

ExRDM39x (ATEX)

Explosion-protected stepper motors

Motor manual

V1.05, 01.2012



Important information

This manual is part of the product.

Carefully read this manual and observe all instructions.

Keep this manual for future reference.

Hand this manual and all other pertinent product documentation over to all users of the product.

Carefully read and observe all safety instructions and the chapter "Before you begin - safety information".

Some products are not available in all countries.

For information on the availability of products, please consult the catalog.

Subject to technical modifications without notice.

All details provided are technical data which do not constitute warranted qualities.

Most of the product designations are registered trademarks of their respective owners, even if this is not explicitly indicated.

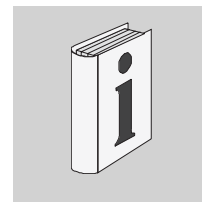
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About this manual



This manual is valid for ExRDM standard products. Chapter "1 Introduction" lists the type code for this product. The type code allows you to identify whether your product is a standard product or a customized version.

Source manuals The latest versions of the manuals can be downloaded from the Internet at:

<http://www.schneider-electric.com>

Corrections and suggestions We always try to further optimize our manuals. We welcome your suggestions and corrections.

Please get in touch with us by e-mail:

techcomm@schneider-electric.com.

Work steps If work steps must be performed consecutively, this sequence of steps is represented as follows:

- Special prerequisites for the following work steps
 - ▶ Step 1
 - ◁ Specific response to this work step
 - ▶ Step 2

If a response to a work step is indicated, this allows you to verify that the work step has been performed correctly.

Unless otherwise stated, the individual steps must be performed in the specified sequence.

Making work easier Information on making work easier is highlighted by this symbol:



Sections highlighted this way provide supplementary information on making work easier.

SI units SI units are the original values. Converted units are shown in brackets behind the original value; they may be rounded.

Example:

Minimum conductor cross section: 1.5 mm² (AWG 14)

Glossary Explanations of special technical terms and abbreviations.

Index List of keywords with references to the corresponding page numbers.

1 Introduction

1

The explosion-protected 3-phase stepper motors excel with a robust design and a high torque in relation to their size.

Type of protection The motors have the type of protection Ex d IIC T4 Gb.
This means:

- Applied harmonized standards, especially EN 60079-0, EN 60079-1 und EN 60034-1
- Approved as per ATEX 94/9/EC
- Type of protection flameproof enclosure "d"
- Equipment group II
- Gas group
- Temperature class "T4" (135°C)
- Use in potentially explosive atmospheres (hazardous locations) of zones 1 and 2, equipment category 2G (gas)
- Tested thermistor monitoring devices are mandatory for temperature monitoring.

Approval All information only relates to the ATEX version.

1.1 Nameplate

The nameplate shows the following motor data:

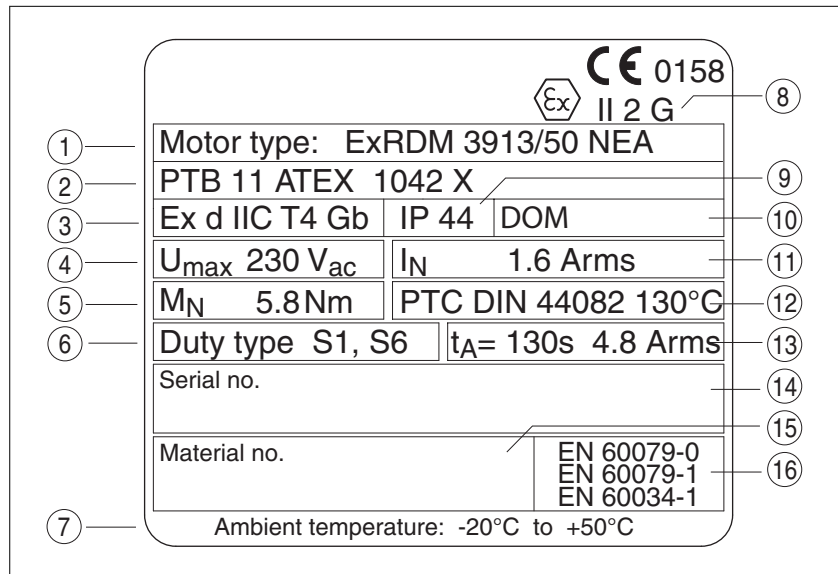


Figure 1: Nameplate with sample values

- (1) Motor type
- (2) ATEX certification number
- (3) Product classification
- (4) Maximum supply voltage
- (5) Nominal torque
- (6) Permissible duty types
- (7) Maximum and minimum ambient temperatures
- (8) Equipment category
- (9) IP degree of protection
- (10) Date of manufacture
- (11) Nominal current
- (12) Temperature sensor (PTC as per DIN 44082)
- (13) Switch-off time t_A
- (14) Serial number
- (15) Order no.
- (16) Applied harmonized standards, especially

