SEW EURODRIVE

Latest News



Explosion-Proof AC Motors
EDRN80 – 315 ATEX and IECEx

Edition 06/2018

23510455/EN



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1 Market requirements

The topics environmental protection and efficiently conserving valuable resources gained importance in recent years. For this reason, numerous industrialized nations have passed laws and regulations that stipulate the limit values for products with a considerable energy consumption. The goal is to decrease the consumption of primary energy and simultaneously reduce the CO_2 emissions.

An important criterion for EDRN.. motors are the planned changes to efficiency requirements in international and European markets.

Motors and gearmotors destined for the North American market (HazLoc-NA®) according to the Class Division System were released for sale in April 2016. Motors with energy efficiency class IE3 or NEMA Premium are mandatory in the USA.

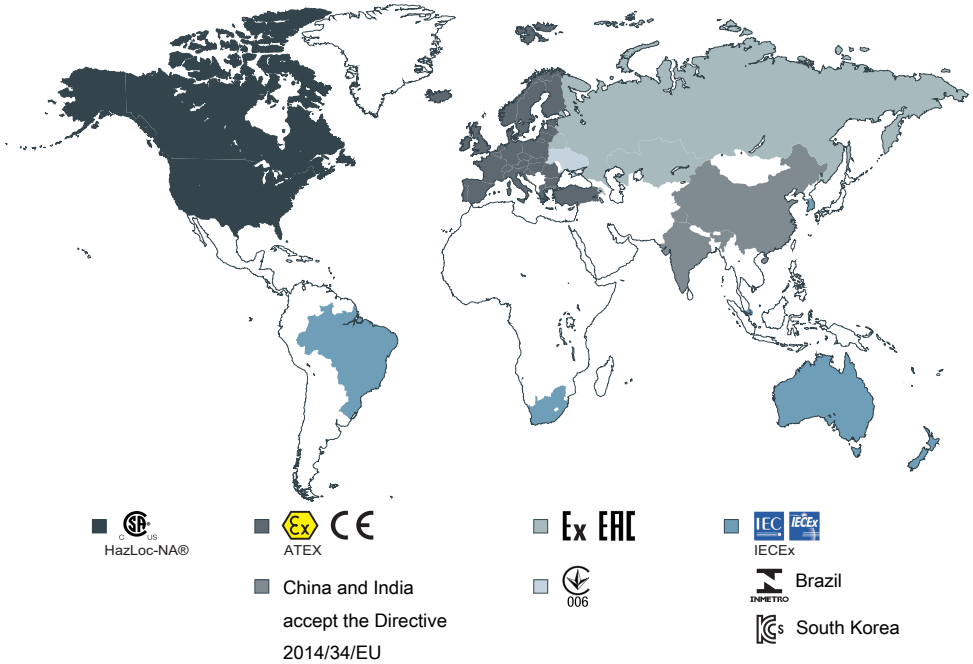
All important motor manufacturers offer motors for potentially explosive atmospheres. Usually, such motors are standardized based on the normative requirements.

In general, SEW-EURODRIVE delivers motors and gearmotors equipped with additional features depending on the application. Additional features are for example current-insulated bearings or reinforced bearings required due to a higher overhung load at the output shaft.

In order to allow for the EDRN.. motors to be used in as many countries as possible, the following rule sets were adhered to:

- ATEX: EU Europe and countries that approve ATEX.
- IECEx: Countries that approve IECEx.
- HazLoc-NA®: USA and Canada.

In the countries that are not highlighted in this list, either no country-specific requirements on explosion protection apply and ATEX, IECEx or HazLoc-NA® are recognized, or the requirements on explosion protection are currently unknown.



1.1 Energy efficiency requirements for explosion-proof motors

The table lists the countries where motors must meet the requirements for a minimum efficiency.

Country	Law/standard/regulation	Description	Minimum efficiency with S1
Australia	MEPS 2006, AS/NZS 1359	Energy efficiency legislation from 2002, binding since April 2006	IE2
Brazil	Decree No. 553 NBR 17094-1	Energy efficiency legislation from 2008, binding since December 2009	IR2 (IE2) Only for motors in protection type Ex nA
China	GB 18613-2012	Energy efficiency legislation from 2012, binding since September 2012	IE2
Europe (EU)	Directive 2009/125/EC Reg. 640/2009, Reg. 4/2014, binding since July 2014	Energy-related product directive from 2009, binding since June 2011	For Europe, explosion-proof motors are currently excluded. The successor to regulation 640/2009 will also include explosion-proof motors in the energy efficiency requirements. The draft currently only lists motors with increased safety as exception from this.
India	Gazette of India No. D. L.-33004/99, IS 12615:2011	Energy-related product directive and standard	IE2
Canada	EER 2016	Energy efficiency legislation from 2010, amendment no. 13, binding since June 2017	IE3
New Zealand	MEPS 2006, AS/NZS 1359	Energy efficiency legislation from 2002, binding since April 2006	IE2
Mexico	NOM-016-ENER-2016	Energy efficiency legislation binding since December 2010	IE3
Switzerland	ENV 730.01	Application of Reg 640/2009 and Reg 4/2014	As in EU Europe
South Korea	REELS (Regulation on Energy Efficiency Labeling and Standards)	MKE-2015-28	IE3 As of October 01, 2015: 37 – 200 kW As of October 01, 2018: 0.75 – 200 kW
Turkey	Gazette No. 28197/ SGM-2012/2 and SGM-2015/15		As in EU Europe
USA	EISA 2007/2014, DOE 10 CFR Part 431		NEMA Premium (IE3)

The aim of SEW-EURODRIVE is to be able to deliver motors subject to certain normative standards into all countries where standard motors are also being delivered to.

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1.2 Rule sets ATEX, IECEx system, HazLoc-NA®

Rule sets	ATEX	IECEx system	HazLoc-NA ® USA	Canada
Requirements	Operating guideline 1999/92/EC Product guideline 2014/34/EU	–	NFPA, NEC – National Electrical Code	CEC – Canadian Electric Code
Standards for electrical equipment	EN 60079 ff.	IEC 60079 ff.	NEC 500, UL 1004	CSA C22.2
Standards for mechanical devices	EN 13463 ff. up to October 31, 2019 EN ISO 80079-36 and -37	– ISO 80079-36 and -37	–	–
Zone division	EN 60079-10-1 EN 60079-10-2	IEC 60079-10-1 IEC 60079-10-2	NEC 500, 505	CSA C22.2
Unit category	Categories	Equipment protection level EPL	Class - Division Class - Zone	Class - Division Class - Zone
Proof of conformity	EU type examination certificate Declaration of conformity	Certificate of Conformity (CoC)	Certificate of Conformity	Certificate of Conformity

1.3 Important changes to rule sets and standards

New ATEX Directive for manufacturers

In Europe, the Directive 94/9/EC has been replaced by Directive 2014/34/EU of the European Parliament and Council of February 26, 2014 on the harmonization of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres (new version). Directive 2014/34/EU is binding as of April 20, 2016.

This brings up 2 key questions:

Are EC declarations of conformity according to Directive 94/9/EC still valid after April 20, 2016?

Yes. Products placed on the market before April 20, 2016 require an EC declaration of conformity according to Directive 94/9/EC. Such products may also be provided on the market with the EC declaration of conformity after April 20, 2016, as long as the product has already been placed on the market before that date (for example in case of existing stock of dealers).

Products that are initially placed on the market, or taken into operation after April 20, 2016 require an EU declaration of conformity according to Directive 2014/34/EU.

SEW-EURODRIVE has replaced all declarations of conformity for the EDRS.., EDRE.., and EDRN.. motors according to Directive 2014/34/EU. (acc. to PTB, Div. 3 Chemical Physics and Explosion Protection FAQ, https://www.ptb.de/cms/ptb/fachabteilungen/abt3/exschutz/exaktuelleinfos/faq-2014-34-eu.html, 10/2018, original only available in German)

Are certificates issued according to Directive 94/9/EG, such as the EC type examination certificate or quality assurance certificates still valid after April 20, 2016?

Yes. Article 41 (2) of Directive 2014/34/EU states: "Certificates issued under Directive 94/9/EC shall be valid under this Directive."

Certificates in this context are issued by a notified body. This means, certificated according to Directive 94/9/EC can still be used for EU declarations of conformity according to 2014/34/EU, as a new certification for the product would be required otherwise. (acc. to PTB, Div. 3 Chemical Physics and Explosion Protection FAQ, https://www.ptb.de/cms/ptb/fachabteilungen/abt3/exschutz/exaktuelleinfos/faq-2014-34-eu.html, 10/2018, original only available in German)

1.3.1 New version of IEC/EN 60079-7

A revised version of standard EN 60079-7 came into effect on August 1, 2016. In comparison to EN 60079-7:2007-08, the following changes (relevant to SEW-EURODRIVE) have been implemented:

- Introduction of the equipment protection levels eb and ec
- Requirements for protection type nA from IEC 60079-15 were carried over into part 7.

	Protection type	
Zone 1	Ex e (IEC 60079-7:2006/ EN 60079-7:2007)	Ex eb (IEC/EN 60079-7:2015)
Zone 2	Ex nA (IEC/EN 60079-15:2010)	Ex ec (IEC/EN 60079-7:2015)

Increased safety e

Protection type applicable for electric devices. Additional measures are applied to increase the level of safety, thus preventing the possibility of high temperatures and the occurrence of sparks or electric arcs during proper operation or under specified special conditions.

Electrical devices with protection type "increased safety e" must meet the requirements of one of the following protection levels:

- Protection level eb (EPL Gb)
- Protection level ec (EPL Gc)

Implications for SEW-EURODRIVE

New products such as EDRN.. motors are developed in line with the new standard and are labeled with the protection level eb or ec.

Existing products, such as the EDRS.. and EDRE.. motors, can still be certified according to the previous standard on which their development was based.

As an innovative company, we see it as our duty to offer the products according to the current standards. The designation of the EDRS.. and EDRE.. motors will be changed to the new designation as of July 01, 2018.

Date of application

The European standard was accepted by CENELEC on July 31, 2015 an became valid as DIN standard on August 01, 2016. A transition period until July 31, 2018 applies to DIN EN 60079-7 (VDE 0170-6):2007-08.

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1.3.2 New standards EN ISO 80079

The new EN ISO 80079-36 and -37 standards specify the basic requirements for design, constructing, testing and labeling non-electrical equipment intended for use in potentially explosive atmospheres.

The new standard EN ISO 80079-36/-37 was published in the official journal of the European Union in 2016 and replaces the EN 13463-1/-5/-6/-8 standards. There is a transition period, which ends on October 31, 2019. The presumption principle for the old EN 13463-1/-5/-6/-8 standards expires on November 1, 2019.

Explosion protection for non-electric devices	New	Old
Basics and requirements	EN ISO 80079-36:2016-12	EN 13463-1:2009-07
Protection by constructional safety c	EN ISO 80079-37:2016-12	EN 13463-5:2011-10
Protection through liquid immersion k		EN 13463-8:2004-01

EN ISO 80079-36:2016-12

Potentially explosive atmospheres – part 36: Non-electrical equipment for use in potentially explosive atmospheres – Basics and requirements

DIN EN ISO 80079-36:2016-12 specifies the basic requirements for design, constructing, testing and labeling non-electrical equipment and explosion-proof components intended for use in potentially explosive atmospheres.

This standard is also applicable to design, constructing, testing and labeling of components, protective systems, devices and assemblies of these products that have a potential source of ignition and are intended for use in potentially explosive atmospheres.

The standard does not specify safety requirements except for those directly related to a risk of explosion. This standard supplements and modifies the general requirements of IEC 60079-0 to the values specified in table 1.

This standard serves as basis for placing non-electrical equipment on the market according to Directive 2014/34/EU for potentially explosive atmospheres. This is intended to determine a consistent safety level.

ISO 80079-36:2016-12 replaces DIN EN 13463-1:2009-07: Non-electrical equipment for use in potentially explosive atmospheres – Part 1: Basic method and requirements

Date of application

The standard is valid since December 01, 2016. A transition period until October 31, 2019 applies to DIN EN 13463-1:2009-07.

EN ISO 80079-37:2016-12

Potentially explosive atmospheres – part 37: Non-electrical equipment for explosive atmospheres – Non-electrical type of protection constructional safety c, control of ignition sources b, liquid immersion k (ISO 80079-37:2016)

This international standard defines the requirements on design and construction of non-electrical equipment intended for operation in potentially explosive atmospheres, and protected with protection types constructional safety c, control of ignition sources b, liquid immersion k.

This standard supplements and modifies the requirements in DIN EN ISO 80079-36.

The degrees of protection c, k and b are not applicable to group I. EPL Ma without additional preventive measures.

The protection types described in the standard can either be applied individually or in combination, in order to meet the requirements of equipment of group I, II and III depending on the ignition hazard assessment in DIN EN ISO 80079-36.

This standard serves as basis for placing non-electrical equipment on the market according to Directive 2014/34/EU for potentially explosive atmospheres. This is intended to determine a consistent safety level.

EN ISO 80079-37:2016-12 replaces EN 13463-5:2011-10: "Non-electrical equipment for use in potentially explosive atmospheres – Part 5: Protection by constructional safety c'" and EN 13463-8:2004-01: "Non-electrical equipment for use in potentially explosive atmospheres – Part 8: Protection by liquid immersion 'k'; English version of EN 13463-8:2003".

Date of application

The Standard is valid since December 01, 2016. A transition period until October 31, 2019 applies to DIN EN 13463-5:2011-10, DIN EN 13463-6:2005-07 and DIN EN 13463-8:2004-01.

SEW-EURODRIVE has introduced the marking on February 01, 2018.

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2 Explosion protection

2.1 Why explosion protection?

Operating systems and machines in areas with potentially explosive air/gas or air/dust mixtures requires special measures. When the formation of potentially explosive atmospheres cannot be avoided, drives with special protection must be used in these hazardous areas.

Corresponding standards and regulations govern the options for using equipment within established hazard zones. These standards also prescribe the requirements for the construction of such drives that must be adhered to by system manufacturers.

2.2 Directives, standards and regulations

In many countries, country-specific regulations apply to the use of electrical and mechanical products in areas with potentially explosive atmospheres.

The series of standards IEC 60079 defines the basic requirements for explosion protection. The series of standards IEC 60079 serves as basis for national standards in countries that recognize the IEC standards. In Europe, the IEC standards have been introduced almost unchanged as EN standards.

In addition, authoritative guideline and local requirements from the regulation for operating areas apply.

Three important rule sets that regulate the use of electrical drives in potentially explosive atmospheres are listed below:

- IECEx: Countries that approve the IECEx agreement.
- ATEX: EU Europe and countries that approve ATEX.
- HazLoc-NA®: Valid for the North American market, based on the class division system.

2.3 Explosion protection according to the IECEx agreement

The IECEx certification agreement serves as a worldwide platform for the mutual recognition of test results for obtaining certification or approval for explosion-proof electrical equipment.

The following 2 rule sets serve as basis for this:

- IECEx 01 IEC Scheme for the Certification to Standards for Electrical Equipment for Explosive Atmospheres (IECEx Scheme) – Basic Rules
- IECEx 02 IEC Scheme for the Certification to Standards for Electrical Equipment for Explosive Atmospheres (IECEx Scheme) – Rules of Procedure

The agreement serves to promote international trade with explosion-proof electrical equipment by eliminating double tests and certifications, which were required so far. The fundamental purpose of the agreement is to verify compliance with the IEC standards for electrical equipment in potentially explosive atmospheres in an internationally recognized form.

This ensures the adherence to these standards certified by test laboratories (ExTL, Ex-Testing Laboratories) and certification bodies (ExCB, Ex-Certification Bodies). This means the product assessment procedure in regard of compliance with the standards has the same result in each country.

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Currently, Australia and New Zealand accept drives with IECEx certification without further registration.

EDRS.., EDRE.. and EDRN.. motors by SEW-EURODRIVE are IECEx certified by the "Physikalisch-Technische Bundesanstalt" (PTB) and this approved for operation in potentially explosive atmospheres. Certified motors are marked with the depicted logo.

The certificate according to IECEx (CoC = Certificate of Conformity) serves as basis for other country-specific registrations and certifications, e.g. in Korea or Brazil.

The IECEx CoC are available on the website www.iecex.ch.

2.3.1 Equipment protection level EPL

The EPL (Equipment Protection Level) is defined in the standard IEC 60079-0. In parallel to the categories in the European Directive on explosion protection, this EPL categorization marks the use of equipment according to the zone classification for potentially explosive areas.

The following table lists the assignment of EPL and zones for the products described in this document:

IEC/EN 60079-0		Directive 2014/34/EU		IEC/EN 60079-10-X	Protection type
EPL	**Group**	**Equipment group**	**Equipment category**	**Zone**	
Gb	II	II	2G	1	Ex e/eb
Gc			3G	2	Ex nA/ec
Db	III		2D	21	Ex tb
Dc			3D	22	Ex tc

"EN 60079-10-1:2016-10; Potentially explosive areas – part 10-1: Categorization – Areas with potential risk of gas explosions (IEC 60079-10-1:2015 + COR1:2015)"

"EN 60079-10-2:2015-10; Potentially explosive areas – part 10-2: Categorization – Areas with potential risk of dust explosions (IEC 60079-10-2:2015)"

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2.4 Explosion protection according to EU directives

2.4.1 EU directive 1999/92/EC

The requirements for production plants, division into zones and the assignment of equipment categories to zones are defined in EU Directive 1999/92/EC. This is binding for the operator.

According to the Directive, the operator of the equipment must divide potentially explosive atmospheres into zones.

Zone		Probability of a potentially explosive atmosphere	Relevant for drives from SEW-EURODRIVE
Gas	Dust		
0	20	Continuous, long-term, frequent, predominant in time	–
1	21	Occasionally, in normal operation	x
2	22	Seldom, short-term	x

If not otherwise specified in the explosion protection document (based on a risk estimation), equipment and protective systems in potentially explosive atmospheres according to the categories of Directive 2014/34/EU must be selected.

The following equipment categories must to be used in these zone, as long as they are suitable for combustible gases, vapors, mist and/or dust.

- in Zone 0 or Zone 20: Equipment in category 1
- in Zone 1 or Zone 21: Equipment in category 1 or category 2
- in Zone 2 or Zone 22: Equipment in category 1, category 2 or category 3.

2.4.2 EU Directive 2014/34/EU

EU Directive 2014/34/EU provides binding minimum requirements to be applied within the European Union to equipment intended for use in potentially explosive atmospheres. The minimum requirements are defined in the European standards. These standards are identical with the international EX standards on the IEC level.

Thus, the motors meet the requirements of Directive 2014/34/EU, even the requirements of international standards. In relation to drives, the criteria of both standards cover motors as well as all other electrical and mechanical components such as gear units, mechanical variable speed gear units, brakes, forced cooling fans, integrated frequency inverters, sensors, and actuators.

Directive 2014/34/EU defines the minimum requirements for units and divides the units into categories.



Naturally, EU Directive 2014/34/EU also applies to all products which are manufactured outside the EU, imported into the EU and operated in the EU. Explosion-proof equipment is also marked with the CE mark and the Ex mark on the nameplate as a visual sign for conformity with the Directive.

The requirements for production plants, division into zones and the assignment of equipment categories to zones are defined in EU Directive 1999/92/EC.

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2.4.3 Division of explosion-proof equipment into categories

According to EU Directive 2014/34/EU, explosion-proof equipment is divided into categories. The category specifies the protection level of the equipment, describes the operating conditions and makes it easier to assign permitted equipment to a zone. In addition to the degree of protection (normal, high, very high), the directive distinguishes between potentially explosive G (gas) and D (dust) atmospheres.

Category	Degree of protection	Guaranteed protection	Operating conditions	Relevant for drives from SEW-EURODRIVE
M1	Very high	• With 2 independent preventive measures • 2 unrelated faults may occur	Equipment continues to operate in the presence of a potentially explosive atmosphere.	–
1	Very high	• With 2 independent preventive measures • 2 unrelated faults may occur	Equipment continues to operate in the presence of a potentially explosive atmosphere.	–
M2	High	• Suitable for normal operation and harsh operating conditions.	Equipment is switched off in the presence of a potentially explosive atmosphere.	–
2	High	• With one preventive measure suitable for normal operation and malfunctions that are likely to occur frequently • 1 fault may occur	Equipment continues to operate in the presence of a potentially explosive atmosphere.	x
3	Normal	• Suitable for normal operation	Equipment continues to operate in the presence of a potentially explosive atmosphere.	x

2.4.4 Categories and protection types

Category 1 – Particularly high safety

SEW-EURODRIVE doesn't manufacture gear units and motors in category 1.

Consequently, drives from SEW-EURODRIVE cannot be used in zones 0 and 20, where potentially explosive atmospheres are to be expected on a continuous and long-term basis.

Category 2 – High safety

Drives in category 2 are safe in terms of the expected unit malfunctions and are predominantly intended for use in zones 1 and 21. These drives can also be used in zones 2 and 22.

Category 3 – Normal safety

Equipment in category 3 is safe when it is used as intended and overload is predictable. These units are designed for zones 2 and 22.

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2.4.5 Overview of explosion-proof equipment

The following table describes the categorization of explosion-proof operating resources in equipment group I and II, as well as the assignment of equipment category, zone and protection type.

	Equipment group II Other areas with potentially explosive atmospheres due to gas or dust					
Category	1		2		3	
Potentially explosive atmosphere[1)]	G	D	G	D	G	D
Zone	0	20	1	21	2	22
Protection type						
Motor	–		d, e (eb)	t (tb)	e (ec)	t (tc)
Gear unit	–		h (c, k, ...)	h (c, k, ...)	h (c, k, ...)	h (c, k, ...)

1) G = Gas atmosphere, D = Dust atmosphere

INFORMATION

All gear units and motors offered by SEW-EURODRIVE for potentially explosive atmospheres are equipment group II units. SEW-EURODRIVE does not supply any drives for use in equipment group I (mining).

2.5 Protection types for equipment category 2/EPL .b

Equipment in category 1 is approved for use in zones 1 and 21.

2.5.1 Motors

Protection type d – Flameproof enclosure (IEC/EN 60079-1)

The housing is able to withstand the pressure even if an explosion occurs inside the motor. Gas which may escape from the motor is sufficiently cooled so it will not ignite a potentially explosive atmosphere outside the motor. This is achieved by ignition gaps, which also reduce the pressure that builds up in the event of an explosion.

Protection type d – Increased safety (IEC/EN 60079-7)

No source of ignition is present in normal operation. This safety is achieved by design measures at the motor, such as higher quality insulation systems or larger air gaps. Normal operation is operation including the usual equipment malfunctions.

Depending on the equipment category, units are marked with eb (suitable for zone 1).

Protection type t – Protection through housing (IEC/EN 60079-31)

Protection type t is for motors that are used in areas with ignitable dusts. Depending on the equipment category, units are marked with tb (suitable for zone 21).

In this case, explosion protection is realized by preventing the ingression of ignitable dust and the occurrence of impermissibly high temperatures on the surface.

For units with protection type t, a difference is made between:

- Non-conducting dust
- Conducting dust

Depending on the dust classification, the units must be designed at least with degree of protection IP5x or IP6x according to EN 60529.

2.5.2 Gear units

Protection type c – Constructional safety (EN ISO 80079-37)

Protection type c (constructional safety c) is achieved through constructional measures that provide adequate protection against the possibility of ignition due to hot surfaces, sparks and adiabatic compression. The units are marked with "h" according to the equipment category.

Protection type k – Liquid immersion (EN ISO 80079-37)

The protection type k (liquid immersion) is obtained by partial or complete immersion in a protective liquid, or by constant wetting of an ignitable surface with a protective liquid. These measures guarantee a separation of ignitable atmospheres or deactivation of potential sources of ignition. The units are marked with "h" according to the equipment category.

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2.6 Protection types for equipment category 3/EPL .c

Equipment in category 2 is approved for use in zones 1 and 22.

2.6.1 Motors

Protection type d – Increased safety (IEC/EN 60079-7)

An example of typical electrical drives for zone 2 (gas) are motors of protection level ec (old: nA - non-sparking). The requirements of protection level ec largely correspond to the requirements of protection type eb, but for operation without malfunctions.

Protection type t – Protection through housing (IEC/EN 60079-31)

Protection type t is for motors that are to be used in areas with ignitable dusts. The units are designated with tc (suitable for zone 22) according to the equipment category.

In this case, explosion protection is realized by preventing the ingression of ignitable dust and the occurrence of impermissibly high temperatures on the surface.

For units with protection type t, a difference is made between:

- Non-conducting dust
- Conducting dust

Depending on the dust classification, the units must be designed at least with degree of protection IP5x or IP6x according to EN 60529.

2.6.2 Gear units

Gear units by SEW-EURODRIVE are suitable for operation in zone 1 and 21. For this reason, they can also be operated in zone 2 and 22.

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2.7 Normative motor protection requirements

Motor protection must be in accordance with the respective approvals. 2 basic types of motor protection are distinguished:

1. Current-controlled safety device for temperature limitation e.g. motor circuit breakers
2. Temperature limitation (or monitoring) via temperature sensors e.g. PTC thermistors (PTC resistor: Option designation /TF)

Combinations are possible but must be listed in the approval especially for protection type e and protection level eb.

The following table shows the type of motor protection required according to the respective approval and standard:

Category	**2**			**3**		
EPL	**EPL .b**			**EPL .c**		
Design	**2G, 2D, 2GD, 2G-b, 2D-b, 2GD-b**			**3G, 3D, 3GD, 3G-c, 3D-c, 3GD-c**		
Operation	**Supply system**	**Inverter**	**Switching operation**	**Supply system**	**Inverter**	**Switching operation**
Operating mode (on nameplate)	S1	S1	S4 – 50%	S1	S1	S1
Identification (on nameplate)	t_E time I_A/I_N	Identification, nameplate with inverter data	Time t_A, additional identification	No additional specifications	Identification, nameplate with inverter data	No additional specifications
Motor protection according to	1	2	2	1	2	2

Information

In general, only motors intended for continuous duty may be monitored using current-depending protection devices. The continuous duty includes easy startups that do not occur frequently. With these startups, no significant additional heating occurs.

Motors for heavy startup conditions or for high switching frequencies may only be operated with safety equipment to ensure that the permitted limit temperature is not exceeded.

Heavy startup is present when the current-dependent delayed safety device selected for normal operational conditions already switches off the motor during the motor start-up time. This is the case when the acceleration time is > 1.7 x t_E time.

