.14 Extensions for add-on encoder cables

11.14.1 Encoder extension cable with M23 connector – encoder connection cover

Prefabricated cables for encoders

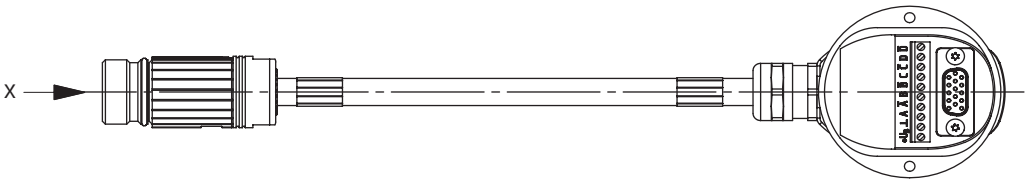
DRN.. motors

Encoder	DRN71 – 132S	DRN132M – 280
Sine encoder	ES7S	EG7S
TTL (V_B = DC 9 – 30 V)	ES7R	EG7R
RS485	AS7W	AG7W

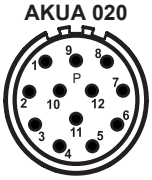
DR2S.. motors

Encoder	DR2S71 – 80
Sine encoder	ES7S
TTL (V_B = DC 9 – 30 V)	ES7R
RS485	AS7W

Cable drawing and assignment: M23 connector – encoder connection cover



4173472011

Inverter connection					Motor connection side
Plug connector View X	Contact	Signal	Cable core color	Signal	Contact
AKUA 020 	3	A cos+	Red (RD)	A cos+	A
	4	$\overline{A}$ cos-	Blue (BU)	$\overline{A}$ cos-	$\overline{A}$
	5	B sin+	Yellow (YE)	B sin+	B
	6	$\overline{B}$ sin-	Green (GN)	$\overline{B}$ sin-	$\overline{B}$
	1	C+	Brown (BN)	C+	C
	2	C-	White (WH)	C-	$\overline{C}$
	8	Data+	Black (BK)	Data+	D
	7	Data-	Violet (VT)	Data-	$\overline{D}$
	12	UB	Pink (PK)	UB	+UB
	11	GND	Gray (GY)	GND	GND

Part numbers

Installation type	M23 connector – encoder connection cover
Fixed installation	13621963

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11.14.2 Encoder extension cable with M23 connector – open

Prefabricated cables for encoders

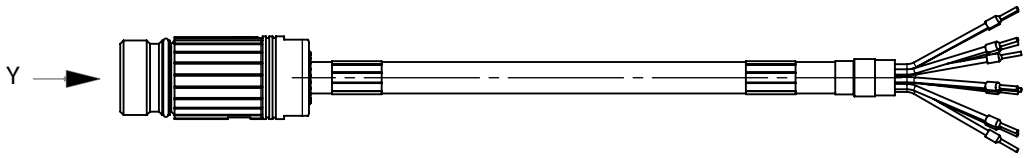
DRN.. motors

Encoder	DRN71 – 132S	DRN132M – 280
Sine encoder	ES7S	EG7S
TTL (V_B = DC 9 – 30 V)	ES7R	EG7R
RS485	AS7W	AG7W

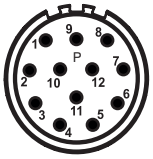
DR2S.. motors

Encoder	DR2S71 – 80
Sine encoder	ES7S
TTL (V_B = DC 9 – 30 V)	ES7R
RS485	AS7W

Cable drawing and assignment: M23 connector – open



4173474571

Inverter connection					Motor connection side
Plug connector View Y	Contact	Signal	Cable core color	Signal	Contact
AKUA 020 	3	A cos+	Red (RD)	A cos+	A
	4	$\overline{A}$ cos-	Blue (BU)	$\overline{A}$ cos-	$\overline{A}$
	5	B sin+	Yellow (YE)	B sin+	B
	6	$\overline{B}$ sin-	Green (GN)	$\overline{B}$ sin-	$\overline{B}$
	1	C+	Brown (BN)	C+	C
	2	C	White (WH)	C	$\overline{C}$
	8	Data+	Black (BK)	Data+	D
	7	Data–	Violet (VT)	Data–	$\overline{D}$
	12	UB	Red/blue + gray (RD-BU + GY)	UB	+UB
	11	GND	Gray/pink + pink (GY-PK + PK)	GND	GND

Part numbers

Installation type	M23 connector – open
Fixed installation	13623184

11.14.3 Encoder extension cable with M23 connector – M23 connector

Prefabricated cables for encoders

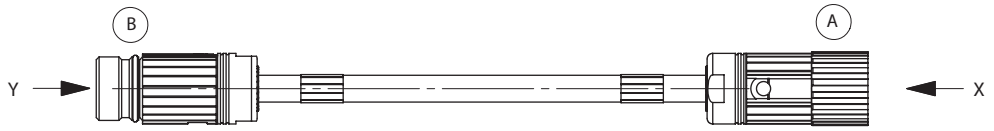
DRN.. motors

Encoder	DRN71 – 132S	DRN132M – 280
Sine encoder	ES7S	EG7S
TTL (V_B = DC 9 – 30 V)	ES7R	EG7R
RS485	AS7W	AG7W

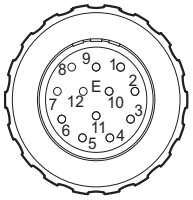
DR2S.. motors

Encoder	DR2S71 – 80
Sine encoder	ES7S
TTL (V_B = DC 9 – 30 V)	ES7R
RS485	AS7W

Cable drawing and assignment: M23 connector – M23 connector



4173478155

Inverter connection					Motor connection side	
Plug connector View Y	Contact	Signal	Cable core color	Signal	Contact	Plug connector View X
AKUA 020 	3	A cos+	Red (RD)	A cos+	3	ASTA 021FR 
	4	$\overline{A}$ cos-	Blue (BU)	$\overline{A}$ cos-	4	
	5	B sin+	Yellow (YE)	B sin+	5	
	6	$\overline{B}$ sin-	Green (GN)	$\overline{B}$ sin-	6	
	1	C+	Brown (BN)	C+	1	
	2	C	White (WH)	C	2	
	8	Data+	Black (BK)	Data+	8	
	7	Data–	Violet (VT)	Data–	7	
	12	UB	Red/blue + gray (RD-BU + GY)	UB	12	
	11	GND	Gray/pink + pink (GY-PK + PK)	GND	11	

Part numbers

Installation type	M23 connector – M23 connector
Fixed installation	13623192
Cable carrier installation	13621971

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11.14.4 Encoder extension cable with D-sub – M23 connector

Prefabricated cables for encoders

DRN.. motors

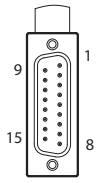
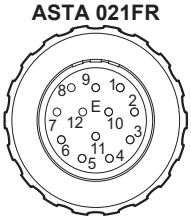
Encoder	DRN71 – 132S	DRN132M – 280
Sine encoder	ES7S	EG7S
TTL (V_B = DC 9 – 30 V)	ES7R	EG7R
RS485	AS7W	AG7W

DR2S.. motors

Encoder	DR2S71 – 80
Sine encoder	ES7S
TTL (V_B = DC 9 – 30 V)	ES7R
RS485	AS7W

Cable drawing and assignment: D-sub – M23 connector

4173480971

Inverter connection					Motor connection side	
Plug connector View Y	Contact	Signal	Cable core color	Signal	Contact	Plug connector View X
	1	A cos+	Red (RD)	A cos+	3	
	9	$\overline{A}$ cos-	Blue (BU)	$\overline{A}$ cos-	4	
	2	B sin+	Yellow (YE)	B sin+	5	
	10	$\overline{B}$ sin-	Green (GN)	$\overline{B}$ sin-	6	
	3	C+	Brown (BN)	C+	1	
	11	C	White (WH)	C	2	
	4	Data+	Black (BK)	Data+	8	
	12	Data–	Violet (VT)	Data–	7	
	15	UB	Red/blue + gray (RD-BU + GY)	UB	12	
	8	GND	Gray/pink + pink (GY-PK + PK)	GND	11	

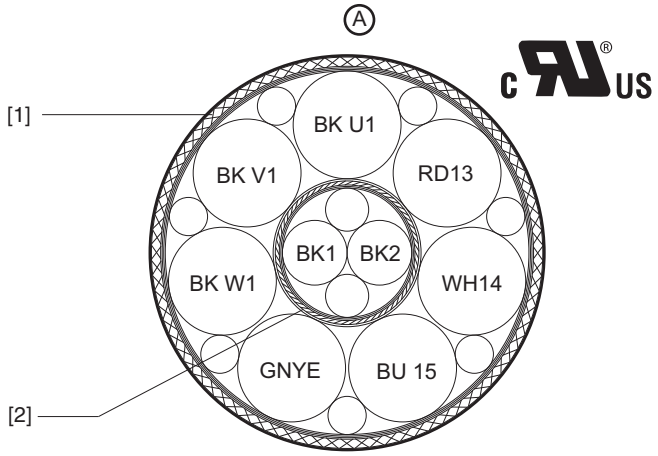
Part numbers

Installation type	D-sub – M23 connector
Fixed installation	13621998

11.15 Cable specifications of the power cables

11.15.1 Cable type A

Mechanical design



4173573387

Cable type A	Connection between Z.7 or Z.8 field distributors and AC motors Connection between MOVIMOT® or MOVI-SWITCH® 2S with AC motors (for mounting close to the motor)
[1]	Overall shield
[2]	Shield

- Supply cores: 7 × 1.5 mm²
- Control core pair: 2 × 0.75 mm²
- Insulation: TPE-U (polyurethane)
- Conductor: Bare E-Cu strand, extra fine wires with individual wire ≤ 0.15 mm
- Shield: Tinned E-Cu wire
- Overall diameter: 15.3 – 15.9 mm
- Color of outer cable sheath: Black

Electrical properties

- Line resistance for 1.5 mm² (20 °C): max. 13 Ω/km
- Line resistance for 0.75 mm² (20 °C): max. 26 Ω/km
- Operating voltage for core 1.5 mm²: max. 750 V (c US 600 V)
- Operating voltage for core 0.75 mm²: max. 350 V (c US 600 V)
- Insulation resistance at 20 °C:min. 20 MΩ x km

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Mechanical properties

- Suitable for cable carriers
  - Bending cycles > 2.5 million
  - Travel speed ≤ 3 m/s
- Bending radius in the cable track: 10 x diameter
- Bending radius for fixed routing: 5 x diameter
- Torsional strength (e.g. rotary table applications)
  - Torsion ±180° for a cable length of > 1 m
  - Torsional cycles > 100.000

INFORMATION

You will have to check the mechanical marginal conditions if you encounter reversed bending and high torsional load for a length of < 3 m. Contact SEW-EURODRIVE in such cases.

Thermal properties

- Processing and operation: -30 °C to +90 °C (c UL us: -30 °C to +80 °C)
- Transportation and storage: -40 °C to +90 °C (c UL us: -30 °C to +80 °C)

Chemical properties

- Oil resistance according to DIN EN 50363-10-2 (test method according to DIN EN 60811-404)
- General fuel resistance (such as diesel, gasoline) according to DIN ISO 6722 parts 1 and 2
- Flame retardant according to UL 1581 section 1060 Vertical Flame Test (FT1)
- Flame retardant according to CSA C22.2 No.3-92 Vertical Flame Test (FT1)
- Flame retardant according to IEC 60332-1-2
- Halogen-free according to IEC 60754-1
- General resistance to acids, alkalis, and cleaning agents
- General resistance against dusts (e.g. magnesite, bauxite)
- General resistance against microbes and fungi
- General hydrolytic resistance
- General resistance against UV radiation
- Free from paint-wetting impairment substances
- UV- and weather-resistant according to DIN EN ISO 4892-2

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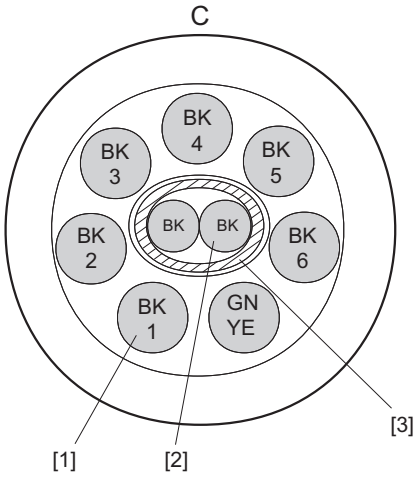
11.15.2 Cable type C

Mechanical design



4173611659

Cable type C	Connection of MOVISWITCH® 2S to AC motors (for mounting close to the motor with option P2.A)
[1]	Cores 2.5 mm ²
[2]	Cores 0.75 mm ²
[3]	Shield

- Supply cores: 7 x 2.5 mm²
- Control cores: 2 x 0.75 mm²
- Insulation: PVC/Special PVC
- Conductor: Fine wires to VDE class 5, copper strand conductor
- Shield: Braided tinned copper shield
- Overall diameter: 15.2 mm

Electrical properties

- Conductor resistance for 2.5 mm²: 8.5 Ω/km
- Conductor resistance for 0.75 mm²: 26 Ω/km
- Operating voltage for 2.5 mm² cores: 600 V/1000 V
- Operating voltage for conductors 0.75 mm²: AC 48 V
- Insulation resistance: 20 MΩ x km

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Mechanical properties

- Bending radius in the cable track: 20 x diameter
- Bending radius for fixed routing: 6 x diameter

Thermal properties

- Processing and operation
  - Flexible routing: -5 °C to +70 °C
  - Fixed routing: -30 °C to +80 °C
- Transport and storage: -30 °C to +80 °C

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11.16 Cable specification of encoder cables

11.16.1 Fixed installation

Accessory designation		ES7S/EG7S/ES7R/ EG7R/ES7C/EG7C/ AS7W/AG7W/AH7Y/ AS7Y/AG7Y/.K8./EI8.	EH7S/AH7Y	EI7C[1]
Cable cross sections		**6 x 2 x 0.25 mm²** **4 x 2 x 0.25+2 x 0.5 mm²** **5 x 2 x 0.25+2 x 0.5 mm²**	**5 x 2 x 0.25 mm²**	
Manufacturer				
Manufacturer's designation		LI9YCY		
Operating voltage V_0 / V AC	V	230 / 350		
Temperature range	°C	Fixed installation -40 to +80		
Maximum temperature	°C	+ 80		
Minimum bending radius	mm	43	36.5	73
Outside diameter D	mm	8.6 ± 0.2 8.8 ± 0.2	7.3 ± 0.2	
Core identification		DIN 47 100		
Sheath color		Green, similar to RAL 6018		
Approval(s)		DESINA/VDE/UL/CSA/CE		
Capacitance core/shielding	nF/km	110		
Capacitance core/core	nF/km	70		
Halogen-free		no		
Silicone-free		yes		
CFC-free		yes		
Inner insulation (core)		PP		
Outer insulation (sheath)		PVC		
Flame-retardant/self-extinguishing		no		Flame retardant according to VDE0472, Part 802, Test type B, according to IEC 60332-1
Conductor material		Cu blank		
Shielding		Braided tinned Cu		
Weight (cable)	kg/km	107	78	83