1.2 Type code

	ExRDM	3	9	10/	50	N	E	I	7	A	IP44	O	O	D4	K	60
Product family Explosion-protected stepper motors																
Number of motor phases 3 = 3																
Motor size (flange) 9 = 85 mm																
Motor length 10 = 194 mm 13 = 224 mm																
Number of pole pairs 50 = 50 N = Reserved																
Encoder O = Without encoder E = With encoder																
Encoder type A = Absolute I = Incremental																
Winding (motor voltage) 7 = 230 V _{AC} (325 V _{DC})																
Approval A = ATEX																
Degree of protection IP44 = IP44 at shaft bushing																
Gearbox type O = Without gearbox U = Planetary gear ATEX																
Gear ratio O = Without gearbox 3 = 3:1 5 = 5:1																
Shaft diameter D4 = 14 mm DO = With gearbox																
Shaft version K = Woodruff key as per DIN 6888 O = With gearbox																
Centering collar 60 = 60 mm OO = With gearbox																

2 Before you begin - safety information

2

2.1 Qualification of personnel

Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation are authorized to work on and with this product. In addition, these persons must have received safety training to recognize and avoid hazards involved. These persons must have sufficient technical training, knowledge and experience and be able to foresee and detect potential hazards that may be caused by using the product, by changing the settings and by the mechanical, electrical and electronic equipment of the entire system in which the product is used.

All persons working on and with the product must be fully familiar with all applicable standards, directives, and accident prevention regulations when performing such work.

2.2 Intended use

This product is an explosion-protected motor and intended for industrial use according to this manual.

The motor is designed for connection to an ATEX cut-off. The product may only be used in compliance with all applicable safety regulations and directives, the specified requirements and the technical data.

Prior to using the product, you must perform a risk assessment in view of the planned application. Based on the results, the appropriate safety measures must be implemented.

Since the product is used as a component in an entire system, you must ensure the safety of persons by means of the design of this entire system (for example, machine design).

Operate the product only with the specified cables and accessories. Use only genuine accessories and spare parts.

Any use other than the use explicitly permitted is prohibited and can result in hazards.

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel.

2.3 Hazard categories

Safety instructions to the user are highlighted by safety alert symbols in the manual. In addition, labels with symbols and/or instructions are attached to the product that alert you to potential hazards.

Depending on the seriousness of the hazard, the safety instructions are divided into 4 hazard categories.

DANGER

DANGER indicates an imminently hazardous situation, which, if not avoided, **will result** in death or serious injury.

WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury, or equipment damage.

CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in injury or equipment damage.

CAUTION

CAUTION used without the safety alert symbol, is used to address practices not related to personal injury (e.g. **can result** in equipment damage).

2.4 Basic information

DANGER

EXPLOSION HAZARD CAUSED BY INCORRECT HANDLING

- Do not modify or repair the product.
- Do not open the connection compartment in the presence of an ignitable mixture. Even a movement of the shaft can cause a spark with the terminal compartment open.
- Prevent damage to housing components that are part of the explosion protection gap. Do not use sharp-edged tools to open the connection compartment.
- Close the connection compartment according to the instructions.
- Use the product in the approved Ex zones only.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER**HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH**

- Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation and who have received safety training to recognize and avoid hazards involved are authorized to work on and with this drive system. Installation, adjustment, repair and maintenance must be performed by qualified personnel.
- The system integrator is responsible for compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.
- Supplement the motor cable grounding conductor with an additional protective ground conductor to the motor housing.
- Do not touch unshielded components or terminals with voltage present. Use only electrically insulated tools.
- The motor generates voltage when the shaft is rotated. Prior to performing any type of work on the drive system, block the motor shaft to prevent rotation.
- AC voltage can couple voltage to unused conductors in the motor cable. Insulate both ends of unused conductors in the motor cable.
- Do not short across the DC bus terminals or the DC bus capacitors.
- Before performing work on the drive system:
 - Disconnect all power, including external control power that may be present.
 - Place a "Do Not Turn On" label on all power switches.
 - Lock all power switches in the open position.
 - Wait for the DC bus capacitors to discharge (see the product manual for the power stage). Then measure the DC bus voltage and verify it is less than $< 42 V_{dc}$ (see the product manual for the power stage).
- Install and close all covers before applying voltage.

Failure to follow these instructions will result in death or serious injury.

▲ WARNING**LOSS OF CONTROL**

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop, overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical functions.
- System control paths may include communication links. Consideration must be given to the implication of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines.¹⁾
- Each implementation of the product must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death or serious injury.

- 1) For USA: Additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems".

2.5 Standards and terminology

Technical terms, terminology and the corresponding descriptions in this manual are intended to use the terms or definitions of the pertinent standards.