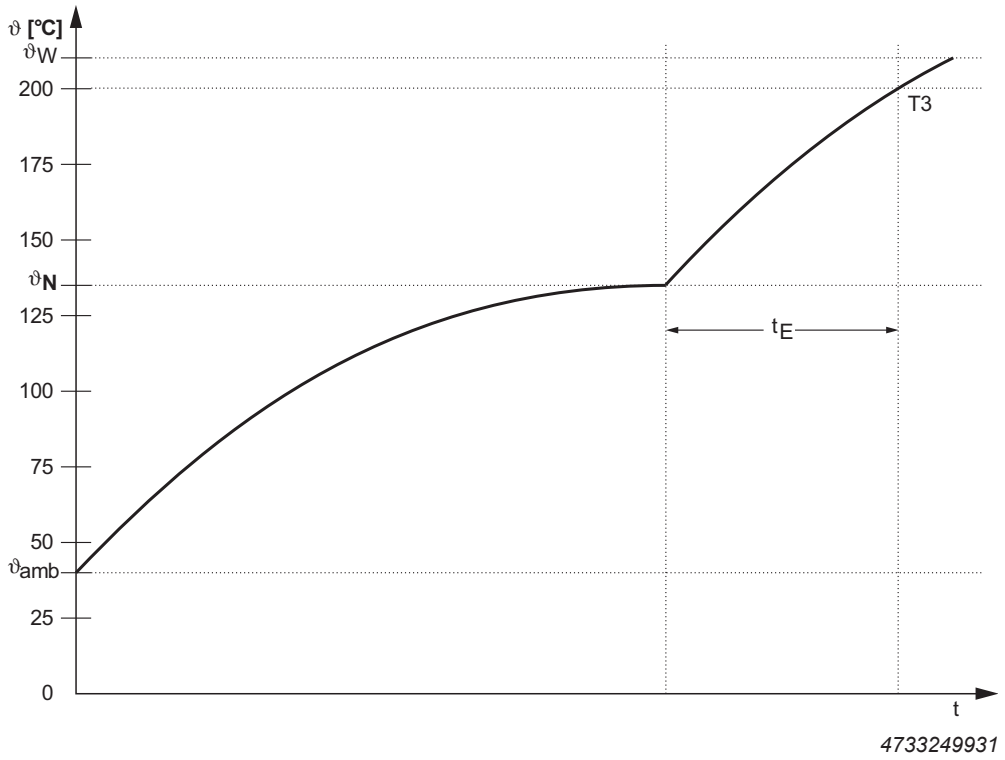
After comprehensive calculations and test, all specifications were adhered to when the technical data were defined. The is especially necessary for motors in protection level ec operated in zone 2 in switching operation.

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2.7.1 Protection using current-depending safety equipment for temperature limitation

Special features of protection type e – increased safety and protection level eb

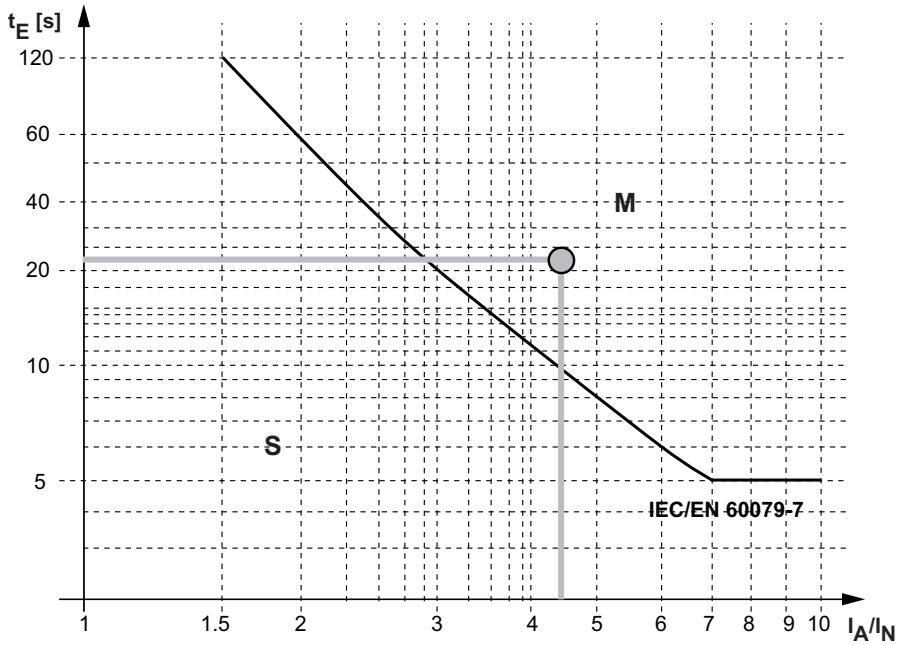
The following graph shows a sample temperature profile on 1 motor with a blocked shaft. The temperature rises from the nominal temperature ϑ_N to the maximum permitted surface temperature T3 = 200 °C during the time t_E.



A special protective circuit breaker switches off the motor within the time t_E if a malfunction occurs. This ensures that the equipment doesn't reach the critical temperature (in this example 22 °C in temperature class T3).

In order to ensure that the motor circuit breaker (S) is safely triggered according to EN 60079-7, the ratio of time t_E to the ratio of startup current to nominal current (I_A/I_N) for motors (M) in protection type e with protection level eb must be above the limit characteristic curve, as depicted in the following diagram.

To protect the motors from overtemperature, the motor circuit breaker (S) must be switched in a way, so that the ratio of time t_E to the ratio of startup current to nominal current (I_A/I_N) is below the limit value, as depicted in the following diagram.



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Temperature protection at protection level ec

The thermal protection for machines in protection level ec is provided by the general industry requirements if malfunctions are expected. No additional safety devices are required to maintain the explosion protection.

IECEx currently doesn't contain a standard for for complex safety devices in regard of risk of explosion. For this reason protective devices can only be ATEX-certified. National regulations must also be observed.

The permitted procedure to ensure the thermal protection is described in chapter "Normative motor protection requirements" (→ 🗎 20).

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2.8 Identification of explosion-proof drives

2.8.1 Designation according to EU directive

At least the following information must be attached visibly and permanently to each unit and protection system.

- Name, registered trade name, or registered trade brand, and manufacturer address.
- CE marking (see annex II to regulation (EG) no. 765/2008).
- Designation of the series and type.
- If applicable, batch number and serial number.
- Year of manufacture, hexagonal Explosion protection mark, and the mark for equipment group and equipment category.
- For equipment group II, the letter G (for areas with potentially explosive gas, vapor or mist/air mixtures).
- The letter D (for areas in which dust could produce potentially explosive atmospheres).

In addition, all safety-relevant information must be attached to the equipment before operation.

2.8.2 Marking in accordance with directives and standards

The protection types are linked to equipment groups, categories, potentially explosive atmospheres, minimum degrees of protection and temperature classes and are indicated on the nameplate according to EU Directive 2014/34/EU.

The identification according to the standard includes the following icons:

- The Ex icon shows that the electrical equipment meets the requirements of one or more protection types.
- Icon for the relevant protection type.
- Icon for the group plus information on gas or dust.

Information

The IECEx identification consists of the normative part.

Examples

Example 1: Operating resources in protection type e for increased safety: 0102 II 2G Ex eb IIC T3 Gb

Example 2: Operating resources in protection type t for dust explosion protection provided by the housing: II 3D Ex tc IIIC T120 °C Dc

Example 1	Example 2		Meaning
CE		Designation according to EU directive	CE marking
0102			Identification number of the notified body (here: PTB), only for category 2
			Explosion protection mark
II			Equipment group
2	3		Category
G	D		• G for areas containing potentially explosive mixtures of gas, steam, fog, and air. • D for areas where dust may create potentially explosive atmospheres.
Ex		Designation according to standard	Icon showing that the device complies with one or more protection types.
eb	tc		Information on protection type/protection level • eb: Increased safety • tc: Protection through housing
IIC	IIIC		Information on: • IIC: Gas group • IIIC: Dust group
T3	T120 °C		T3: Temperature class T120 °C: Maximum surface temperature in degrees Celsius
Gb	Dc		Equipment protection level (EPL)

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2.8.3 Identification for potentially explosive gas atmospheres

Example

Ex eb	Icon for protection type/protection level
IIC	Classification of the gas group
T3	Temperature class
Gb	Equipment protection level

Classification of the gas group

Electrical equipment of group II is intended for operation in areas in which potentially explosive gas atmospheres are expected, with the exception of mine openings with a risk of firedamp.

Electrical equipment of group II is subdivided according to the characteristics of the potentially explosive atmosphere that they will be used in.

Subgroups of group II:

- IIA, typical gas is propane.
- IIB, typical gas is ethylene.
- IIC, typical gas is hydrogen.

Equipment labeled with IIB is suitable for applications requiring equipment for group IIA. Accordingly, equipment labeled with IIC is suitable for applications requiring equipment for group IIA or group IIB.

Indication of temperature class

The ignition temperature of the gas medium affects the selection of explosion-proof equipment. The table below lists how the maximum surface temperatures for electrical equipment of group II is categorized and the assignment of the ignition temperature.

Temperature class	Maximum surface temperature in °C	Ignition temperature of the gas medium in relation to the limit temperature in °C
T1	450	> 450
T2	300	300 – 450
T3	200	200 – 300
T4	135	135 – 200
T5	100	100 – 135
T6	85	85 – 100

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2.8.4 Identification for potentially explosive dust atmospheres

Example

Ex tc	Icon for explosion protection with protection type/protection level
IIIC	Classification of the dust group
T120°C	Maximum surface temperature in °C
Dc	Equipment protection level

Classification of the dust group

In addition, equipment group III has been split up into three subgroups A, B and C depending on the type of dust. This also includes a minimum requirement on the degree of protection according to IEC/EN 60529:

Equipment group	Approved for atmospheres with	Minimum degree of protection IP
IIIA	Inflammable fluffing	5x
IIIB	Non-conducting dust	5x
IIIC	Conductive dust	6x

x Placeholder

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2.9 Standard conformity

2.9.1 Motors

ERDN.. motors according to ATEX and IECEx made by SEW-EURODRIVE meet the requirements of relevant standards and regulations. The most important standards are:

Standard	Description
IEC 60034-1 EN 60034-1	Rotating Electrical Machines – Part 1: Rating and performance
IEC 60034-2-1 EN 60034-2-1	Rotating electrical machines, determining losses and efficiency
IEC 60034-5 EN 60034-5	Rotating Electrical Machines – Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code)
IEC 60034-7 EN 60034-7	Rotating Electrical Machines – Part 7: Classification of types of construction, mounting arrangements and terminal box position (IM code)
IEC 60034-9 EN 60034-9	Rotating electrical machines – Noise limits
IEC 60034-14 EN 60034-14	Rotating electrical machines – Vibration severity
IEC 60034-29 EN 60034-29	Rotating Electrical Machines – Part 29: Equivalent loading and superposition techniques – Indirect testing to determine temperature rise
IEC 60034-30-1 EN 60034-30-1	Rotating electrical machines – Classifying efficiency classes (IE code)
EN 50347	General purpose three-phase induction motors having standard dimensions and outputs
IEC 60072	Dimensions and performance of rotating electrical machines.
EN 60079-0 IEC 60079-0	Potentially explosive atmospheres – Part 0: Equipment – General requirements
IEC 60079-7 EN 60079-7	Potentially explosive atmosphere – Part 7: Equipment protection by increased safety e
IEC 60079-31 EN 60079-31	Potentially explosive atmosphere – Part 31: Equipment dust ignition protection by housing t
IEC 60079-14 EN 60079-14	Potentially explosive atmosphere – Part 14: Project planning, selection and setup of electrical machinery
IEC 60079-17 EN 60079-17	Potentially explosive atmosphere – Part 17: Testing and maintenance of electrical machinery
IEC 60079-19 EN 60079-19	Potentially explosive atmospheres – Part 19: Equipment repair, overhaul and reclamation

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In connection with functional safety:

- **EN ISO 13849-1**

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

2.9.2 Gear units

Gear units for explosion-proof areas made by SEW-EURODRIVE meet the requirements of relevant standards and regulations. The most important standards are:

Standard	Description
EN ISO 80079-36	Potentially explosive atmospheres – part 36: Non-electrical equipment for use in potentially explosive atmospheres – Basics and requirements (ISO 80079-36:2016)
EN ISO 80079-37	Potentially explosive atmospheres – Part 37: Non-electrical equipment for explosive atmospheres - Non-electrical type of protection constructional safety c, control of ignition sources b, liquid immersion k (ISO 80079-37:2016)

The new EN ISO 80079-36 and -37 standards specify the basic requirements for design, constructing, testing and labeling non-electrical equipment intended for use in potentially explosive atmospheres.

The new standard EN ISO 80079-36/-37 was published in 2016 and replaces the previously known EN 13463-1/-5/-6/-8 standards. There is a transition period, which will end on October 31, 2019.

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3 Product description

3.1 Characteristics and features

ATEX-certified EDRN.. motors of equipment group II comply with category 2 and 3 for gas and dust.

IECEx-certified EDRN.. motors meet the requirements of EPL (Equipment Protection Level) b and c for gas and dust.

The HazLoc-NA® approval was performed for the Class Division System common in North America.

Other country-specific registrations, approvals and registrations for countries such as China, Korea, India or Brazil are required and in preparation.

The use in hybrid mixtures is not permitted.

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3.2 Basic structure of the motors

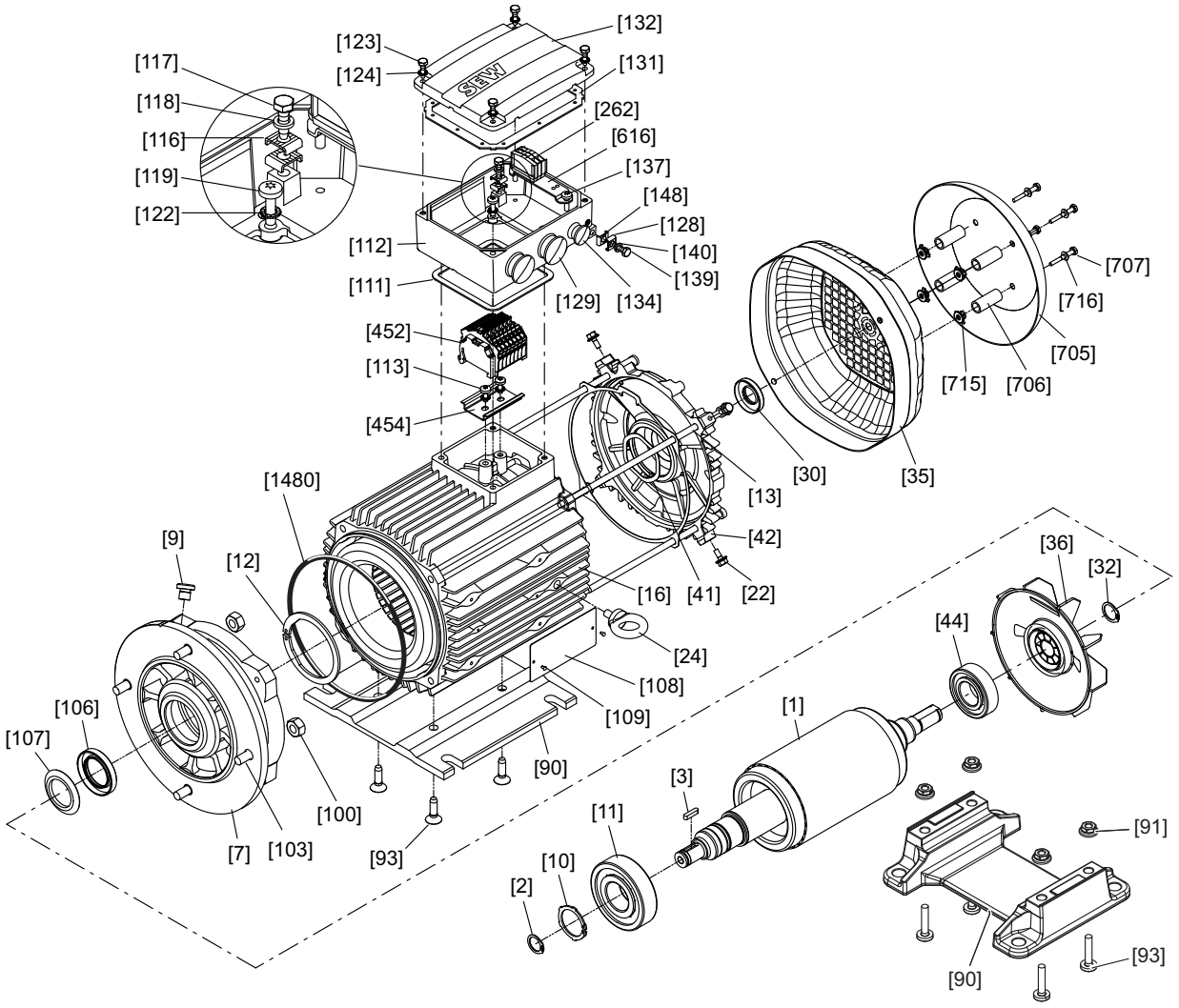
EDRN.. motors have a very similar structure to DRN.. motors. . Parts known from the modular concept are used with these series. The decisive difference of the 2 motor series is that all components of the EDRN.. series must be tested according to the specifications in the respective standard. These specifications make it necessary to use other components than the standard DRN.. series in some cases.

Two examples:

Motors intended for use in dust atmospheres are always equipped with an aluminum fan. This prevents static charging.

Motors up to size 132S are equipped with terminal strips with cage clamp (/KCC). This ensures that the normative requirements on increased clearance and creepage distance are adhered to.

The following figure shows an example of the basic structure of EDR..71 – 132, EDRN80 – 132S motors with cage clamp:



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3.3 Nameplate

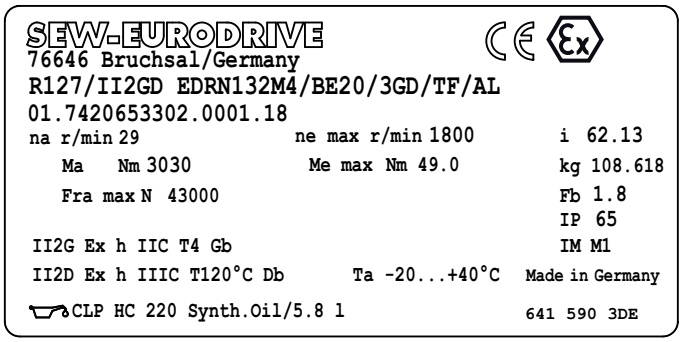
Explosion-proof gearmotors are equipped with 2 nameplates. 1 nameplate at the gear unit and 1 nameplate at the motor.

In case of inverter operation, an additional nameplate listing all necessary inverter data is attached to the terminal box.

The example below depicts the nameplates for a gearmotor:

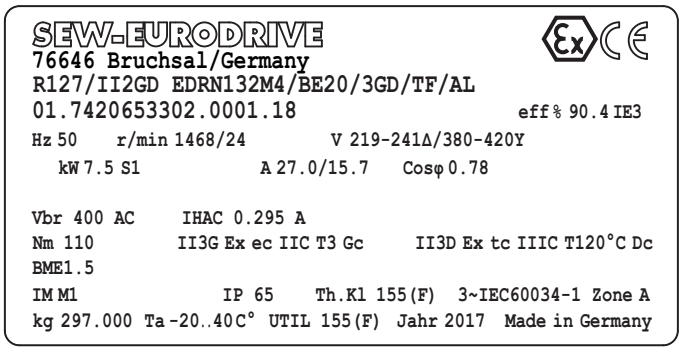
- R127/II2GD EDRN132M4/BE20/3GD/TF/AL

Gear unit nameplate



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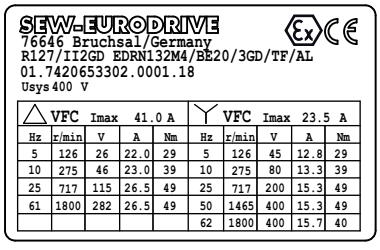
Motor nameplate



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Nameplate with inverter data

The motor may only be operated at an inverter if this nameplate is attached to the gearmotor.

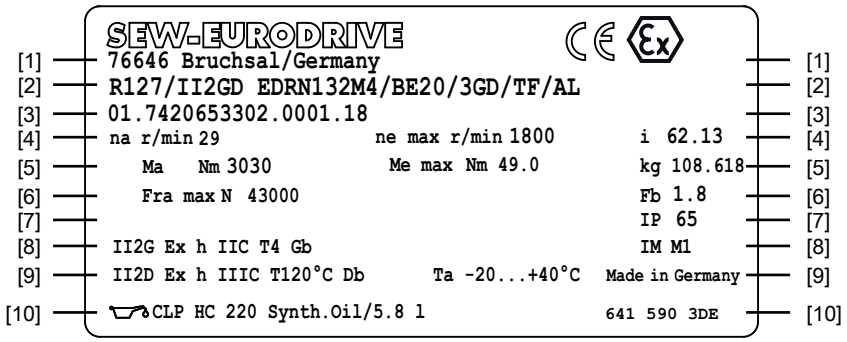


△ VFC Imax 41.0 A					Y VFC Imax 23.5 A				
Hz	r/min	V	A	Nm	Hz	r/min	V	A	Nm
5	126	26	22.0	29	5	126	45	12.8	29
10	275	46	23.0	39	10	275	80	13.3	39
25	717	115	26.5	49	25	717	200	15.3	49
61	1800	282	26.5	49	50	1465	400	15.3	49
					62	1800	400	15.7	40

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3.3.1 Nameplates

Gear unit nameplate



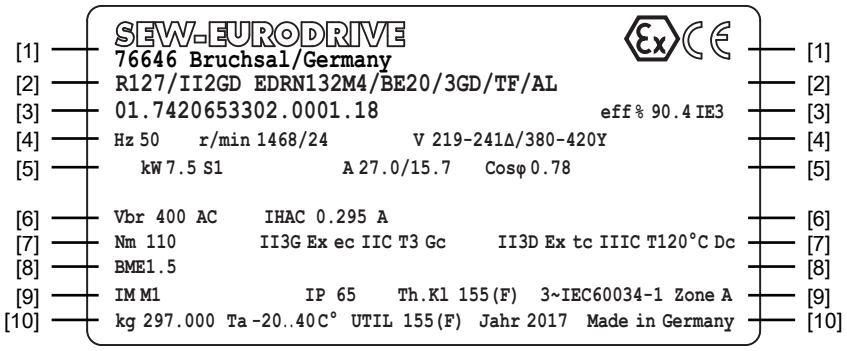
23229078667

Line	Information
[1]	• Manufacturer, address • Explosion protection mark, CE mark The identification on the upper edge of the nameplate are only present when the motor has been certified accordingly or when it includes the relevant components.
[2]	• Type designation
[3]	• Serial number
[4]	• Output speed • Maximum input speed • Gear unit ratio
[5]	• Output torque • Maximum input torque • Gearmotor weight
[6]	• Maximum overhung load on the output shaft • SEW-EURODRIVE service factor
[7]	• Degree of protection
[8]	• Mounting position
[9]	• Information on explosion protection • Ambient temperature
[10]	• Oil type and oil fill volume

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Motor nameplate

ATEX

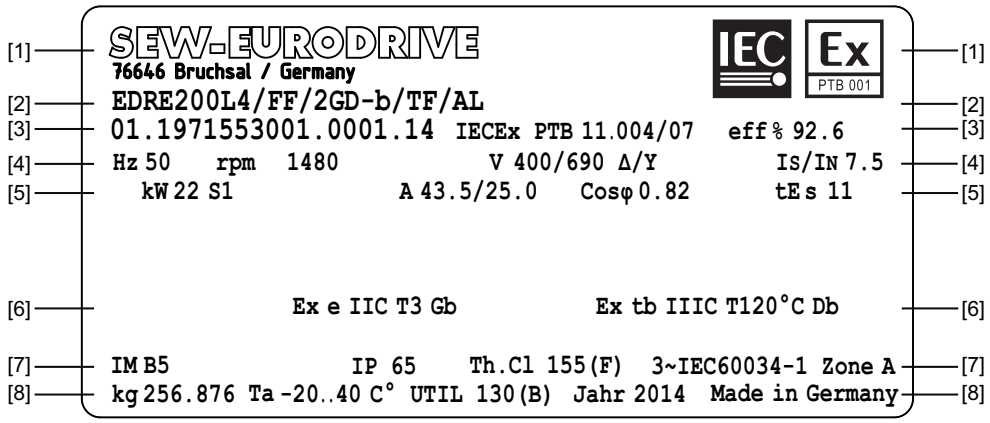


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Line	Information
[1]	• Manufacturer, address • Explosion protection mark, CE mark The identification on the upper edge of the nameplate are only present when the motor has been certified accordingly or when it includes the relevant components.
[2]	• Type designation
[3]	• Serial number • Rated efficiency for motors included in the scope of the IEC 60034-30-1 standard
[4]	• Rated frequency • Rated speed • Nominal voltage
[5]	• Rated power, operating mode • Rated current • Power factor for AC motors
[6]	• Nominal voltage of the brake • Holding current A
[7]	• Braking torque • Specifications on explosion protection: Gas • Specifications on explosion protection: Dust
[8]	• Brake rectifier
[9]	• Mounting position • Degree of protection according to IEC/EN 60034-5 • Thermal class • Number of phases and underlying rating and performance standards (IEC/EN 60034X and/or equivalent national standard) • Zone A = Section A from IEC/EN 60034-1

Line	Information
[10]	• Gearmotor weight • Ambient temperature • Thermal capacity utilization of the motor • Year of manufacture • Country of manufacture

IECEx

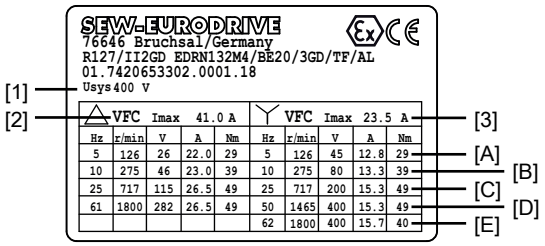


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Line	Information
[1]	• Manufacturer, address • IECEx marking and the number of the approval authority The identification on the upper edge of the nameplate are only present when the motor has been certified accordingly or when it includes the relevant components.
[3]	• Serial number • Certificate number IECEx for line operation • Rated efficiency for motors included in the scope of the IEC 60034-30-1 standard
[6]	Explosion protection mark according to IEC 60079 • Ex e = Protection type IIC = Gas group T3 = temperature class (gas) Gb = EPL (Equipment Protection Level) • Ex tb = protection type IIIC = dust group T120°C = surface temperature (dust) Db = EPL (Equipment Protection Level)

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Additional nameplate data of the inverter



23229182603

Line	Information
[1]	System voltage – line voltage of frequency inverter
[2]	(Voltage Mode Flux Control) Voltage controlled control mode of the inverter
[3]	Maximum permitted peak current, e.g. when accelerating with VFC control mode
[A]	The additional nameplate lists the thermal limit characteristic curve of the motor (item A – E) considering voltage and frequency. The minimum and maximum frequency may deviate depending on the option.
[B]	
[C]	
[D]	
[E]	

Brake nameplate

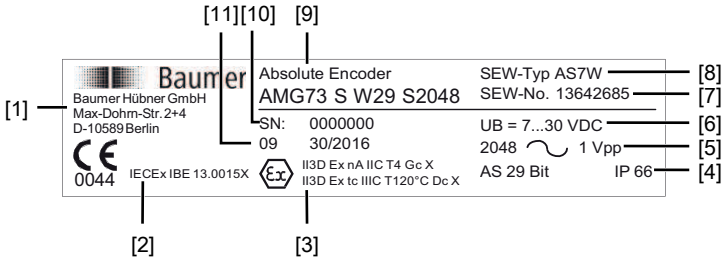


23269576971

Line	Information
[1]	Manufacturer logo
[2]	Data matrix
[3]	Brake
[4]	Assembly number
[5]	Information on inverter operation
[6]	Internal identification number
[7]	Type designation of the brake with ..E indicating the design according to ATEX/IECEx (internal designation)
[8]	Braking torque
[9]	Winding calculation
[10]	Part number
[11]	Explosion protection mark

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Encoder nameplate

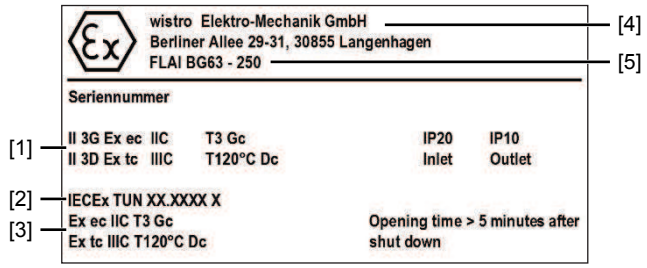


23380821515

Line	Information
[1]	Manufacturer, address
[2]	Number of the IECEx Certificate of Conformity (CoC) IECEx IBE 13.0015X issued by IBExU Institut für Sicherheitstechnik GmbH (0044)
[3]	Explosion protection identification
[4]	Degree of protection
[5]	Resolution and signal
[6]	Nominal voltage
[7]	SEW-EURODRIVE part number
[8]	SEW-EURODRIVE type designation
[9]	Encoder, manufacturer's designation
[10]	Serial number
[11]	Calendar week and year of manufacture

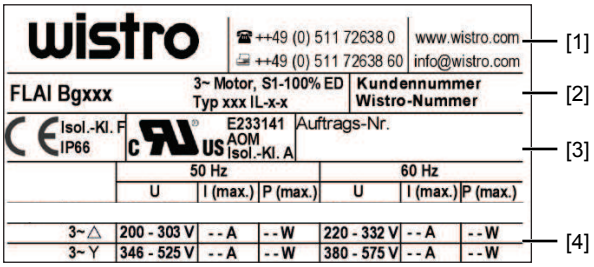
Forced cooling fan nameplate

The forced cooling fan is equipped with 2 nameplates. One nameplate lists all information on explosion protection, the other one lists all electrical data.