1) EI7C encoders require a maximum of 8 conductors, additional conductors potentially for temperature sensors

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11.16.2 Cable carrier installation

Accessory designation			EH7S/AH7Y/EI7C	EI7C[1)]
Cable cross sections		**6 x 2 x 0.25 mm²** **4 x 2 x 0.25+2 x 0.5 mm²** **5 x 2 x 0.25+2 x 0.5 mm²**	**5 x 2 x 0.25 mm²**	**4 x 2 x 0.25 mm²**
Manufacturer		**Nexans**		**HELUKABEL/ Leoni**
Manufacturer's designation		SSL18YC11Y 6 x 2 x 0.25 SSL18YC11Y 5 x 2 x 0.25		Top encoder 503, 74419
Operating voltage V_0 / V AC	V	300		
Temperature range	°C	-20 to +60		-20 to +80
Maximum temperature	°C	+90 (on conductor)	+60	+80
Minimum bending radius	mm	100	96	63
Outside diameter D	mm	9.8 ± 0.2 8.8 ± 0.2	9.6 ± 0.2	8.4 ± 0.2
Maximum acceleration	m/s^2	20		50
Maximum speed	m/min	200		300
Core identification		DIN 47100		
Sheath color		Green similar to RAL 6018		
Approval(s)		DESINA/VDE	DESINA/VDE/UL/ CE	DESINA/VDE/UL/ CSA/CE
Capacitance core/shielding	nF/km	100	85	110
Capacitance core/core	nF/km	58		70
Halogen-free		yes		
Silicone-free		yes		
CFC-free		yes		
Inner insulation (core)		PP		
Outer insulation (sheath)		PUR		
Flame-retardant/self-extinguishing		yes		
Conductor material		E-Cu blank		
Shielding		Braided tinned Cu		
Weight	kg/km	130	114	89
Minimum bending cycles		≥ 5 million		

1) EI7C encoders require a maximum of 8 conductors, additional conductors potentially for temperature sensors

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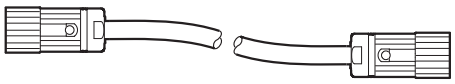
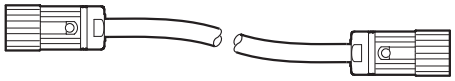
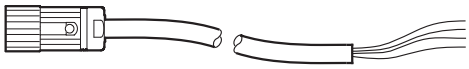
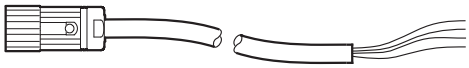
11.17 Motor cables for DRN.. motors with MOVILINK® DDI interface

The following tables list the cables available for this connection.

11.17.1 Cable cross section 1.5 mm²

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, without coding ring, female — M23, without coding ring, female	CE/UL: 28105931	LEONI LEHC 005244	Variable 	1.5 mm² / AC 500 V
 M23, without encoding ring, female — M23, without encoding ring, female	CE/UL: 28105869	LEONI LEHC 005498	Variable 	1.5 mm² / AC 500 V
 M23, without coding ring, female — Open	CE/UL: 18191541	LEONI LEHC 005244	Variable 	1.5 mm² / AC 500 V
 M23, without coding ring, female — Open	CE/UL: 28105818	LEONI LEHC 005498	Variable 	1.5 mm² / AC 500 V

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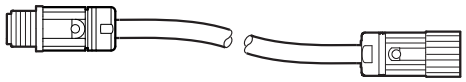
Connection cable		Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
		CE/UL: 18195466	LEONI LEHC 005244	Variable	1.5 mm² / AC 500 V
M23, without coding ring, male	M23, without coding ring, female				

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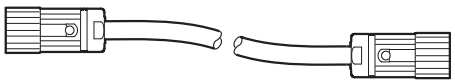
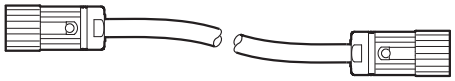
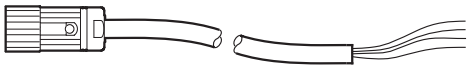
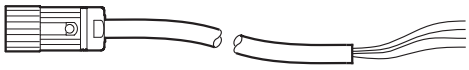
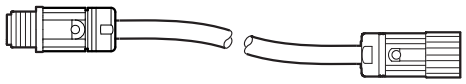
11.17.2 Cable cross section 2.5 mm²

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, without coding ring, female — M23, without coding ring, female	CE/UL: 28105958	LEONI LEHC 005254	Variable	2.5 mm² / AC 500 V
 M23, without coding ring, female — M23, without coding ring, female	CE/UL: 28105877	LEONI LEHC 005499	Variable	2.5 mm² / AC 500 V
 M23, without coding ring, female — Open	CE/UL: 18191568	LEONI LEHC 005254	Variable	2.5 mm² / AC 500 V
 M23, without coding ring, female — Open	CE/UL: 28105826	LEONI LEHC 005499	Variable	2.5 mm² / AC 500 V
 M23, without coding ring, male — M23, without coding ring, female	CE/UL: 18195474	LEONI LEHC 005254	Variable	2.5 mm² / AC 500 V

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11.17.3 Connection of cables with open end

The following table shows the conductor assignment of the cables with the following part numbers:

Part number	Signal name	Core color	Identification	Assembly
18191541	U	Black	U/L1/C/L+	Not prefabricated
18191568	V	Black	V/L2	Not prefabricated
28105818	W	Black	W/L3/D/L-	Not prefabricated
28105826	Brake 13	Black	1	Not prefabricated
	Brake 14	Black	3	Not prefabricated
	Brake 15	Black	2	Not prefabricated
	PE	Green/yellow	–	Not prefabricated
	DDI	Violet	–	Coaxial connector

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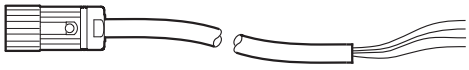
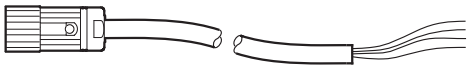
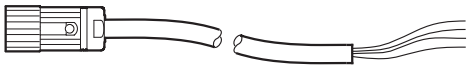
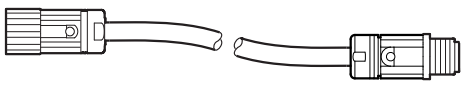
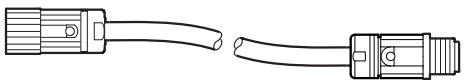
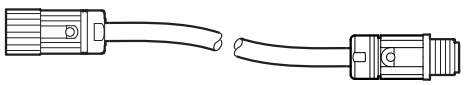
11.17.4 Connection cable, fixed installation

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, without coding ring, female — Open	CE/cURus: 28123808	LEONI LEHC® 005775	Variable 	4 × 1.5 mm² + 4 × 1.0 mm² + RG58 / AC 500 V
 M23, without coding ring, female — Open	CE/cURus: 28123816	LEONI LEHC® 005776	Variable 	4 × 2.5 mm² + 4 × 1.0 mm² + RG58 / AC 500 V
 M23, without coding ring, female — Open	CE/cURus: 28123824	LEONI LEHC® 005777	Variable 	4 × 4.0 mm² + 4 × 1.0 mm² + RG58 / AC 500 V
 M23, without coding ring, female — M23, without coding ring, male	CE/cURus: 28123905	LEONI LEHC® 005775	Variable 	4 × 1.5 mm² + 4 × 1.0 mm² + RG58 / AC 500 V
 M23, without coding ring, female — M23, without coding ring, male	CE/cURus: 28123913	LEONI LEHC® 005776	Variable 	4 × 2.5 mm² + 4 × 1.0 mm² + RG58 / AC 500 V
 M23, without coding ring, female — M23, without coding ring, male	CE/cURus: 28123921	LEONI LEHC® 005777	Variable 	4 × 4.0 mm² + 4 × 1.0 mm² + RG58 / AC 500 V

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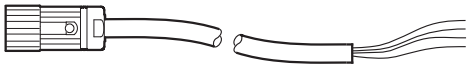
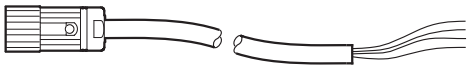
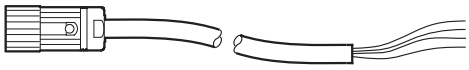
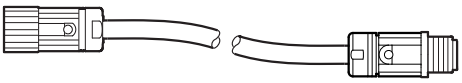
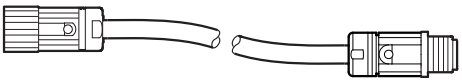
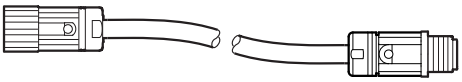
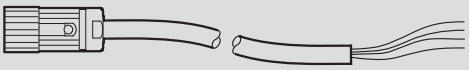
11.17.5 Connection cable, cable carrier installation

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, without coding ring, female — Open	CE/cURus: 28123743	LEONI LEHC® 005796	Variable	4 × 1.5 mm² + 4 × 1.0 mm² + RG58 / AC 500 V
 M23, without coding ring, female — Open	CE/cURus: 28123751	LEONI LEHC® 005770	Variable	4 × 2.5 mm² + 4 × 1.0 mm² + RG58 / AC 500 V
 M23, without coding ring, female — Open	CE/cURus: 28123778	LEONI LEHC® 005771	Variable	4 × 4.0 mm² + 4 × 1.0 mm² + RG58 / AC 500 V
 M23, without coding ring, female — M23, without coding ring, male	CE/cURus: 28123859	LEONI LEHC® 005796	Variable	4 × 1.5 mm² + 4 × 1.0 mm² + RG58 / AC 500 V
 M23, without coding ring, female — M23, without coding ring, male	CE/cURus: 28123867	LEONI LEHC® 005770	Variable	4 × 2.5 mm² + 4 × 1.0 mm² + RG58 / AC 500 V
 M23, without coding ring, female — M23, without coding ring, male	CE/cURus: 28123875	LEONI LEHC® 005771	Variable	4 × 4.0 mm² + 4 × 1.0 mm² + RG58 / AC 500 V

11.17.6 Motor cable connections for DRN.. motors without brake with MOVILINK® DDI interface

Connecting the cable with connectors on the motor end.

The following table shows the core assignment of the cables:

Motor side  **Inverter side**

Contact		Signal	Conductor color	Conductor color IEC 60757	Identification	Prefabrication	Description
M23	M40						
U	U	U	Black	BK	U/L1	Not prefabricated	Motor connection phase U
V	V	V	Black	BK	V/L2	Not prefabricated	Motor connection phase V
W	W	W	Black	BK	W/L3	Not prefabricated	Motor connection phase W
A	1	Reserved	Yellow	YE	A	Not prefabricated	Do not connect
B	+	Reserved	Orange	Upper limit	B	Not prefabricated	Do not connect
C	N	Reserved	Pink	PK	C	Not prefabricated	Do not connect
D	2	Reserved	Violet	VT	D	Not prefabricated	Do not connect
PE	PE	PE	Yellow/ green	YE/GN		Not prefabricated	PE connection
DDI	DDI	DDI	Violet	VT		Coaxial connector	MOVILINK® DDI

Insulate unconnected conductor ends.

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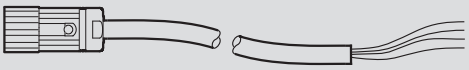
11.17.7 Motor cable connection for DRN.. motors with BE brake with MOVILINK® DDI interface

Connecting the cable with connectors on the motor end.

The following table shows the core assignment of the cables:

Motor side  **Inverter side**

Contact		Signal	Con-ductor color	Conductor color IEC 60757	Identi-fication	Assembly	Description
M23	M40						
U	U	U	Black	BK	U/L1	Not prefabricated	Motor connection phase U
V	V	V	Black	BK	V/L2	Not prefabricated	Motor connection phase V
W	W	W	Black	BK	W/L3	Not prefabricated	Motor connection phase W
A	1	Reserved	Yellow	YE	A	Not prefabricated	Do not connect
B	+	15	Orange	Upper limit	B	Not prefabricated	Brake connection 15
C	N	13	Pink	PK	C	Not prefabricated	Brake connection 13
D	2	14	Violet	VT	D	Not prefabricated	Brake connection 14
PE	PE	PE	Yellow/ green	YE/GN		Not prefabricated	PE connection
DDI	DDI	DDI	Violet	VT		Coaxial connector	MOVILINK® DDI

Insulate unconnected conductor ends.

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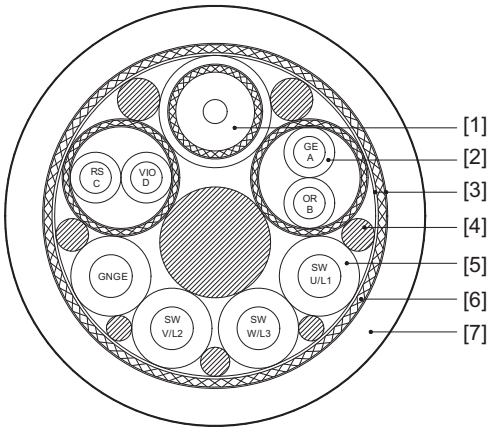
11.17.8 Cable specifications

Cable carrier installation

Type		LEHC 005796	LEHC 005770	LEHC 005771	LEHC 005772	LEHC 005773
Part number of bulk cable, not prefabricated		28123336	28123344	28123352	28123360	28123379
Cross section		4 × 1.5 mm²	4 × 2.5 mm²	4 × 4.0 mm²	4 × 6.0 mm²	4 × 10 mm²
Mechanical design		 29346392715				
[1]	Coaxial cable	Coax Z50 in accordance with RG58				
	Conductor	Stranded copper wire, tinned, 19 × 0.182 mm				
	Dielectric	Polypropylene Ø 2.95				
	Shielding	Braided copper wire, tinned, 0.128 mm				
		Optical coverage at least 90%				
	Sheath	TPE				
	Diameter	4.2 mm				
	Color	Violet				
[2]	Cores	2 shielded conductor pairs 2 × 1.0 mm²	2 shielded conductor pairs 2 × 1.0 mm²	2 shielded conductor pairs 2 × 1.0 mm²	2 shielded conductor pairs 2 × 1.5 mm²	Shielded element 4 × 1.5 mm²
		Stranded copper wire, bare				
		Single wire 0.15 mm				
		in accordance with DIN EN 60228 class 6				
		IEC 60228 Class 6				
	Insulation	Polypropylene				
	Shielding	Braided copper wire, 0.10 mm, tinned	Braided copper wire, 0.10 mm, tinned	Braided copper wire, 0.10 mm, tinned	Braided copper wire, 0.10 mm, tinned	Braided copper wire, 0,128 mm, tinned
		Optical coverage at least 85%				
	Diameter	2.1 mm	2.1 mm	2.1 mm	2.4 mm	2.4 mm
	Colors	Yellow with black label A				
		Orange with black label B				
		Pink with black label C				
		Purple with black label D				
[3]	Banding	-				
[4]	Filler	-				
[5]	Cores	4 × 1.5 mm²	4 × 2.5 mm²	4 × 4.0 mm²	4 × 6.0 mm²	4 × 10 mm²
	Conductor	Stranded copper wire, bare				
		Single wire 0.15 mm	Single wire 0.15 mm	Single wire 0.15 mm	Single wire 0.2 mm	Single wire 0.2 mm
		in accordance with DIN EN 60228 class 6				
		IEC 60228 Class 6				
	Diameter	3.0 mm	3.6 mm	3.75 mm	4.6 mm	5.8 mm
	Insulation	Polypropylene				
	Colors	Green yellow, black with label: U/L1; V/L2; W/L3				