In the area of drive systems, this includes, but is not limited to, terms such as "safety function", "safe state", "fault", "fault reset", "failure", "error", "error message", "warning", "warning message", etc.

Among others, these standards include:

- IEC 61800 series: "Adjustable speed electrical power drive systems"
- IEC 61158 series: "Industrial communication networks - Fieldbus specifications"
- IEC 61784 series: "Industrial communication networks - Profiles"
- IEC 61508 series: "Functional safety of electrical/electronic/programmable electronic safety-related systems"

Also see the glossary at the end of this manual.

3 Technical Data

3

This chapter contains information on the ambient conditions and on the mechanical and electrical properties of the product family and the accessories.

3.1 ExRDM General

3.1.1 Environmental influences

Ambient temperature and relative humidity during operation

Temperature (t)	[°C]	-20°C ... +50°C
Relative humidity (non-condensing)	[%]	75 annual mean 95 on 30 days

Ambient conditions transportation and storage

The environment during transportation and storage must be dry and free from dust. The maximum vibration and shock load must be within the specified limits.

The storage time is primarily determined by the service life of the lubricants in the bearings; do not store the product for more than 36 months. It is recommended to periodically operate the motor.

Temperature	[°C]	-25 ... +70
-------------	------	-------------

Service life

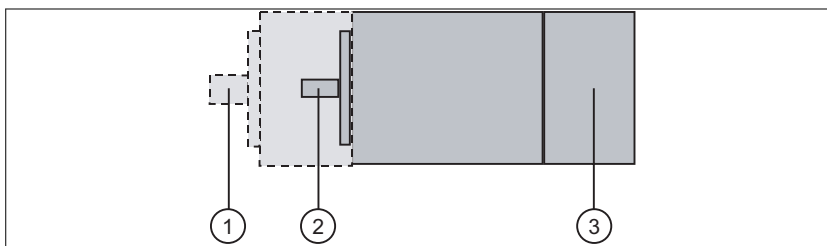
The service life of the motors when operated correctly is limited primarily by the bearing service life.

The following operating conditions can significantly reduce the service life:

- Installation altitude higher than 1000 m above m.s.l. Note the European standard EN 60034-1.
- Continuous operating temperatures greater than 80°C
- Rotary movements exclusively within an angle of $\leq 100^\circ$
- Operation with very high angular acceleration
- Operation under vibration load greater than 20 m/s²
- High cycle frequencies
- Allowing sealing rings to run dry
- Contact of the seals with aggressive media

3.1.2 Degree of protection

IP degree of protection The motors have the following degrees of protection as per EN 60034-5:



Item		Degree of protection
1	Gearbox	IP54
2	Shaft exit front	IP44
3	Terminal box	IP56

See page 18 for the permissible mounting positions.

Type of protection The motors have the type of protection Ex d IIC T4 Gb. This means:

- Applied harmonized standards, especially EN 60079-0, EN 60079-1 und EN 60034-1
- Approved as per ATEX 94/9/EC
- Type of protection flameproof enclosure "d"
- Equipment group II
- Gas group
- Temperature class "T4" (135°C)
- Use in potentially explosive atmospheres (hazardous locations) of zones 1 and 2, equipment category 2G (gas)
- Tested thermistor monitoring devices are mandatory for temperature monitoring.

3.2 ExRDM39x

3.2.1 Motor-specific data

Motor type			ExRDM3910N ExRDM3910NEi	ExRDM3913N ExRDM3913NEi	ExRDM3913NEa
Nominal voltage		[V _{ac}] ¹⁾	230	230	230
		[V _{dc}] ²⁾	325	325	325
Maximum voltage to ground		[V _{ac}]	250	250	250
Nominal current with duty type S1	I _N	[A]	1.6	1.6	1.6
Nominal current with duty type S6 ³⁾ 40% duty cycle 60% duty cycle	I _N	[A]	2.7	2.7	2.7
			1.6	1.6	1.6
Winding resistance	R _W	[Ω]	7.5	9.3	9.3
Nominal torque	M _N	[Nm]	4.0	5.8	5.8
Holding torque	M _H	[Nm]	4.5	6.55	6.55
Rotor inertia	J _R	[kgm ²]	2.2 * 10 ⁻⁴	3.3 * 10 ⁻⁴	3.3 * 10 ⁻⁴
Steps per revolution 4)	z		200 / 400 / 500 / 1000 / 2000 / 4000 / 5000 / 10000		
Step angle ⁴⁾	α	[°]	1.8 / 0.9 / 0.72 / 0.36 / 0.18 / 0.09 / 0.072 / 0.036		
Systematic angle tolerance per step ⁵⁾	Δα _s	[']	±6	±6	±6
Maximum starting frequency ⁴⁾	f _{A0m}	[kHz]	5.3	5.3	5.3
Electrical time constant	τ	[ms]	~9	~11	~11
Type of protection			Ex d IIC T4 Gb	Ex d IIC T4 Gb	Ex d IIC T4 Gb
Total length			194	224	250
Mass	m	[kg]	7.4	9.5	9.8