23422649483

Line	Information
[1]	Identification for explosion protection according to EU directive and IEC/ EN 60079
[2]	No. of the IECEx Certificate of Conformity (CoC) IECEx TUN 17.0009X Issued by TÜV NORD CERT GmbH
[3]	Identification for explosion protection according to EU directive and IEC 60079
[4]	Manufacturer, address



23422652811

Line	Information
[1]	Manufacturer, address, contact data
[2]	Type and size
[3]	CE marking Approved as Recognized Component for USA and Canada
[4]	Rated data

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3.3.2 Type designation of EDRN.. motors

R127/II2GD EDRN132M4 /BE20 /3GD /TF /AL	
R127/II2GD	Helical gear unit in size 127 and explosion-proof design
E	Explosion-proof design
DR	Product family
N	Labeling of the product line
132M	Size and length
4	Number of poles
/BE20	Brake
/3GD	Explosion protection design
/TF	Thermal motor protection
/AL	Metal fan

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3.4 Designs and options

3.4.1 Basic design in category 2/EPL .b

Characteristic	2G, 2G-b	2D, 2D-b	2GD, 2GD-b
Operating mode	Line operation	Line operation	Line operation
Cyclic duration factor	S1	S1	S1
Voltage range	No (fixed voltage)		
Up to 5.5 kW	230/400 V △/人	230/400 V △/人	230/400 V △/人
from 7.5 kW	400/690 V △/人	400/690 V △/人	400/690 V △/人
Frequency	50 Hz	50 Hz	50 Hz
Thermal class	155(F)	155(F)	155(F)
Capacity utilization of the thermal class	130(B)	130(B)	130(B)
Degree of protection according to EN 60529	IP54	IP65	IP65
Stator housing Aluminum/gray cast iron	EDRN80 – 180, EDRN200 – 315		
Terminal box Aluminum/gray cast iron	EDRN80 – 225, EDRN80 – 315		
Connection	KCC up to EDRN132S EDRN132M and larger: Clamp bolt with anti-twist frame		
Fan	Plastic fan	Metal fan	Metal fan
Ambient temperature	-20°C to + 40 °C	-20°C to + 40 °C	-20°C to + 40 °C
Paint coat	RAL 7031 (blue-gray)	RAL 7031 (blue-gray)	RAL 7031 (blue-gray)
Gas identification	II2G Ex eb IIC T3 Gb	–	II2G Ex eb IIC T3 Gb
Dust identification	–	II2D Ex tb IIIC T120°C Db	II2D Ex tb IIIC T120°C Db
Protection type/protection level	eb	tb	eb, tb

3.4.2 Basic design in category 3/EPL .c

Characteristic	3G, 3G-c	3D, 3D-c	3GD, 3GD-c
Operating mode	Line operation	Line operation	Line operation
Cyclic duration factor S1 – 10	S1	S1	S1
Voltage range	Yes 219 – 241/380 – 420 △/人 or 380 – 420/656 – 724 △/人		
Up to 5.5 kW	230/400 V △/人	230/400 V △/人	230/400 V △/人
from 7.5 kW	400/690 V △/人	400/690 V △/人	400/690 V △/人
Frequency	50 Hz	50 Hz	50 Hz
Thermal class	155(F)	155(F)	155(F)
Capacity utilization of the thermal class	130(B)	130(B)	130(B)
Degree of protection according to EN 60529	IP54	IP54	IP54
Stator housing Aluminum/gray cast iron	EDRN80 – 180, EDRN200 – 315		
Terminal box Aluminum/gray cast iron	EDRN80 – 225, EDRN80 – 315		
Connection	KCC up to EDRN132S EDRN132M and larger: Clamp bolt with anti-twist frame		
Fan	Plastic fan	Metal fan	Metal fan
Ambient temperature	-20 °C to + 40 °C	-20 °C to + 40 °C	-20 °C to + 40 °C
Paint coat	RAL 7031 (blue-gray)	RAL 7031 (blue-gray)	RAL 7031 (blue-gray)
Gas identification	II3G Ex ec IIC T3 Gc	–	II3G Ex ec IIC T3 Gc
Dust identification	–	II3D Ex tc IIIB T120 °C Dc	II3D Ex tc IIIB T120 °C Dc
Protection type/protection level	ec	tc	ec, tc

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3.4.3 Explosion-proof motors

The following table shows the possible explosion protection categories:

Design	Option
/2G	Motors according to Directive 2014/34/EU, category 2 (gas)
/2D	Motors according to Directive 2014/34/EU, category 2 (dust)
/2GD	Motors according to Directive 2014/34/EU, category 2 (gas/dust)
/3G	Motors according to Directive 2014/34/EU, category 3 (gas)
/3D	Motors according to Directive 2014/34/EU, category 3 (dust)
/3GD	Motors according to Directive 2014/34/EU, category 3 (gas/dust)

3.4.4 Explosion-proof motors

The following table shows the possible explosion protection categories:

Design	Option
/2G-b	Motors according to IEC 60079, EPL Gb (gas) for zone 1
/2D-b	Motors according to IEC 60079, EPL Db (dust) for zone 21
/2GD-b	Motors according to IEC 60079, EPL Gb/Db (gas/dust) for zone 1/zone 21
/3G-c	Motors according to IEC 60079, EPL Gc (gas) for zone 2
/3D-c	Motors according to IEC 60079, EPL Dc (dust) for zone 22
/3GD-c	Motors according to IEC 60079, EPL Gc/Dc (gas/dust) for zone 2/zone 22

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3.4.5 Output types

The following table shows possible output designs:

Designation	Design	Option
/FI	/2G, /2D, /2GD,/3G, / 3D, /3GD 2G-b, 2GD-b 2D-b, 2GD-b3G-c, 3D-c, 3GD-c	IEC foot-mounted motor
/F.A, /F.B		Universal foot-mounted motor
/FG		7-series integral motor, as stand-alone motor
/FF		IEC flange-mounted motor with bore
/FT		IEC flange-mounted motor with threads
/FL		General flange-mounted motor (other than IEC)
/FM		7-series integral motor with IEC feet
/FE		IEC flange-mounted motor with bore and IEC feet
/FY		IEC flange-mounted motor with threads and IEC feet
/FK		General flange-mounted motor (other than IEC) with feet
2W		2nd shaft end on the motor/brakemotor

3.4.6 Mechanical attachments

The following table shows possible mechanical attachments:

Designation	Design	Option
/BE..[1)]	/3G, /3D, /3GD3G-c, 3D-c, 3GD-c	Spring-loaded brake with specification of size
HR		Manual brake release, re-engaging.
HF		Manual brake release, lockable
/RS	/2G, /2D, /2GD,/3G, / 3D, /3GD 2G-b, 2GD-b 2D-b, 2GD-b3G-c, 3D-c, 3GD-c	Backstop

1) Also available in design for functional safety

3.4.7 Temperature sensor/temperature detection

The following table shows the thermal protection options:

Designation	Design	Option
/TF	/2G, /2D, /2GD,/3G, / 3D, /3GD 2G-b, 2GD-b 2D-b, 2GD-b3G-c, 3D-c, 3GD-c	Temperature sensor (PTC thermistor or PTC resistor)
/PK		PT1000 temperature sensor
/PT		1 or 3 PT100 sensor(s)

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3.4.8 Encoder

The following table shows possible encoder designs:

Designation	Design	Option
/ES7S[1] /EG7S[1] /EV7S, /EH7S	3G-c, 3GD-c 3D-c, 3GD-c	Add-on speed sensor with sin/cos interface
/ES7R /EG7R / EH7R		Add-on speed sensor with TTL (RS422) interface
/ES7C /EG7C /EV7C /EH7C		Add-on speed sensor with HTL interface
/AS7W, /AG7W, / AV7W		Add-on absolute encoder, RS485 interface (multi-turn) and sin/cos interface
/AS7Y[1] /AG7Y[1] /AV7Y /AH7Y		Add-on absolute encoder, SSI interface (multi-turn) and sin/cos interface
/ES7A /EG7A		Mounting adapter for speed sensors with solid shaft
/EH7T		Add-on speed sensor with TTL (RS422) interface
EV2C / EV2R / EV2S / EV2T		Add-on incremental encoder with solid shaft
/XV.A		Mounting adapter for third-party speed sensors
/XV..		Mounted third-party speed sensors

1) Also available in design for functional safety

3.4.9 Connection options

The following table shows alternative designs of the power connection. Designs with terminal board do not have an extra type designation.

Designation	Design	Included in the scope of delivery
/KCC	/2G, /2D, /2GD,/3G, / 3D, /3GD 2G-b, 2GD-b 2D-b, 2GD-b3G-c, 3D-c, 3GD-c	Terminal strip with cage clamps (EDR..71 – 132, EDRN80 – 132S motors)

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3.4.10 Ventilation

The following table shows possible ventilation variants:

Designation	Design	Option
/VE	3G-c, 3GD-c 3D-c, 3GD-c	Forced cooling fan
/ AL	/2D, /2GD, 3D, /3GD 2G-b, 2GD-b, 3GD-c, 3D-c	Metal fan
None	/2G, /3G /2G-b, /3G-c	Standard fan (plastic)
/C	/2G, /2D, /2GD,/3G, / 3D, /3GD 2G-b, 2GD-b 2D-b, 2GD-b3G-c, 3D-c, 3GD-c	Canopy for fan guard

3.4.11 Bearings

The following table shows possible bearings for motors:

Designation	Design	Option
/NS	/2G, /2D, /2GD, /3G, /3D, /3GD /2G-b, /2D-b, /2GD-b, /3G-c, /3D-c, /3GD-c	Relubrication device
/ERF		Reinforced bearings on A-side with rolling bearing
/NIB		Insulated bearing B-side

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3.5 Target industries and relevant risk of explosion

Automotive industry

Potentially explosive gas/air mixtures can form when paint is being prepared and in spray cabins.

When aluminum car body parts are processed, potentially explosive dust-air mixtures may be produced.

Chemical industry

Combustible gases, liquids and solids are converted and processed in many different processes. This can create explosive mixtures.

Waste disposal companies

The digester gases produced during the treatment of waste water in sewage treatment works can create explosive gas/air mixtures.

Wood processing industry

During wood processing, wood dust is created. This can create explosive dust/air mixtures, e.g. in filters or silos.

Agriculture

Some agricultural businesses operate biogas installations. If biogas leaks, potentially explosive biogas/air mixtures may be produces.

Metalworking operations

Potentially explosive metal dusts can be produced during surface treatment, such as grinding. These metal dusts pose a risk of explosion in dust extraction systems.

Mills

Potentially explosive dusts can be produced in mills. During the following transport and packaging processes, static discharge causes a risk of explosion.

Food/feed industry

Explosive dust can be created during the transport and storage of seeds, feed meal, sugar, etc.. Potentially explosive atmospheres can be created in the filter during suction and filtration.

Pharmaceutical industry

Alcohol is often used as solvent during drug manufacturing. In addition, active ingredients and auxiliary materials that can cause dust explosions, such as lactose, may also be used.

Refineries

The hydrocarbons used in refineries are flammable. Depending on the flash point, these materials may potentially create dust-explosive atmospheres even at room temperature. The area around oil processing equipment is usually classified as potentially explosive.

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Recycling operations

Waste in dust form and leftover combustible liquids can create explosive atmospheres.

3.6 Approvals and certifications

3.6.1 Europe



The EU declaration of conformity documents that EDRN.. motors comply with Directive 2014/34/EU.



The EU declaration of conformity of explosion-proof motors is included in each motor delivery. With SEW-EURODRIVE it is part of the operating instructions. The following applies to declarations of conformity: If a large number of products is delivered to the same customer, a single copy may be included in the relevant batch or delivery.

Motors in category 2

Directive 2014/34/EU stipulates the following:

In case of motors with internal combustion and of electrical equipment in these groups and categories, the EU type examination according to annex III of the Directive must be performed in combination with the following procedure:

- Conformity with the prototype based on internal manufacturing control with monitored product testing according to annex VI.
- Conformity with the prototype based on quality assurance aspects for the product described in annex VII.

The EU type examination is part of the conformity assessment procedure, where a notified body examines and tests the technical prototype for a product, and certifies that the prototype meets all requirements of the Directive applicable to the product.

The conformity for motors of category 2 was evaluated by the PTB (Physikalisch-Technische Bundesanstalt – notified body no. 0102). This includes all conformity assessment modules specified in the standard, such as type examinations, as well as the recognition of the QM systems by SEW-EURODRIVE.

SEW-EURODRIVE decided to use this quality assurance procedure as it includes high quality demands and all certifications according to ISO 9001. The the quality assurance system for EDR.. motors has also been evaluated by the PTB. The evaluation is renewed every 5 years.

Gear units in category 2

For mechanical units, apply the internal production control according to annex VIII. The technical documents according to annex VIII No. 2 must be transmitted to a certified body, who immediately confirms receiving them and stores the documents.

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Motors in category 3

Directive 2014/34/EU prescribes the internal production control according to annex VIII as mandatory for equipment group II and equipment category 3.

"Internal production control is the conformity assessment procedure whereby the manufacturer fulfills the obligations laid down in points 2, 3 and 4, and ensures and declares on his sole responsibility that the products concerned satisfy the requirements of this Directive that apply to them."

If requested, motors for operation in power plants and refineries according to "VIK Recommendation 1 – AC Asynchronous Motors – Technical Requirements" can be delivered.

The motors mainly adhere to this recommendation and are marked with the logo.

3.6.2 International markets

Market access is contingent to local approvals in many countries. Additional laws, regulations and market conventions must be adhered to. Experience has shown that an identification of the product is required together with certification. This is realized at SEW-EURODRIVE with one or several logos on the main nameplate, with additional labels on the motor, or by providing the relevant certificates.

The following countries have special requirements for motors. The country-specific requirements apply to the motor in general, the efficiency and, possibly, to the explosion protection. Some countries have special requirements on the gear unit such as EU Europe. The relevant marking is attached to the gear unit if these requirements are met.

3.6.3 Australia/New Zealand

Australia and New Zealand recognize the IECEx Certificate of Conformity (COC) without additional certification or registration. The motors must be MEPS-approved (IE2 ≥ 0.75 kW) and registered.

EDRS.., EDRE.. and EDRN.. motors meet these requirements.

3.6.4 Eurasian Customs Union

Gearmotors for the Eurasian Economic Union (Russia, Kazakhstan, Belarus; Armenia, and Kyrgyzstan) are certified according to the requirements of TR CU certificate/declaration. They are marked with the EAC logo (Eurasian Conformity). Products designated for use in potentially explosive areas are additionally marked.

EDRS.., EDRE.. and EDRN.. motors meet these requirements.

3.6.5 Ukraine

Gearmotors for the Ukrainian market are certified according to the "Ukrainian Technical Regulations" (UA TR) and are marked accordingly.

The EDRS.. and EDRE.. motors meet these requirements.

Availability in the sales systems is in preparation.

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3.6.6 China



In China, requirements on explosion protection are described in the series of standards GB 3836. These standards were harmonized with the older editions of the series of standards IEC 60079. In many cases, gearmotors for the Chinese market do not require additional certifications for explosion protection, as many operators and authorities recognize motors according to EU standards. According to the Chinese efficiency regulations, the motors are marked with the Chinese Energy Label (CEL).

The EDRS.. and EDRE.. motors meet these requirements.

The EDRN.. motors are in preparation.

3.6.7 India

In India, 2 standards are important for the selection of electrical devices:

- IS 5571: Guide for Selection and Installation of Electrical Equipment for Hazardous Areas (other than mines). This standard is based on IEC 60079-14.
- IS 5572-2009: Classification of hazardous areas (other than mines) having flammable gases and vapors for electrical installation. This standard quotes IEC 60079-10.

Operating resources in protection type n (non-sparking) and e (increased safety) are only permitted in zone 2.

Motors in protection type d must be used for zone 1.

For operating resources in potentially explosive areas, the approval by the Chief Controller of Explosives (CCE or CCoE) is often prescribed.

The certified motors are marked with the CCoE identification no.

EDRE.. motors in protection type Ex e are CCoE certified.

As of January 01, 2018, motors must meet the requirements of IS 12615:2011. Motors must adhere to energy efficiency class IE2.

Currently, only motors with dimensions and sizes according to the standard are affected. Motors subject to the regulation are marked with the BIS identification. They may only be mounted on permitted permitted locations.

Gearmotors have deviating dimensions and are currently excluded.

EDRN.. motors are currently not certified according to IS 12615 but can be used as gearmotor.

A revision to the standard is currently in progress and is planned to be published in 2018. The new version no longer excepts gearmotors.

3.6.8 Brazil

Segurança
INMETRO OCP 0017

The Brazilian legislation requires a Certificate of Conformity (CoC), created by the National Institute of Metrology, Quality and Technology (INMETRO). For this reason, the IECEx CoC is not valid in Brazil. The test reports (ExTRs) however are approved and part of the CoC, as long as the motors with INMETRO certification are listed on the IECEx website.

Requirements for potentially explosive atmospheres of the Brazilian market are specified in regulations no. 179 (May 2010) and No. 89 (February 2012).

The EDRS.. and EDRE.. motors meet these requirements.

The EDRN.. motors are in preparation.

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3.6.9 South Korea



According to articles 34 and 35 of the Occupational Safety & Health Act, in South Korea products in potentially explosive atmospheres must be KOSHA (Korea Occupational Safety and Health Agency) certified.

The Republic of Korea has joined the IECEx agreement. Test reports required for the IECEx certification of the EDR.. motors are approved by the KOSHA. However, individual certificates for the respective motors are issued.

South Korean regulations are guided by the series of standards IEC 60079. Potentially explosive atmospheres are classified according to the Korean standard KS C IEC 60079-10. Devices are selected according to KS C IEC 60079-14.

Certified motors are marked with the KCs logo and the certification number.

The EDRS.. and EDRE.. motors meet these requirements.

The EDRN.. motors are in preparation.

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4 Technical data

4.1 Operating temperature

The motors are designed for use in a temperature range between -20 °C and +40 °C in the standard version.

For applications operated outside of the standard temperature range, additional permitted temperature ranges are possible. Depending on the operating mode and/or selected options, not all temperature ranges can be realized.

- -20 °C to +50 °C
- -20 °C to +60 °C
- -40 °C to +40 °C[1)]

Additionally available for stand-alone motors in category 3:

- -40 °C to +50 °C[1)]

[1)]This temperature range is only possible with anti-condensation heating. The optional anti-condensation heating is available for EDRN90 and larger.

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4.2 Motor

The technical data of the motors in this document refer to the standard temperature range of -20 °C to +40 °C.

4.2.1 Identification

The following table lists the available identifications of EDRN80M – 315.

Rule set	Gas	Dust
ATEX	II2G Ex eb IIB T2 Gb II2G Ex eb IIC T2 Gb II2G Ex eb IIB T3 Gb II2G Ex eb IIC T3 Gb II2G Ex eb IIB T4 Gb II2G Ex eb IIC T4 Gb	II2D Ex tb IIIC T120°C Db II2D Ex tb IIIC T140°C Db
ATEX	II3G Ex ec IIB T3 Gc II3G Ex ec IIC T3 Gc	II3D Ex tc IIIB T120°C Dc II3D Ex tc IIIC T120°C Dc II3D Ex tc IIIB T140°C Dc II3D Ex tc IIIC T140°C Dc
IECEx	Ex eb IIB T2 Gb Ex eb IIC T2 Gb Ex eb IIB T3 Gb Ex eb IIC T3 Gb Ex eb IIB T4 Gb Ex eb IIC T4 Gb	Ex tb IIIC T120°C Db Ex tb IIIC T140°C Db
IECEx	Ex ec IIB T3 Gc Ex ec IIC T3 Gc	Ex tc IIIB T120°C Dc Ex tc IIIC T120°C Dc Ex tc IIIB T140°C Dc Ex tc IIIC T140°C Dc

The following table lists the available designs of explosion protection.

Rule set	Unit category	Designs
ATEX	Category 2	2G, 2GD, new: 2D
ATEX	Category 3	3D, 3GD new: 3G
IECEx	EPL .b	2G-b, 2GD-b, new: 2D-b
IECEx	EPL .c	3D-c, 3GD-c new: 3G-c

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4.2.2 Overview of designs and operating mode

Design	Temperature class / maximum surface temperature	Line operation	Frequency inverter operation
3G, 3G-c	T3	Yes	Yes
3D, 3D-c	T120 °C	Yes	Yes
3GD, 3GD-c	T3/T120 °C	Yes	Yes
2G, 2G-b	T3	Yes	Yes
2D, 2D-b	T120 °C	Yes	Yes
2GD, 2GD-b	T3/T120 °C	Yes	Yes
2G, 2G-b	T2	Yes	no
2G, 2G-b	T4	Yes	no
2G, 2G-b[1)]	T3	Yes	no

1) Reduced power rating for motors with increased safety e according to DIN V 42673 2

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4.2.3 Overview of 50 Hz and 60 Hz motors

In order to meet the requirements of applicable standards in regard of the ratio I_A/I_N, and in regard of the heating time t_E, the power rating of devices in design 2G and 2G-b is reduced for size 180M and larger. As the power reduction can be significantly high in temperature class T3, the new motors in design 2G and 2G-b were also certified in temperature class T2 for the first time. This allows for offering motors with higher nominal motor power in the same size to the customer.

The table provides an overview of the available power ratings according to design and temperature class/surface temperature. This applies to the standards ATEX and IECEx.

For temperature class 4 in combination with line operation, only motor size EDRN80M4 in category 2/EPL .b is currently available.

Overview 50 Hz

Motor	P_N in kW			
	2D 2D-b 3G, 3D, 3GD 3G-c, 3D-c, 3GD-c	**2G, 2GD 2G-b, 2GD-b**	**2G 2G-b**	**2G [1] 2G-b[1]**
	T3/T120 °C	**T3/T120 °C**	**T2**	**T3**
EDRN80M4	0.75	0.75	0.75	–
EDRN90S4	1.1	1.1	1.1	1
EDRN90L4	1.5	1.5	1.5	1.35
EDRN100LS4	2.2	2.2	2.2	2
EDRN100L4	3[2]	3[2]	3	2.5
EDRN112M4	4	4	4	3.6
EDRN132S4	5.5[2]	5.5[2]	5.5	5
EDRN132M4	7.5	7.5	7.5	6.8
EDRN132L4	9.2[2]	9.2[2]	9.2	–
EDRN160M4	11	11	11	10
EDRN160L4	15	15	15	13.5
EDRN180M4	18.5	–	17.5	–
EDRN180L4	22	17.5	20	–
EDRN200L4	30[2]	24[2]	27	–
EDRN225S4	37	–	33	–
EDRN225M4	45	–	40	–
EDRN250M4	55	30	50	–
EDRN280S4	75	36	–	–
EDRN280M4	90[2]	44	68	–
EDRN315S4	110	58 **70**	80	–
EDRN315M4	132[2]	84	100	–
EDRN315L4	160[2]	–	–	–
EDRN315H4	200	100	–	–

1) Reduced power rating for motors with increased safety e according to DIN V 42673 2

2) Applies to categories 2D, 2D-b/2GD, 2GD-b: The maximum surface temperature is 140 °C, depending on the selected options.