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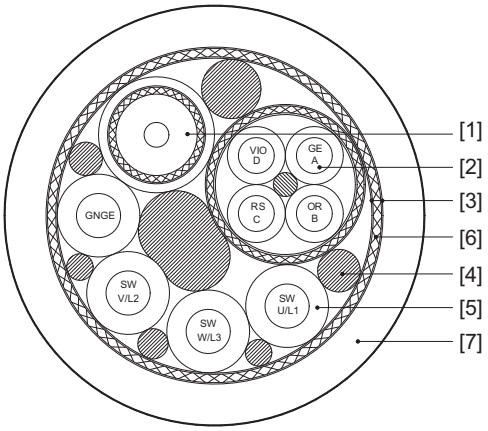
Type		LEHC 005796	LEHC 005770	LEHC 005771	LEHC 005772	LEHC 005773
Part number of bulk cable, not prefabricated		**28123336**	**28123344**	**28123352**	**28123360**	**28123379**
Cross section		**4 × 1.5 mm²**	**4 × 2.5 mm²**	**4 × 4.0 mm²**	**4 × 6.0 mm²**	**4 × 10 mm²**
[6]	Shield	Braided tinned copper wires, 0.15 mm	Braided tinned copper wires, 0.15 mm	Braided tinned copper wires, 0.15 mm	Braided tinned copper wires, 0.2 mm	Braided tinned copper wires, 0.2 mm
		Optical coverage at least 85%				
[7]	Outer cable jacket	Polyurethane, flame retardant, halogen-free				
	Color	Flat orange				
	Label	SEW-EURODRIVE 28123336 4 × 1.5 + 2 × 2 × 1C + 1 × Z50	SEW-EURODRIVE 28123344 4 × 2.5 + 2 × 2 × 1C + 1 × Z50	SEW-EURODRIVE 28123352 4 × 4.0 + 2 × 2 × 1C + 1 × Z50	SEW-EURODRIVE 28123360 4 × 6.0 + 2 × 2 × 1.5C + 1 × Z50	SEW-EURODRIVE 28123379 4 × 10 + 2 × 2 × 1.5C + 1 × Z50
		LEHC005796 Rev. 0 E47543-LIL c UL us	LEHC 005770 Rev.0 E47543-LIL c UL us	LEHC 005771 Rev.0 E47543-LIL c UL us	LEHC 005772 Rev.0 E47543-LIL c UL us	LEHC 005773 Rev.0 E47543-LIL c UL us
		AWM STYLE 21223 I/II A/B 80 °C 1000V FT1 Week/year of production				
	Diameter	15.7 mm	16.7 mm	17.0 mm	19.7 mm	22.1 mm
Electrical properties						
	Operating voltage conductors V_0/V	0.6 kV/1.0 kV				
	Operating voltage according to UL style 21223	Max. 1000 V				
	Surge impedance coaxial cable	50 Ω ± 2 Ω				
Mechanical properties						
	Bending radius	min. 3 × outer diameter for one-time installation min. 5 × outer diameter for fixed installation min. 10 × outer diameter for cable carriers				
	Travel speed	Max. 5 m/s				
	Acceleration	max. 20 m/s²				
	Bending cycles	min. 5 × 10⁶				
	Mass	332 kg/km	392 kg/km	444 kg/km	626 kg/km	827 kg/km
Thermal properties						
	Operating temperature	Fixed installation: -40 °C to +90 °C Cable carrier installation: -30 °C to +90 °C				
	Operating temperature according to cURus	Fixed installation: -40 °C to +80 °C Cable carrier installation: -30 °C to +80 °C				
Chemical properties						
	Oil resistance	DIN VDE 0282-10/HD 22.10 S2				
	Flame retardant	UL 1581 section 1060 Vertical Flame Test (FT1) CSA C22.2 No.3-92 Vertical Flame Test (FT1) IEC 60332-1-2				
Other features						
		EU Directive 2011/65/EU (RoHS), Free of paint-wetting impairment substances, Halogen-free according to IEC 60754-1, General fuel resistance, General resistance to acids, alkalis, and cleaning agents, General resistance against dusts, General resistance against microbes and fungi, Generally hydrolysis-resistant, General resistance against UV radiation				
Approvals						
		UL Subject 758, Style 21223 CSA - C22.2 No. 210 cURus E47543 UL Style 21223 80 °C 1000V FT1 cUL AWM I/II A/B 80 °C 1000V FT1				

Fixed installation

Type		LEHC 005775	LEHC 005776	LEHC 005777	LEHC 005778	LEHC 005779
Part number of bulk cable, not prefabricated		**28123395**	**28123409**	**28123417**	**28123425**	**28123433**
Cross section		**4 × 1.5 mm²**	**4 × 2.5 mm²**	**4 × 4.0 mm²**	**4 × 6.0 mm²**	**4 × 10 mm²**
Mechanical design		 *29346395147*				
[1]	Coaxial cable	Coax Z50 in accordance with RG58				
	Conductor	Stranded copper wire, tinned, 19 × 0.182 mm				
	Dielectric	Polypropylene Ø 2.95				
	Shielding	Braided copper wire, tinned, 0.128 mm				
		Optical coverage at least 90%				
	Sheath	TPE				
	Diameter	4.2 mm				
	Color	Violet				
[2]	Cores	Shielded element 4 × 1.0 mm²	Shielded element 4 × 1.0 mm²	Shielded element 4 × 1.0 mm²	Shielded element 4 × 1.5 mm²	Shielded element 4 × 1.5 mm²
		Stranded copper wire, bare				
		Single wire 0.20 mm	Single wire 0.20 mm	Single wire 0.20 mm	Single wire 0.25 mm	Single wire 0.25 mm
		in accordance with DIN EN 60228 class 5				
		IEC 60228 Class 5				
	Insulation	Polypropylene				
	Shielding	Braided copper wire, 0,128 mm, tinned				
		Optical coverage at least 85%				
	Diameter	2.1 mm	2.1 mm	2.1 mm	2.35 mm	2.35 mm
	Colors	Yellow with black label A				
		Orange with black label B				
		Pink with black label C				
		Purple with black label D				
[3]	Banding	-	-	-	-	-
[4]	Filler	-	-	-	-	-
[5]	Cores	4 × 1.5 mm²	4 × 2.5 mm²	4 × 4.0 mm²	4 × 6.0 mm²	4 × 10 mm²
	Conductor	Stranded copper wire, bare				
		Single wire 0.25 mm	Single wire 0.25 mm	Single wire 0.30 mm	Single wire 0.30 mm	Single wire 0.40 mm
		in accordance with DIN EN 60228 class 5				
		IEC 60228 Class 5				
	Diameter	3.0 mm	3.6 mm	3.75 mm	4.7 mm	5.8 mm
	Insulation	Polypropylene				
	Colors	Green yellow, black with label: U/L1; V/L2; W/L3				
[6]	Shield	Braided tinned copper wires, 0.15 mm	Braided tinned copper wires, 0.15 mm	Braided tinned copper wires, 0.15 mm	Braided tinned copper wires, 0.20 mm	Braided tinned copper wires, 0.20 mm
		Optical coverage at least 85%				

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Type		LEHC 005775	LEHC 005776	LEHC 005777	LEHC 005778	LEHC 005779
Part number of bulk cable, not prefabricated		**28123395**	**28123409**	**28123417**	**28123425**	**28123433**
Cross section		**4 × 1.5 mm²**	**4 × 2.5 mm²**	**4 × 4.0 mm²**	**4 × 6.0 mm²**	**4 × 10 mm²**
[7]	Outer cable jacket	PVC				
	Color	orange				
	Label	SEW-EURODRIVE 28123395 4 × 1.5 + 4 × 1C + 1 × Z50	SEW-EURODRIVE 28123409 4 × 2.5 + 4 × 1C + 1 × Z50	SEW-EURODRIVE 28123417 4 × 4.0 + 4 × 1C + 1 × Z50	SEW-EURODRIVE 28123425 4 × 6.0 + 4 × 1.5C + 1 × Z50	SEW-EURODRIVE 28123433 4 × 10 + 4 × 1.5C + 1 × Z50
		LEHC005775 Rev. 0 E47543-LIL c UL us	LEHC005776 Rev. 0 E47543-LIL c UL us$_S$	LEHC 005777 Rev.0 E47543-LIL c UL us	LEHC 005778 Rev.0 E47543-LIL c UL us	LEHC 005779 Rev.0 E47543-LIL c UL us
		AWM STYLE 2570 I/II A/B 80 °C 1000 V FT1 Week/year of production				
	Diameter	15.2 mm	16.1 mm	16.4 mm	19.0 mm	21.8 mm
Electrical properties						
	Operating voltage conductors V_0/V	0.6 kV/1.0 kV				
	Operating voltage according to UL style 21223	Max. 1000 V				
	Surge impedance coaxial cable	50 Ω ± 2 Ω				
Mechanical properties						
	Bending radius	min. 3 × outer diameter for one-time installation min. 5 × outer diameter for fixed installation min. 10 × outer diameter if moved occasionally				
	Mass	312 kg/km	361 kg/km	412 kg/km	576 kg/km	791 kg/km
Thermal properties						
	Operating temperature	Fixed installation: -40 °C to +90 °C If moved occasionally: -10 °C to +90 °C				
	Operating temperature according to cURus	Fixed installation: -40 °C to +80 °C If moved occasionally: -10 °C to +80 °C				
Chemical properties						
	Oil resistance	DIN EN 50363-4-1 (test method according to DIN EN 60811-404)				
	Flame retardant	UL 1581 section 1060 Vertical Flame Test (FT1) CSA C22.2 No.3-92 Vertical Flame Test (FT1) IEC 60332-1-2				
Other features						
		EU Directive 2011/65/EU (RoHS)				

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12 Address Directory

Germany			
Headquarters Production plant Sales	**Bruchsal**	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Strasse 42 76646 Bruchsal, Germany P.O. box address Postfach 3023 • D-76642 Bruchsal, Germany	Tel. +49 7251 75-0 Fax +49 7251 75-1970 http://www.seweurodrive.com sew@sew-eurodrive.de
Production Plant / Industrial Gear Units	**Bruchsal**	SEW-EURODRIVE GmbH & Co KG Christian-Pähr-Str.10 76646 Bruchsal, Germany	Tel. +49 7251 75-0 Fax +49 7251 75-2970
Production plant	**Graben**	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Strasse 1 76676 Graben-Neudorf, Germany P.O. box address Postfach 1220 • 76671 Graben-Neudorf, Germany	Tel. +49 7251 75-0 Fax +49 7251 75-2970
	Östringen	SEW-EURODRIVE GmbH & Co KG, Oestringen Plant Franz-Gurk-Strasse 2 76684 Oestringen, Germany	Tel. +49 7253 9254-0 Fax +49 7253 9254-90 oestringen@sew-eurodrive.de
Service Competence Centers	**Mechanical/ Mechatronic Components**	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Strasse 1 76676 Graben-Neudorf, Germany	Tel. +49 7251 75-1710 Fax +49 7251 75-1711 sc-mitte@sew-eurodrive.de
	Electronics	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Strasse 42 76646 Bruchsal, Germany	Tel. +49 7251 75-1780 Fax +49 7251 75-1769 sc-elektronik@sew-eurodrive.de
Drive Technology Center	**North**	SEW-EURODRIVE GmbH & Co KG Alte Ricklinger Strasse 40-42 30823 Garbsen (near Hanover)	Tel. +49 5137 8798-30 Fax +49 5137 8798-55 sc-nord@sew-eurodrive.de
	East	SEW-EURODRIVE GmbH & Co KG Daenkritzer Weg 1 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 85551 Kirchheim (near Munich)	Tel. +49 89 909552-10 Fax +49 89 909552-50 sc-sued@sew-eurodrive.de
	West	SEW-EURODRIVE GmbH & Co KG Siemensstrasse 1 40764 Langenfeld (near Düsseldorf)	Tel. +49 2173 8507-30 Fax +49 2173 8507-55 sc-west@sew-eurodrive.de
	Drive Service Hotline/24-hour availability		+49 800 SEWHELP +49 800 7394357
Technical offices	**Augsburg**	SEW-EURODRIVE GmbH & Co KG August-Wessels-Strasse 27 86156 Augsburg, Germany	Tel. +49 821 22779-10 Fax +49 821 22779-50 tb-augsburg@sew-eurodrive.de
	Berlin	SEW-EURODRIVE GmbH & Co KG Lilienthalstrasse 3a 12529 Schoenefeld, Germany	Tel. +49 306331131-30 Fax +49 306331131-36 tb-berlin@sew-eurodrive.de
	Lake Constance	SEW-EURODRIVE GmbH & Co KG Dornierstraße 4 88677 Markdorf, Germany	Tel. +49 7544 96590-90 Fax +49 7544 96590-99 tb-bodensee@sew-eurodrive.de
	Bremen	SEW-EURODRIVE GmbH & Co KG Bornstr.19 ... 22 28195 Bremen, Germany	Tel. +49 421 33918-10 Fax +49 421 33918-22 tb-bremen@sew-eurodrive.de
	Dortmund	SEW-EURODRIVE GmbH & Co KG Hildastraße 8 44145 Dortmund, Germany	Tel. +49 231 229028-10 Fax +49 231 229028-20 tb-dortmund@sew-eurodrive.de
	Dresden	SEW-EURODRIVE GmbH & Co KG Hauptstrasse 32 01445 Radebeul, Germany	Tel. +49 351 26338-0 Fax +49 351 26338-38 tb-dresden@sew-eurodrive.de
	Erfurt	SEW-EURODRIVE GmbH & Co KG Dubliner Strasse 12 99091 Erfurt, Germany	Tel. +49 361 21709-70 Fax +49 361 21709-79 tb-erfurt@sew-eurodrive.de
	Guestrow	SEW-EURODRIVE GmbH & Co KG Glasewitzer Chaussee 33 B 18273 Guestrow, Germany P.O. box address Postfach 1216 • 18262 Güstrow, Germany	Tel. +49 3843 8557-80 Fax +49 3843 8557-88 tb-guestrow@sew-eurodrive.de