1) Maximum RMS value

2) DC bus voltage

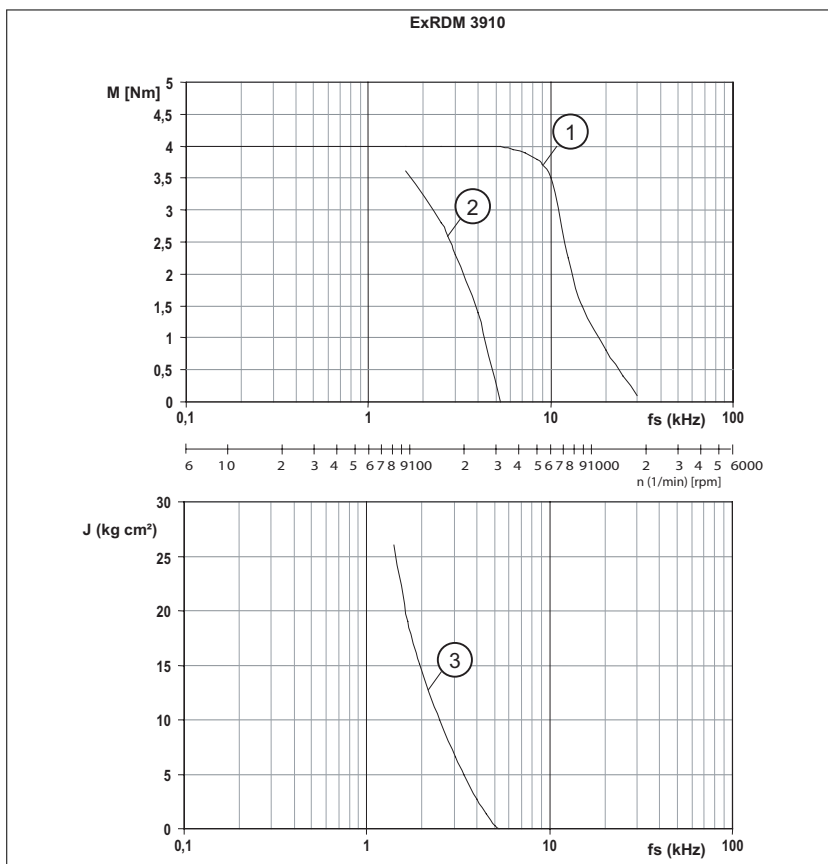
3) With a cycle duration of 10 minutes. Duty type not permissible in the case of motors with gearbox.