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Overview 60 Hz

Motor	P_N in kW		
	2D 2D-b 3G, 3D, 3GD 3G-c, 3D-c, 3GD-c	2G 2G-b 2GD, 2DG-b	2G 2G-b
	T3/T120 °C	T3/T120 °C	T2
EDRN80M4	0.75	0.75	0.75
EDRN90S4	1.1	1.1	1.1
EDRN90L4	1.5	1.5	1.5
EDRN100LM4	2.2	2.2	2.2
EDRN100L4	3[1)]	3[1)]	3
EDRN112M4	4	4	4
EDRN132S4	5.5[1)]	5.5[1)]	5.5
EDRN132M4	7.5	7.5	7.5
EDRN132L4	9.2[1)]	9.2[1)]	9.2
EDRN160M4	11	11	11
EDRN160L4	15	15	15
EDRN180M4	18.5	–	17.5
EDRN180L4	22	17.5	20
EDRN200L4	30[1)]	24[1)]	27
EDRN225S4	37	–	33
EDRN225M4	45	–	40
EDRN250ME4	55	30	50
EDRN280S4	75	36	–
EDRN280M4	90[1)]	44	68
EDRN315S4	110	58 **70**	80
EDRN315ME4	132[1)]	84	100
EDRN315L4	160[1)]	–	–
EDRN315H4	200	100	–

1) Applies to categories 2D, 2D-b/2GD, 2GD-b: The maximum surface temperature is 140 °C, depending on the selected options.

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4.2.4 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
t_E	Heating time

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4.2.5 EDRN.., 400 V, 50 Hz, 3GD, 3GD-c, T3/T120 °C

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
EDRN 80M 4	0.75	4.95	1440	1.75	0.74	80.7	82.9	82.9	6.7	3.1 2.7	3.4
EDRN 90S 4	1.1	7.2	1455	2.55	0.73	83.5	85.0	84.5	6.9	2.7 2.1	3.3
EDRN 90L 4	1.5	9.8	1461	3.4	0.74	84.6	86.1	85.6	7.5	2.7 2.0	3.3
EDRN 100LS 4	2.2	14.5	1450	4.75	0.76	86.4	87.5	86.9	7.1	2.9 2.2	3.3
EDRN 100L 4	3	19.7	1456	6.4	0.76	87.3	88.3	87.8	8.2	3.4 2.3	3.7
EDRN 112M 4	4	26	1464	7.9	0.81	88.6	89.4	88.7	8.2	2.4 1.6	3.6
EDRN 132S 4	5.5	36	1461	10.5	0.84	90.6	90.6	89.6	8.3	2.8 2.2	3.5
EDRN 132M 4	7.5	49	1468	15.2	0.78	90.8	91.1	90.4	7.8	3.1 2.4	3.3
EDRN 132L 4	9.2	60	1470	18.7	0.77	90.8	91.6	91.0	8.4	3.7 1.8	3.7
EDRN 160M 4	11	71	1473	21	0.81	91.1	91.7	91.4	7.3	2.6 2.2	3.0
EDRN 160L 4	15	97	1474	29	0.80	91.9	92.5	92.1	8.0	3.0 2.0	3.4
EDRN 180M 4	18.5	120	1478	33.5	0.85	92.8	93.1	92.6	9.5	3.6 2.9	3.6
EDRN 180L 4	22	142	1477	38.5	0.87	93.4	93.6	93.0	9.6	3.5 2.1	3.4
EDRN 200L 4	30	194	1480	56	0.82	93.3	93.9	93.6	8.2	2.9 2.5	3.3
EDRN 225S 4	37	240	1482	64	0.88	94.3	94.4	93.9	8.4	3.0 2.3	2.7
EDRN 225M 4	45	290	1482	81	0.85	94.1	94.5	94.2	8.8	3.0 2.2	2.7
EDRN 250M 4	55	355	1482	104	0.80	94.4	94.8	94.6	8.2	4.0 2.5	2.9
EDRN 280S 4	75	485	1482	143	0.79	94.9	95.3	95.0	7.6	3.7 2.6	2.9
EDRN 280M 4	90	580	1481	161	0.84	95.4	95.6	95.2	7.7	3.6 2.0	2.7
EDRN 315S 4	110	710	1488	189	0.87	95.4	95.7	95.5	6.7	2.9 2.1	3.1
EDRN 315M 4	132	850	1487	230	0.87	95.6	95.9	95.6	6.5	2.7 2.0	2.9
EDRN 315L 4	160	1030	1486	275	0.87	95.9	96.1	95.9	6.5	2.7 2.0	2.8
EDRN 315H 4	200	1280	1489	355	0.84	95.4	96.0	96.0	9.5	3.7 2.8	3.8

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Motor type	P_N	M_N	n_N	m_{Mot}	J_{Mot} [1]	BE..	Z_0 BGE	M_B	m_{BMot}	J_{BMot} [1]
	kW	Nm	min^{-1}	kg	10^{-4} kgm²		h^{-1}	Nm	kg	10^{-4} kgm²
EDRN 80M 4	0.75	4.95	1440	14	28.1	BE2	1640	10	19	32.6
EDRN 90S 4	1.1	7.2	1455	20	59.6	BE2	1200	14	24	64.4
EDRN 90L 4	1.5	9.8	1461	23	72.9	BE5	1160	20	29	78.9
EDRN 100LS 4	2.2	14.5	1450	27	87	BE5	1220	28	33	93
EDRN 100L 4	3	19.7	1456	34	117	BE5	740	40	40	123
EDRN 112M 4	4	26	1464	45	183	BE11	580	55	59	193
EDRN 132S 4	5.5	36	1461	57	246	BE11	420	80	71	256
EDRN 132M 4	7.5	49	1468	73	405	BE20	220	110	100	456
EDRN 132L 4	9.2	60	1470	82	463	BE20	200	150	110	514
EDRN 160M 4	11	71	1473	115	839	BE20	180	150	145	899
EDRN 160L 4	15	97	1474	130	1060	BE30	160	200	170	1200
EDRN 180M 4	18.5	120	1478	155	1660	BE32	100	300	200	1890
EDRN 180L 4	22	142	1477	175	1970	BE32	90	300	220	2200
EDRN 200L 4	30	194	1480	280	2800	BE32	100	400	335	3030
EDRN 225S 4	37	240	1482	310	4490	BE60	50	400 [2]	380	4820
EDRN 225M 4	45	290	1482	310	4490	BE60	40	400 [2]	380	4820
EDRN 250M 4	55	355	1482	460	7500	BE120	40	800	560	8110
EDRN 280S 4	75	485	1482	520	9070	BE120	30	800 [2]	620	9680
EDRN 280M 4	90	580	1481	630	12100	BE120	20	800 [2]	730	12700
EDRN 315S 4	110	710	1488	870	23700	BE120	10	800 [2]	970	24300
EDRN 315M 4	132	850	1487	890	25100	BE120	10	800 [2]	990	25700
EDRN 315L 4	160	1030	1486	1020	28900	BE120	7	800 [2]	1120	29500
EDRN 315H 4	200	1280	1489	1140	35500	BE120	5	800 [2]	1240	36100

1) The values apply to the designs 3D and 3GD / 3D-c and 3GD-c. For the mass moments of inertia Jmot for 3G/3G-c design, refer to chapter "Mass moment of inertia for 3G and 3G-c design"

2) The braking torque M_B does not meet the requirements: M_B ≥ 2xM_N

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4.2.6 EDRN.., 400 V, 50 Hz, 2D, 2D-b, T120°C

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
EDRN 80M 4	0.75	4.95	1440	1.78	0.74	80.7	82.9	82.9	6.9	3.1 2.7	3.4
EDRN 90S 4	1.1	7.2	1455	2.6	0.73	83.5	85.0	84.5	7.6	2.7 2.1	3.3
EDRN 90L 4	1.5	9.8	1461	3.6	0.74	84.6	86.1	85.6	7.6	2.7 2.0	3.3
EDRN 100LS 4	2.2	14.5	1450	5	0.76	86.4	87.5	86.9	7.6	2.9 2.2	3.3
EDRN 100L 4	3	19.7	1456	6.7	0.76	87.3	88.3	87.8	8.5	3.4 2.3	3.7
EDRN 112M 4	4	26	1464	8.5	0.81	88.6	89.4	88.7	8.8	2.4 1.6	3.6
EDRN 132S 4	5.5	36	1461	11.2	0.84	90.6	90.6	89.6	8.8	2.8 2.2	3.5
EDRN 132M 4	7.5	49	1468	15.7	0.78	90.8	91.1	90.4	8.1	3.1 2.4	3.3
EDRN 132L 4	9.2	60	1470	19.9	0.77	90.8	91.6	91.0	8.5	3.7 1.8	3.7
EDRN 160M 4	11	71	1473	22	0.81	91.1	91.7	91.4	8.0	2.6 2.2	3.0
EDRN 160L 4	15	97	1474	30.5	0.81	91.9	92.5	92.1	8.5	3.0 2.0	3.4
EDRN 180M 4	18.5	120	1478	35	0.85	92.8	93.1	92.6	9.5	3.6 2.9	3.6
EDRN 180L 4	22	142	1477	41	0.87	93.4	93.6	93.0	8.9	3.5 2.1	3.4
EDRN 200L 4	30	194	1480	59	0.82	93.3	93.9	93.6	7.5	2.9 2.5	3.3
EDRN 225S 4	37	240	1482	66	0.88	94.3	94.4	93.9	7.8	3.0 2.3	2.7
EDRN 225M 4	45	290	1483	84	0.85	94.1	94.5	94.2	8.8	3.0 2.2	2.7
EDRN 250M 4	55	355	1482	104	0.80	94.4	94.8	94.6	8.2	4.0 2.5	2.9
EDRN 280S 4	75	485	1482	151	0.79	94.9	95.3	95.0	7.6	3.7 2.6	2.9
EDRN 280M 4	90	580	1481	161	0.84	95.4	95.6	95.2	7.7	3.6 2.0	2.7
EDRN 315S 4	110	710	1488	189	0.87	95.4	95.7	95.5	6.7	2.9 2.1	3.1
EDRN315M 4	132	850	1487	230	0.87	95.6	95.9	95.6	6.5	2.7 2.0	2.9
EDRN 315L 4	160	1030	1486	275	0.87	95.9	96.1	95.9	6.5	2.7 2.0	2.8
EDRN 315H 4	200	1280	1489	355	0.84	95.4	96.0	96.0	9.5	3.7 2.8	3.8

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4.2.7 EDRN.., 400 V, 50 Hz, 2G, 2G-b T3, 2GD, 2GD-b, T3/120°C

Motor	P_N	M_N	n_N	I_N	cosφ	$\eta_{50\%}$	$\eta_{75\%}$	$\eta_{100\%}$	t_E	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
	kW	Nm	min^{-1}	A		%	%	%	s			
EDRN 80M 4	0.75	4.95	1440	1.78	0.74	80.7	82.9	82.9	20	6.9	3.1 2.7	3.4
EDRN 90S 4	1.1	7.2	1455	2.6	0.73	83.5	85.0	84.5	10	7.6	2.7 2.1	3.3
EDRN 90L 4	1.5	9.8	1461	3.6	0.74	84.6	86.1	85.6	8	7.6	2.7 2.0	3.3
EDRN 100LS 4	2.2	14.5	1450	5	0.76	86.4	87.5	86.9	8	7.6	2.9 2.2	3.3
EDRN 100L 4	3	19.7	1456	6.7	0.76	87.3	88.3	87.8	8	8.5	3.4 2.3	3.7
EDRN 112M 4	4	26	1464	8.5	0.81	88.6	89.4	88.7	6	8.8	2.4 1.6	3.6
EDRN 132S 4	5.5	36	1461	11.2	0.84	90.6	90.6	89.6	6	8.8	2.8 2.2	3.5
EDRN 132M 4	7.5	49	1468	15.7	0.78	90.8	91.1	90.4	5	8.1	3.1 2.4	3.3
EDRN 132L 4	9.2	60	1470	19.9	0.77	90.8	91.6	91.0	5	8.5	3.7 1.8	3.7
EDRN 160M 4	11	71	1473	22	0.81	91.1	91.7	91.4	6	8.0	2.6 2.2	3.0
EDRN 160L 4	15	97	1474	30.5	0.81	91.9	92.5	92.1	5	8.5	3.0 2.0	3.4
EDRN 180L 4	17.5	113	1474	32.5	0.88	93.2	93.3	92.6	6	8.7	3.1 2.0	2.9
EDRN 200L 4	24	155	1478	45.5	0.84	93.1	93.6	93.2	5	7.3	2.7 2.1	2.6
EDRN 250M 4	30	193	1482	57	0.85	93.4	93.8	93.6	7	6.9	3.1 2.2	2.5
EDRN 280S 4	36	230	1479	67	0.85	93.9	94.2	93.9	8	6.5	2.6 1.9	2.1
EDRN 280M 4	44	285	1476	82	0.87	94.7	94.7	94.2	8	6.3	2.6 1.6	1.9
EDRN 315S 4	58	370	1490	100	0.87	94.1	94.7	94.8	7	8.0	3.1 2.3	3.4
EDRN 315S 4	70	450	1487	120	0.88	94.9	95.2	95.0	6	6.7	2.5 1.9	2.7
EDRN 315M4	84	540	1484	145	0.88	95.3	95.5	95.2	7	6.3	2.2 1.7	2.4
EDRN 315H 4	110	710	1486	187	0.89	95.3	95.7	95.4	6	6.9	2.6 2.0	2.7

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4.2.8 EDRN.., 400 V, 50 Hz, 2G, 2G-b, T2

Motor	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	t_E s	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
EDRN 80M 4	0.75	4.95	1440	1.78	0.74	80.7	82.9	82.9	23	6.9	3.1 2.7	3.4
EDRN 90S 4	1.1	7.2	1455	2.6	0.73	83.5	85.0	84.5	12	7.6	2.7 2.1	3.3
EDRN 90L 4	1.5	9.8	1461	3.6	0.74	84.6	86.1	85.6	9	7.6	2.7 2.0	3.3
EDRN 100LS 4	2.2	14.5	1450	5	0.76	86.4	87.5	86.9	10	7.6	2.9 2.2	3.3
EDRN 100L 4	3	19.7	1456	6.7	0.76	87.3	88.3	87.8	9	8.5	3.4 2.3	3.7
EDRN 112M 4	4	26	1464	8.5	0.81	88.6	89.4	88.7	8	8.8	2.4 1.6	3.6
EDRN 132S 4	5.5	36	1461	11.2	0.84	90.6	90.6	89.6	8	8.8	2.8 2.2	3.5
EDRN 132M 4	7.5	49	1468	15.7	0.78	90.8	91.1	90.4	12	8.1	3.1 2.4	3.3
EDRN 132L 4	9.2	60	1470	19.9	0.77	90.8	91.6	91.0	9	8.5	3.7 1.8	3.7
EDRN 160M 4	11	71	1473	22	0.81	91.1	91.7	91.4	19	8.0	2.6 2.2	3.0
EDRN 160L 4	15	97	1474	30.5	0.81	91.9	92.5	92.1	16	8.5	3.0 2.0	3.4
EDRN 180M 4	17.5	113	1476	33	0.87	93.0	93.2	92.6	12	9.4	3.5 2.7	3.4
EDRN 180L 4	20	129	1476	37	0.87	93.3	93.5	93.0	13	8.6	3.6 2.7	3.2
EDRN 200L 4	27	174	1478	52	0.84	93.6	94.0	93.6	14	7.3	2.8 2.1	2.7
EDRN 225S 4	33	215	1481	58	0.89	94.5	94.5	93.9	11	7.2	2.5 2.0	2.2
EDRN 225M 4	40	260	1482	72	0.86	94.4	94.6	94.2	7	8.5	2.9 2.2	2.6
EDRN 250M 4	50	320	1483	93	0.81	94.3	94.8	94.6	6	8.2	3.7 2.4	2.8
EDRN 280M 4	68	440	1482	128	0.86	95.0	95.3	95.0	8	8.2	3.8 2.2	2.4
EDRN 315S 4	80	510	1487	136	0.88	95.1	95.4	95.2	13	7.1	2.6 1.9	2.8
EDRN 315M 4	100	640	1484	170	0.88	95.6	95.8	95.4	14	6.6	2.3 1.7	2.4

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4.2.9 EDRN.., 400 V, 50 Hz, 2G, T3 (DIN V 42673-2)

Motor	P_N	M_N	n_N	I_N	cosφ	$\eta_{50\%}$	$\eta_{75\%}$	$\eta_{100\%}$	t_E	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
	kW	Nm	min^{-1}	A		%	%	%	s			
EDRN 90S 4	1	6.5	1465	2.4	0.70	80.7	83.8	84.5	10	8.2	3.0 2.3	3.7
EDRN 90L 4	1.35	8.8	1464	3.35	0.71	82.8	85.2	85.3	8	8.2	3.0 2.3	3.7
EDRN 100LS 4	2	13	1466	4.5	0.73	85.2	86.8	86.7	8	8.4	3.2 2.5	3.6
EDRN 100L 4	2.5	16.3	1462	5.6	0.73	86.2	87.7	87.7	8	10.0	4.0 2.7	4.4
EDRN 112M 4	3.6	23.5	1469	7.4	0.78	87.5	88.9	88.6	6	10.0	2.7 1.8	4.0
EDRN 132S 4	5	32.5	1468	10.2	0.80	89.0	90.0	89.6	6	9.6	3.1 3.2	4.0
EDRN 132M 4	6.8	44	1472	14.1	0.76	89.8	90.7	90.4	10	9.1	3.5 2.7	3.7
EDRN 160M 4	10	65	1477	21	0.79	91.5	91.9	91.4	6	8.3	2.9 2.4	3.3
EDRN 160L 4	13.5	87	1476	28.5	0.76	92.1	92.5	92.1	5	9.1	3.3 2.2	3.7

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4.2.10 EDRN.., 380 V, 60 Hz, 3GD, 3GD-c, T3 /T120°C

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
EDRN 80M 4	0.75	4.1	1746	1.8	0.74	82.8	85.2	85.5	7.7	3.4 2.7	3.9
EDRN 90S 4	1.1	6	1757	2.65	0.72	84.4	86.5	86.5	7.7	2.9 2.1	3.6
EDRN 90L 4	1.5	8.1	1763	3.5	0.74	84.6	86.5	86.5	8.5	3.0 1.7	3.6
EDRN 100LM 4	2.2	12	1757	4.95	0.75	88.6	89.8	89.5	8.6	3.1 2.2	3.8
EDRN 100L 4	3	16.3	1759	6.8	0.75	88.4	89.6	89.5	8.7	3.5 2.1	3.9
EDRN 112M 4	4	21.5	1766	8.3	0.81	89.1	89.1	89.5	10.0	2.4 1.3	3.7
EDRN 132S 4	5.5	30	1765	11	0.83	91.4	92.3	91.7	9.1	3.1 2.8	4.1
EDRN 132M 4	7.5	40.5	1770	15.7	0.79	91.6	92.1	91.7	8.0	3.4 2.3	3.4
EDRN 132L 4	9.2	49.5	1772	19.4	0.78	91.4	92.1	91.7	7.9	3.9 1.7	3.7
EDRN 160M 4	11	59	1774	22	0.81	91.5	92.5	92.4	6.4	2.4 1.8	2.8
EDRN 160L 4	15	81	1774	29.5	0.82	92.5	93.3	93.0	8.4	3.1 2.1	3.4
EDRN 180M 4	18.5	99	1779	35	0.86	93.3	93.8	93.6	8.9	3.7 3.1	3.6
EDRN 180L 4	22	118	1779	41	0.88	93.6	93.9	93.6	9.1	3.8 2.4	3.6
EDRN 200L 4	30	161	1781	58	0.84	93.4	94.1	94.1	7.9	3.2 2.3	3.0
EDRN 225S 4	37	198	1784	68	0.88	94.5	94.8	94.5	8.4	3.1 1.6	2.2
EDRN 225M 4	45	240	1784	83	0.87	94.8	95.2	95.0	8.3	3.6 2.0	2.4
EDRN 250ME 4	55	295	1786	105	0.83	94.6	95.3	95.4	8.0	4.1 2.1	2.5
EDRN 280S 4	75	400	1784	147	0.81	94.9	95.4	95.4	8.6	4.3 2.4	2.8
EDRN 280M 4	90	480	1783	168	0.85	95.0	95.5	95.4	7.4	4.3 2.3	2.6
EDRN 315ME 4	132	700	1790	240	0.87	95.3	96.0	96.2	7.8	3.5 2.9	4.0
EDRN 315L 4	160	860	1787	285	0.88	95.8	96.3	96.2	6.9	2.9 2.4	3.3

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Motor type	P_N	M_N	n_N	m_{Mot}	J_{Mot} [1]	BE..	Z_0 BGE	M_B	m_{BMot}	J_{BMot} [1]
	kW	Nm	min^{-1}	kg	10^{-4} kgm²		h^{-1}	Nm	kg	10^{-4} kgm²
EDRN 80M 4	0.75	4.1	1746	14	28.1	BE2	1060	10	19	32.6
EDRN 90S 4	1.1	6	1757	20	59.6	BE2	770	14	24	64.4
EDRN 90L 4	1.5	8.1	1763	23	72.9	BE5	750	20	29	78.9
EDRN 100LM 4	2.2	12	1757	33	96.3	BE5	590	28	39	102
EDRN 100L 4	3	16.3	1759	34	117	BE5	460	40	40	123
EDRN 112M 4	4	21.5	1766	45	183	BE11	370	55	59	193
EDRN 132S 4	5.5	30	1765	57	246	BE11	270	80	71	256
EDRN 132M 4	7.5	40.5	1770	73	405	BE20	140	110	100	456
EDRN 132L 4	9.2	49.5	1772	82	463	BE20	120	110	110	514
EDRN 160M 4	11	59	1774	115	839	BE20	120	150	145	899
EDRN 160L 4	15	81	1774	130	1060	BE30	100	200	170	1200
EDRN 180M 4	18.5	99	1779	155	1660	BE30	60	200	195	1790
EDRN 180L 4	22	118	1779	175	1970	BE32	60	300	220	2200
EDRN 200L 4	30	161	1781	280	2800	BE32	60	400	335	3030
EDRN 225S 4	37	198	1784	310	4490	BE32	30	400	365	4720
EDRN 225M 4	45	240	1784	310	4490	BE60	25	400 [2]	380	4820
EDRN 250ME 4	55	295	1786	510	9070	BE120	20	600	610	9680
EDRN 280S 4	75	400	1784	520	9070	BE120	20	800	620	9680
EDRN 280M 4	90	480	1783	630	12100	BE120	10	800 [2]	730	12700
EDRN 315ME 4	132	700	1790	1000	28600	BE120	5	800 [2]	1100	29300
EDRN 315L 4	160	860	1787	1020	28900	BE120	5	800 [2]	1120	29500

1) The values apply to the designs 3D and 3GD / 3D-c and 3GD-c. For the mass moments of inertia Jmot for 3G/3G-c design, refer to chapter "Mass moment of inertia for 3G and 3G-c design"

2) The braking torque M_B does not meet the requirements: M_B ≥ 2xM_N

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4.2.11 EDRN.., 380 V, 60 Hz, 2D, 2D-b, T120°C

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
EDRN 80M 4	0.75	4.1	1740	1.88	0.74	82.0	84.9	85.5	7.6	3.4 2.7	3.9
EDRN 90S 4	1.1	6	1755	2.75	0.73	83.5	86.0	86.5	8.3	3.0 2.1	3.6
EDRN 90L 4	1.5	8.1	1761	3.8	0.74	83.8	86.1	86.5	8.3	3.0 1.8	3.6
EDRN 100LM 4	2.2	12	1757	5.1	0.75	88.1	89.5	89.5	8.6	3.1 2.2	3.8
EDRN 100L 4	3	16.3	1756	7.1	0.76	87.6	89.3	89.5	9.3	3.6 2.1	4.0
EDRN 112M 4	4	21.5	1764	8.9	0.81	88.4	89.6	89.5	9.2	2.5 1.3	3.7
EDRN 132S 4	5.5	30	1761	11.8	0.84	90.9	91.8	91.7	9.2	3.2 2.6	3.9
EDRN 132M 4	7.5	40.5	1768	16.6	0.78	91.1	91.9	91.7	8.5	3.4 2.4	3.4
EDRN 132L 4	9.2	49.5	1770	21	0.77	91.0	91.9	91.7	8.9	3.9 1.7	3.7
EDRN 160M 4	11	59	1773	23	0.81	91.2	92.3	92.4	8.7	2.4 1.8	2.9
EDRN 160L 4	15	81	1774	31.5	0.81	92.3	93.3	93.0	8.8	3.1 2.1	3.4
EDRN 180M 4	18.5	99	1779	37	0.86	93.3	93.8	93.6	10.4	3.7 3.1	3.6
EDRN 180L 4	22	118	1779	42.5	0.88	93.6	93.9	93.6	9.4	3.8 2.4	3.6
EDRN 200L 4	30	161	1781	62	0.84	93.4	94.1	94.1	8.3	3.2 2.3	3.0
EDRN 225S 4	37	198	1782	69	0.88	94.5	94.8	94.5	8.5	3.1 1.6	2.2
EDRN 225M 4	45	240	1783	89	0.85	94.8	95.2	95.0	9.6	3.6 2.0	2.4
EDRN 250ME 4	55	295	1783	116	0.83	94.6	95.3	95.4	8.0	4.1 2.1	2.5
EDRN 280S 4	75	400	1782	159	0.79	94.9	95.4	95.4	8.6	4.3 2.4	2.8
EDRN 280M 4	90	480	1783	169	0.85	95.0	95.5	95.4	7.4	4.3 2.3	2.6

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4.2.12 EDRN.., 380 V, 60 Hz, 2G, 2G-b T3, 2GD, 2GD-b T3/120°C