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Germany			
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	Hanover/Garbsen	SEW-EURODRIVE GmbH & Co KG Alte Ricklinger Str.40-42 30823 Garbsen, Germany P.O. box address Postfach 1104 53 • 30804 Garbsen, Germany	Tel. +49 5137 8798-10 Fax +49 5137 8798-50 tb-hannover@sew-eurodrive.de
	Heilbronn	SEW-EURODRIVE GmbH & Co KG Zeppelinstrasse 7 74357 Boennigheim, Germany	Tel. +49 7143 8738-0 Fax +49 7143 8738-25 tb-heilbronn@sew-eurodrive.de
	Herford	SEW-EURODRIVE GmbH & Co KG Göbenstraße 3 – 7 32052 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 76467 Bietigheim, Germany P.O. box address Postfach 43 • 76463 Bietigheim, Germany	Tel. +49 7245 9190-10 Fax +49 7245 9190-20 tb-karlsruhe@sew-eurodrive.de
	Kassel	SEW-EURODRIVE GmbH & Co KG Lange Strasse 14 34253 Lohfelden, Germany	Tel. +49 561 95144-80 Fax +49 561 95144-90 tb-kassel@sew-eurodrive.de
	Koblenz	SEW-EURODRIVE GmbH & Co KG Bahnstrasse 17a 56743 Mendig, Germany	Tel. +49 2652 9713-30 Fax +49 2652 9713-40 tb-koblenz@sew-eurodrive.de
	Lahr	SEWEURODRIVE GmbH & Co KG Europastrasse 3/1 77933 Lahr/Schwarzwald, Germany	Tel. +49 7821 90999-60 Fax +49 7821 90999-79 tb-lahr@sew-eurodrive.de
	Langenfeld	SEW-EURODRIVE GmbH & Co KG Siemensstrasse 1 40764 Langenfeld, Germany	Tel. +49 2173 8507-10 Fax +49 2173 8507-50 tb-langenfeld@sew-eurodrive.de
	Magdeburg	SEW-EURODRIVE GmbH & Co KG Breiteweg 53 39179 Barleben, Germany	Tel. +49 39203 7577-1 Fax +49 39203 7577-9 tb-magdeburg@sew-eurodrive.de
	Mannheim	SEW-EURODRIVE GmbH & Co KG Besselstrasse 26 68219 Mannheim, Germany	Tel. +49 621 71683-10 Fax +49 621 71683-22 tb-mannheim@sew-eurodrive.de
	Munich	SEW-EURODRIVE GmbH & Co KG Domagkstrasse 5 85551 Kirchheim, Germany	Tel. +49 89 90955-110 Fax +49 89 90955-150 tb-muenchen@sew-eurodrive.de
	Muenster	SEW-EURODRIVE GmbH & Co KG Hafenplatz 4 48155 Muenster, Germany	Tel. +49 251 41475-11 Fax +49 251 41475-50 tb-muenster@sew-eurodrive.de
	Nuremberg	SEW-EURODRIVE GmbH & Co KG Plattenaeckerweg 6 90455 Nuremberg, Germany	Tel. +49 911 98884-50 Fax +49 911 98884-60 tb-nuernberg@sew-eurodrive.de
	Regensburg	SEW-EURODRIVE GmbH & Co KG Im Gewerbepark A15 93059 Regensburg, Germany	Tel. +49 941 46668-68 Fax +49 941 46668-66 tb-regensburg@sew-eurodrive.de
	Rhine-Main	SEW-EURODRIVE GmbH & Co KG Niederstedter Weg 5 61348 Bad Homburg, Germany	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 70771 Leinfelden-Echterdingen, Germany	Tel. +49 711 16072-0 Fax +49 711 16072-72 tb-stuttgart@sew-eurodrive.de
	Ulm	SEWEURODRIVE GmbH & Co KG Dieselstrasse 14 89160 Dornstadt, Germany	Tel. +49 7348 9885-0 Fax +49 7348 9885-90 tb-ulm@sew-eurodrive.de
	Drive Center Wuerzburg	SEW-EURODRIVE GmbH & Co KG Nuernbergerstrasse 118 97076 Wuerzburg-Lengfeld, Germany	Tel. +49 931 27886-60 Fax +49 931 27886-66 tb-wuerzburg@sew-eurodrive.de
	Zwickau / Meerane	SEW-EURODRIVE GmbH & Co KG Dänkritzer Weg 1 08393 Meerane, Germany	Tel. +49 3764 7606-0 Fax +49 3764 7606-20 tb-zwickau@sew-eurodrive.de

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Production plant **Sales** **Service**	**Haguenau**	SEW-USOCOME 48-54 route de Soufflenheim B. P. 20185 67506 Haguenau Cedex, France	Tel. +33 3 88 73 67 00 Fax +33 3 88 73 66 00 http://www.usocome.com sew@usocome.com
Production plant	**Forbach**	SEW-USOCOME Zone industrielle Technopôle Forbach Sud B. P. 30269 57604 Forbach Cedex, France	Tel. +33 3 87 29 38 00
Assembly plant **Sales** **Service**	**Bordeaux**	SEW-USOCOME Parc d'activités de Magellan 62 avenue de Magellan - B. P. 182 33607 Pessac Cedex, France	Tel. +33 5 57 26 39 00 Fax +33 5 57 26 39 09
	Lyon	SEW-USOCOME Parc d'affaires Roosevelt Rue Jacques Tati 69120 Vaulx en Velin, France	Tel. +33 4 72 15 37 00 Fax +33 4 72 15 37 15
	Nantes	SEW-USOCOME Parc d'activités de la forêt 4 rue des Fontenelles 44140 Le Bignon, France	Tel. +33 2 40 78 42 00 Fax +33 2 40 78 42 20
	Paris	SEW-USOCOME Zone industrielle 2 rue Denis Papin 77390 Verneuil l'Etang, France	Tel. +33 1 64 42 40 80 Fax +33 1 64 42 40 88
Technical offices	**Alsace**	SEW-USOCOME 1 rue Auguste Gasser 68360 Soultz, France	Tel. +33 3 89 74 51 62 Fax +33 3 89 76 58 71
	Aquitaine/Charente	SEW-USOCOME Parc d'activités de Magellan 62 avenue de Magellan - B.P.182 33607 Pessac Cedex, France	Tel. +33 5 57 26 39 08 Fax +33 5 57 26 39 09
	Auvergne/Limousin	SEW-USOCOME Farges 19600 Chasteaux, France	Tel. +33 5 55 20 12 10 Fax +33 5 55 20 12 11
	Lower Normandy	SEW-USOCOME 5 rue de la Limare 14250 Brouay, France	Tel. +33 2 31 37 92 86 Fax +33 2 31 74 68 15
	Burgundy	SEW-USOCOME 10 rue de la poste 71350 Saint Loup Géanges, France	Tel. +33 3 85 49 92 18 Fax +33 3 85 49 92 19
	Brittany	SEW-USOCOME Parc d'activités de la forêt 4 rue des Fontenelles 44140 Le Bignon, France	Tel. +33 2 40 78 42 04 Fax +33 2 40 78 42 20
	Centre/Poitou	SEW-USOCOME Parc d'activités de la forêt 4 rue des Fontenelles 44140 Le Bignon, France	Tel. +33 2 40 78 42 11 Fax +33 2 40 78 42 20
	Champagne-Ardenne	SEW-USOCOME 25 bis rue Victor Hugo Appartement 7 10120 Saint André les Vergers, France	Tel. +33 3 25 79 63 24 Fax +33 3 25 79 63 25
	Franche-Comté	SEW-USOCOME 24 avenue Charles Boby 70000 Quincey, France	Tel. +33 3 81 60 20 47 Fax +33 3 81 87 75 93
	Île-de-France East/Aisne	SEW-USOCOME 20 rue Félix Faure 02100 Saint Quentin, France	Tel. +33 3 23 62 81 24 Fax +33 3 23 62 81 44
	Île-de-France North/Picardy	SEW-USOCOME 25bis rue Kléber 92300 Levallois Perret, France	Tel. +33 1 41 05 92 74 Fax +33 1 41 05 92 75
	Île-de-France South	SEW-USOCOME 6 chemin des bergers Lieu-dit Marchais 91410 Roinville sous Dourdan, France	Tel. +33 1 60 81 10 56 Fax +33 1 60 81 10 57

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France			
	Lothringen/Northern Alsace	SEW-USOCOME 1 rue de la forêt 54250 Champigneulles, France	Tel. +33 3 83 96 28 04 Fax +33 3 83 96 28 07
	Midi-Pyrénées/ Roussillon	SEW-USOCOME 179 route de Grazac 31190 Caujac, France	Tel. +33 5 61 08 15 85 Fax +33 5 61 08 16 44
	Nord-Pas-de-Calais	SEW-USOCOME 209, route d'Hesdigneul 62360 Hesdin l'Abbé, France	Tel. +33 3 21 10 86 86 Fax +33 3 21 10 86 87
	Paris/Île-de-France West	SEW-USOCOME 42 avenue Jean Jaurès 78580 Maule, France	Tel. +33 1 30 90 89 86 Fax +33 1 30 90 93 15
	Pays de la Loire	SEW-USOCOME Parc d'activités de la forêt 4 rue des Fontenelles 44140 Le Bignon, France	Tel. +33 2 40 78 42 03 Fax +33 2 40 78 42 20
	Provence-Alpes-Côte d'Azur	SEW-USOCOME Le Clos Montolivet 9 impasse Bounin – Bât. A 13012 Marseille, France	Tel. +33 4 91 18 00 11 Fax +33 4 91 18 00 12
	Rhône-Alpes East	SEW-USOCOME Montée de la Garenne 26750 Génissieux, France	Tel. +33 4 75 05 65 95 Fax +33 4 75 05 65 96
	Rhône-Alpes North	SEW-USOCOME Parc d'affaires Roosevelt Rue Jacques Tati 69120 Vaulx en Velin, France	Tel. +33 4 72 15 37 03 Fax +33 4 72 15 37 15
	Rhône-Alpes West	SEW-USOCOME Parc d'affaires Roosevelt Rue Jacques Tati 69120 Vaulx en Velin, France	Tel. +33 4 72 15 37 04 Fax +33 4 72 15 37 15
Algeria			
Sales	**Algiers**	REDUCOM Sarl 16, rue des Frères Zaghnoune Bellevue 16200 El Harrach Alger	Tel. +213 21 8214-91 Fax +213 21 8222-84 info@reducom-dz.com http://www.reducom-dz.com
Argentina			
Assembly plant **Sales**	**Buenos Aires**	SEW EURODRIVE ARGENTINA S.A. Ruta Panamericana Km 37.5, Lote 35 (B1619IEA) Centro Industrial Garín Prov. de Buenos Aires	Tel. +54 3327 4572-84 Fax +54 3327 4572-21 sewar@sew-eurodrive.com.ar http://www.sew-eurodrive.com.ar
	Córdoba	SEW EURODRIVE ARGENTINA S.A. Ruta Nacional 19, Manzana 97, Lote 5 (X5125) Malvinas Argentinas Prov. de Córdoba	Tel. +54 351-490-0010 sewcor@sew-eurodrive.com.ar http://www.sew-eurodrive.com.ar
	Santa Fe	SEW EURODRIVE ARGENTINA S.A. Ruta Prov. 21 Km 7, Lote 41 Parque Industrial Alvear (2126) Gral. Alvear Prov. de Santa Fe	Tel. +54 341-317-7277 sewsfe@sew-eurodrive.com.ar http://www.sew-eurodrive.com.ar
Service	**Mendoza**	SEW EURODRIVE ARGENTINA S.A.	Tel. +54 261-430-0060 sewmen@sew-eurodrive.com.ar http://www.sew-eurodrive.com.ar
Technical offices	**Tucumán**	SEW EURODRIVE ARGENTINA S.A. Balcarce 609 (T4000IAM) S.M. de Tucumán Prov. de Tucumán	Tel. +54 381-400-4569 sewtuc@sew-eurodrive.com.ar http://www.sew-eurodrive.com.ar
	Bahía Blanca	SEW EURODRIVE ARGENTINA S.A. O'Higgins 95, 1er Piso A (B8000IVA) Bahía Blanca Prov. de Buenos Aires	Tel. +54 291-451-7345 sewbb@sew-eurodrive.com.ar http://www.sew-eurodrive.com.ar
	Comahue	SEW EURODRIVE ARGENTINA S.A. Puerto Rico 1885 (R8324IOE) Cipolletti Prov. de Río Negro	Tel. +54 299-478-1290 sewcomahue@sew-eurodrive.com.ar http://www.sew-eurodrive.com.ar

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Argentina			
Mining	**Mendoza**	SEW EURODRIVE ARGENTINA S.A.	Tel. +54 261-430-0060 mineria@sew-eurodrive.com.ar http://www.sew-eurodrive.com.ar
Australia			
Assembly plants **Sales** **Service**	**Melbourne**	SEW-EURODRIVE PTY. LTD. 27 Beverage Drive Tullamarine, Victoria 3043, Australia	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, Australia	Tel. +61 2 9725-9900 Fax +61 2 9725-9905 enquires@sew-eurodrive.com.au
Sales **Service**	**Adelaide**	SEW-EURODRIVE PTY. LTD. 9C Park Way Mawson Lakes, SA 5095, Australia	Tel. +61 8 8161 4000 Fax +61 8 8161 4002 enquires@sew-eurodrive.com.au
	Brisbane	SEW-EURODRIVE PTY.LTD. 1 /34 Collinsvale St Rocklea, Queensland, 4106, Australia	Tel. +61 7 3276 5100 Fax +61 7 3276 5102 enquires@sew-eurodrive.com.au
	Perth	SEW-EURODRIVE PTY. LTD. 10 Colin Jamieson Drive Welshpool, WA 6106, Australia	Tel. +61 8 9251-4900 Fax +61 8 9251-4903 enquires@sew-eurodrive.com.au
Sales	**Townsville**	SEW-EURODRIVE PTY. LTD. 12 Leyland Street Garbutt, QLD 4814, Australia	Tel. +61 7 4779 4333 Fax +61 7 4779 5333 enquires@sew-eurodrive.com.au
Austria			
Assembly plant **Sales** **Service**	**Vienna**	SEW-EURODRIVE Ges.m.b.H. Richard-Strauss-Strasse 24 1230 Wien, Austria	Tel. +43 1 617 55 00-0 Fax +43 1 617 55 00-30 http://www.sew-eurodrive.at sew@sew-eurodrive.at
Technical offices	**Linz**	SEW-EURODRIVE Ges.m.b.H. Reuchlinstr. 6/3 4020 Linz, Austria	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 8045 Graz, Austria	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 6850 Dornbirn, Austria	Tel. +43 5572 3725 99-0 Fax +43 5572 3725 99-20 tb-dornbirn@sew-eurodrive.at
Bangladesh			
Sales	**Bangladesh**	SEW-EURODRIVE INDIA PRIVATE LIMITED 345 DIT Road East Rampura Dhaka-1219, Bangladesh	Mobile +88 01729 097309 salesdhaka@seweurodrive-bangladesh.com
Belarus			
Sales	**Minsk**	SEW-EURODRIVE BY RybalkoStr. 26 220033 Minsk, Belarus	Tel. +375 17 298 47 56 / 298 47 58 Fax +375 17 298 47 54 http://www.sew.by sales@sew.by
Belgium			
Assembly plant **Sales** **Service**	**Brussels**	**SEW-EURODRIVE n.v./s.a.** Researchpark Haasrode 1060 Evenementenlaan 7 BE-3001 Leuven	Tel. +32 16 386-311 Fax +32 16 386-336 http://www.sew-eurodrive.be info@sew-eurodrive.be
Service Competence Centers	**Industrial gear units**	**SEW-EURODRIVE n.v./s.a.** Rue de Parc Industriel, 31 6900 Marche-en-Famenne, Belgium	Tel. +32 84 219-878 Fax +32 84 219-879 http://www.sew-eurodrive.be service-wallonie@sew-eurodrive.be
Brazil			
Production plant **Sales** **Service**	**São Paulo**	SEW-EURODRIVE Brasil Ltda. Avenida Amâncio Gaiolli, 152 - Rodovia Presidente Dutra Km 208 Guarulhos - 07251-250 - SP, Brazil SAT - SEW ATENDE - 0800 7700496	Tel. +55 11 2489-9133 Fax +55 11 2480-3328 http://www.sew-eurodrive.com.br sew@sew.com.br