4) With suitable control

5) Measured at 1000 steps per revolution; unit: minute of arc

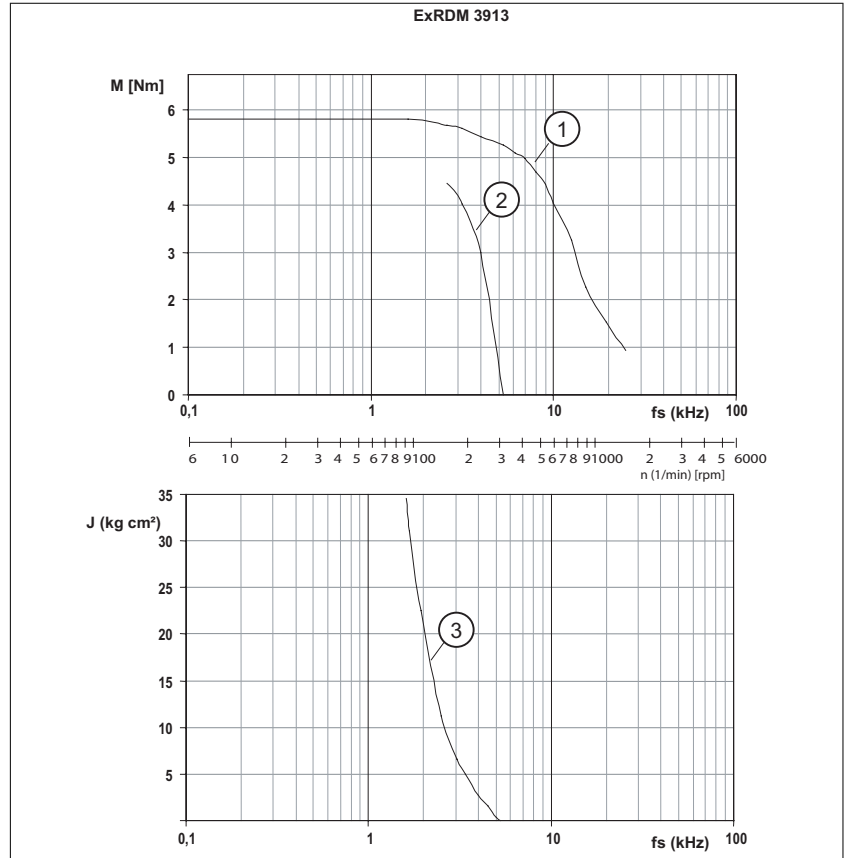
3.2.2 Characteristic curves

ExRDM3910



- (1) Pull-out torque M_{Bm}
- (2) Pull-in torque M_{Am}
- (3) Maximum load inertia in the starting range J_{Lm}

ExRDM3913



- (1) Pull-out torque M_{Bm}
- (2) Pull-in torque M_{Am}
- (3) Maximum load inertia in the starting range J_{Lm}

3.2.3 Shaft load

The following conditions apply:

- Nominal bearing service life in operating hours at a probability of failure of 10%
 $l_{10h} = 20000h$
- Speed of rotation
 $n = 600 \text{ min}^{-1}$
- Ambient temperature = 40°C
- Nominal torque = 100% duty cycle

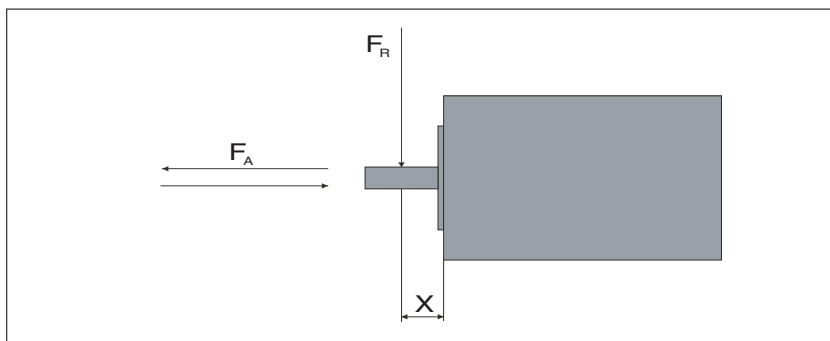


Figure 2: Points of application of forces

Maximum shaft forces

If these conditions are met the maximum forces shown in the table below may act on the shaft:

		ExRDM3910	ExRDM1913
Maximum radial force F_R [N] $X = 10 \text{ mm}$	100% duty cycle	110	110
Maximum axial force F_A [N] Tensile Pressure	100% duty cycle	170 30	170 30
Maximum force during pressing on [N]		80	80

Axial and radial limit loads must not be applied simultaneously

Maximum force during pressing on

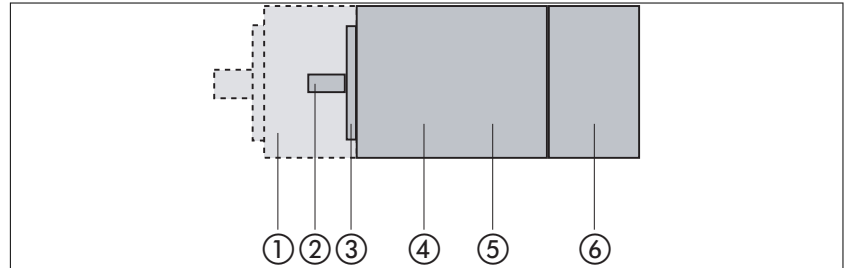
The force applied during pressing on must not exceed the maximum permissible axial force that may act on the rolling bearing, see chapter "3.2.3 Shaft load". Applying assembly paste (such as Klüberpaste 46 MR 401) to the shaft and the component to be mounted reduces friction and mechanical impact on the surfaces.

If the shaft has a thread, it is recommend to use it to press on the component to be mounted. This way there is no axial force acting on the rolling bearing.

It is also possible to shrink-fit, clamp or glue the component to be mounted.

3.2.4 Motor versions

Due to the flexible modular system and an advanced variant management system, the versions described below can be offered. Below the schematic view, the type code shows all available versions of this motor size.