Motor	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	t_E s	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
EDRN 80M 4	0.75	4.1	1740	1.88	0.74	82.0	84.9	85.5	20	7.6	3.4 2.7	3.9
EDRN 90S 4	1.1	6	1755	2.75	0.73	83.5	86.0	86.5	10	8.3	3.0 2.1	3.6
EDRN 90L 4	1.5	8.1	1761	3.8	0.74	83.8	86.1	86.5	8	8.3	3.0 1.8	3.6
EDRN 100LM 4	2.2	12	1757	5.1	0.75	88.1	89.5	89.5	9	8.6	3.1 2.2	3.8
EDRN 100L 4	3	16.3	1756	7.1	0.76	87.6	89.3	89.5	8	9.3	3.6 2.1	4.0
EDRN 112M 4	4	21.5	1764	8.9	0.81	88.4	89.6	89.5	6	9.2	2.5 1.3	3.7
EDRN 132S 4	5.5	30	1761	11.8	0.84	90.9	91.8	91.7	6	9.2	3.2 2.6	3.9
EDRN 132M 4	7.5	40.5	1768	16.6	0.78	91.1	91.9	91.7	5	8.5	3.4 2.4	3.4
EDRN 132L 4	9.2	49.5	1770	21	0.77	91.0	91.9	91.7	5	8.9	3.9 1.7	3.7
EDRN 160M 4	11	59	1773	23	0.81	91.2	92.3	92.4	6	8.7	2.4 1.8	2.9
EDRN 160L 4	15	81	1774	31.5	0.81	92.3	93.3	93.0	5	8.8	3.1 2.1	3.4
EDRN 180L 4	17.5	94	1774	34	0.88	93.5	93.9	93.6	6	9.1	3.2 2.5	2.9
EDRN 200L 4	24	129	1778	48	0.84	92.8	93.8	93.8	5	8.0	2.8 2.3	3.1
EDRN 250ME 4	30	160	1785	58	0.84	92.7	93.8	94.1	8	8.2	3.6 2.0	2.6
EDRN 280S 4	36	193	1779	71	0.85	93.6	94.5	94.5	8	7.1	2.8 2.0	2.3
EDRN 280M 4	44	235	1776	87	0.87	94.6	95.1	95.0	8	6.9	2.6 1.8	2.0

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4.2.13 EDRN.., 380 V, 60 Hz, 2G, 2G-b, T2

Motor	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	t_E s	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
EDRN 80M 4	0.75	4.1	1740	1.88	0.74	82.0	84.9	85.5	23	7.6	3.4 2.7	3.9
EDRN 90S 4	1.1	6	1755	2.75	0.73	83.5	86.0	86.5	12	8.3	3.0 2.1	3.6
EDRN 90L 4	1.5	8.1	1761	3.8	0.74	83.8	86.1	86.5	9	8.3	3.0 1.8	3.6
EDRN 100LM 4	2.2	12	1757	5.1	0.75	88.1	89.5	89.5	11	8.6	3.1 2.2	3.8
EDRN 100L 4	3	16.3	1756	7.1	0.76	87.6	89.3	89.5	9	9.3	3.6 2.1	4.0
EDRN 112M 4	4	21.5	1764	8.9	0.81	88.4	89.6	89.5	8	9.2	2.5 1.3	3.7
EDRN 132S 4	5.5	30	1761	11.8	0.84	90.9	91.8	91.7	8	9.2	3.2 2.6	3.9
EDRN 132M 4	7.5	40.5	1768	16.6	0.78	91.1	91.9	91.7	12	8.5	3.4 2.4	3.4
EDRN 132L 4	9.2	49.5	1770	21	0.77	91.0	91.9	91.7	9	8.9	3.9 1.7	3.7
EDRN 160M 4	11	59	1773	23	0.81	91.2	92.3	92.4	19	8.7	2.4 1.8	2.9
EDRN 160L 4	15	81	1774	31.5	0.81	92.3	93.3	93.0	16	8.8	3.1 2.1	3.4
EDRN 180M 4	17.5	94	1776	34.5	0.87	93.4	93.9	93.6	12	10.0	4.0 3.3	3.9
EDRN 180L 4	20	108	1776	39	0.87	93.3	93.8	93.6	13	9.0	3.3 2.8	3.2
EDRN 200L 4	27	145	1778	54	0.84	93.3	94.1	94.1	14	8.0	2.8 2.4	3.2
EDRN 225S 4	33	177	1781	61	0.89	94.4	94.7	94.5	11	7.9	3.0 2.0	2.4
EDRN 225M 4	40	215	1782	76	0.86	94.7	95.1	95.0	7	9.3	3.5 2.1	2.6
EDRN 250ME 4	50	270	1781	100	0.85	94.8	95.4	95.4	12	7.2	4.3 2.3	2.6
EDRN 280M 4	68	365	1782	134	0.86	94.6	95.3	95.4	8	9.0	3.4 2.0	2.7

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4.2.14 EDRN.., 440 V, 60 Hz, 3GD, 3GD-c, T3 / T120°C

Information on motors

Motor	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		%	%	%			
EDRN 80M 4	0.75	4.1	1746	1.56	0.74	82.8	85.2	85.5	7.7	3.4 2.7	3.9
EDRN 90S 4	1.1	6	1757	2.3	0.72	84.4	86.5	86.5	7.7	2.9 2.1	3.6
EDRN 90L 4	1.5	8.1	1763	3	0.74	84.6	86.5	86.5	8.5	3.0 1.7	3.6
EDRN 100LM 4	2.2	12	1757	4.25	0.75	88.6	89.8	89.5	8.6	3.1 2.2	3.8
EDRN 100L 4	3	16.3	1759	5.9	0.75	88.4	89.6	89.5	8.7	3.5 2.1	3.9
EDRN 112M 4	4	21.5	1766	7.3	0.81	89.1	89.1	89.5	10.0	2.4 1.3	3.7
EDRN 132S 4	5.5	30	1765	9.8	0.83	91.4	92.3	91.7	9.1	3.1 2.8	4.1
EDRN 132M 4	7.5	40.5	1770	13.9	0.79	91.6	92.1	91.7	8.0	3.4 2.3	3.4
EDRN 132L 4	9.2	49.5	1772	17	0.78	91.4	92.1	91.7	7.9	3.9 1.7	3.7
EDRN 160M 4	11	59	1774	19.6	0.81	91.5	92.5	92.4	6.4	2.4 1.8	2.8
EDRN 160L 4	15	81	1774	26.5	0.82	92.5	93.3	93.0	8.4	3.1 2.1	3.4
EDRN 180M 4	18.5	99	1779	30.5	0.86	93.3	93.8	93.6	8.9	3.7 3.1	3.6
EDRN 180L 4	22	118	1779	36.5	0.88	93.6	93.9	93.6	9.1	3.8 2.4	3.6
EDRN 200L 4	30	161	1781	52	0.84	93.4	94.1	94.1	7.9	3.2 2.3	3.0
EDRN 225S 4	37	198	1784	61	0.88	94.5	94.8	94.5	8.4	3.1 1.6	2.2
EDRN 225M 4	45	240	1784	73	0.87	94.8	95.2	95.0	8.3	3.6 2.0	2.4
EDRN 250ME 4	55	295	1786	94	0.83	94.6	95.3	95.4	8.0	4.1 2.1	2.5
EDRN 280S 4	75	400	1784	128	0.81	94.9	95.4	95.4	8.6	4.3 2.4	2.8
EDRN 280M 4	90	480	1783	151	0.85	95.0	95.5	95.4	7.4	4.3 2.3	2.6

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Further information on motors and brakemotors

Motor type	P_N	M_N	n_N	m_{Mot}	J_{Mot} [1]	BE..	Z_0 BGE	M_B	m_{BMot}	J_{BMot} [1]
	kW	Nm	min^{-1}	kg	10^{-4} kgm²		h^{-1}	Nm	kg	10^{-4} kgm²
EDRN 80M 4	0.75	4.1	1746	14	28.1	BE2	1060	10	19	32.6
EDRN 90S 4	1.1	6	1757	20	59.6	BE2	770	14	24	64.4
EDRN 90L 4	1.5	8.1	1763	23	72.9	BE5	750	20	29	78.9
EDRN 100LM 4	2.2	12	1757	33	96.3	BE5	590	28	39	102
EDRN 100L 4	3	16.3	1759	34	117	BE5	460	40	40	123
EDRN 112M 4	4	21.5	1766	45	183	BE11	370	55	59	193
EDRN 132S 4	5.5	30	1765	57	246	BE11	270	80	71	256
EDRN 132M 4	7.5	40.5	1770	73	405	BE20	140	110	100	456
EDRN 132L 4	9.2	49.5	1772	82	463	BE20	120	110	110	514
EDRN 160M 4	11	59	1774	115	839	BE20	120	150	145	899
EDRN 160L 4	15	81	1774	130	1060	BE30	100	200	170	1200
EDRN 180M 4	18.5	99	1779	155	1660	BE30	60	200	195	1790
EDRN 180L 4	22	118	1779	175	1970	BE32	60	300	220	2200
EDRN 200L 4	30	161	1781	280	2800	BE32	60	400	335	3030
EDRN 225S 4	37	198	1784	310	4490	BE32	30	400	365	4720
EDRN 225M 4	45	240	1784	310	4490	BE60	25	400 [2]	380	4820
EDRN 250ME 4	55	295	1786	510	9070	BE120	20	600	610	9680
EDRN 280S 4	75	400	1784	520	9070	BE120	20	800	620	9680
EDRN 280M 4	90	480	1783	630	12100	BE120	10	800 [2]	730	12700

1) The values apply to the designs 3D and 3GD / 3D-c and 3GD-c. For the mass moments of inertia Jmot for 3G/3G-c design, refer to chapter "Mass moment of inertia for 3G and 3G-c design"

2) The braking torque M_B does not meet the requirements: M_B ≥ 2xM_N

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4.2.15 EDRN.., 440 V, 60 Hz, 2D, 2D-b, T120°

Motor	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		%	%	%			
EDRN 80M 4	0.75	4.1	1740	1.62	0.74	82.0	84.9	85.5	7.6	3.4 2.7	3.9
EDRN 90S 4	1.1	6	1755	2.4	0.73	83.5	86.0	86.5	8.3	3.0 2.1	3.6
EDRN 90L 4	1.5	8.1	1761	3.3	0.74	83.8	86.1	86.5	8.3	3.0 1.8	3.6
EDRN 100LM 4	2.2	12	1757	4.45	0.75	88.1	89.5	89.5	8.6	3.1 2.2	3.8
EDRN 100L 4	3	16.3	1756	6.1	0.76	87.6	89.3	89.5	9.3	3.6 2.1	4.0
EDRN 112M 4	4	21.5	1764	7.7	0.81	88.4	89.6	89.5	9.2	2.5 1.3	3.7
EDRN 132S 4	5.5	30	1761	10.2	0.84	90.9	91.8	91.7	9.2	3.2 2.6	3.9
EDRN 132M 4	7.5	40.5	1768	14.3	0.78	91.1	91.9	91.7	8.5	3.4 2.4	3.4
EDRN 132L 4	9.2	49.5	1770	18.2	0.77	91.0	91.9	91.7	8.9	3.9 1.7	3.7
EDRN 160M 4	11	59	1773	20	0.81	91.2	92.3	92.4	8.7	2.4 1.8	2.9
EDRN 160L 4	15	81	1774	27.5	0.81	92.3	93.3	93.0	8.8	3.1 2.1	3.4
EDRN 180M 4	18.5	99	1779	32	0.86	93.3	93.8	93.6	10.4	3.7 3.1	3.6
EDRN 180L 4	22	118	1779	37	0.88	93.6	93.9	93.6	9.4	3.8 2.4	3.6
EDRN 200L 4	30	161	1781	54	0.84	93.4	94.1	94.1	8.3	3.2 2.3	3.0
EDRN 225S 4	37	198	1782	60	0.88	94.5	94.8	94.5	8.5	3.1 1.6	2.2
EDRN 225M 4	45	240	1783	76	0.85	94.8	95.2	95.0	9.6	3.6 2.0	2.4
EDRN 250ME 4	55	295	1783	100	0.83	94.6	95.3	95.4	8.0	4.1 2.1	2.5
EDRN 280S 4	75	400	1782	137	0.79	94.9	95.4	95.4	8.6	4.3 2.4	2.8
EDRN 280M 4	90	480	1783	146	0.85	95.0	95.5	95.4	7.4	4.3 2.3	2.6

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4.2.16 EDRN.., 440 V, 60 Hz, 2G, 2G-b T3, 2GD, 2GD-b T3/T120°C

Motor	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	t_E s	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
EDRN 80M 4	0.75	4.1	1740	1.62	0.74	82.0	84.9	85.5	20	7.6	3.4 2.7	3.9
EDRN 90S 4	1.1	6	1755	2.4	0.73	83.5	86.0	86.5	10	8.3	3.0 2.1	3.6
EDRN 90L 4	1.5	8.1	1761	3.3	0.74	83.8	86.1	86.5	8	8.3	3.0 1.8	3.6
EDRN 100LM 4	2.2	12	1757	4.45	0.75	88.1	89.5	89.5	9	8.6	3.1 2.2	3.8
EDRN 100L 4	3	16.3	1756	6.1	0.76	87.6	89.3	89.5	8	9.3	3.6 2.1	4.0
EDRN 112M 4	4	21.5	1764	7.7	0.81	88.4	89.6	89.5	6	9.2	2.5 1.3	3.7
EDRN 132S 4	5.5	30	1761	10.2	0.84	90.9	91.8	91.7	6	9.2	3.2 2.6	3.9
EDRN 132M 4	7.5	40.5	1768	14.3	0.78	91.1	91.9	91.7	5	8.5	3.4 2.4	3.4
EDRN 132L 4	9.2	49.5	1770	18.2	0.77	91.0	91.9	91.7	5	8.9	3.9 1.7	3.7
EDRN 160M 4	11	59	1773	20	0.81	91.2	92.3	92.4	6	8.7	2.4 1.8	2.9
EDRN 160L 4	15	81	1774	27.5	0.81	92.3	93.3	93.0	5	8.8	3.1 2.1	3.4
EDRN 180L 4	17.5	94	1774	29.5	0.88	93.5	93.9	93.6	6	9.1	3.2 2.5	2.9
EDRN 200L 4	24	129	1778	41.5	0.84	92.8	93.8	93.8	5	8.0	2.8 2.3	3.1
EDRN 250ME 4	30	160	1785	50	0.84	92.7	93.8	94.1	8	8.2	3.6 2.0	2.6
EDRN 280S 4	36	193	1779	61	0.85	93.6	94.5	94.5	8	7.1	2.8 2.0	2.3
EDRN 280M 4	44	235	1776	75	0.87	94.6	95.1	95.0	8	6.9	2.6 1.8	2.0

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4.2.17 EDRN.., 440 V, 60 Hz, 2G, 2G-b, T2

Motor	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	t_E s	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
EDRN 80M 4	0.75	4.1	1740	1.62	0.74	82.0	84.9	85.5	23	7.6	3.4 2.7	3.9
EDRN 90S 4	1.1	6	1755	2.4	0.73	83.5	86.0	86.5	12	8.3	3.0 2.1	3.6
EDRN 90L 4	1.5	8.1	1761	3.3	0.74	83.8	86.1	86.5	9	8.3	3.0 1.8	3.6
EDRN 100LM 4	2.2	12	1757	4.45	0.75	88.1	89.5	89.5	11	8.6	3.1 2.2	3.8
EDRN 100L 4	3	16.3	1756	6.1	0.76	87.6	89.3	89.5	9	9.3	3.6 2.1	4.0
EDRN 112M 4	4	21.5	1764	7.7	0.81	88.4	89.6	89.5	8	9.2	2.5 1.3	3.7
EDRN 132S 4	5.5	30	1761	10.2	0.84	90.9	91.8	91.7	8	9.2	3.2 2.6	3.9
EDRN 132M 4	7.5	40.5	1768	14.3	0.78	91.1	91.9	91.7	12	8.5	3.4 2.4	3.4
EDRN 132L 4	9.2	49.5	1770	18.2	0.77	91.0	91.9	91.7	9	8.9	3.9 1.7	3.7
EDRN 160M 4	11	59	1773	20	0.81	91.2	92.3	92.4	19	8.7	2.4 1.8	2.9
EDRN 160L 4	15	81	1774	27.5	0.81	92.3	93.3	93.0	16	8.8	3.1 2.1	3.4
EDRN 180M 4	17.5	94	1776	30	0.87	93.4	93.9	93.6	12	10.0	4.0 3.3	3.9
EDRN 180L 4	20	108	1776	34	0.87	93.3	93.8	93.6	13	9.0	3.3 2.8	3.2
EDRN 200L 4	27	145	1778	47	0.84	93.3	94.1	94.1	14	8.0	2.8 2.4	3.2
EDRN 225S 4	33	177	1781	53	0.89	94.4	94.7	94.5	11	7.9	3.0 2.0	2.4
EDRN 225M 4	40	215	1782	65	0.86	94.7	95.1	95.0	7	9.3	3.5 2.1	2.6
EDRN 250ME 4	50	270	1781	86	0.85	94.8	95.4	95.4	12	7.2	4.3 2.3	2.6
EDRN 280M 4	68	365	1782	116	0.86	94.6	95.3	95.4	8	9.0	3.4 2.0	2.7

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4.2.18 Mass moment of inertia for 3G and 3G-c design

The following table lists the motor moment of inertia for the designs 3G and 3G-c:

Motor	J_{Mot}	J_{Bmot}
EDRN 80M 4	24.7	29.2
EDRN 90S 4	54	58.7
EDRN 90L 4	67.2	73.2
EDRN 100LS 4	81.4	87.4
EDRN 100L 4	112	118
EDRN 112M 4	178	188
EDRN 132S 4	241	251
EDRN 132M 4	381	432
EDRN 132L 4	439	490
EDRN 160M 4	817	877
EDRN 160L 4	1040	1170
EDRN 180M 4	1630	1860
EDRN 180L 4	1950	2180
EDRN 200L 4	2660	2890
EDRN 225S 4	4350	4680
EDRN 225M 4	4350	4680
EDRN 250M 4	7360	7980
EDRN 280S 4	8940	9550
EDRN 280M 4	12000	12600
EDRN 315S 4	23400	24000
EDRN 315M 4	24800	25400
EDRN 315L 4	28600	29200
EDRN 315H 4	35200	35800

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4.3 Brake

The brake option /BE is available for motors in category 3/EPL .c.

4.3.1 Braking torque assignment

Motor size EDRN80 – 100

Motor	Brake	Braking torque gradation in Nm									
EDRN80	BE05	1.8	2.5	3.5							
	BE1				5.0	7.0					
	BE2				5.0	7.0	10	14			
EDRN90	BE1				5.0	7.0					
	BE2				5.0	7.0	10	14			
	BE5							14	20	28	40
EDRN100	BE1				5.0	7.0					
	BE2				5.0	7.0	10	14			
	BE5							14	20	28	40

Motor size EDRN112 – 180

Motor	Brake	Braking torque gradation in Nm										
EDRN112	BE5	14	20	28	40							
	BE11			20	40	55	80					
EDRN132S	BE5	14	20	28	40							
	BE11			20	40	55	80					
EDRN132M/L	BE11			20	40	55	80					
	BE20				40	55	80	110	150			
EDRN160 EDRN180	BE20				40	55	80	110	150			
	BE30						75	100	150	200	300	
	BE32							100	150	200	300	400

Motor size EDRN200 – 315

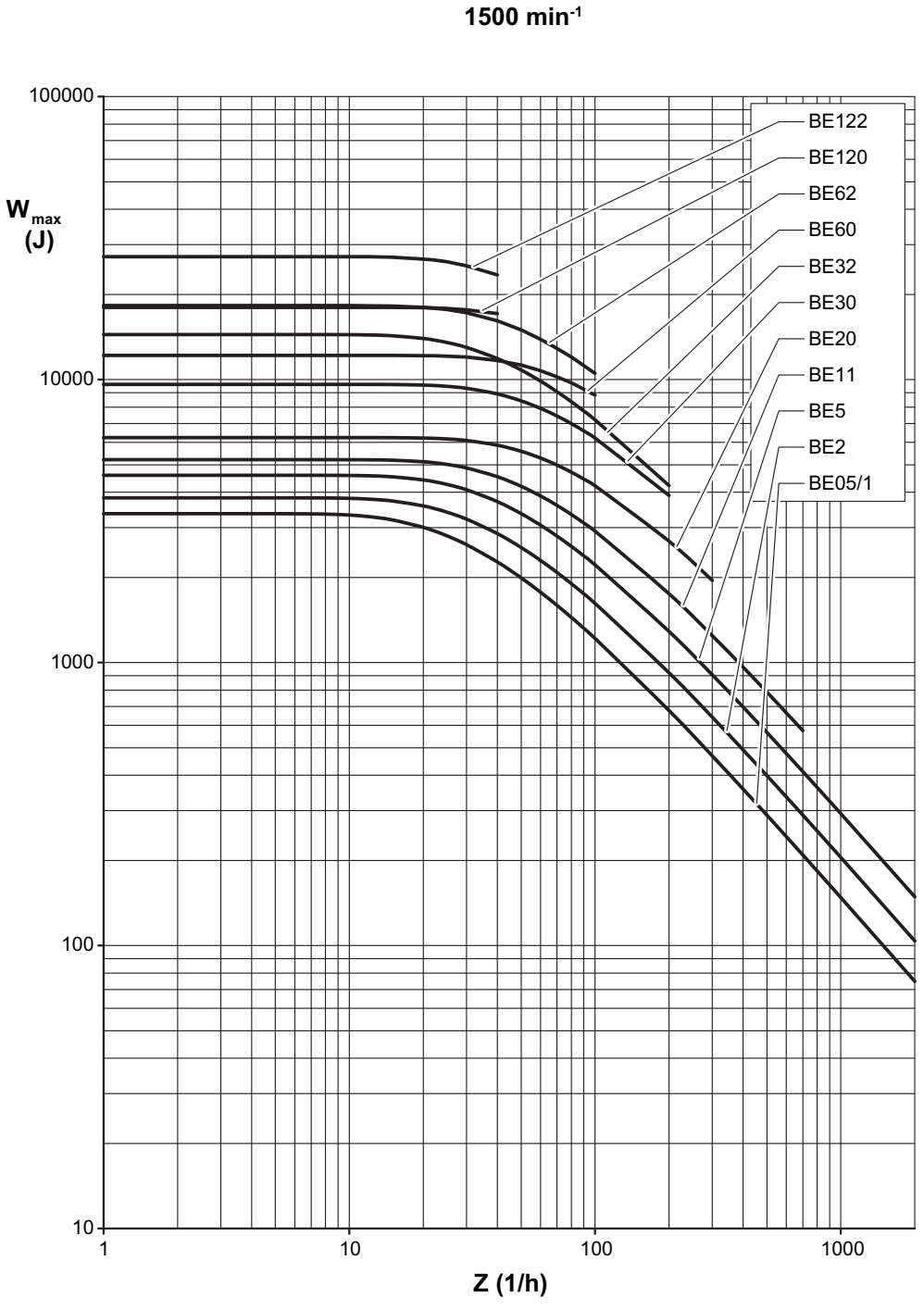
Motor	Brake	Braking torque gradation in Nm											
EDRN200 EDRN225	BE30	75	100	150	200								
	BE32		100	150	200	300	400						
	BE60				200	300	400	500					
	BE62[1)]						400		600	800	1000		
EDRN250/280	BE60				200	300	400	500					
	BE62[1)]						400		600	800	1000		
	BE120						400		600	800			
	BE122[1)]									800		1200	1600
EDRN315	BE120						400		600	800			
	BE122[1)]									800		1200	1600