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Brazil			
Assembly plants **Sales** **Service**	**Rio Claro**	SEW-EURODRIVE Brasil Ltda. Rodovia Washington Luiz, Km 172 Condomínio Industrial Conpark Caixa Postal: 327 13501-600 – Rio Claro / SP	Tel. +55 19 3522-3100 Fax +55 19 3524-6653 montadora.rc@sew.com.br
	Joinville	SEW-EURODRIVE Brasil Ltda. Rua Dona Francisca, 12.346 – Pirabeiraba 89239-270 – Joinville / SC	Tel. +55 47 3027-6886 Fax +55 47 3027-6888 filial.sc@sew.com.br
	Indaiatuba	SEW-EURODRIVE Brasil Ltda. Estrada Municipal Jose Rubim, 205 Rodovia Santos Dumont Km 49 13347-510 – Indaiatuba / SP	Tel. +55 19 3835-8000 sew@sew.com.br
Bulgaria			
Sales	**Sofia**	BEVER-DRIVE GmbH Bogdanovetz Str.1 1606 Sofia, Bulgaria	Tel. +359 2 9151160 Fax +359 2 9151166 bever@bever.bg
Cameroon			
Sales	**Douala, Cameroon**	Electro-Services Rue Drouot Akwa B.P. 2024 Douala, Cameroon	Tel. +237 33 431137 Fax +237 33 431137 electrojemba@yahoo.fr
Canada			
Assembly plants **Sales** **Service**	**Toronto**	SEW-EURODRIVE CO. OF CANADA LTD. 210 Walker Drive Bramalea, ON L6T 3W1	Tel. +1 905 791-1553 Fax +1 905 791-2999 http://www.sew-eurodrive.ca l.watson@sew-eurodrive.ca
	Vancouver	SEW-EURODRIVE CO. OF CANADA LTD. Tilbury Industrial Park 7188 Honeyman Street Delta, BC V4G 1G1	Tel. +1 604 946-5535 Fax +1 604 946-2513 b.wake@sew-eurodrive.ca
	Montreal	SEW-EURODRIVE CO. OF CANADA LTD. 2555 Rue Leger Lasalle, PQ H8N 2V9	Tel. +1 514 367-1124 Fax +1 514 367-3677 a.peluso@sew-eurodrive.ca
	Please contact us for more addresses of service centers in Canada.		
Chile			
Assembly plant **Sales** **Service**	**Santiago de Chile**	SEW-EURODRIVE CHILE LTDA. Las Encinas 1295 Parque Industrial Valle Grande LAMPA RCH-Santiago de Chile P.O. box address Casilla 23 Correo Quilicura - Santiago - Chile	Tel. +56 2 75770-00 Fax +56 2 75770-01 http://www.sew-eurodrive.cl ventas@sew-eurodrive.cl
China			
Production plant **Assembly plant** **Sales** **Service**	**Tianjin**	SEW-EURODRIVE (Tianjin) Co., Ltd. No. 46, 7th Avenue, TEDA Tianjin 300457	Tel. +86 22 25322612 Fax +86 22 25323273 info@sew-eurodrive.cn http://www.sew-eurodrive.cn
Assembly plant **Sales** **Service**	**Suzhou**	SEW-EURODRIVE (Suzhou) Co., Ltd. 333, Suhong Middle Road Suzhou Industrial Park Jiangsu Province, 215021	Tel. +86 51262581781 Fax +86 512 62581783 suzhou@sew-eurodrive.cn
	Guangzhou	SEW-EURODRIVE (Guangzhou) Co., Ltd. No. 9, JunDa Road East Section of GETDD Guangzhou 510530, China	Tel. +86 20 82267890 Fax +86 20 82267922 guangzhou@sew-eurodrive.cn
	Shenyang	SEW-EURODRIVE (Shenyang) Co., Ltd. 10A-2, 6th Road Shenyang Economic Technological Development Area Shenyang, 110141, China	Tel. +86 24 25382538 Fax +86 24 25382580 shenyang@sew-eurodrive.cn
	Wuhan	SEW-EURODRIVE (Wuhan) Co., Ltd. 10A-2, 6th Road No. 59, the 4th Quanli Road, WEDA 430056 Wuhan, China	Tel. +86 27 84478388 Fax +86 27 84478389 wuhan@sew-eurodrive.cn

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China			
	Xi'An	SEW-EURODRIVE (Xi'An) Co., Ltd. No. 12 Jinye 2nd Road Xi'An High-Technology Industrial Development Zone Xi'An 710065	Tel. +86 29 68686262 Fax +86 29 68686311 xian@sew-eurodrive.cn
Colombia			
Assembly plant **Sales** **Service**	**Bogota**	SEW-EURODRIVE COLOMBIA LTDA. Calle 22 No. 132-60 Bodega 6, Manzana B Santafé de Bogotá, Colombia	Tel. +57 1 54750-50 Fax +57 1 54750-44 http://www.sew-eurodrive.com.co sew@sew-eurodrive.com.co
Côte d'Ivoire			
Sales	**Abidjan**	SICA Société Industrielle & Commerciale pour l'Afrique 165, Boulevard de Marseille 26 BP 1173 Abidjan 26	Tel. +225 21 25 79 44 Fax +225 21 25 88 28 sicamot@aviso.ci
Croatia			
Sales **Service**	**Zagreb**	KOMPEKS d. o. o. Zeleni dol 10 10 000 Zagreb, Croatia	Tel. +385 1 4613-158 Fax +385 1 4613-158 kompeks@inet.hr
Czech Republic			
Sales **Assembly plant** **Service**	**Hostivice**	SEW-EURODRIVE CZ S.R.O. Floriánova 2459 253 01 Hostivice	Tel. +420 255 709 601 Fax +420 235 350 613 http://www.sew-eurodrive.cz sew@sew-eurodrive.cz
	Drive Service Hotline/24-hour availability	HOTLINE: +420 800 739 739 (800 SEW SEW)	**Service:** Tel. +420 255 709 632 Fax +420 235 358 218 servis@sew-eurodrive.cz
Assembly plant **Service**	**Plzeň**	SEW-EURODRIVE CZ S.R.O. Areal KRPA a.s. Zahradni 173/2 326 00 Plzeň	Tel. +420 378 775 320 Fax +420 377 970 710 sew@sew-eurodrive.cz
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	Hradec Králové	SEW-EURODRIVE CZ S.R.O. Čechova 498 50202 Hradec Králové	Tel. +420 495 510 141 Fax +420 495 521 313 miroslav.moravec@sew-eurodrive.cz
	Ostrava	SEW-EURODRIVE CZ S.R.O. Studentská 6202/17 708 00 Ostrava-Poruba	Tel. +420 597 329 044 david.kenkus@sew-eurodrive.cz
	Klatovy	SEW-EURODRIVE CZ S.R.O. Vídeňská 841 33901 Klatovy	Tel. +420 376 331 634 Fax +420 376 331 634 viktor.kubernat@sew-eurodrive.cz
Service	**Horní Moštěnice**	SEW-EURODRIVE CZ S.R.O. Nám.Dr.M.Tyrše 14/64 751 17 Horní Moštěnice	Tel. +420 581 224 374 Fax +420 581 224 374 servis@sew-eurodrive.cz
Denmark			
Assembly plant **Sales** **Service**	**Copenhagen**	SEW-EURODRIVE A/S Geminivej 28-30 2670 Greve, Denmark	Tel. +45 43 9585-00 Fax +45 43 9585-09 http://www.sew-eurodrive.dk sew@sew-eurodrive.dk
Egypt			
Sales **Service**	**Cairo**	Copam Egypt for Engineering & Agencies 33 El Hegaz ST, Heliopolis, Cairo, Egypt	Tel. +20 2 22566-299 +1 23143088 Fax +20 2 22594-757 http://www.copam-egypt.com/ copam@datum.com.eg
Estonia			
Sales	**Tallinn**	ALAS-KUUL AS Reti tee 4 EE-75301 Peetri küla, Rae vald, Harjumaa, Estonia	Tel. +372 6593230 Fax +372 6593231 veiko.soots@alas-kuul.ee

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Finland			
Assembly plant **Sales** **Service**	**Hollola**	SEW-EURODRIVE OY Vesimäentie 4 15860 Hollola 2, Finland	Tel. +358 201 589-300 Fax +358 3 780-6211 http://www.sew-eurodrive.fi sew@sew.fi
Service	**Hollola**	SEW-EURODRIVE OY Keskikankaantie 21 FIN-15860 Hollola	Tel. +358 201 589-300 Fax +358 3 780-6211 http://www.sew-eurodrive.fi sew@sew.fi
Technical offices	**Helsinki**	SEW-EURODRIVE OY Luutnantintie 5 00410 Helsinki, Finland	Tel. +358 201 589-300 sew@sew.fi
	Vaasa	SEW-EURODRIVE OY Asemakatu 7 65100 Vaasa, Finland	Tel. +358 201 589-300 sew@sew.fi
	Kuopio	SEW-EURODRIVE OY Viestikatu 3 70600 Kuopio, Finland	Tel. +358 201 589-300 sew@sew.fi
Production plant **Assembly plant**	**Karkkila**	SEW Industrial Gears Oy Valurinkatu 6, PL 8 FI-03600 Karkkila, 03601 Karkkila	Tel. +358 201 589-300 Fax +358 201 589-310 sew@sew.fi http://www.sew-eurodrive.fi
Gabon			
Sales	**Libreville, Gabon**	ESG Electro Services Gabun Feu Rouge Lalala 1889 Libreville Gabon	Tel. +241 741059 Fax +241 741059 esg_services@yahoo.fr
Greece			
Sales	**Athens**	Christ. Boznos & Son S.A. 12, K. 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
Technical office	**Thessaloniki**	Christ. Boznos & Son S.A. Asklipiou 26 562 24 Evosmos, Thessaloniki, Greece	Tel. +30 2 310 7054-00 Fax +30 2 310 7055-15 info@boznos.gr
Great Britain			
Assembly plant **Sales** **Service**	**Normanton**	SEW-EURODRIVE Ltd. DeVilliers Way Trident Park Normanton West Yorkshire WF6 1GX	Tel. +44 1924 893-855 Fax +44 1924 893-702 http://www.sew-eurodrive.co.uk info@sew-eurodrive.co.uk
	Drive Service Hotline/24-hour availability		Tel. +44 1924 896911
Service Competence Centers	**Southern England**	SEW-EURODRIVE Ltd. Unit 41 Easter Park Benyon Road Silchester Reading Berkshire RG7 2PQ	Tel. +44 1189 701-699 Fax +44 1189 701-021
Technical offices	**Midlands**	SEW-EURODRIVE Ltd. 5 Sugar Brook Court Aston Road Bromsgrove Worcs. B60 3EX	Tel. +44 1527 877-319 Fax +44 1527 575-245
	Scotland	SEW-EURODRIVE Ltd. No 37 Enterprise House Springkerse Business Park Stirling FK7 7UF	Tel. +44 17 8647-8730 Fax +44 17 8645-0223

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Hong Kong			
Assembly plant **Sales** **Service**	**Hong Kong**	SEW-EURODRIVE LTD. Unit No. 801-806, 8th Floor Hong Leong Industrial Complex No. 4, Wang Kwong Road Kowloon, Hong Kong	Tel. +852 36902200 Fax +852 36902211 contact@sew-eurodrive.hk
Hungary			
Sales **Service**	**Budapest**	SEW-EURODRIVE Kft. 1037 Budapest, Hungary Kunigunda u. 18	Tel. +36 1 437 06-58 Fax +36 1 437 06-50 http://www.sew-eurodrive.hu office@sew-eurodrive.hu
India			
Company office **Assembly plant** **Sales** **Service**	**Vadodara**	SEW-EURODRIVE India Private Limited Plot No. 4, GIDC POR Ramangamdi • Vadodara - 391 243, India Gujarat	Tel. +91 265 3045200, +91 265 2831086 Fax +91 265 3045300, +91 265 2831087 http://www.seweurodriveindia.com salesvadodara@seweurodriveindia.com
Assembly plant **Sales** **Service**	**Chennai**	SEW-EURODRIVE India Private Limited Plot No. K3/1, Sipcot Industrial Park Phase II Mambakkam Village Sriperumbudur - 602105 Kancheepuram Dist, Tamil Nadu	Tel. +91 44 37188888 Fax +91 44 37188811 saleschennai@seweurodriveindia.com
Technical offices	**Ahmedabad**	SEW-EURODRIVE India Private Limited 306, Shaan office complex, Behind Sakar-IV, Ellisebridge, Ashram Road Ahmedabad – Gujarat, India	Tel. +91 79 40072067/68 Fax +91 79 40072069 salesahmedabad@seweurodrivein-dia.com
	Aurangabad	SEW-EURODRIVE INDIA PRIVATE LIMITED	Tel. +91 86000 12333 salesaurangabad@seweurodrivein-dia.com
	Bangalore	SEW-EURODRIVE India Private Limited Sy.no:41-P3, Peenya1, Phase 1A, Peenya Village, Yeswanthapura Hobli, Bangalore North Taluk, Bangalore Dist, Karnataka	Tel. +91 80 22266565 Fax +91 80 22266569 salesbangalore@seweurodriveindia.com
		SEW-EURODRIVE India Private Limited # C-104, 3rd Block, KSSIDC Complex, Electronic City. Bangalore – 560100, Karnataka	Tel. +91 80 28522662 / 28522663 salesbangalore@seweurodriveindia.com
	Bangladesh	SEW-EURODRIVE INDIA PRIVATE LIMITED Genetic Udayanchal, House-96 (6th Floor), Road-23/A, Block-B, Banani, Dhaka-1213, Bangladesh	Mobile +88 01729 097309 salesdhaka@seweurodrive-bangladesh.com
	Bellary	SEW-EURODRIVE India Private Limited Door no-56/279 Ward No-16, Sindhigi compound, Near Raghavendra talkies, Bellary-583101 Karnataka	Tel. +91 77609 88668 salesbellary@seweurodriveindia.com
	Chandigarh	SEW-EURODRIVE India Private Limited # 72, Type- 4, Power Colony, Chandigarh - Rupnagar Highway Rupnagar- 140001, Punjab	Tel. +91 81462 67606 saleschandigarh@seweurodrivein-dia.com
	Chennai	SEW-EURODRIVE India Private Limited 2nd Floor, Josmans Complex, No. 5, McNichols Road, Chetpet Chennai - 600031 - Tamil Nadu, India	Tel. +91 44 42849813 Fax +91 44 42849816 saleschennai@seweurodriveindia.com
	Kochi	SEW-EURODRIVE India Private Limited CF7-(2), Block No 1, Vasanth Nagar, Opposite Jawahar Lal Nehru Stadium, Palarivattom – Cochin 682025	Tel. +91 98951 30375 salescochin@seweurodriveindia.com
	Coimbatore	SEW-EURODRIVE INDIA PRIVATE LIMITED 687/2, SRI SAKTHIVEL TOWERS (NEAR DEEPAM HOSPITAL) TRICHY ROAD, RAMANATHAPURAM COIMBATORE - 641 045.Tamilnadu, India	Tel. +91 422 2322420 Fax +91 422 2323988 salescoimbatore@seweurodrivein-dia.com