Item	Type
1	Gearbox: - 3:1 - 5:1
2	Shaft version: - \varnothing 14 mm
3	Centering collar: - \varnothing 60 mm
4	Size: - 90
5	Length: - 10 - 13
6	Options: - Without encoder - With incremental encoder - With absolute encoder (ExRDM3913 only)

3.2.5 Dimensions

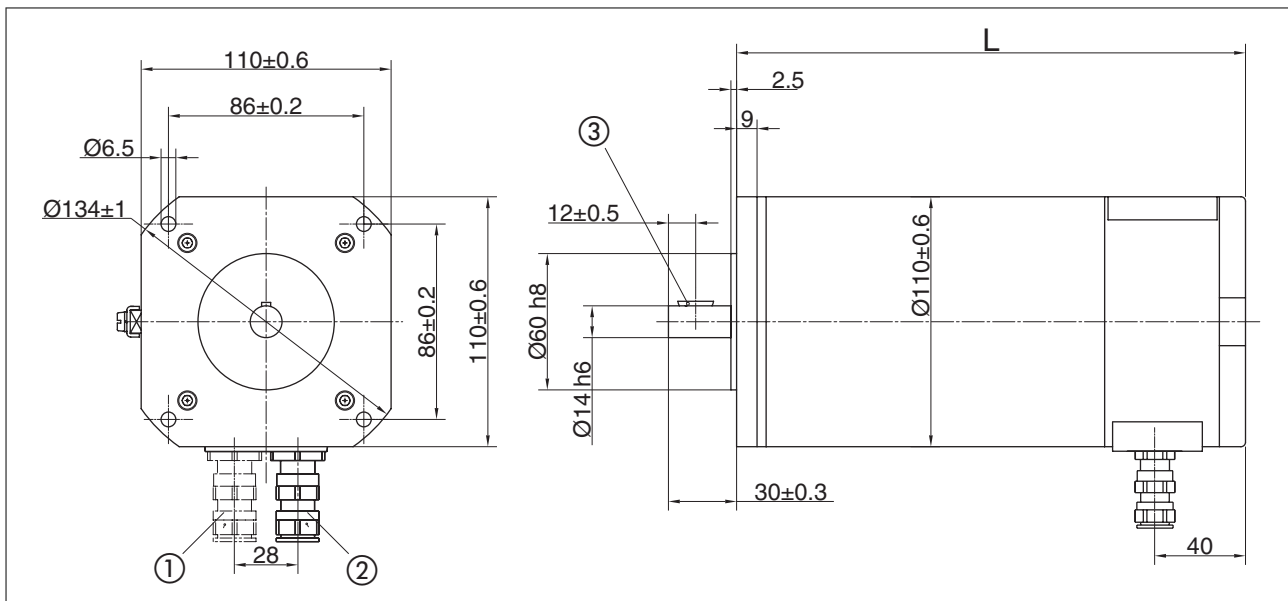


Figure 3: Dimensions ExRDM39xN- and ExRDM39xNEi

- (1) Cable entry encoder
- (2) Cable entry motor
- (3) Woodruff key 5 x 6.5 EN 60034-7