1) Only for 3D, 3D-c design

4.3.2 Permitted braking work

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

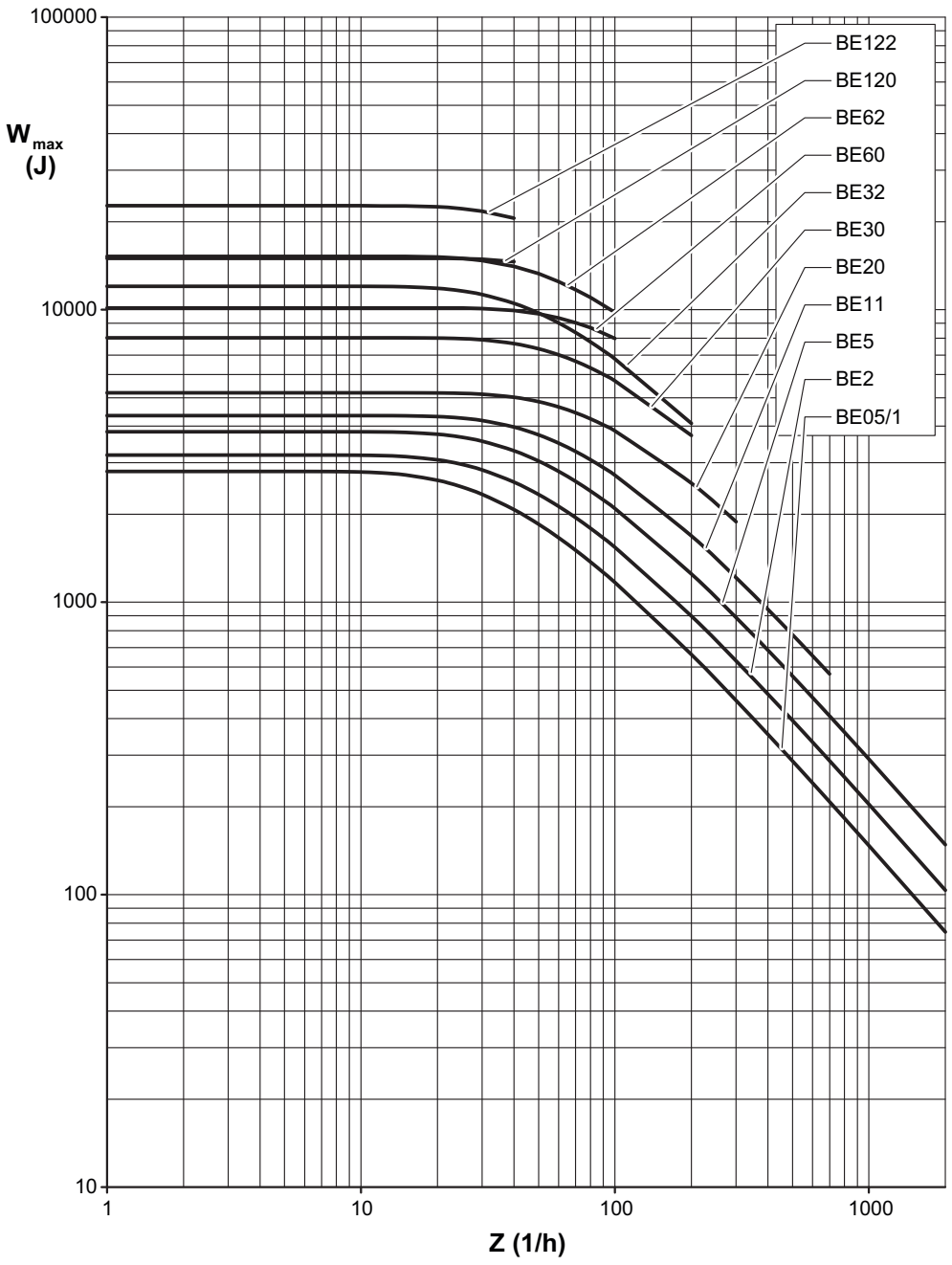
Permitted braking work for BE brakes



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1800 min^{-1}



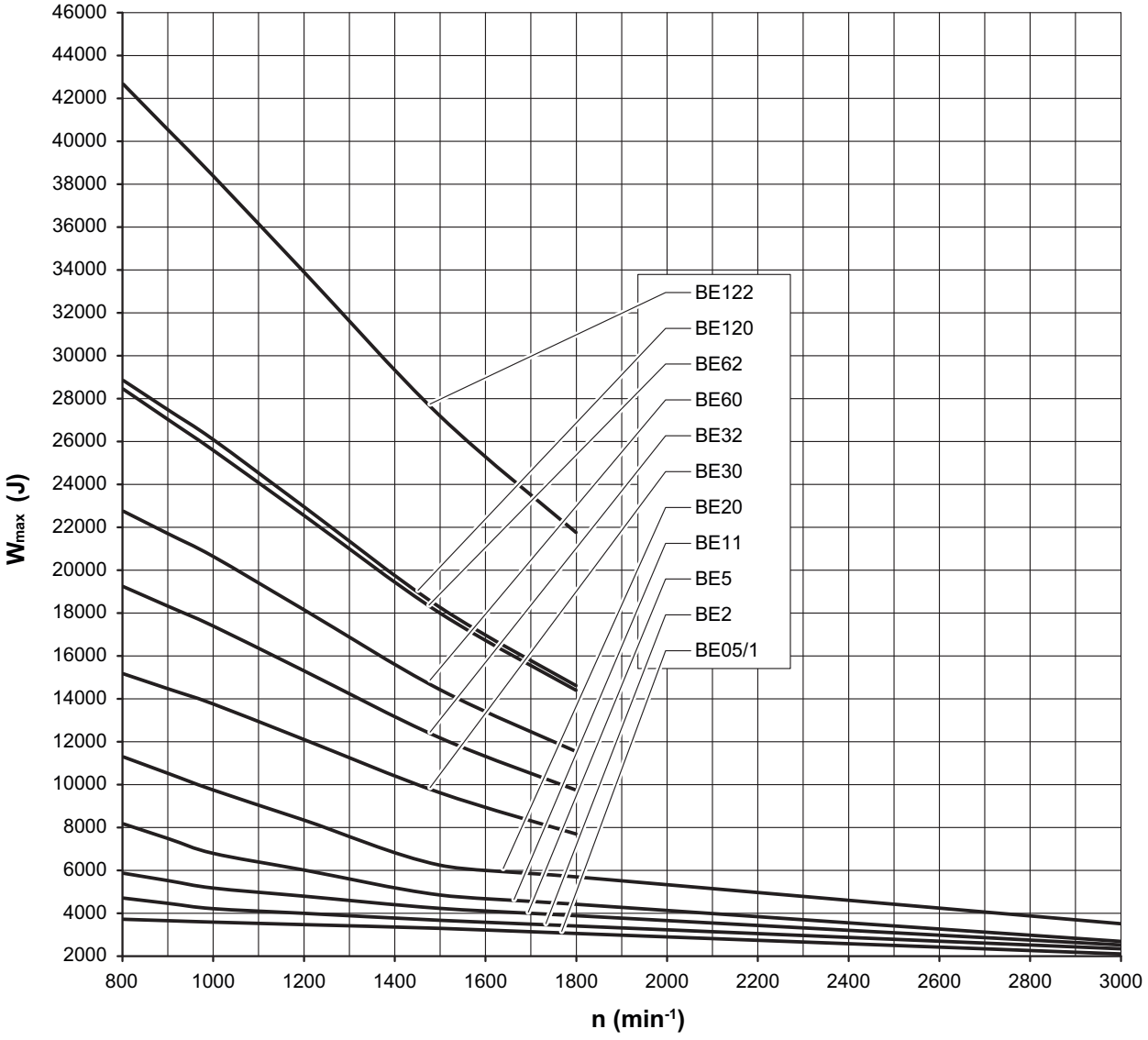
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4.3.3 Permitted braking work for BE brake in case of emergency stop

The permitted braking work of the brakes is defined for the speeds 1500 min^{-1} and 1800 min^{-1} in the known W^{max} / Z diagrams.

Values for intermediate speeds are often required for controlled drives. The following diagram and the value tables apply for the switching frequency Z = 1 1/h. They list the maximally permitted braking work in the event of emergency stop depending on the speed.

Maximum permitted braking work in case of emergency stop braking operations:



36028802649255307

INFORMATION

For brakes BE30 – BE122, braking operations above 1800 min^{-1} are not permitted.

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Table with values for maximally permitted braking work in case of emergency stop braking operations

n in min^{-1}	W_{max} in J										
	BE05/1	BE2	BE5	BE11	BE20	BE30	BE32	BE60	BE62	BE120	BE122
800	3718	4711	5873	8184	11310	15185	22777	19256	28884	28480	42720
900	3651	4462	5524	7489	10530	14474	21712	18328	27492	27040	40560
1000	3584	4212	5174	6794	9750	13764	20646	17400	26100	25600	38400
1100	3526	4103	4984	6405	9048	12935	19403	16356	24534	24080	36160
1200	3468	3995	4794	6016	8346	12106	18160	15312	22968	22560	33920
1300	3409	3886	4605	5627	7644	11278	16916	14268	21402	21040	31680
1400	3351	3778	4415	5238	6942	10449	15673	13224	19836	19520	29440
1500	3293	3669	4225	4849	6240	9620	14430	12180	18270	18000	27200
1600	3213	3580	4111	4705	6058	8979	13468	11368	17052	16800	25387
1700	3134	3492	3998	4561	5876	8337	12506	10556	15834	15600	23573
1800	3054	3403	3884	4416	5694	7696	11544	9744	14616	14400	21760
1900	2975	3315	3770	4272	5512	–	–	–	–	–	–
2000	2895	3226	3657	4128	5330	–	–	–	–	–	–
2100	2816	3137	3543	3984	5148	–	–	–	–	–	–
2200	2736	3049	3429	3840	4966	–	–	–	–	–	–
2300	2657	2960	3316	3695	4784	–	–	–	–	–	–
2400	2577	2872	3202	3551	4602	–	–	–	–	–	–
2500	2498	2783	3088	3407	4420	–	–	–	–	–	–
2600	2418	2694	2975	3263	4238	–	–	–	–	–	–
2700	2339	2606	2861	3119	4056	–	–	–	–	–	–
2800	2259	2517	2747	2974	3874	–	–	–	–	–	–
2900	2180	2429	2634	2830	3692	–	–	–	–	–	–
3000	2100	2340	2520	2686	3510	–	–	–	–	–	–

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4.3.4 Safety brake

In regard of braking and holding, safety brakes serve to realize safety functions and thus increase the overall safety. The safety brake represents the safety-relevant actuator in the intelligent interaction of sensor, control and actuator.

The safety brakes meet category 1 according to EN ISO 13849, parts 1 and 2, and meet the requirements of functional safety.

Available safety brakes: BE05 to BE32

The following safety functions can be realized for braking and holding:

- SBA (safe brake actuation)
- SBH (safe brake hold)

4.3.5 Brake control

With design 3D, 3D-c, the brake rectifier is in the terminal box as standard. As an option, the brake rectifier can also be installed in the control cabinet.

With all other designs, the brake rectifier must be configured for installation in the control cabinet.

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4.4 Mechanical backstop

The option mechanical backstop /RS is available for motors in category 2 and 3, as well as EPL .b and .c. The mechanical backstop is used in order to prevent the rotor from running backwards on motors that have been switched off. Using the mechanical backstop to prevent an incorrect direction of rotation (cause by switching against the locking direction) is not permitted.

INFORMATION

In inverter operation, the speed range must only be used to reach lift-off speed as quick as possible. Permanent operation below the lift-off speed is not permitted.

4.4.1 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
EDRN80	130	860	2.1	0.42
EDRN90 EDRN100	370	750	2.8	1.65
EDRN112 EDRN132S	490	730	5.5	1.50
EDRN132M EDRN132L	700	700	8	4.5
EDRN160 EDRN180	1400	610	15.5	38.0
EDRN200 EDRN225	2500	400	25	45.0
EDRN250 EDRN280	2500	400	30	63.0
EDRN315	6300	320	48	75.0

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4.5 Encoders

The encoder option is available for motors in category 3/EPL .c. The following add-on encoders can be used:

En-coders	Motors	Encoder type	Mounting type	Supply	Signal	Wiring diagram
				DC V		
ES7S	EDR..71 – 132, EDRN80 – 132S	Incremental	Shaft-centered	7 – 30	1 Vss sin/cos	68180xx08
ES7R	EDR..71 – 132, EDRN80 – 132S	Incremental	Shaft-centered	7 – 30	TTL (RS422)	68179xx08
ES7C	EDR..71 – 132, EDRN80 – 132S	Incremental	Shaft-centered	4.75 – 30	HTL/TTL (RS422)	68179xx08
AS7W	EDR..71 – 132, EDRN80 – 132S	Absolute value	Shaft-centered	7 – 30	1 Vss sin/cos +RS485	68181xx08
AS7Y	EDR..71 – 132, EDRN80 – 132S	Absolute value	Shaft-centered	7 – 30	1 Vss sin/cos + SSI	68182xx07
EG7S	EDR..160 – 280, EDRN132M – 280	Incremental	Shaft-centered	7 – 30	1 Vss sin/cos	68180xx08
EG7R	EDR..160 – 280, EDRN132M – 280	Incremental	Shaft-centered	7 – 30	TTL (RS422)	68179xx08
EG7C	EDR..160 – 280, EDRN132M – 280	Incremental	Shaft-centered	4.75 – 30	HTL/TTL (RS422)	68179xx08
AG7W	EDR..160 – 280, EDRN132M – 280	Absolute value	Shaft-centered	7 – 30	1 Vss sin/cos +RS485	68181xx08
AG7Y	EDR..160 – 280, EDRN132M – 280	Absolute value	Shaft-centered	7 – 30	1 Vss sin/cos + SSI	68182xx07
EH7C	EDR../EDRN315	Incremental	Shaft-centered	10 – 30	HTL	08511xx08
EH7R	EDR../EDRN315	Incremental	Shaft-centered	10 – 30	TTL (RS422)	08511xx08
EH7S	EDR../EDRN315	Incremental	Shaft-centered	10 – 30	1 Vss sin/cos	08511xx08
EH7T	EDR../EDRN315	Incremental	Shaft-centered	5 (±5%)	TTL (RS422)	08511xx08
AH7Y	EDR../EDRN315	Incremental	Shaft-centered	9 – 30	TTL+SSI (RS422)	08259xx07
EV7C	EDR..71 – 280 EDRN80 – 280	Incremental	Flange centered	4.75 – 30	HTL/TTL (RS-422)	68179xx08
EV7R	EDR..71 – 280 EDRN80 – 280	Incremental	Flange centered	7 – 30	TTL (RS422)	68179xx08
EV7S	EDR..71 – 280 EDRN80 – 280	Incremental	Flange centered	7 – 30	1 Vss sin/cos	68180xx08
AV7W	EDR..71 – 280 EDRN80 – 280	Absolute value	Flange centered	7 – 30	1 Vss sin/cos (RS485)	68181xx08
AV7Y	EDR..71 – 280 EDRN80 – 280	Absolute value	Flange centered	7 – 30	1 Vss sin/cos + SSI	68182xx07

It may occur that not all options listed above can be selected in the Configurator. If required, the options must be enabled.

Built-in encoders are not available for ATEX/IECEx motors.

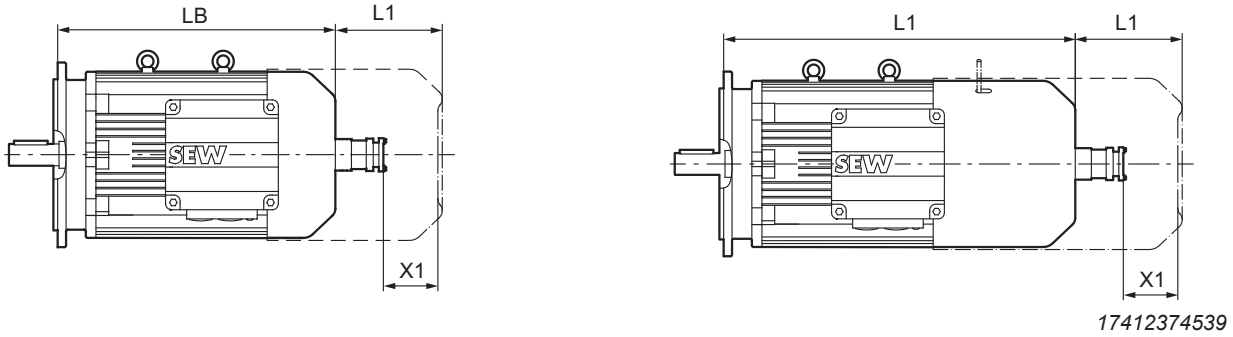
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4.5.1 Encoder mounting adapter for XV.A encoders according to customer specifications

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. For the dimensions of XV.A encoder mounting adapters for motors of category 3/EPL .c (EDRN80 – 280), refer to the following table.

Mounting adapter	Design	
	Encoder shaft	Centering
XV1A	6 mm	50 mm
XV2A	10 mm	50 mm
XV3A	12 mm	80 mm
XV4A	11 mm	85 mm
XV7A	10 mm	50 mm

Other mounting adapters are available on request.



Motor	Motor L1	Brake-motor L2	Additional length L3	Max. encoder length X1			Short protection cover	Max. encoder length X2			Long protective cover
				XV1A	XV2A	XV3A		XV1A	XV2A	XV3A	
	mm	mm	mm	mm	mm	mm		mm	mm	mm	
EDRN80	202	121	107	62	51	44	13629859	169	158	151	13620193
EDRN90 EDRN100	210	117	137	56	45	38	13614541	193	182	175	13616137
EDRN112 EDRN132S	279	167	175	107	96	89	13617036	282	271	264	13620746
EDRN132M EDRN132L	359	222	–	165	154	147	21004153	–	–	–	–
EDRN160 EDRN180	460	272	–	213	202	195	13634844	–	–	–	–
EDRN200 EDRN225	495	290	–	231	220	213	13622978	–	–	–	–
EDRN250 EDRN280	242		–	149	–	–	13629218	–	–	–	–
EDRN250 EDRN280	312		–	–	–	–	–	219	–	–	13636200

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Motor	Motor L1	Brakemotor L2	Additional length L3	Max. encoder length X1		Short protection cover	Max. encoder length X2		Long protective cover
				XV4A	XV7A		XV4A	XV7A	
	mm	mm	mm	mm	mm		mm	mm	
EDRN80	202	121	107	49	62	13629859	156	169	13620193
EDRN90 EDRN100	210	117	137	43	56	13614541	180	193	13616137
EDRN112 EDRN132S	279	167	175	94	107	13617036	269	282	13620746
EDRN132M EDRN132L	359	222	–	152	165	21004153	–	–	–
EDRN160 EDRN180	460	272	–	200	213	13634844	–	–	–
EDRN200 EDRN225	495	290	–	218	231	13622978	–	–	–
EDRN250 EDRN280	242		–	–	122	13629218	–	–	–
EDRN250 EDRN280	312		–	–	–	–	–	192	13636200

4.5.2 Safety encoders

Safety encoders allow you to increase the safety 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. This connection is dimensioned in such a way that fault exclusion is achieved.

Available safety encoders

Encoders	encoder interface
ES7S/EG7S	Safe sin/cos interface
AS7W/AG7W	RS485 interface (multi-turn) + safe sin/cos interface
AS7Y/AG7Y	SSI interface (multi-turn) + safe sin/cos interface

Safety encoders meet the requirements of SIL2 according to IEC 62061/IEC 61508, as well as PL d according to EN ISO 13849-1.

The following safety functions can be realized in regard of rotational speed, direction of rotation, idle state, and relative position:

SS1, SS2, SOS, SLS, SDI, SLI, SSR, SAR, SSM

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4.6 Forced cooling fan

The forced cooling fans /VE for motors in category 3/EPL .c are available with the following voltages for sized 71 – 315:

- 50 Hz: 200 – 303 V△ / 346 – 525 V⅄
- 60 Hz: 220 – 332 V△ / 380 – 575 V ⅄

INFORMATION

Operation at a single-phase supply voltage is not possible with the forced cooling fans (part number range 2097... and 2098...) with ATEX and IECEx approval.

Motors with forced air cooling must be protected against overload.

Due to the low motor currents, a PTC thermistor is installed in the types V80 – V160. To avoid exceeding the permitted surface temperatures in case of a fault, a suitable trip switch must be used.

If the motor with forced air cooling is not equipped with a PTC thermistor detector, the overload protection is achieved using a motor circuit breaker.

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4.6.1 Star connection 346 V – 525 V/50 Hz and 380 V – 575 V/60 Hz

Motor	Fan	Fan motor	Voltage range 50 Hz	Current	Voltage range 60 Hz	Current	Maximum power consumption
				A		A	W
EDRN80	V80	B20 ILI 2-9	346 – 525	0.08	380 – 575	0.07	42
EDRN90	V90	B31 ILI 2-9	346 – 525	0.25	380 – 575	0.21	120
EDRN100	V100	B31 ILI 2-9	346 – 525	0.25	380 – 575	0.21	123
EDRN112 – 132	V112	B31 ILI 2-9	346 – 525	0.24	380 – 575	0.20	144
EDRN160 – 180	V180	C62 IL 4-9	346 – 525	0.27	380 – 575	0.23	97
EDRN200 – 225	V200	D48 ILI 4-9	346 – 525	0.39	380 – 575	0.33	260
EDRN250 to 280	V250	F50 ILI 4-9	346 – 525	0.69	380 – 575	0.59	509
EDRN315	V315	F50 ILI 4-9	346 – 525	0.69	380 – 575	0.59	509

4.6.2 Delta connection 200 V – 303 V/50 Hz and 220 V – 332 V/60 Hz

Motor	Fan	Fan motor	Voltage range 50 Hz	Current	Voltage range 60 Hz	Current	Maximum power consumption
				A		A	W
EDRN80	V80	B20 ILI 2-9	200 – 303	0.13	220 – 332	0.11	42
EDRN90	V90	B31 ILI 2-9	200 – 303	0.44	220 – 332	0.37	120
EDRN100	V100	B31 ILI 2-9	200 – 303	0.44	220 – 332	0.37	123
EDRN112 – 132	V112	B31 ILI 2-9	200 – 303	0.42	220 – 332	0.36	144
EDRN160 – 180	V180	C62 IL 4-9	200 – 303	0.47	220 – 332	0.40	97
EDRN200 – 225	V200	D48 ILI 4-9	200 – 303	0.68	220 – 332	0.58	260
EDRN250 to 280	V250	F50 ILI 4-9	200 – 303	1.20	220 – 332	1.02	509
EDRN315	V315	F50 ILI 4-9	200 – 303	1.20	220 – 332	1.02	509

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4.7 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.

4.7.1 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						

4.8 Center of gravity of motors

With the designs 3G, 3G-c, and 2G, 2G-b, the center of gravity has the same position for EDRN.. motors and DRN.. motors. With the designs 3D, 3D-c/3GD, 3GD-c, and 2D, 2D-b/2GD, 2GD-b the center of gravity has a different position due to the aluminum fan.

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4.9 Overhung loads and axial loads

Overhung and axial loads are identical to the loads present at DRN.. motors.

4.10 Bearing

For information on the bearings, refer to the operating instructions "Explosion-Proof AC Motors EDR..71 – 315, EDRN80 – 315 – ATEX" and "Explosion-Proof AC Motors EDR..71 – 315, EDRN80 – 315 – IECEx".

4.11 Ventilation

In case of dust atmospheres, prevent static charging. For this reason, EDRN.. motors in the variants 2D, 2D-b, 2GD, 2GD-b, 3D, 3D-c, 3GD and 3GD-c are equipped with an aluminum fan.

For zones with gas atmospheres only, the variants 2G, 2G-b, 3G and 3G-c are equipped with a plastic fan as standard.

The option /Z flywheel fan is not available for explosion-proof motors.

4.12 Vibration class

EDRN.. motors by SEW-EURODRIVE meet the requirements for achieving vibration class A according to DIN EN 60034-14. This applies independently of components mounted to the B-side. 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.

4.13 Surface protection/painting

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

The equipment (gear units and motors) must be designed according to IEC/EN 60079-0 or IEC/EN 80079-36, in a way that hazards caused by electrostatic charge can be avoided under normal operating, maintenance, and cleaning conditions. The standard describes the use of non-metallic coatings. This also included surface protection and the general coating system.

SEW-EURODRIVE delivers the drives with a coating that complies with the requirements regarding the prevention of electrostatic charge according to EN/IEC 60079-0 and IEC/EN 80079-36.

Re-painting of gear units, motors and gear motors should be avoided if possible, as the normative specifications on the maximum paint layer thickness might be exceeded.

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4.14 Winding

The standard winding is equipped with a reinforced insulation of the copper wires, which heps to obtain an increased voltage endurance of the winding insulation.

- Line-to-line voltage U_{LL} = 1700 V
- Line-to-ground voltage U_{LG} = 1200 V

4.15 Terminal box

EDRN.. motors are equipped with the terminal box for brakemotors as as standard. This terminal box has an external connection required for equipotential bonding.

4.16 Connection technology

The motor winding is connected using a terminal strip with cage clamp /KCC as standard for rated powers up to 5.5 kW. The power cable connection is replaced by a terminal strip with cage clamp connections.

As an option, a connection using a terminal board with anti-twist frame can be selected.

For rated powers of 7.5 kW and higher, a connection using a terminal board with anti-twist frame is available as standard.

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5 Drive selection

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

5.1 Drive selection – non-controlled motor

5.1.1 Flow diagram

The following flow diagram illustrates the project planning procedure for a non-controlled drive without gear unit, in line operation.

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

Necessary information regarding the machine to be driven

- Information about the zone, temperature class/maximum surface temperature as well as of the gas/dust group (inquiry forms for explosion-proof gearmotors)
- 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

↓

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Motor selection

- Select the device category, temperature class/maximum surface temperature, and gas/dust group
- 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
- Take account of derating due to installation altitude
- Take account of ambient temperature
- Permitted overhung loads
- Permitted switching frequency
- Maximum speed
- Number of poles
- Operating mode
- Mounting position selection
- Motor options (brake, ventilation, motor protection, degree of protection, painting, etc.)

↓

Optional: Brake selection

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

↓

Ensuring that all requirements have been met.

Motors in category 2 and EPL .b

Continuous duty

The motors are designed for continuous duty at a constant power rating (S1) and marked accordingly. This includes low load startup at a small number of starts per hour that cause hardly any additional heating.

The overload protection must be ensured using a time delayed, current-controlled overload protection device.

The protective device not only monitors the motor current, but also the stopped motor during the t_E time.

Switching operation

Motors marked with S1, S4-50% may be operated in operating mode S1 and S4-50%.

Operating mode S4 considers start-up and load changes. Operating mode S4 is extended by the relative cyclic duration factor (cdf), the mass moment of inertia of the motor (J_M) and mass moment of inertia of the load (J_{ext}). Both mass moments of inertia refer to the motor shaft and are indicated on the nameplate.

For the calculation of the permitted cycles per hour, use the formula for calculating the starting frequency. The permitted no-load starting frequency (Z_0) required for the calculation refers to 50% cdf and is documented in the EC type examination certificate.

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The evaluation of PTC thermistors (/TF) are the only measure to prevent overheating.

Motors in category 3 and EPL .c

Continuous duty

The motors are designed for continuous duty at a constant power rating (S1) and marked accordingly. This includes low load startup at a small number of starts per hour that cause hardly any additional heating.

The overload protection must be ensured using a time delayed, current-controlled overload protection device.

Switching operation

In case of switching frequencies that are assigned to operating modes S3, S4 and S6, the load changes must be considered in addition to start-up. This is ensured by calculating the permitted switching frequency. For this calculation, use the formula for calculating the starting frequency.

The evaluation of PTC thermistors (/TF) are the only measure to prevent overheating.

Important notes on the brake

In line operation, the brake is applied at rated speed of the motor when the drive is switched off or in case of an emergency stop. The braking work may not exceed the specified maximum braking work per braking operation. For this calculation, use the formula for calculating the braking work in chapter Line operation.

The evaluation of PTC thermistors (/TF) are the only measure to prevent overheating. The brakemotors from SEW-EURODRIVE are equipped with PTC thermistors (/TF) in general.

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5.1.2 Line operation

Motors in category 2 and EPL .b

Continuous duty

The motors are designed for continuous duty at a constant power rating (S1) and marked accordingly. This includes low load startup at a small number of starts per hour that cause hardly any additional heating.

The overload protection must be ensured using a time delayed, current-controlled overload protection device.

The protective device not only monitors the motor current, but also the stopped motor during the t_E time.

Switching operation

Motors marked with S1, S4-50% may be operated in operating mode S1 and S4-50%.

Operating mode S4 considers start-up and load changes. Operating mode S4 is extended by the relative cyclic duration factor (cdf), the mass moment of inertia of the motor (J_M) and mass moment of inertia of the load (J_{ext}). Both mass moments of inertia refer to the motor shaft and are indicated on the nameplate.

For the calculation of the permitted cycles per hour, use the formula for calculating the starting frequency. The permitted no-load starting frequency (Z_0) required for the calculation refers to 50% cdf and is documented in the EC type examination certificate.

The evaluation of PTC thermistors (/TF) are the only measure to prevent overheating.

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Motors in category 3 and EPL .c

Continuous duty

The motors are designed for continuous duty at a constant power rating (S1) and marked accordingly. This includes low load startup at a small number of starts per hour that cause hardly any additional heating.

The overload protection must be ensured using a time delayed, current-controlled overload protection device.