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India			
	Cuttack	SEW-EURODRIVE India Private Limited Plot No. 1764, Nuasahi, Nayapalli Bhubaneswar-12 Orissa	Tel. +91 9937446333 salescuttack@seweurodriveindia.com
	Gandhidham	SEW-EURODRIVE India Private Limited TCX-S-28, FF, Ward 12/A, Gandhidham - Kutch - 370201	Tel. +91 81282 36850 salesgandhidham@seweurodrivein-dia.com
	Hyderabad	SEW-EURODRIVE India Private Limited 408, 4th Floor, Meridian Place Green Park Road Amerpeet Hyderabad - 500016 - Andhra Pradesh, India	Tel. +91 40 23414698 Fax +91 40 23413884 saleshyderabad@seweurodriveindia.com
	Jamshedpur	SEW-EURODRIVE India Private Limited Flat no.: S1 " Kashi Kunj",h. No. 60, New Rani Kudar Road No - 3 P.o. + P.s. - Kadma Jamshedpur - Pin - 831005 Jharkhand	Tel. +91 9934123671 salesjamshedpur@seweurodrivein-dia.com
	Kolhapur	SEW EURODRIVE India Private Limited	Tel. +91 86000 20846 saleskolhapur@seweurodriveindia.com
	Kolkata	SEW EURODRIVE India Private Limited 2nd floor, Room No. 35 Chowringhee Court 55, Chowringhee Road Kolkata - 700 071 - West Bengal, India	Tel. +91 33 22827457 Fax +91 33 22894204 saleskolkata@seweurodriveindia.com
	Lucknow	SEW-EURODRIVE India Private Limited 69, Shiv Vihar Colony Vikas Nagar-5 Lucknow 226022 - Uttar Pradesh	Tel. +91 9793627333 saleslucknow@seweurodriveindia.com
	Mumbai	SEW-EURODRIVE India Private Limited 312 A, 3rd Floor, Acme Plaza, J.B. Nagar, Andheri Kurla Road, Andheri (E) Mumbai - 400059 - Maharashtra, India	Tel. +91 22 28348440 Fax +91 22 28217858 salesmumbai@seweurodriveindia.com
	Nagpur	SEW-EURODRIVE India Private Limited Plot No 49, New Kailash Nager, Samta colony, Nagpur-440027	Tel. +91 95610 89525 salesnagpur@seweurodriveindia.com
	Nashik	SEW-EURODRIVE India Private Limited 107, "YOG" Bunglow, Mahatama Nagar, Trimbak Road, Nashik, Maharashtra – 422 007	Tel. +91 9665752978 salesnashik@seweurodriveindia.com
	New Delhi	SEW-EURODRIVE India Private Limited 1008, 10th Floor, 12th Level "Westend Mall" Tower Plot, District Centre Adjacent Hotel Hilton Janak Puri, New Delhi – 110058	Tel. +91 11 25544111 Fax +91 11 25544113 salesdelhi@seweurodriveindia.com
	Pune	SEW-EURODRIVE India Private Limited Jai Tulajabhavani Complex. Office No: 15 First Floor, Opp. Century Enka Company, MIDC Bhosari, Pune 411 026	Tel. +91 20-65118890 / 91 Fax +91 20 25380721 salespune@seweurodriveindia.com
		SEW-EURODRIVE India Private Limited LUNAWAT PRISM 4th Floor, S.No. 148 Opposite Wanaz Company, Besides Mega Mart At Neena Co-Operative Housing Society, Paud Road, Pune 411038 - Maharashtra, India	Tel. +91 20 25380730/735 Fax +91 20 25380721 salespune@seweurodriveindia.com praveen.hosur@seweurodriveindia.com
	Raipur	SEW-EURODRIVE India Private Limited A-42, Ashoka Millenium Complex, Ring Road-1, Raipur 492 001 - Chhattisgarh, India	Tel. +91 771 4090765 Fax +91 771 4090765 salesraipur@seweurodriveindia.com
	Ranchi	SEW-EURODRIVE India Private Limited Flat No.: A - 101, Krishna Shree Apartment, Anantpur, P.O. Doranda – Ranchi 834002	Tel. +91 8294630772 salesranchi@seweurodriveindia.com

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India			
	Tiruchirappalli	SEW-EURODRIVE India Private Limited A-106,Trichy Towers, Chandrasekarapuram, Salai Road, Trichy – 620018.	Mobile +91 95009 88081 salestrichy@seweurodriveindia.com
	Vadodara	SEW-EURODRIVE India Private Limited Unit No. 301, Savorite Bldg, Plot No. 143, Vinayak Society, off old Padra Road, Vadodara - 390 007. Gujarat	Tel. +91 265 2325258 Fax +91 265 2325259 salesvadodara@seweurodriveindia.com
	Vijayawada	SEW-EURODRIVE India Private Limited Door No:40-5/3-10A, Syam Nagar, NGO's Colony, Tikkle Road, Vijayawada-520010	Tel. +91 99895 01748 Fax +91 8662475157 Mobile +91 9989501748 salesvijayawada@seweurodrivein-dia.com
Indonesia			
Sales	**Jakarta**	PT. Cahaya Sukses Abadi Komplek Rukan Puri Mutiara Blok A no 99, Sunter Jakarta 14350, Indonesia	Tel. +62 21 65310599 Fax +62 21 65310600 csajkt@cbn.net.id
		PT. Agrindo Putra Lestari Jl.Prof.DR.Latumenten no27/A Jakarta 11330	Tel. +62 21 63855588 Fax +62 21 63853789 aplindo@indosat.net.id
	Medan	PT. Serumpun Indah Lestari Pulau Solor no. 8, Kawasan Industri Medan II Medan 20252	Tel. +62 61 687 1221 Fax +62 61 6871429 / +62 61 6871458 / +62 61 30008041 sil@serumpunindah.com serumpunindah@yahoo.com
	Surabaya	PT. TRIAGRI JAYA ABADI Jl. Sukosemolo No. 63, Galaxi Bumi Permai G6 No. 11 Surabaya 60122	Tel. +62 31 5990128 Fax +62 31 5962666 triagri@indosat.net.id
		CV. Multi Mas Jl. Raden Saleh 43A Kav. 18 Surabaya 60174	Tel. +62 31 5458589 / +62 31 5317224 Fax +62 31 5317220 / +62 31 5994629 sianhwa@sby.centrin.net.id
Ireland			
Sales **Service**	**Dublin**	Alperton Engineering Ltd. 48 Moyle Road Dublin Industrial Estate Glasnevin, Dublin 11, Ireland	Tel. +353 1 830-6277 Fax +353 1 830-6458 info@alperton.ie http://www.alperton.ie
Iceland			
Sales	**Reykjavik**	VARMA & VELAVERK EHF Dalshrauni 5 IS-220 Hafnarjördur	Tel. +354 585 1070 Fax +354 585 1071 varmaverk@varmaverk.is http://www.varmaverk.is
Israel			
Sales	**Tel Aviv**	Liraz Handasa Ltd. Ahofer Str 34B / 228 58858 Holon, Israel	Tel. +972 3 5599511 Fax +972 3 5599512 http://www.liraz-handasa.co.il office@liraz-handasa.co.il
Italy			
Assembly plant **Sales** **Service**	**Solaro**	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Via Bernini,14 I-20020 Solaro (Milano), Italy	Tel. +39 02 96 9801 Fax +39 02 96 980 999 http://www.sew-eurodrive.it sewit@sew-eurodrive.it
Technical offices	**Bologna**	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Via della Grafica, 47 40064 Ozzano dell'Emilia (Bo), Italy	Tel. +39 051 65-23-801 Fax +39 02 96 980 499
	Caserta	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Viale Carlo III Km. 23,300 81020 S. Nicola la Strada (Caserta), Italy	Tel. +39 0823 219011 Fax +39 02 96 980 599
	Milan	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Via Bernini,14 I-20020 Solaro (Milano), Italy	Tel. +39 02 96 980229 Fax +39 02 96 980 999

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Italy			
	Pescara	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Viale Europa,132 I-65010 Villa Raspa di Spoltore (PE)	Tel. +39 085 41-59-427 Fax +39 02 96 980 699
	Turin	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Filiale Torino c.so Unione Sovietica 612/15 - int. C 10135 Torino, Italy	Tel. +39 011 3473780 Fax +39 02 96 980 799
	Verona	SEW-EURODRIVE di R. Blickle & Co.s.a.s. Via Antonio Meucci 5, I-37042 - Caldiero (VR)	Tel. +39 045 89-239-11 Fax +39 02 96 980 814
Japan			
Assembly plant **Sales** **Service**	**Iwata**	SEW-EURODRIVE JAPAN CO., LTD 250-1, Shimoman-no, Iwata Shizuoka 438-0818	Tel. +81 538 373811 Fax +81 538 373855 http://www.sew-eurodrive.co.jp 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, Japan	Tel. +81 92 713-6955 Fax +81 92 713-6860 sewkyushu@jasmine.ocn.ne.jp
	Osaka	SEW-EURODRIVE JAPAN CO., LTD. Higobashi Shimizu Bldg. 10th floor 1-3-7 Tosabori, Nishi-ku Osaka, 550-0001, Japan	Tel. +81 6 6444--8330 Fax +81 6 6444--8338 sewosaka@crocus.ocn.ne.jp
	Tokyo	SEW-EURODRIVE JAPAN CO., LTD. Omarimon Yusen Bldg. 13th floor 3-23-5 Nishinbashi, Minato-ku Tokyo 105-0003, Japan	Tel. +81 3 3239-0469 Fax +81 3 3239-0943 sewtokyo@basil.ocn.ne.jp
Kazakhstan			
Sales	**Almaty**	ТОО "СЕВ-ЕВРОДРАЙВ" пр.Райымбека, 348 050061 г. Алматы Республика Казахстан	Тел. +7 (727) 334 1880 Факс +7 (727) 334 1881 http://www.sew-eurodrive.kz sew@sew-eurodrive.kz
Kenya			
Sales	**Nairobi**	Barico Maintenances Ltd Kamutaga Place Commercial Street Industrial Area P.O.BOX 52217 - 00200 Nairobi	Tel. +254 20 6537094/5 Fax +254 20 6537096 info@barico.co.ke
Latvia			
Sales	**Riga**	SIA Alas-Kuul Katlakalna 11C 1073 Riga, Latvia	Tel. +371 6 7139253 Fax +371 6 7139386 http://www.alas-kuul.com info@alas-kuul.com
Lebanon			
Sales Lebanon	**Beirut**	Gabriel Acar & Fils sarl B. P. 80484 Bourj Hammoud, Beirut, Lebanon	Tel. +961 1 510 532 Fax +961 1 494 971 ssacar@inco.com.lb
		After Sales Service	service@medrives.com
Sales Jordan / Kuwait / Saudi Arabia / Syria	**Beirut**	Middle East Drives S.A.L. (offshore) Sin El Fil. B. P. 55-378 Beirut	Tel. +961 1 494 786 Fax +961 1 494 971 info@medrives.com http://www.medrives.com
		After Sales Service	service@medrives.com
Lithuania			
Sales	**Alytus**	UAB Irseva Statybininku 106C LT-63431 Alytus	Tel. +370 315 79204 Fax +370 315 56175 irmantas@irseva.lt http://www.sew-eurodrive.lt
Luxembourg			
Assembly plant **Sales** **Service**	**Brussels**	**SEW-EURODRIVE n.v./s.a.** Researchpark Haasrode 1060 Evenementenlaan 7 BE-3001 Leuven	Tel. +32 16 386-311 Fax +32 16 386-336 http://www.sew-eurodrive.lu info@sew-eurodrive.be

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Madagascar			
Sales	**Antananarivo**	Ocean Trade BP21bis. Andraharo Antananarivo. 101 Madagascar	Tel. +261 20 2330303 Fax +261 20 2330330 oceantrabp@moov.mg
Malaysia			
Assembly plant **Sales** **Service**	**Johor**	SEW-EURODRIVE SDN BHD No. 95, Jalan Seroja 39, Taman Johor Jaya 81000 Johor Bahru, Johor West Malaysia	Tel. +60 7 3549409 Fax +60 7 3541404 sales@sew-eurodrive.com.my
Technical offices	**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 51229633 Fax +60 3 51229622 sewsa@sew-eurodrive.com.my
	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 sewpg@sew-eurodrive.com.my
Morocco			
Sales **Service**	**Mohammedia**	SEW-EURODRIVE SARL 2 bis, Rue Al Jahid 28810 Mohammedia	Tel. +212 523 32 27 80/81 Fax +212 523 32 27 89 sew@sew-eurodrive.ma http://www.sew-eurodrive.ma
Mauritania			
Sales	**Zouérat**	AFRICOM - SARL En Face Marché Dumez P.B. 88 Zouérate	Tel. +222 45 44 50 19 Fax +222 45 44 03 14 contact@africom-sarl.com
Macedonia			
Sales	**Skopje**	Boznos DOOEL Dime Anicin 2A/7A 1000 Skopje	Tel. +389 23256553 Fax +389 23256554 http://www.boznos.mk
Mexico			
Assembly plant **Sales** **Service**	**Quéretaro**	SEW-EURODRIVE MEXICO SA DE CV SEM-981118-M93 Tequisquiapan No. 102 Parque Industrial Quéretaro C.P. 76220 Quéretaro, Mexico	Tel. +52 442 1030-300 Fax +52 442 1030-301 http://www.sew-eurodrive.com.mx scmexico@seweurodrive.com.mx
Mongolia			
Sales	**Ulan Bator**	SEW-EURODRIVE Representative Office Mongolia Olympic street 8, 2nd floor Juulchin corp bldg., Sukhbaatar district, Ulaanbaatar 14253	Tel. +976-70009997 Fax +976-70009997 http://www.sew-eurodrive.mn sew@sew-eurodrive.mn
Namibia			
Sales	**Swakopmund**	DB Mining & Industrial Services Einstein Street Strauss Industrial Park Unit1 Swakopmund	Tel. +264 64 462 738 Fax +264 64 462 734 sales@dbmining.in.na
New Zealand			
Assembly plants **Sales** **Service**	**Auckland**	SEW-EURODRIVE NEW ZEALAND LTD. P.O. Box 58-428 82 Greenmount Drive East Tamaki Auckland, New Zealand	Tel. +64 9 2745627 Fax +64 9 2740165 http://www.sew-eurodrive.co.nz sales@sew-eurodrive.co.nz
	Christchurch, New Zealand	SEW-EURODRIVE NEW ZEALAND LTD. 10 Settlers Crescent, Ferrymead Christchurch, New Zealand	Tel. +64 3 384-6251 Fax +64 3 384-6455 sales@sew-eurodrive.co.nz