	ExRDM3910	ExRDM3913
Total length L [mm]	194 ±1	224 ±1

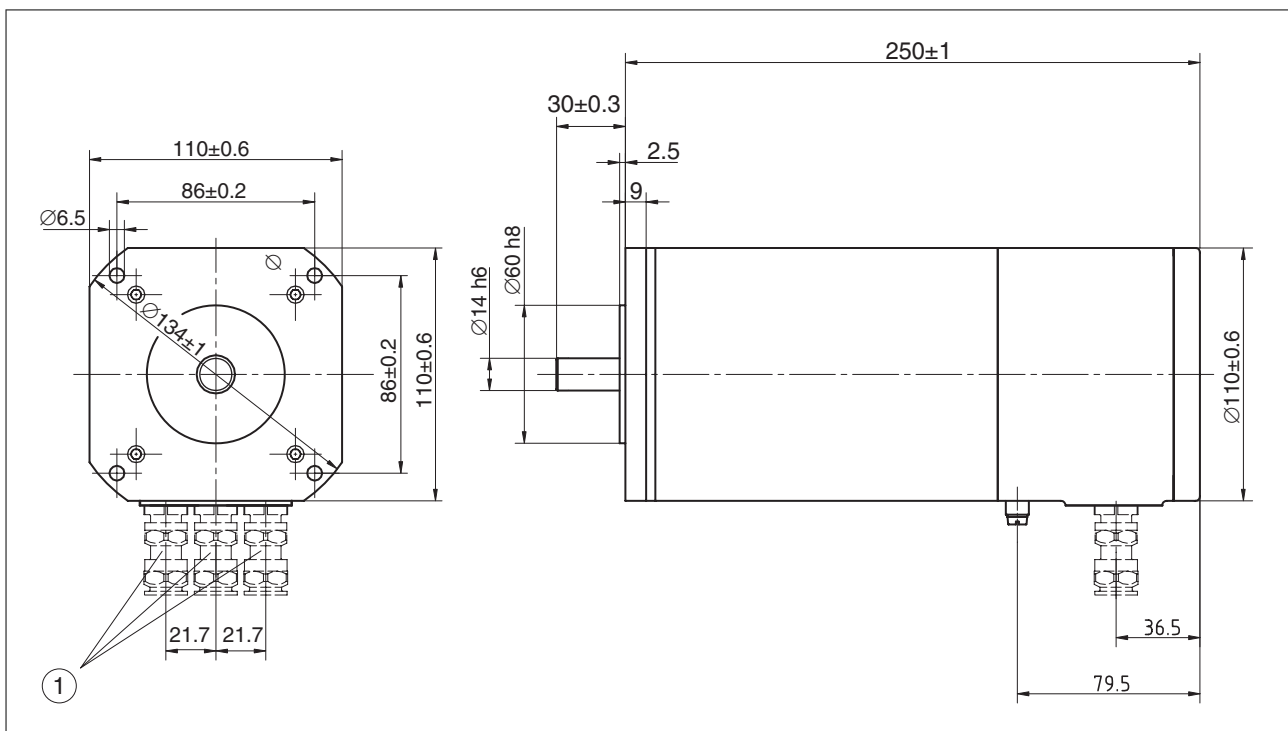


Figure 4: Dimensions ExRDM39xNEa

- (1) Cable entry (motor and encoder)

3.2.6 Encoder

3-phase stepper motors can be equipped with an optional encoder. This measuring system provides feedback on the actual position if the power stage is fitted with rotation monitoring electronics. Rotation monitoring compares the reference position and the actual position of the motor and signals an error if the difference exceeds a specified limit (position deviation -> following error). For example, this enables detection of mechanical overload of the motor.

Incremental encoder

Resolution	1000 increments / revolution
Index pulse	1 increment / revolution
Output	RS422
Signals	A, B, I
Pulse shape	Rectangular
Supply voltage	5V \pm 10%
Maximum supply current	0.125 A

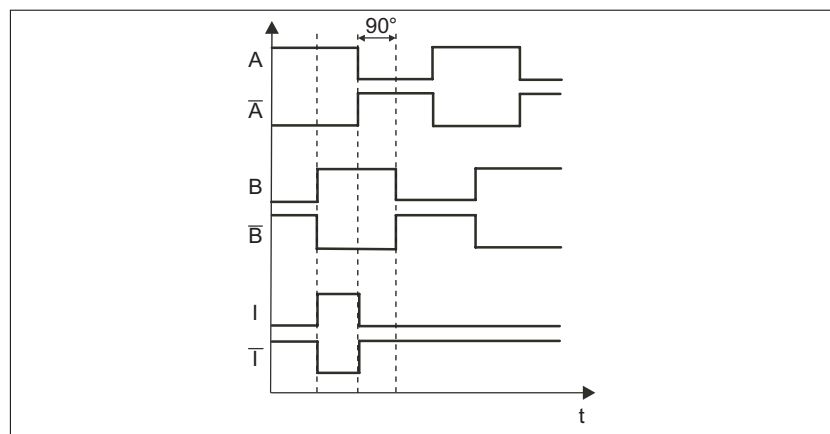


Figure 5: Pulse diagram for positive direction of movement

Absolute encoder

Encoder type: ECE-BA

The absolute encoder is a product of TR Electronic GmbH. Additional information can be found on the Internet at:

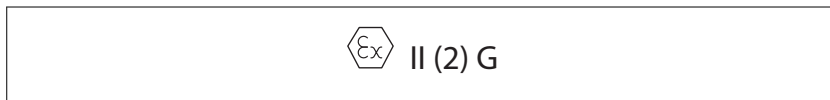
<http://www.schneider-electric.com>.

Direction of rotation

Rotation of the motor shaft in a positive or negative direction of rotation. Positive direction of rotation is when the motor shaft rotates clockwise as you look at the end of the protruding motor shaft.

3.2.7 Temperature monitoring

In the case of motor overtemperature, an approved thermistor monitoring device must disconnect all power to the power stage. The device must have the following label:



Temperature sensors (PTC as per DIN 44082) are integrated in the motor winding. The temperature sensors do not have a protective separation; they are only isolated from the motor winding by the basic insulation.

3.3 Gearbox PL50

The explosion-protected 3-phase stepper motors can be equipped with the PL50 gearbox.

The available torques depend on the gear ratio and the efficiency of the gearbox.



The actual torques at a given control frequency f_s must be calculated on the basis the characteristic torque curves. The gearbox inertia must be added to the rotor inertia and the external moment of inertia to calculate the maximum start/stop frequency from the characteristic start/stop curve.

If the PL50 gearbox is used, duty type S6 is not permissible.

The gearbox is a product of Neugart GmbH. Additional information can be found at:

<http://www.schneider-electric.com>.