Switching operation

In case of switching frequencies that are assigned to operating modes S3, S4 and S6, the load changes must be considered in addition to start-up. This is ensured by calculating the permitted switching frequency. For this calculation, use the formula for calculating the starting frequency.

The evaluation of PTC thermistors (/TF) are the only measure to prevent overheating.

Important notes on the brake

In line operation, the brake is applied at rated speed of the motor when the drive is switched off or in case of an emergency stop. The braking work may not exceed the specified maximum braking work per braking operation. For this calculation, use the formula for calculating the braking work in chapter Line operation.

The evaluation of PTC thermistors (/TF) are the only measure to prevent overheating. The brakemotors from SEW-EURODRIVE are equipped with PTC thermistors (/TF) in general.

5.1.3 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 via the permitted switching frequency.

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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.

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:

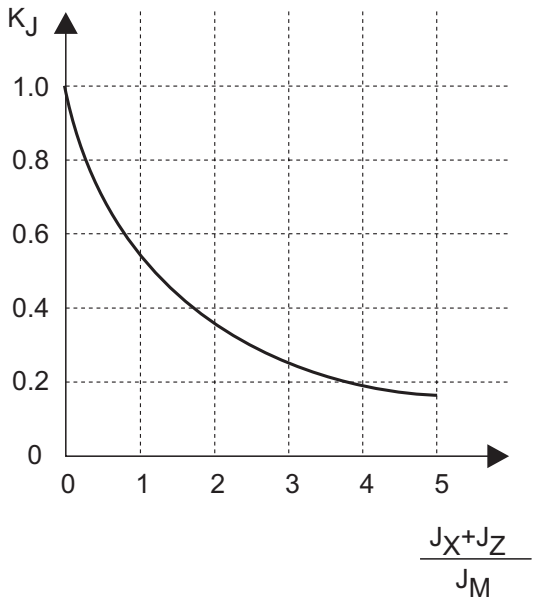
$$\mathbf{Z = Z_0 \times K_J \times K_M \times K_P}$$

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.

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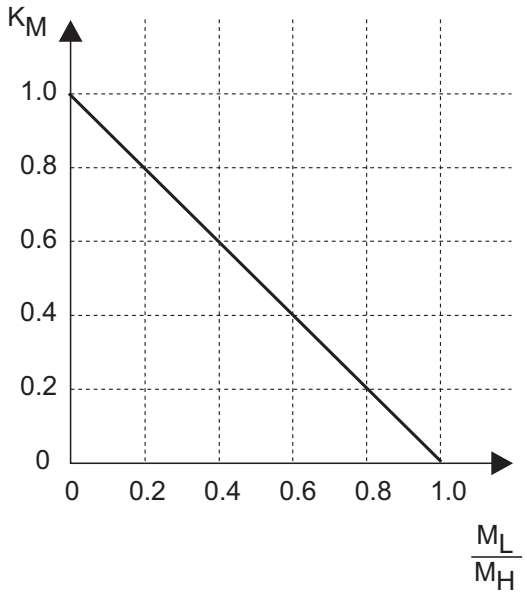
You can determine the factors K_J, K_M and K_P using the following diagrams according to different parameters.

Factor K_J depending on the additional mass moment of inertia



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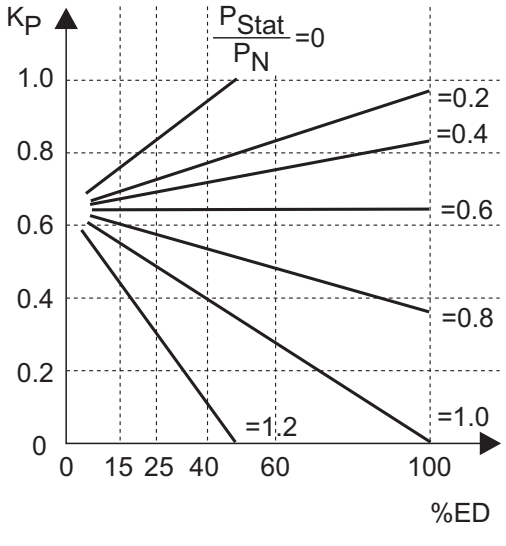
Factor K_M depending on the external load during run-up



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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

Example: Calculating the permitted switching frequency

Brakemotor: EDRN80M4/FF/3GD/KCC/AL with BE2 brake used as line-powered drive

No-load starting frequency Z_0 with BMS brake rectifier = 640 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% ED $\rightarrow K_P = 0.65$

$Z = Z_0 \times K_J \times K_M \times K_P = 640\ h^{-1} \times 0.2 \times 0.4 \times 0.65 = 33\ h^{-1}$

The cycle duration is 109.09 s.

The switch-on time amounts to 65.45 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".

5.2 Drive selection – controlled motor

5.2.1 Flow diagram

The following flow diagram illustrates the determination procedure for a controlled drive. The drive consists of a motor that is powered by an inverter.

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

Necessary information regarding the machine to be driven

- Information about the zone, temperature class/maximum surface temperature as well as of the gas/dust group (inquiry forms for explosion-proof gearmotors)
- 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

↓

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Motor selection

- Select the device category, temperature class/maximum surface temperature, and gas/dust group
- Specify motor voltage and motor frequency
- Identify the efficiency class demanded in the country of use, required approvals and certifications
- Static and maximum torque
- Take account of derating due to installation altitude
- Take account of 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, thermal motor protection, degree of protection, painting, etc.)

↓

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 addition 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

↓

Ensuring that all requirements have been met.

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5.2.2 Permitted voltage stress in operation with inverters by SEW-EURODRIVE

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.

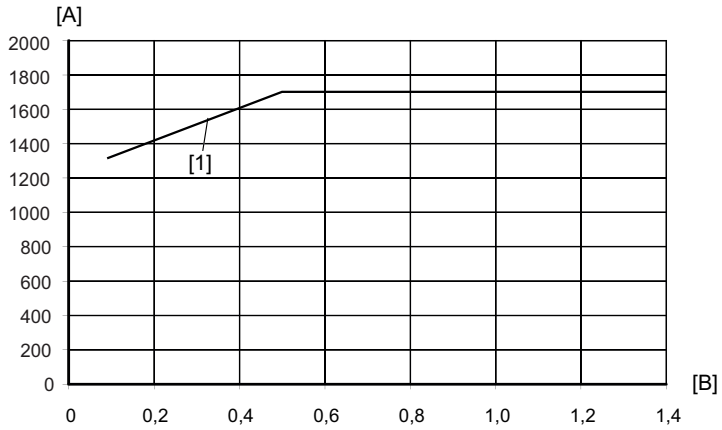
The standard winding can resist voltage peaks up to:

- Line-to-line voltages U_{LL} = 1700 V
- Line-to-ground voltages U_{LG} = 1200 V

For this reason, operating motors with inverters by SEW-EURODRIVE up to 500 V is only permitted in motoring operation with the standard winding. Operating these units in generator mode is only permitted in combination with a braking resistance.

5.2.3 Permitted voltage stress in inverter operation

Operating motors from SEW-EURODRIVE on inverters is permitted if the pulse voltages at the motor terminals indicated in the following figure are not exceeded:



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[A] Permitted pulse U_{LL} in V
[B] Rise time in µs
[1] Permitted pulse voltage for EDR../EDRN.. motors

INFORMATION

The permitted maximum PE voltage of 1200 V must not be exceeded in IT system operation even in the event of an error.

INFORMATION

If the permitted pulse voltage is exceeded, you have to provide for according measures to limit it. Consult the manufacturer of the inverter.

INFORMATION

The maximum permitted nominal motor voltage for inverter operation is 500 V.

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5.2.4 Limit characteristic curves of the motors in inverter operation

If EDRN.. 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
- Type of cooling – Self-cooling or forced cooling fan
- Base frequency: f_{base}△ = 50 Hz (400 V 人) or f_{base} = 87 Hz (400 V)
- Motor terminal voltage

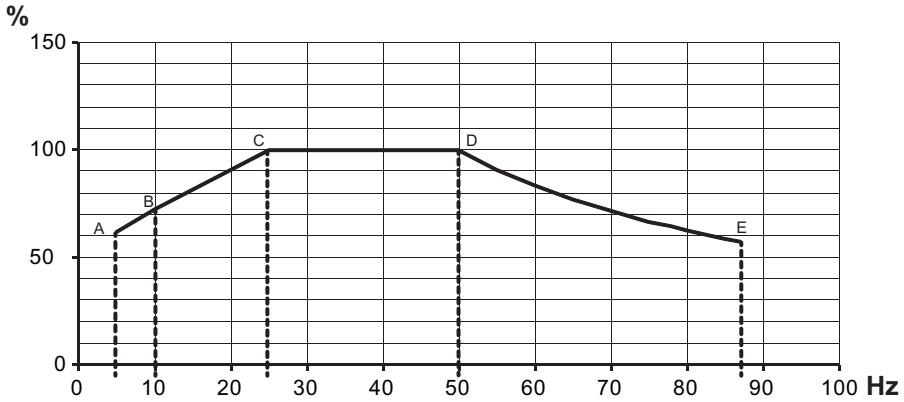
The effective operating point derived from the travel cycle must be below the limit curve. It comprises the effective torque and the mean speed.

Thermal limit characteristic curve

Points A to E described the motor torque progress in the ideal case, with the motor terminal voltage matching the rated motor voltage.

The points A, B and C define the "reduced" torque in the lower speed range caused by the reduced motor cooling. These values are independent of the voltage.

The points D to E describe the progress of the torque characteristic in field weakening. Field weakening begins at point D. Point E is the permitted thermal torque at limit speed. Both points are dependent on the voltage and must be calculated during the motor configuration.

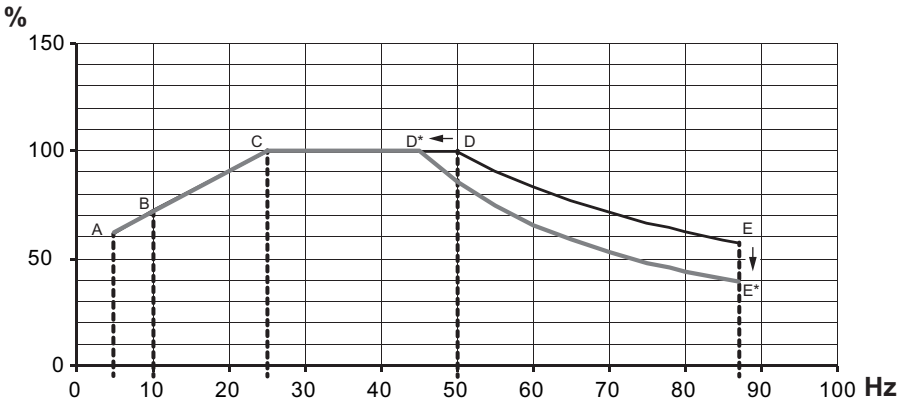


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The ideal case described above does not occur in reality, because drive components such as inverters, filters, and cables are subject to voltage losses. To avoid having to configure the voltage-dependent part of the characteristic curve (points D and E) for each motor, the "typical application case" is defined for explosion-proof motors according to ATEX and IECEx.

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The points A, B, C, D* and E* describe the motor torque progress for a typical application case. This case is distinguished by the fact that not the entire supply voltage is available at the motor terminal board due to the voltage drop in the inverter and in the motor cable. This means the points D and E shift and the new points D* and E* create a new field weakening progress.



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The typical application factor is defined by the following conditions:

- Rated motor voltage = Line voltage

  Rated motor voltage 230/400 V or multi-range voltage 219 – 241 V Δ / 380 – 420 V Y at a line voltage of 400 V.
- Line voltage tolerance ≤ 5%
- Motor cable length ≤ 100 m and voltage drop of the motor cable ≤ 10 V
- When the inverter series MOVITRAC® B or MOVIDRIVE® B are used
- No line chokes or sine filter used

If all conditions are met, a motor terminal voltage of minimum 360 V is ensured. The limit characteristic curves on the following pages can be used.

In case one of the stated conditions is not met, the motor terminal voltage must be calculated, see also the "Explosion-Proof AC Motors – EDR..71 – 315, EDRN..80 – 315 – ATEX" and "Explosion-Proof AC Motors – EDR..71 – 315, EDRN..80 – 315 – IECEx" operating instructions.

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Limit characteristic curves of EDRN.. motors in inverter operation

INFORMATION

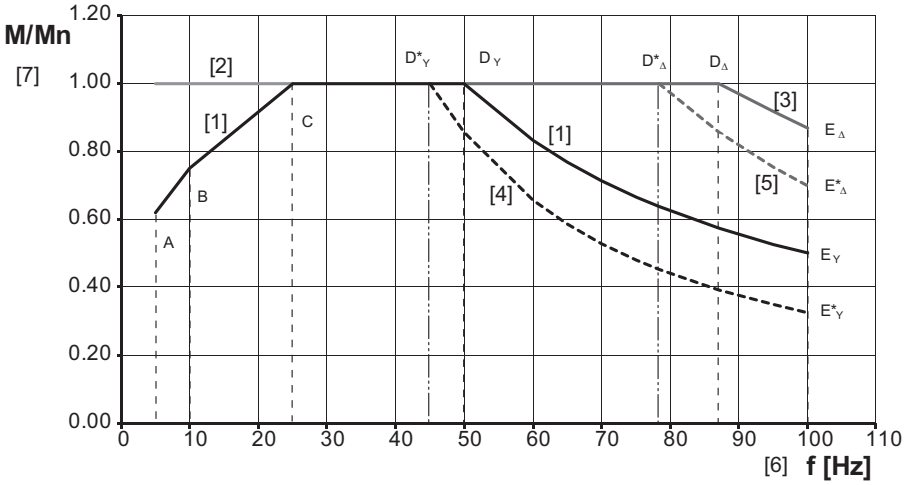
The maximum permitted dynamic limit torque is 150% of the rated motor torque.

Observe the additional limit speeds in chapters "Limit speeds" (→ 🗎 103).

Category 3, EPL .c

Typical limit characteristic curves of EDRN80 – 225 motors

The following diagram shows the typical limit characteristic curve for EDRN80 – 225 motors in category 3/EPL .c. Refer to the nameplate for the exact values.

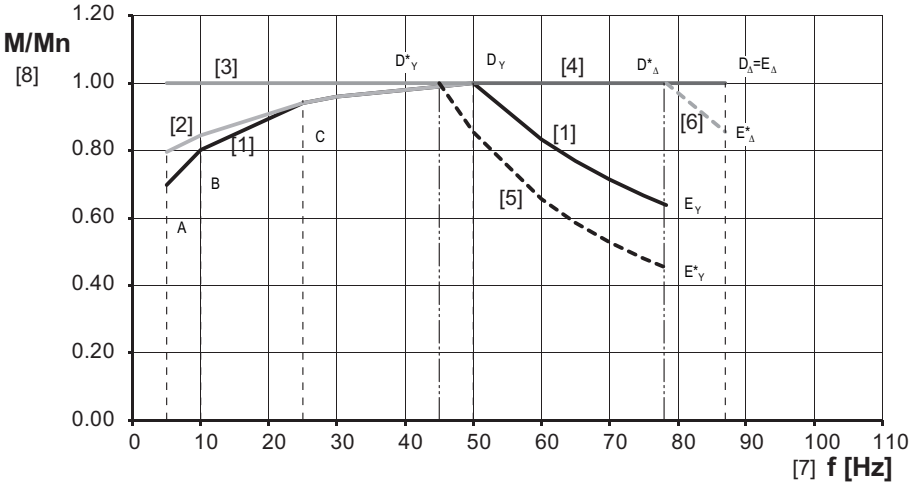


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[1] Star connection
[2] Forced cooling fan /VE
[3] Delta connection
[4] Typical application – star connection
[5] Typical application – delta connection
[6] Supply frequency of the motor
[7] Torque ratio M/M_N

Typical limit characteristic curves of EDRN250 – 315 motors

The following diagram shows the typical limit curve of EDRN250 – 315 motors in category 3/EPL .c. Refer to the nameplate for the exact values.



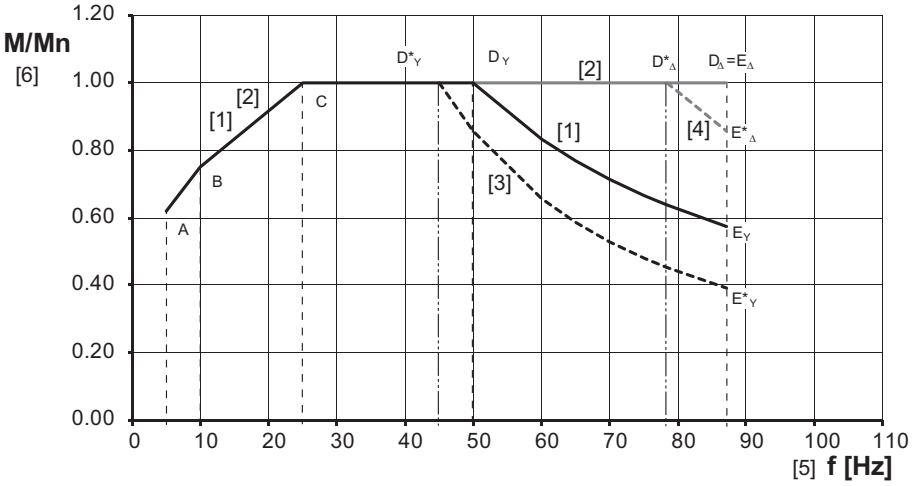
18014412884703755

[1] Star connection for EDR..250/280
[2] Star connection for EDR..315
[3] Forced cooling fan /VE
[4] Delta connection
[5] Typical application – star connection
[6] Typical application – delta connection
[7] Supply frequency of the motor
[8] Torque ratio M/M_N

Category 2, EPL .b

Typical limit characteristic curves of EDRN80 – 315 motors

The following diagram shows the typical limit curve of EDRN80 – 315 motors in category 2/EPL .b. Refer to the nameplate for the exact values.



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[1] Star connection
[2] Delta connection
[3] Typical application – star connection
[4] Typical application – delta connection
[5] Supply frequency of the motor
[6] Torque ratio M/M_N

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5.2.5 Limit speeds

The values for minimum and maximum limit speed may deviate from the specified values due to installed options or due to use of a primary gear unit.

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.., EDR.., and EDRN.. AC Motors – Standard Brake/Safety Brake".
- Braking from speeds > 1800 1/min is not permitted for brake sizes BE30 to BE122 for every application. Observe the project planning procedure and the application-specific maximum speeds for braking operations in manual "Project Planning for BE.. Brakes – DR.., DRN.., EDR.., and EDRN.. AC Motors – Standard Brake/ Safety Brake". Before activating the mechanical brake, use the controller to reduce the speed.

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.

Other motor options

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

Category 3, EPL .c

Motors		Limit speeds in min^{-1}		
	kW	n_{min}	n_{max}	
		⅄ or △	⅄	△
EDRN80M4	0.75	107	2856	2923
EDRN90S4	1.1	121	2881	2945
EDRN90L4	1.5	120	2897	2948
EDRN100LS4	2.2	112	2878	2933
EDRN100L4	3	116	2890	2939
EDRN112M4	4	120	2884	2935
EDRN132S4	5.5	120	2879	2939
EDRN132M4	7.5	126	2869	2953
EDRN132L4	9.2	127	2887	2957
EDRN160M4	11	130	2905	2960
EDRN160L4	15	130	2912	2960
EDRN180M4	18.5	134	2559	2584
EDRN180L4	22	133	2560	2582
EDRN200L4	30	136	2567	2586
EDRN225S4	37	137	1776	1776
EDRN225M4	45	137	1776	1776
EDRN250M4	55	138	1778	1778
EDRN280S4	75	137	1776	1776
EDRN280M4	90	136	1774	1774

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Motors		Limit speeds in min^{-1}		
	kW	n_{min}	n_{max}	
		⅄ or △	⅄	△
EDRN315S4	110	141[1)]	–	1783
EDRN315M4	132	140[1)]	–	1782
EDRN315L4	160	139[1)]	–	1780
EDRN315H4	200	142[1)]	–	1785

1) Only valid for delta connection

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Category 2/EPL .b

Motors		Limit speeds in min^{-1}		
	kW	n_{min}	n_{max}	
		⅄ or △	⅄	△
EDRN80M4	0.75	107	2498	2557
EDRN90S4	1.1	121	2326	2346
EDRN90L4	1.5	120	2331	2351
EDRN100LS4	2.2	112	2514	2534
EDRN100L4	3	116	2523	2543
EDRN112M4	4	120	1802	1822
EDRN132S4	5.5	120	1802	1822
EDRN132M4	7.5	126	1817	1837
EDRN132L4	9.2	127	1820	1840
EDRN160M4	11	130	2351	2371
EDRN160L4	15	130	2352	2372
EDRN180M4	18.5	134	2213	2235
EDRN180L4	22	133	2211	2230
EDRN200L4	30	136	2364	2382
EDRN225S4	37	137	1776	1776
EDRN225M4	45	137	1776	1776
EDRN250M4	55	138	1778	1778
EDRN280S4	75	137	1776	1776
EDRN280M4	90	136	1774	1774
EDRN315S4	110	141[1)]	–	1783
EDRN315M4	132	140[1)]	–	1782
EDRN315L4	160	139[1)]	–	1780
EDRN315H4	200	142[1)]	–	1785

1) Only valid for delta connection

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5.2.6 Motor/inverter assignment

Motors in category 2/EPL .b

The EU type examination certificate defines the requirements regarding inverters for motors in category 2 and protection type "eb" and "tb". Only frequency inverters may be used that comply with the requirements specified in the EU type examination certificate.

- The inverter rated current may be maximally twice the rated motor current.
- Short-term current limit of 150% referring to the rated motor current.
- The current monitoring of the inverter must record the rms value of the machine current with a tolerance of ± 5% in regard of the rated motor current.
- Speed-dependent current limit.
- Monitoring of minimum and maximum frequency.
- Maximum overload time 60 s.
- The maximum overload time and the permitted duration for operation below the minimum frequency refers to a time interval of 10 min.
- Minimum clock frequency 3 kHz.

The inverter series MOVITRAC® B and MOVIDRIVE® B meet the stated requirements.

- MOVITRAC® B can be used for the basic control range and for the field weakening range.
- MOVIDRIVE® B is only suitable for the basic control range.

EDRN.. motors in ⅄ connection at a motor voltage of 230/400 V

Motors 2G, 2G-b 2D, 2D-b 2GD, 2GD-b	P_N	I_N	Inverter power										
	kW	A	kW										
			0.25	0.37	0.55	0.75	1.1	1.5	2.2	3	4	5.5	7.5
EDRN80M4	0.75	1.8	–	o	o	x	o	–	–	–	–	–	–
EDRN90S4	1.1	2.6	–	–	o	o	x	o	–	–	–	–	–
EDRN90L4	1.5	3.5	–	–	–	–	o	x	o	o	–	–	–
EDRN100LS4	2.2	4.9	–	–	–	–	–	o	x	o	o	–	–
EDRN100L4	3	6.6	–	–	–	–	–	–	o	x	o	o	–
EDRN112M4	4	8.4	–	–	–	–	–	–	–	o	x	o	o
EDRN132S4	5.5	10.7	–	–	–	–	–	–	–	–	o	x	o
EDRN132M4	7.5	15.3	–	–	–	–	–	–	–	–	–	o	x
EDRN132L4	9.2	19.9	–	–	–	–	–	–	–	–	–	–	o
EDRN160M4	11	21	–	–	–	–	–	–	–	–	–	–	o

Motors 2G, 2G-b 2D, 2D-b 2GD, 2GD-b	P_N	I_N	Inverter power													
	kW	A	kW													
			11	15	22	30	37	45	55	75	90	110	132	160	200	250
EDRN132M4	7.5	15.3	o	–	–	–	–	–	–	–	–	–	–	–	–	–
EDRN132L4	9.2	19.9	x	o	–	–	–	–	–	–	–	–	–	–	–	–
EDRN160M4	11	21	x	o	–	–	–	–	–	–	–	–	–	–	–	–
EDRN160L4	15	29	o	x	o	–	–	–	–	–	–	–	–	–	–	–
EDRN180M4[1)]	18.5	34.5	–	o	x	o	–	–	–	–	–	–	–	–	–	–
EDRN180L4[2)]	17.5	31	o	x	o	o	–	–	–	–	–	–	–	–	–	–
EDRN180L4[1)]	22	39	–	o	x	o	o	–	–	–	–	–	–	–	–	–
EDRN200L4[2)]	24	45.5	–	o	x	o	o	o	–	–	–	–	–	–	–	–
EDRN200L4[1)]	30	57	–	–	o	x	o	o	o	–	–	–	–	–	–	–
EDRN225S4[1)]	37	65	–	–	o	o	x	o	o	o	–	–	–	–	–	–
EDRN225M4[1)]	45	82	–	–	–	o	o	x	o	o	–	–	–	–	–	–

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Motors 2G, 2G-b 2D, 2D-b 2GD, 2GD-b	P_N	I_N	Inverter power													
	kW	A	kW													
			11	15	22	30	37	45	55	75	90	110	132	160	200	250
EDRN250M4[2]	30	59	–	–	o	x	o	o	o	–	–	–	–	–	–	–
EDRN250M4[1]	55	108	–	–	–	–	–	o	x	o	o	o	–	–	–	–
EDRN280S4[2]	36	69	–	–	–	o	x	o	o	o	–	–	–	–	–	–
EDRN280S4[1]	75	144	–	–	–	–	–	–	o	x	o	o	o	–	–	–
EDRN280M4[2]	44	84	–	–	–	o	o	x	o	o	–	–	–	–	–	–
EDRN280M4[1]	90	164	–	–	–	–	–	–	–	o	x	o	o	o	–	–
EDRN315S4[2]	58	102	–	–	–	–	o	o	x	o	o	o	–	–	–	–
EDRN315S4[2]	70	123	–	–	–	–	–	o	o	x	o	o	–	–	–	–
EDRN315M4[2]	84	148	–	–	–	–	–	–	o	o	x	o	o	–	–	–
EDRN315H4[2]	110	208	–	–	–	–	–	–	–	–	o	x	o	o	o	–
EDRN315S4[1]	110	190	–	–	–	–	–	–	–	–	o	x	o	o	o	–
EDRN315M4[1]	132	233	–	–	–	–	–	–	–	–	o	o	x	o	o	–
EDRN315L4[1]	160	277	–	–	–	–	–	–	–	–	–	o	o	x	o	o
EDRN315H4[1]	200	358	–	–	–	–	–	–	–	–	–	–	–	o	x	o