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New Zealand			
Technical offices	**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
Netherlands			
Assembly plant **Sales** **Service**	**Rotterdam**	SEW-EURODRIVE B.V. Industrieweg 175 3044 AS Rotterdam, Netherlands Postbus 10085 3004 AB Rotterdam, Netherlands	Tel. +31 10 4463-700 Fax +31 10 4155-552 Service: 0800-SEWHELP http://www.sew-eurodrive.nl info@sew-eurodrive.nl
Nigeria			
Sales	**Lagos**	EISNL Engineering Solutions and Drives Ltd Plot 9, Block A, Ikeja Industrial Estate (Ogba Scheme) Adeniyi Jones St. End Off ACME Road, Ogba, Ikeja, Lagos Nigeria	Tel. +234 1 217 4332 team.sew@eisnl.com http://www.eisnl.com
Norway			
Assembly plant **Sales** **Service**	**Moss**	SEW-EURODRIVE A/S Solgaard skog 71 1599 Moss, Norway	Tel. +47 69 24 10 20 Fax +47 69 24 10 40 http://www.sew-eurodrive.no sew@sew-eurodrive.no
Pakistan			
Sales	**Karatschi**	Industrial Power Drives Al-Fatah Chamber A/3, 1st Floor Central Commercial Area, Sultan Ahmed Shah Road, Block 7/8, Karachi	Tel. +92 21 452 9369 Fax +92-21-454 7365 seweurodrive@cyber.net.pk
Paraguay			
Sales	**Fernando de la Mora**	SEW-EURODRIVE PARAGUAY S.R.L De la Victoria 112, Esquina nueva Asunción Departamento Central Fernando de la Mora, Barrio Bernardino	Tel. +595 991 519695 Fax +595 21 3285539 sew-py@sew-eurodrive.com.py
Peru			
Assembly plant **Sales** **Service**	**Lima**	SEW DEL PERU MOTORES REDUCTORES S.A.C. Los Calderos, 120-124 Urbanizacion Industrial Vulcano, ATE, Lima, Peru	Tel. +51 1 3495280 Fax +51 1 3493002 http://www.sew-eurodrive.com.pe sewperu@sew-eurodrive.com.pe
Philippines			
Sales	**Luzon**	Totaltech Corporation 5081-B C&L Mansion Filmore Ave. Cor. Fahrenheit St. 1235 Makati City	Tel. +63 2 551-9265 / +63 2 551-9271 / +63 2 551-9378 Fax +63 2 551-9273 totaltech89@gmail.com
	All Areas	P.T. Cerna Corporation 4137 Ponte St., Brgy. Santa Cruz, Makati City 1205	Tel. +63 2 519 6214 Fax +63 2 890 2802 mech_drive_sys@ptcerna.com
Poland			
Assembly plant **Sales** **Service**	**Łódź**	SEW-EURODRIVE Polska Sp.z.o.o. ul. Techniczna 5 92-518 Łódź, Poland	Tel. +48 42 676 53 00 Fax +48 42 676 53 49 http://www.sew-eurodrive.pl sew@sew-eurodrive.pl
	Service	Tel. +48 42 6765332 / 42 6765343 Fax +48 42 6765346	Linia serwisowa 24 hour hotline Tel. +48 602 739 739 (+48 602 SEW SEW) serwis@sew-eurodrive.pl
Technical office	**Tychy**	SEW-EURODRIVE Polska Sp.z.o.o. ul. Strzelecka 66 PL-43-109 Tychy	Tel. +48 32 32 32 610 Fax +48 32 32 32 648
	Bydgoszcz	SEW-EURODRIVE Polska Sp.z.o.o. ul. Fordońska 246 PL-85-959 Bydgoszcz	Tel. +48 52 3606590 Fax +48 52 3606591
	Gdansk	SEW-EURODRIVE Polska Sp.z.o.o. ul. Galaktyczna 30A PL-80-299 Gdańsk	Tel. +48 58 762 70 00 Fax +48 58 762 70 09

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Poland			
	Poznan	SEW-EURODRIVE Polska Sp.z.o.o. ul. Romana Maya 1 61-371 Poznań, Poland	Tel. +48 61 6465500 Fax +48 61 6465519
	Radom	SEW-EURODRIVE Polska Sp.z.o.o. ul. Słowackiego 84 26-600 Radom, Poland	Tel. +48 48 365 40 50 Fax +48 48 365 40 52
Portugal			
Assembly plant **Sales** **Service**	**Coimbra**	SEW-EURODRIVE, LDA. Apartado 15 3050-901 Mealhada, Portugal	Tel. +351 231 20 9670 Fax +351 231 20 3685 http://www.sew-eurodrive.pt infosew@sew-eurodrive.pt
Service Competence Centers	**Lisbon**	SEW-EURODRIVE, LDA. Núcleo Empresarial I de São Julião do Tojal Rua de Entremuros, 54 Fracção I 2660-533 São Julião do Tojal, Portugal	Tel. +351 21 958-0198 Fax +351 21 958-0245 esc.lisboa@sew-eurodrive.pt
Technical office	**Porto**	SEW-EURODRIVE, LDA. Av. 25 de Abril, 68 4440-502 Valongo, Portugal	Tel. +351 229 350 383 Fax +351 229 350 384 Tel. +351 9 32559110 esc.porto@sew-eurodrive.pt
Romania			
Sales **Service**	**Bucharest**	Sialco Trading SRL str. Brazilia nr. 36 011783 Bucuresti, Romania	Tel. +40 21 230-1328 Fax +40 21 230-7170 sialco@sialco.ro
Russia			
Assembly plant **Sales** **Service**	**St. Petersburg**	ZAO SEW-EURODRIVE P.O. Box 36 RUS-195220 St. Petersburg	Tel. +7 812 3332522 +7 812 5357142 Fax +7 812 3332523 http://www.sew-eurodrive.ru sew@sew-eurodrive.ru
Technical office	**Ekaterinburg**	ZAO SEW-EURODRIVE Kominterna Str. 16 Office 614 620078 Ekaterinburg, Russia	Tel. +7 343 310 3977 Fax +7 343 310 3978 eso@sew-eurodrive.ru
	Irkutsk	ZAO SEW-EURODRIVE 5-Armii Str., 31 664011 Irkutsk, Russia	Tel. +7 3952 25 5880 Fax +7 3952 25 5881 iso@sew-eurodrive.ru
	Moscow	ZAO SEW-EURODRIVE Malaja Semjonowskaja Str. д. 9, корпус 2 107023 Moscow	Tel. +7 495 9337090 Fax +7 495 9337094 mso@sew-eurodrive.ru
	Novosibirsk	ZAO SEW-EURODRIVE pr. K Marksa 30 630087 Novosibirsk, Russia	Tel. +7 383 3350200 Fax +7 383 3462544 nso@sew-eurodrive.ru
	Perm	ZAO SEW-EURODRIVE Stakhanovskaya str., 45 Office 512 RUS-614066 Perm	Tel. +7 342 2219494 Fax +7 342 2219444 pso@sew-eurodrive.ru
	Togliatti	ZAO SEW-EURODRIVE Sportivnaya Str. 4B, office 2 Samarskaya obl. 445057 Togliatti, Russia	Tel. +7 8482 710529 Fax +7 8482 810590
Senegal			
Sales	**Dakar**	SENEMECA Mécanique Générale Km 8, Route de Rufisque B.P. 3251, Dakar	Tel. +221 338 494 770 Fax +221 338 494 771 senemeca@sentoo.sn http://www.senemeca.com
Serbia			
Sales	**Belgrade**	DIPAR d.o.o. Ustanicka 128a PC Košum, IV sprat SRB-11000 Beograd, Serbia	Tel. +381 11 347 3244 / +381 11 288 0393 Fax +381 11 347 1337 office@dipar.rs
Singapore			
Assembly plant **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

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Slovakia			
Sales	**Bratislava**	SEW-EURODRIVE SK s.r.o. Rybničná 40 831 06 Bratislava, Slovakia	Tel. +421 2 33595 202 Fax +421 2 33595 200 sew@sew-eurodrive.sk http://www.sew-eurodrive.sk
	Žilina	SEW-EURODRIVE SK s.r.o. Industry Park - PChZ ulica M.R.Štefánika 71 010 01 Žilina, Slovakia	Tel. +421 41 700 2513 Fax +421 41 700 2514 sew@sew-eurodrive.sk
	Banska Bystrica	SEW-EURODRIVE SK s.r.o. Rudlovská cesta 85 974 11 Banská Bystrica, Slovakia	Tel. +421 48 414 6564 Fax +421 48 414 6566 sew@sew-eurodrive.sk
	Košice	SEW-EURODRIVE SK s.r.o. Slovenská ulica 26 040 01 Košice, Slovakia	Tel. +421 55 671 2245 Fax +421 55 671 2254 sew@sew-eurodrive.sk
Slovenia			
Sales **Service**	**Celje**	Pakman - Pogonska Tehnika d.o.o. Ul. XIV. divizije 14 3000 Celje, Slovenia	Tel. +386 3 490 83-20 Fax +386 3 490 83-21 pakman@siol.net
Spain			
Assembly plant **Sales** **Service**	**Bilbao**	SEW-EURODRIVE ESPAÑA, S.L. Parque Tecnológico, Edificio, 302 48170 Zamudio (Vizcaya), Spain	Tel. +34 94 43184-70 Fax +34 94 43184-71 http://www.sew-eurodrive.es sew.spain@sew-eurodrive.es
Technical offices	**Barcelona**	Delegación Barcelona Avda. Francesc Macià, 60 – Planta 16, porta 1 Eix Macià – "Torre Milenium" 08208 Sabadell (Barcelona), Spain	Tel. +34 93 7162200 Fax +34 93 7233007
	Madrid	Delegación Madrid Gran Via. 48-2° A-D 28220 Majadahonda (Madrid), Spain	Tel. +34 91 6342250 Fax +34 91 6340899
	Sevilla	MEB Pólogono Calonge, C/A Nave 2 - C E-41.077 Sevilla, Spain	Tel. +34 954 356 361 Fax +34 954 356 274 mebsa.sevilla@mebsa.com
	Valencia	MEB Músico Andreu i Piqueres, 4 E-46.900 Torrente (Valencia)	Tel. +34 961 565 493 Fax +34 961 566 688 mebsa.valencia@mebsa.com
Sri Lanka			
Sales	**Colombo**	SM International (Pte) Ltd 254, Galle Raod Colombo 4, Sri Lanka	Tel. +94 1 2584887 Fax +94 1 2582981
South Africa			
Assembly plants **Sales** **Service**	**Johannesburg**	SEW-EURODRIVE (PROPRIETARY) LIMITED Eurodrive House Cnr. Adcock Ingram and Aerodrome Roads Aeroton Ext. 2 Johannesburg 2013, South Africa P.O.Box 90004 Bertsham 2013, South Africa	Tel. +27 11 248-7000 Fax +27 11 494-3104 http://www.sew.co.za info@sew.co.za
	Cape Town	SEW-EURODRIVE (PROPRIETARY) LIMITED Rainbow Park Cnr. Racecourse & Omuramba Road Montague Gardens Cape Town, South Africa P.O. Box 36556 Chempet 7442 Cape Town, South Africa	Tel. +27 21 552-9820 Fax +27 21 552-9830 Telex 576 062 bgriffiths@sew.co.za
	Durban, South Africa	SEW-EURODRIVE (PROPRIETARY) LIMITED 48 Prospecton Road Isipingo Durban, South Africa P.O. Box 10433, Ashwood 3605, South Africa	Tel. +27 31 902 3815 Fax +27 31 902 3826 cdejager@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

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South Africa			
Technical offices	**Port Elizabeth**	SEW-EURODRIVE PTY LTD. 8 Ruan Access Park Old Cape Road Greenbushes 6000 Port Elizabeth	Tel. +27 41 3722246 Fax +27 41 3722247 dtait@sew.co.za
South Korea			
Assembly plant **Sales** **Service**	**Ansan**	SEW-EURODRIVE KOREA CO., LTD. B 601-4, Banweol Industrial Estate #1048-4, Shingil-Dong, Danwon-Gu, Ansan-City, Kyunggi-Do Zip 425-839	Tel. +82 31 492-8051 Fax +82 31 492-8056 http://www.sew-korea.co.kr master.korea@sew-eurodrive.com
	Busan	SEW-EURODRIVE KOREA Co., Ltd. No. 1720 - 11, Songjeong - dong Gangseo-ku Busan 618-270, Korea	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 officetel 87-36, Duryu 2-dong, Dalseo-ku Daegu 704-712	Tel. +82 53 650-7111 Fax +82 53 650-7112
	Daejeon	SEW-EURODRIVE KOREA Co., Ltd. No. 1502, Hongin officetel 536-9, Bongmyung-dong, Yusung-ku Daejeon 305-301	Tel. +82 42 828-6461 Fax +82 42 828-6463
	Gwangju	SEW-EURODRIVE KOREA Co., Ltd. 4fl., Dae-Myeong B/D 96-16 Unam-dong, Buk-ku Kwangju 500-170	Tel. +82 62 511-9172 Fax +82 62 511-9174
	Seoul	SEW-EURODRIVE KOREA Co., Ltd. No.504 Sunkyung officetel 106-4 Kuro 6-dong, Kuro-ku Seoul 152-054, Korea	Tel. +82 2 862-8051 Fax +82 2 862-8199
Swaziland			
Sales	**Manzini**	C G Trading Co. (Pty) Ltd PO Box 2960 Manzini M200	Tel. +268 2 518 6343 Fax +268 2 518 5033 engineering@cgtrading.co.sz
Sweden			
Assembly plant **Sales** **Service**	**Jönköping**	SEW-EURODRIVE AB Gnejsvägen 6-8 55303 Jönköping, Sweden Box 3100 S-55003 Jönköping	Tel. +46 36 3442 00 Fax +46 36 3442 80 http://www.sew-eurodrive.se jonkoping@sew.se
Sales	**Göteborg**	SEW-EURODRIVE AB Gustaf Werners gata 8 42132 Västra Frölunda, Sweden	Tel. +46 31 70968 80 Fax +46 31 70968 93 goteborg@sew.se
	Stockholm	SEW-EURODRIVE AB Björkholmsvägen 10 14146 Huddinge, Sweden	Tel. +46 8 44986 80 Fax +46 8 44986 93 stockholm@sew.se
	Malmö	SEW-EURODRIVE AB Borrgatan 5 21124 Malmö, Sweden	Tel. +46 40 68064 80 Fax +46 40 68064 93 malmo@sew.se
	Skellefteå	SEW-EURODRIVE AB Trädgårdsgatan 8 93131 Skellefteå, Sweden	Tel. +46 910 7153 80 Fax +46 910 7153 93 skelleftea@sew.se
Switzerland			
Assembly plant **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	**Romandy**	André Gerber Es Perreyres 1436 Chamblon, Switzerland	Tel. +41 24 445 3850 Fax +41 24 445 4887
	Bern / Solothurn	Rudolf Bühler Muntersweg 5 2540 Grenchen, Switzerland	Tel. +41 32 652 2339 Fax +41 32 652 2331
	Central Switzerland, Aargau	Armin Pfister Stierenweid 4950 Huttwill, BE, Switzerland	Tel. +41 62 962 54 55 Fax +41 62 962 54 56