1) Only category 2D, 2D-b

2) Only category 2G, 2G-b, 2GD, 2GD-b

x = recommended o = permitted – = not permitted

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EDRN.. motors in △ connection at a motor voltage of 230/400 V

Motors 2G, 2G-b 2D, 2D-b 2GD, 2GD-b	P_N	I_N	Inverter power													
	kW	A	kW													
			0.25	0.37	0.55	0.75	1.1	1.5	2.2	3	4	5.5	7.5	11	15	22
EDRN80M4	0.75	3.1	–	–	–	o	o	X	o	–	–	–	–	–	–	–
EDRN90S4	1.1	4.5	–	–	–	–	–	o	X	o	–	–	–	–	–	–
EDRN90L4	1.5	6.1	–	–	–	–	–	–	o	X	o	–	–	–	–	–
EDRN100LS4	2.2	8.5	–	–	–	–	–	–	–	o	X	o	o	–	–	–
EDRN100L4	3	11.4	–	–	–	–	–	–	–	–	o	X	o	–	–	–
EDRN112M4	4	14.5	–	–	–	–	–	–	–	–	–	o	X	o	–	–
EDRN132S4	5.5	18.5	–	–	–	–	–	–	–	–	–	–	o	X	o	–
EDRN132M4	7.5	26.5	–	–	–	–	–	–	–	–	–	–	–	o	X	o

Motors 2G, 2G-b 2D, 2D-b 2GD, 2GD-b	P_N	I_N	Inverter power													
	kW	A	kW													
			11	15	22	30	37	45	55	75	90	110	132	160	200	250
EDRN132L4	9.2	34.4	–	o	X	o	–	–	–	–	–	–	–	–	–	–
EDRN160M4	11	36.3	–	o	X	o	–	–	–	–	–	–	–	–	–	–
EDRN160L4	15	50.2	–	–	o	X	o	o	–	–	–	–	–	–	–	–
EDRN180M4[1)]	18.5	59.7	–	–	o	X	o	o	o	–	–	–	–	–	–	–
EDRN180L4[2)]	17.5	53.6	–	–	o	X	o	o	o	–	–	–	–	–	–	–
EDRN180L4[1)]	22	67.5	–	–	–	o	X	o	o	o	–	–	–	–	–	–
EDRN200L4[2)]	24	78.7	–	–	–	o	o	X	o	o	–	–	–	–	–	–
EDRN200L4[1)]	30	98.6	–	–	–	–	o	o	X	o	o	–	–	–	–	–
EDRN225S4[1)]	37	112	–	–	–	–	–	o	o	X	o	o	–	–	–	–
EDRN225M4[1)]	45	142	–	–	–	–	–	–	o	o	X	o	o	–	–	–
EDRN250M4[2)]	30	102	–	–	–	–	o	o	X	o	o	o	–	–	–	–
EDRN250M4[1)]	55	187	–	–	–	–	–	–	–	–	o	X	o	o	–	–
EDRN280S4[2)]	36	119	–	–	–	–	–	o	o	X	o	o	–	–	–	–
EDRN280S4[1)]	75	249	–	–	–	–	–	–	–	–	–	o	X	o	o	o
EDRN280M4[2)]	44	145	–	–	–	–	–	–	o	o	X	o	o	–	–	–
EDRN280M4[1)]	90	284	–	–	–	–	–	–	–	–	–	o	o	X	o	o
EDRN315S4[2)]	58	176	–	–	–	–	–	–	–	o	o	X	o	o	–	–
EDRN315S4[2)]	70	213	–	–	–	–	–	–	–	–	o	o	X	o	o	–
EDRN315M4[2)]	84	256	–	–	–	–	–	–	–	–	–	o	o	X	o	o
EDRN315H4[1)]	110	360	–	–	–	–	–	–	–	–	–	–	–	o	X	o
EDRN315S4[1)]	110	329	–	–	–	–	–	–	–	–	o	X	o	o	o	–
EDRN315M4[1)]	132	403	–	–	–	–	–	–	–	–	o	o	X	o	o	–
EDRN315L4[1)]	160	479	–	–	–	–	–	–	–	–	–	o	o	X	o	o
EDRN315H4[1)]	200	619	–	–	–	–	–	–	–	–	–	–	–	o	X	o

1) Only category 2D, 2D-b

2) Only category 2G, 2G-b, 2GD, 2GD-b

x = recommended o = permitted – = not permitted

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Motors in category 3/EPL .c

MOVITRAC® B and MOVIDRIVE® B can be used for the basic control range and for the field weakening range.

Non-SEW inverter

Only use inverters with similar values of output current and output voltage as MOVITRAC® B and MOVIDRIVE® B.

EDRN.. motors in ⅄ connection at a motor voltage of 230/400 V

Motors 3G, 3G-c, 3D, 3D-c, 3GD, 3GD-c	P_N	I_N	Inverter power											
	kW	A	kW											
			0.25	0.37	0.55	0.75	1.1	1.5	2.2	3	4	5.5	7.5	11
EDRN80M4	0.75	1.8	–	o	o	x	o	o	–	–	–	–	–	–
EDRN90S4	1.1	2.6	–	–	o	o	x	o	o	–	–	–	–	–
EDRN90L4	1.5	3.5	–	–	–	o	o	x	o	o	–	–	–	–
EDRN100LS4	2.2	4.9	–	–	–	–	–	o	x	o	o	–	–	–
EDRN100L4	3	6.6	–	–	–	–	–	–	o	x	o	o	–	–
EDRN112M4	4	8.4	–	–	–	–	–	–	–	o	x	o	–	–
EDRN132S4	5.5	10.7	–	–	–	–	–	–	–	–	o	x	o	–
EDRN132M4	7.5	17	–	–	–	–	–	–	–	–	o	o	x	–
EDRN132L4	9.2	20.5	–	–	–	–	–	–	–	–	–	o	o	x
EDRN160M4	11	23	–	–	–	–	–	–	–	–	–	–	o	x
EDRN160L4	15	30	–	–	–	–	–	–	–	–	–	–	–	o
EDRN180M4	18.5	34	–	–	–	–	–	–	–	–	–	–	–	o

Motors 3G, 3G-c, 3D, 3D-c, 3GD, 3GD-c	P_N	I_N	Inverter power											
	kW	A	kW											
			15	22	30	37	45	55	75	90	110	132	160	200	250
EDRN160M4	11	23	o	o	–	–	–	–	–	–	–	–	–	–	–
EDRN160L4	15	30	x	o	–	–	–	–	–	–	–	–	–	–	–
EDRN180M4	18.5	34	o	x	–	–	–	–	–	–	–	–	–	–	–
EDRN180L4	22	39	o	x	o	o	o	–	–	–	–	–	–	–	–
EDRN200L4	30	57	–	o	x	o	o	o	o	–	–	–	–	–	–
EDRN225S4	37	65	–	–	o	x	o	o	–	–	–	–	–	–	–
EDRN225M4	45	82	–	–	o	o	x	o	o	o	o	–	–	–	–
EDRN250M4	55	108	–	–	–	o	o	x	o	o	o	o	–	–	–
EDRN280S4	75	144	–	–	–	–	–	o	x	o	o	o	o	–	–
EDRN280M4	90	164	–	–	–	–	–	–	o	x	o	o	o	o	–
EDRN315S4	110	190	–	–	–	–	–	–	–	o	x	o	o	o	o
EDRN315M4	132	233	–	–	–	–	–	–	–	o	o	x	o	o	o
EDRN315L4	160	277	–	–	–	–	–	–	–	–	o	o	x	o	o
EDRN315H4	200	358	–	–	–	–	–	–	–	–	–	o	o	x	o

x = recommended o = permitted – = not permitted

EDRN.. motors in △ connection at a motor voltage of 230/400 V

Motors 3G, 3G-c, 3D, 3D-c, 3GD, 3GD-c	P_N	I_N	Inverter power											
	kW	A	kW											
			0.25	0.37	0.55	0.75	1.1	1.5	2.2	3	4	5.5	7.5	11
EDRN80M4	0.75	3.1	–	–	–	o	x	o	o	o	–	–	–	–
EDRN90S4	1.1	4.5	–	–	–	–	o	o	x	o	o	–	–	–
EDRN90L4	1.5	6.1	–	–	–	–	–	–	o	x	o	o	–	–
EDRN100LS4	2.2	8.5	–	–	–	–	–	–	–	o	x	o	o	–
EDRN100L4	3	11.4	–	–	–	–	–	–	–	–	o	x	o	o
EDRN112M4	4	14.5	–	–	–	–	–	–	–	–	–	o	x	o
EDRN132S4	5.5	18.5	–	–	–	–	–	–	–	–	–	–	o	x
EDRN132M4	7.5	29.4	–	–	–	–	–	–	–	–	–	–	–	o
EDRN132L4	9.2	35.5	–	–	–	–	–	–	–	–	–	–	–	o

Motors 3G, 3G-c, 3D, 3D-c, 3GD, 3GD-c	P_N	I_N	Inverter power											
	kW	A	kW											
			15	22	30	37	45	55	75	90	110	132	160	200	250
EDRN112M4	4	14.5	o	–	–	–	–	–	–	–	–	–	–	–	–
EDRN132S4	5.5	18.5	o	–	–	–	–	–	–	–	–	–	–	–	–
EDRN132M4	7.5	29.4	x	o	o	–	–	–	–	–	–	–	–	–	–
EDRN132L4	9.2	35.5	o	o	o	o	–	–	–	–	–	–	–	–	–
EDRN160M4	11	39.8	o	x	o	o	o	–	–	–	–	–	–	–	–
EDRN160L4	15	51.9	–	x	o	o	o	o	–	–	–	–	–	–	–
EDRN180M4	18.5	58.8	–	o	x	o	o	o	o	–	–	–	–	–	–
EDRN180L4	22	67.5	–	–	o	x	o	o	o	–	–	–	–	–	–
EDRN200L4	30	98.6	–	–	–	o	o	x	o	o	o	–	–	–	–
EDRN225S4	37	112	–	–	–	–	o	o	x	o	o	o	–	–	–
EDRN225M4	45	142	–	–	–	–	–	o	o	x	o	o	o	–	–
EDRN250M4	55	187	–	–	–	–	–	–	o	o	x	o	o	o	–
EDRN280S4	75	249	–	–	–	–	–	–	–	–	o	x	o	o	o
EDRN280M4	90	284	–	–	–	–	–	–	–	–	o	o	x	o	o
EDRN315S4	110	329	–	–	–	–	–	–	–	–	–	o	o	x	o
EDRN315M4	132	403	–	–	–	–	–	–	–	–	–	–	o	o	x
EDRN315L4	160	479	–	–	–	–	–	–	–	–	–	–	–	o	o
EDRN315H4	200	619	–	–	–	–	–	–	–	–	–	–	–	–	o

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5.3 Permitted operating modes and protection concepts

The following operating modes are roughly differentiated:

- Line operation: Continuous duty (S1) and switching operation (S4 50%)
- Operation on inverter

The protection against impermissible heating depends on the operating mode. The following table lists the operating modes and the associated protection concepts. The protective concepts are identical for the standards ATEX and IECEx.



INFORMATION

All motors must be protected from impermissible heating according to ATEX Directive 2014/34/EU. Safety equipment required for safe operation is affected by this Directive and must be certified for this reason.

5.3.1 Category 2/EPL .b

Design	Operating mode acc. to nameplate	Additional nameplate	Permitted operating modes	Protection against excessive heating	Identification on the nameplate
2G 2D 2GD 2G-b 2D-b 2GD-b	S1	–	Line operation: S1	Motor circuit breaker[1)]	Time t_E and relation I_A/I_N 2D, 2D-b: without t_E time
	S1, S4 50%	–	Line operation: S1, S4 50%	PTC thermistor /TF[2)]	t_A time, PTC according to DIN VDE V 0898-1-401, relay functionally tested according to II(2)G
	S1	VFC	Line operation: S1	Motor circuit breaker[1)]	Time t_E and relation I_A/I_N 2D, 2D-b: without t_E time
	S1	VFC	Inverter operation	PTC thermistor and speed-dependent current limiting in the inverter[3)]	Additional nameplate: X identification and permitted continuous currents listed depending on the frequency

1) Motor circuit breaker according to Directive 2014/34/EU
2) The PTC thermistor is monitored by a thermistor motor protection control unit according to Directive 2014/34/EU.
3) The inverter must comply with the EU type examination certificate

5.3.2 Category 3, EPL .c

Design	Operating modes on nameplate	Additional nameplate	Permitted operating modes	Protection against excessive heating	Identification on the nameplate
3G 3D 3GD 3G-c 3D-c 3DC-c	S1	–	Line operation: S1	Motor circuit breaker[1)]	–
	S1		Line operation: Switching operation, soft starter, heavy starting	PTC thermistor /TF[2)]	Option designation /TF
	S1	VFC	Line operation: S1	Motor circuit breaker[1)]	–
	S1	VFC	Line operation: S1	Optional PTC thermistor /TF [2)]	Option designation /TF
	S1	VFC	Line operation: Switching operation, soft starter, heavy starting	PTC thermistor[2)]	Option designation /TF
	S1	VFC	Inverter operation, group drive (only for 3D, 3D-c)	PTC thermistor[2)]	Additional nameplate: Permitted continuous currents listed depending on the frequency

1) Motor circuit breaker according to Directive 2014/34/EU

2) The PTC thermistor is monitored by a thermistor motor protection control unit according to Directive 2014/34/EU.

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5.4 Motor protection device

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

Current-dependent protection devices are usually installed in the control cabinet, for example motor circuit breakers.

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

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

SEW-EURODRIVE provides 2 fundamental types of thermal motor protection for the motors:

- PTC thermistor /TF
- Bimetallic temperature switches /TH (only in variant 3D combined with MOVIMOT®)

The following 2 temperature sensors are available for detecting the motor temperature:

- Temperature sensor /PT
- Temperature sensor /PK

5.4.1 Motor circuit breaker

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 EDRN.. motors, ensure that the motor circuit breakers used are suitable for IE3 motors.

5.4.2 PTC thermistors

Three PTC thermistors (PTC, characteristic curve according to DIN VDE V 0898-1-401) are integrated into the winding overhang of the motor and connected in series. The terminals are located in the terminal box. The values are evaluated by a trip switch in the control cabinet according to Directive 2014/34/EU.

Motor protection with PTC thermistors /TF provide 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.

Explosion-proof AC motors with brake or explosion-proof AC motors intended for inverter operation are equipped with a PTC thermistor as standard.

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5.4.3 Bimetallic switches

Three bimetallic switches are integrated into the winding overhang of the motor and connected in series. The terminals are in the terminal box.

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.

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

Bimetallic switches may only be used with motors operated in dust atmospheres.

5.4.4 Temperature sensor

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

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.

The PTC thermistor is used for motor protection, even when a /PT or /PK temperature sensor is used.

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.

Unless otherwise specified, the technical specifications in this document 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. 219 V – 241 V △/380 V – 420 V 人).

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

- Fixed voltage 50 Hz
- Fixed voltage 60 Hz
- 50 Hz voltage range

The tolerances A and B as specified in standard IEC 60034 apply to rated frequencies, as well as to nominal voltages.

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, contact SEW-EURODRIVE.

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5.5.2 Standard rated voltages depending on the motor size

As standard, motors in the 50 Hz variant 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 tables list the nominal voltages for motors designed for operation at a 50 Hz supply system depending on the rated power.

Motor	Power rating	50 Hz fixed voltage	50 Hz voltage range
	kW	V	V
EDRN80M – EDRN132S	0.75 – 5.5	230 △/400 ⅄	219 – 241 △/380 – 420⅄
EDRN132M – EDRN315H	7.5 – 200	400 △/690 ⅄	380 – 420 △/660 – 720 ⅄

The motor voltage for 60 Hz motors must be selected depending on the country of use.

In such cases, the length (and thus the geometric dimensions) a the same rated power may vary between the 50 Hz and the 60 Hz design.

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5.6 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.

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

Explosion-proof motors by SEW-EURODRIVE are designed for thermal class 155°(F). Depending on the operating mode and design, the motors have the following thermal capacity utilization:

Operating mode	Design	Thermal class	Thermal utilization
Line operation	2G, 2D, 2GD 2G-b, 2D-b, 2GD-b	155(F)	130(B)
Inverter operation	2G, 2D, 2GD 2G-b, 2D-b, 2GD-b	155(F)	130(B)
Line operation	3G, 3D, 3GD 3G-c, 3D-c, 3GD-c	155(F)	130(B)[1)]
Inverter operation	3G, 3D, 3GD 3G-c, 3D-c, 3GD-c	155(F)	155(F)

1) The thermal capacity utilization is adjusted to 155°(F) depending on the selected options.

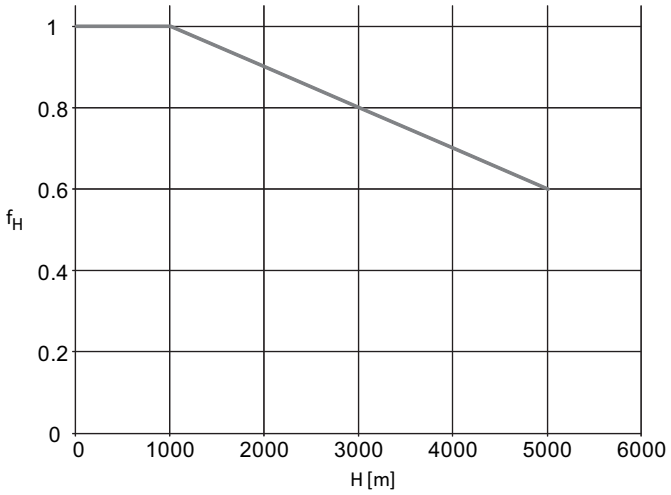
5.6.1 Power reduction, derating

The rated power P_N of a motor depends on the installation altitude. The rated power stated on the nameplate applies for 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 altitudes:

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

The maximum installation altitude is 1000 m in category 2/EPL .b.

The following diagram shows the power reduction depending on the installation altitude for motors in category 3/EPL .c. The factor f_H can be found in the following diagram:



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H Installation altitude above sea level

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6 Customer benefits

The introduction of the motor series EDRN80 – 315 allowed for making the motors even more compatible for worldwide use. Regardless of whether the motors are certified according to ATEX or IECEx standards, the technical data and options are identical.

The most important advantages at a glance:

- Based on the DRN... series, the EDRN.. motors are adapted to explosion protection requirements. The extensive use of standard parts allows for short delivery times and uncomplicated service.
- Line, switched and inverter operation allow them to be used for virtually any application.
- A unique assignment of size and power according to EN 50347 (as with DRN.. motors) helps to select the correct motor. Exceptions are motors in the variants 2G and 2G-b with reduced power.
- 2G motors in the 50 Hz design are also available with power ratings from 0.75 kW to 6.8 kW in accordance with DIN V 42673-2. In addition to power ratings, this means that the new product line is completely compatible with motors from other manufacturers of standardized IEC motors in terms of standardized foot and flange dimensions.
- This comprehensive series covers the standard power range from: 0.18 to 0.55 kW in accordance with energy efficiency class IE1 with the EDRS.. and from 0.75 to 200 kW in accordance with IE3 with the EDRN..
- Motors in designs 3G, 3D, 3GD meet the requirements of Directive 2014/34/EU and the relevant harmonized standards. They are indicated by the CE mark and the applicable explosion protection standard.
- Motors in design 3G-c, 3D-c, 3GD-c are PTB certified according to IECEx Directives and marked with the IECEx logo.
- IECEx certificates are available at http://iecex.iec.ch
- The introduction of the 3G motor design can firstly satisfy customers who require a motor intended solely for gas, and secondly reduce the surcharge (plastic fan instead of an aluminum fan).
- The GD design allows for the customer to achieve a degree of standardization, as these motors can be used in gas and dust atmospheres.
- The large number of options, such as brakes and encoders, makes the motors suitable for almost all applications.
- The motors with IECEx approval are available with standard gear units and gear units according the European Directive 2014/34/EU.
- Certified locations ensure quick local availability in case of replacement or repair.
- The new IE3 motor from the EDRN.. series is generally no bigger than a motor with energy efficiency class IE2 of comparable power from the EDRE.. series.
- The standardized safety encoders and safety brakes allow for realizing safety functions in potentially explosive environments.

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7 Service

Observe the country-specific regulations for performing service work on explosion-proof units. In Germany, the operating safety regulations (BetrSichV) and the Product Safety Act (ProdSG) apply.

7.1 ATEX and IECEx

The standards EN/IEC 60079-17 and 60079-19 must be observed for repair work.

EN/IEC 60079-17 (inspection and maintenance of electrical systems) describes the requirements for activities performed on explosion-proof systems. The system operator must adhere to this.

EN/IEC 60079-19 (device repair, overhauling and regeneration) describes the requirements for service activities performed on explosion-proof devices. This standard must be adhered to when the manufacturer or externally certified repair workshops perform servicing.

Service work on explosion-proof devices by SEW-EURODRIVE, as well as conversion or variation work that change the technical data of the device may only be performed by the SEW-EURODRIVE Service or by certified repair workshops, as they have the necessary knowledge.

Service work in potentially explosive atmosphere and outside of these atmospheres

It is mandatory to distinguish between service work performed in an existing potentially explosive atmosphere and service work performed outside of this atmosphere. Some service work required for explosion-proof devices by SEW-EURODRIVE must not be performed in an existing potentially explosive atmosphere (e.g. due to sparks created by using tools). Only trained and country-specifically certified personnel (certified by national authority) is permitted to perform service and maintenance activities within an existing potentially explosive atmosphere.

For this reason it is recommended to always perform service work for explosion-proof devices outside of existing potentially explosive atmosphere.

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8 Documentation

The following table lists customer documentation and internal documents.

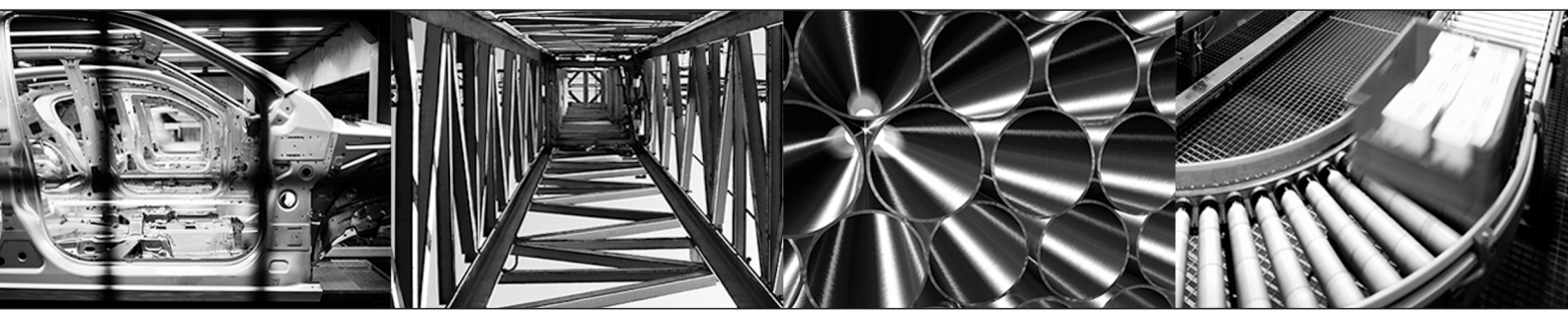
Further languages will be provided.

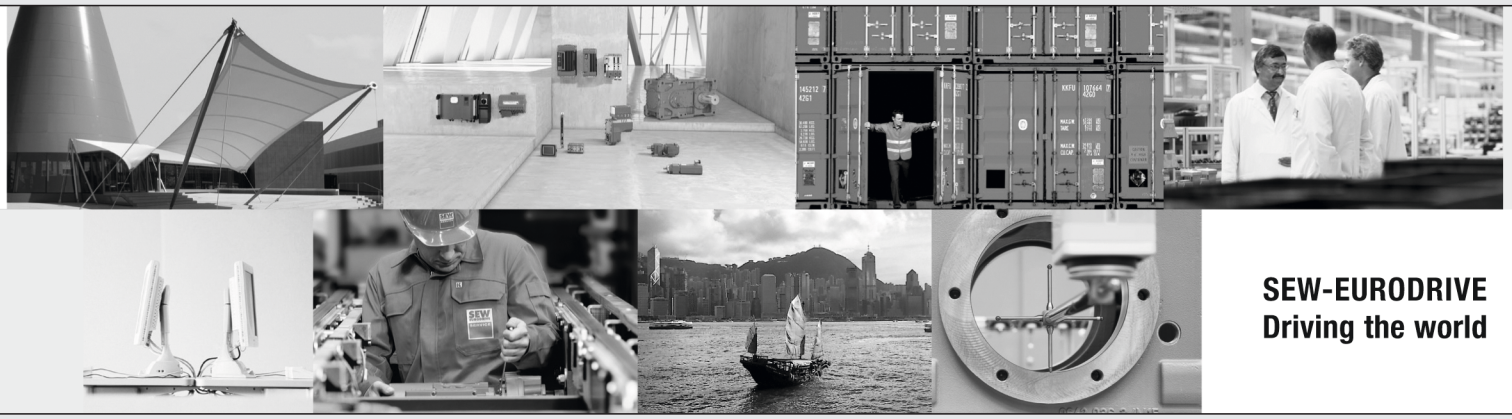
Document	Edition	Part number DE	Part number EN
ATEX EDR../EDRN.. operating instructions	05/2017	23556447	23556455
IECEx EDR../EDRN.. operating instructions	10/2017	23019301	23019328
Addendum to the operating instructions "Safety Encoders and Safety Brakes"	08/2018	24766526	24766534
"Project Planning for BE.. Brakes" manual	08/2018	24766925	24766933
Brochure: Explosion-proof drives in accordance with internationally valid requirements	09/2017	23529644	23529652
Brochure: Gear units, motors, and gearmotors for potentially explosive atmospheres	04/2018	23530049	23530057
EDRN.. gearmotor catalog 50 Hz[1)]	06/2018	23026502	23026510
EDRN.. gearmotor catalog 60 Hz[1)]	Q3/2018	23511648	23511656
Motor catalog (ATEX, IECEx, 50/60 Hz)[1)]	08/2018	23510846	23510854
Inquiry form for explosion-proof gearmotors	08/2017	23511249	23511257
Poster: Explosion protection in accordance with ATEX and IECEx[1)]	06/2018	23530448	23530456

1) In preparation

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