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Switzerland			
	Zurich, Tessin	Gian-Michele Muletta Fischerstrasse 61 8132 Egg bei Zürich, Switzerland	Tel. +41 44 994 81 15 Fax +41 44 994 81 16
	Lake Constance and Eastern Switzerland	Markus Künzle Eichweg 4 9403 Goldach, Switzerland	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, Taiwan	Tel. +886 2 27383535 Fax +886 2 27368268 Telex 27 245 sewtwn@ms63.hinet.net
Tanzania			
Sales	**Dar es Salaam**	SEW-EURODRIVE PTY LIMITED TANZANIA Plot 52, Regent Estate PO Box 106274 Dar Es Salaam	Tel. +255 0 22 277 5780 Fax +255 0 22 277 5788 uroos@sew.co.tz
Thailand			
Assembly plant **Sales** **Service**	**Chonburi**	SEW-EURODRIVE (Thailand) Ltd. 700/456, Moo.7, Donhuaroh Muang Chonburi 20000, Thailand	Tel. +66 38 454281 Fax +66 38 454288 sewthailand@sew-eurodrive.com
Technical offices	**Bangkok**	SEW-EURODRIVE (Thailand) Ltd. 6th floor, TPS Building 1023, Phattanakarn Road Suanluang Bangkok,10250	Tel. +66 2 7178149 Fax +66 2 7178152 sewthailand@sew-eurodrive.com
	Hat Yai	SEW-EURODRIVE (Thailand) Ltd. Hadyai Country Home Condominium 59/101 Soi.17/1 Rachas-Utid Road. Hadyai, Songkhla 90110, Thailand	Tel. +66 74 359441 Fax +66 74 359442 sewthailand@sew-eurodrive.com
	Khon Kaen	SEW-EURODRIVE (Thailand) Ltd. 4th Floor, Kaow-U-HA MOTOR Bldg, 359/2, Mitraphab Road. Muang District Khonkaen 40000, Thailand	Tel. +66 43 225745 Fax +66 43 324871 sew-thailand@sew-eurodrive.com
Tunisia			
Sales	**Tunis**	T. M.S. Technic Marketing Service Zone Industrielle Mghira 2 Lot No. 39 2082 Fouchana	Tel. +216 79 40 88 77 Fax +216 79 40 88 66 http://www.tms.com.tn tms@tms.com.tn
Turkey			
Assembly plant **Sales** **Service**	**Kocaeli-Gebze**	SEW-EURODRİVE Sistemleri San. Ve TIC. Ltd. Sti Gebze Organize Sanayi Böl. 400 Sok No. 401 41480 Gebze Kocaeli	Tel. +90-262-9991000-04 Fax +90-262-9991009 http://www.sew-eurodrive.com.tr sew@sew-eurodrive.com.tr
Technical offices	**Adana**	SEW-EURODRİVE Cevat Yurdakul Cad.No:52 Akdoğan İş Merkezi K:5 D.18 Seyhan / Adana	Tel. +90 322 359 94 15 Fax +90 322 359 94 16
	Ankara	SEW-EURODRİVE 1368.Cadde Eminel İşmerkezi No: 18/68 İvogsan / Ankara	Tel. +90 312 385 33 90 Fax +90 312 385 32 58
	Bursa	SEW-EURODRİVE Üçevler Mah. Bayraktepe Sok. Akay İş Merkezi Kat:3 No: 7/6 Nilüfer / Bursa	Tel. +90 224 443 45 60 Fax +90 224 443 45 58
	Istanbul	SEW-EURODRİVE Tekstilkent Ticaret Merkezi B-13 Blok No:70 Esenler / İstanbul	Tel. +90-262-9991000-04 Fax +90-262-9991009

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Turkey			
	Izmir	SEW-EURODRİVE 1203/11 Sok. No. 4/614 Kara Hasan Atlı İş Merkezi Kat :6 Yenişehir / İzmir	Tel. +90 232 469 62 64 Fax +90 232 433 61 05
Ukraine			
Assembly plant **Sales** **Service**	**Dnipropetrowsk**	ООО «СЕВ-Евродрайв» ул.Рабочая, 23-В, офис 409 49008 Днепропетровск	Тел. +380 56 370 3211 Факс. +380 56 372 2078 http://www.sew-eurodrive.ua sew@sew-eurodrive.ua
Sales	**Kiev**	ООО «СЕВ-Евродрайв» ул.С.Олейника, 21 02068 Киев	Тел. +380 44 503 95 77 Факс. +380 44 503 95 78 kso@sew-eurodrive.ua
	Donetsk	ООО «СЕВ-Евродрайв» ул.25-летия РККА, 1-В, оф. 805 83000 Донецк	Тел. +380 62 38 80 545 Факс. +380 62 38 80 533 dso@sew-eurodrive.ua
	Ivano-Frankivsk	ООО «СЕВ-Евродрайв» ул.Независимости, 4, оф.303 83000 Ивано-Франковск	Тел. +380 342 725 190 Факс. +380 342 725 191 ifso@sew-eurodrive.ua
Uruguay			
Assembly plant **Sales**	**Montevideo**	SEW-EURODRIVE Uruguay, S. A. Jose Serrato 3569 Esqina Corumbe CP 12000 Montevideo	Tel. +598 2 21181-89 Fax +598 2 21181-89 sewuy@sew-eurodrive.com.uy
USA			
Production plant **Assembly plant** **Sales** **Service**	**Southeast Region**	SEW-EURODRIVE INC. 1295 Old Spartanburg Highway P.O. Box 518 Lyman, S.C. 29365	Tel. +1 864 439-7537 Fax Sales +1 864 439-7830 Fax Manufacturing +1 864 439-9948 Fax Assembly +1 864 439-0566 Fax Confidential/HR +1 864 949-5557 http://www.seweurodrive.com cslyman@seweurodrive.com
Assembly plants **Sales** **Service**	**Northeast Region**	SEW-EURODRIVE INC. Pureland Ind. Complex 2107 High Hill Road, P.O. Box 481 Bridgeport, New Jersey 08014, USA	Tel. +1 856 467-2277 Fax +1 856 845-3179 csbridgeport@seweurodrive.com
	Midwest Region	SEW-EURODRIVE INC. 2001 West Main Street Troy, Ohio 45373, USA	Tel. +1 937 335-0036 Fax +1 937 332-0038 cstroy@seweurodrive.com
	Southwest Region	SEW-EURODRIVE INC. 3950 Platinum Way Dallas, Texas 75237, USA	Tel. +1 214 330-4824 Fax +1 214 330-4724 csdallas@seweurodrive.com
	Western Region	SEW-EURODRIVE INC. 30599 San Antonio St. Hayward, CA 94544, USA	Tel. +1 510 487-3560 Fax +1 510 487-6433 cshayward@seweurodrive.com
	Please contact us for other service center addresses in the USA.		
Venezuela			
Assembly plant **Sales** **Service**	**Valencia**	SEW-EURODRIVE Venezuela S.A. Av. Norte Sur No. 3, Galpon 84-319 Zona Industrial Municipal Norte Valencia, Estado Carabobo, Venezuela	Tel. +58 241 832-9804 Fax +58 241 838-6275 http://www.sew-eurodrive.com.ve ventas@sew-eurodrive.com.ve sewfinanzas@cantv.net
United Arab Emirates			
Sales **Service**	**Sharjah**	Copam Middle East (FZC) Sharjah Airport International Free Zone P.O. Box 120709 Sharjah	Tel. +971 6 5578-488 Fax +971 6 5578-499 copam_me@eim.ae
Vietnam			
Sales	**Ho-Chi-Minh-Stadt**	**All sectors except for ports and offshore:** Nam Trung Co., Ltd 250 Binh Duong Avenue, Thu Dau Mot Town, Binh Duong Province HCM office: 91 Tran Minh Quyen Street District 10, Ho Chi Minh City	Tel. +84 8 8301026 Fax +84 8 8392223 namtrungco@hcm.vnn.vn truongtantam@namtrung.com.vn khanh-nguyen@namtrung.com.vn

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Vietnam			
		Ports and offshore: DUC VIET INT LTD Industrial Trading and Engineering Services A75/6B/12 Bach Dang Street, Ward 02, Tan Binh District, 70000 Ho Chi Minh City	Tel. +84 8 62969 609 Fax +84 8 62938 842 totien@ducvietint.com
	Hanoi	Nam Trung Co., Ltd R.205B Tung Duc Building 22 Lang ha Street Dong Da District, Hanoi City	Tel. +84 4 37730342 Fax +84 4 37762445 namtrunghn@hn.vnn.vn
Zambia			
Sales	**Kitwe**	EC Mining Limited Plots No. 5293 & 5294,Tangaanyika Road, Off Mutentemuko Road, Heavy Industrial Park, P.O.BOX 2337 Kitwe	Tel. +260 212 210 642 Fax +260 212 210 645 sales@ecmining.com http://www.ecmining.com

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Inquiry/order

Customer data:

Company: _____ Customer no.: _____
Department: _____
Name: _____ Phone: _____
Street/P.O. box: _____ Fax: _____
_____ Email: _____
Zip code/city: _____

Contact at SEW:

Name: _____ Phone: _____
Technical office: _____ Fax: _____

Technical data:

Quantity: _____ Desired delivery date: _____
Catalog designation: _____

Gear unit type:

☐ Helical gear units ☐ Parallel-shaft helical gear units ☐ Helical-bevel gear unit ☐ Helical-worm gear unit ☐ Spiroplan® gear units
☐ Double gear units ☐ Servo gear units ☐ Variable-speed gear unit ☐ Electrified monorail system ☐ Miscellaneous: _____

Power: _____ kW **Output speed:** _____ rpm **Output torque:** _____ Nm

Cycles/hour: _____ c/h **Cyclic duration factor:** S _____ / _____ % cdf

☐ 1-shift operation ☐ 2-shift operation ☐ 3-shift operation
☐ Regular ☐ Irregular ☐ Very irregular

Mounting position: [1)]

M1	M2	M3	M4	M5	M6	Pivoted
☐	☐	☐	☐	☐	☐	☐

Housing form:

☐ Foot-mounted ☐ Flange (bore) ☐ Flange (thread)
☐ Torque arm ☐ Miscellaneous: _____

Shaft design:

☐ Solid shaft with key ☐ Shrink disk Shaft/hollow shaft Ø: _____ mm
☐ Hollow shaft with key ☐ TorqLOC® Flange Ø : _____ mm

Shaft position (for right-angle gear units): ☐ A | ☐ B | ☐ AB

Terminal box position: ☐ 0°(R) ☐ 90°(B) | ☐ 180°(L) | ☐ 270°(T)

Cable entry: ☐X ☐1 | ☐2 | ☐3

Degree of protection:

IP54	IP55	IP56	IP65	IP66	IP69K
☐	☐	☐	☐	☐	☐

Thermal class:

130(B)	155(F)	180(H)
☐	☐	☐

Surface/corrosion protection:

KS	OS1	OS2	OS3	OS4
☐	☐	☐	☐	☐

Line voltage: _____ V
Line frequency: ☐ 50Hz ☐ 60Hz

Connection type: ☐ Δ | ☐ Y | ☐ YY | ☐ Y/Y

Energy efficiency class: ☐IE1 | ☐IE2 | ☐IE3 | ☐IE4

☐ For inverter operation: Max. frequency: _____ Hz | **Control range:** _____

Required options:

☐ Brake: Voltage _____ V Braking torque: _____ Nm
☐ Manual brake release: ☐ HR or ☐ HF
☐ Forced cooling fan: Forced cooling fan voltage: ____ V
☐ Motor protection: ☐ TF or ☐ TH
☐ Encoder: _____
☐ Plug connector connection: _____
☐ Inverter: _____
☐ RAL 7031 or ☐ RAL _____

Further options:

Special ambient conditions:

Temperature: from _____ °C to _____ °C | ☐ Operation outdoors | ☐ Installation altitude >1000m above NN
Further environmental conditions: _____

Miscellaneous: _____

1) see back

Place, date _____ **Signature:** _____

SEW-EURODRIVE GmbH & Co KG / P.O. Box 30 23 / D-76642 Bruchsal / Tel. +49 7251 75-0 / Fax +49 7251 75-1970
www.sew-eurodrive.com / sew@sew-eurodrive.com

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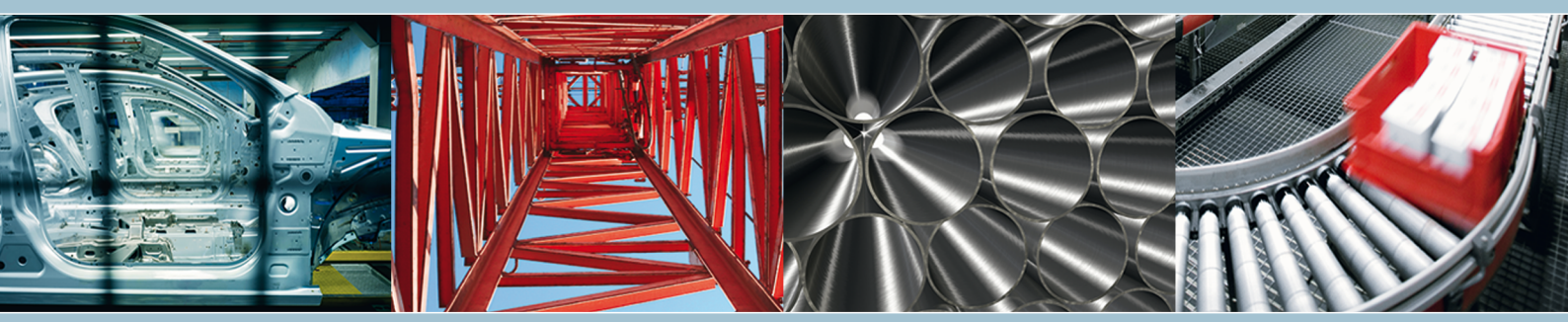

SEW-EURODRIVE
Driving the world

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