3.4 Declaration of conformity

 SCHNEIDER ELECTRIC MOTION DEUTSCHLAND GmbH Breslauer Str. 7 D-77933 Lahr	
<u>EC DECLARATION OF CONFORMITY</u> <u>YEAR 2012</u>	
<input type="checkbox"/> according to EC Directive on Machinery 2006/42/EC <input type="checkbox"/> according to EC Directive EMC 2004/108/EC <input checked="" type="checkbox"/> according to EC Directive Low Voltage 2006/95/EC	
We hereby declare that the products listed below meet the requirements of the EC Directives indicated with respect to design, construction and version distributed by us. This declaration becomes invalid in the case of any modification to the products not authorized by us.	
Designation:	3 Phase motor for the Ex Area
Type:	ExRDM3910/50, ExRDM3913/50
Applied harmonized standards, especially:	EN 60034-1:2010 Thermal class 155 EN 60034-5:2007 Degree of protection IP44 EN 60079-0:2009 EN 60079-1:2007
Applied national standards and technical specifications, especially:	PTB 11 ATEX 1042 X RL 94/9/EG Product documentation
Company stamp:	Schneider Electric Motion Deutschland GmbH Postfach 11 80 • D-77901 Lahr Breslauer Str. 7 • D-77933 Lahr
Date/Signature:	2 January 2012 
Name/Department:	Michael Kunz/R & D

3.5 EC Type Examination Certificate ATEX

An EC Type Examination Certificate is available for this motor series which attest to design compliance and to compliance with the applicable EN standards: PTB 11 ATEX 1042 X

4 Installation

4

⚠ WARNING

GREAT MASS OR FALLING PARTS

The motor can have an unexpectedly great mass.

- Consider the mass of the motor when mounting it. It may be necessary to use a suitable crane.
- Use personal protective equipment (for example, safety shoes and protective gloves).
- Mount the motor in such a way (tightening torque, securing screws) that it cannot come loose even in the case of fast acceleration or continuous vibration.

Failure to follow these instructions can result in death, serious injury or equipment damage.

⚠ WARNING

STRONG ELECTROMAGNETIC FIELDS

Motors can generate strong local electrical and magnetic fields. This can cause interference in sensitive devices.

- Keep persons with implants such as pacemakers away from the motor.
- Do not place any sensitive devices close to the motor.

Failure to follow these instructions can result in death, serious injury or equipment damage.

⚠ WARNING

UNEXPECTED BEHAVIOR CAUSED BY DAMAGE OR FOREIGN OBJECTS

Damage to the product as well as foreign objects, deposits or humidity can cause unexpected behavior.

- Do not use damaged products.
- Keep foreign objects from getting into the product.
- Verify correct seat of seals and cable entries.

Failure to follow these instructions can result in death, serious injury or equipment damage.

CAUTION

DAMAGE CAUSED BY IMPROPER APPLICATION OF FORCES

If the motor is improperly subjected to loads, it can be damaged or fall down.

- Do not step onto the motor.
- Avoid improper use by means of safeguards at the machine or safety instructions.

Failure to follow these instructions can result in injury or equipment damage.

4.1 Before mounting

Checking for damage Damaged drive systems must neither be installed nor operated.

- ▶ Prior to mounting, check the drive system for visible damage.

Cleaning the shaft The shaft extensions are factory-treated with an anti-corrosive. If output components are glued to the shaft, the anti-corrosive must be removed and the shaft cleaned. If required, use a grease removal agent as specified by the glue manufacturer. If the glue manufacturer does not provide information on grease removal, it is recommended to use acetone.

- ▶ Remove the anti-corrosive. Avoid direct contact of the skin and the sealing material with the anti-corrosive or the cleaning agent.

Mounting surface for flange The mounting surface must be stable, clean, deburred and low-vibration.

- ▶ Verify that the system side meets all requirements in terms of dimensions and tolerances.

4.2 Electromagnetic compatibility, EMC

▲ WARNING

SIGNAL AND DEVICE INTERFERENCE

Signal interference can cause unexpected responses of the device.

- Install the wiring in accordance with the EMC requirements.
- Verify compliance with the EMC requirements.

Failure to follow these instructions can result in death, serious injury or equipment damage.



Pre-assembled motor cables and encoder cables in many different lengths are available for the drive solutions. Contact your local sales office.

EMC requirement: Route motor cable separately

When planning the wiring, take into account the fact that the motor cable must be routed separately. The motor cable must be separate from the mains cable or the signal wires.

Motor and encoder cables Motor and encoder cables are especially critical in terms of EMC. Use only pre-assembled cables or cables that comply with the specifications and implement the EMC measures described below.

EMC measures	Effect
Keep cables as short as possible. Do not install unnecessary cable loops, use short cables from the central grounding point in the control cabinet to the external ground connection.	Reduces capacitive and inductive interference.
Ground the product via the motor flange or with a ground strap to the ground connection at the cover of the connector housing.	Reduces emissions, increases immunity.
Connect large surface areas of cable shields, use cable clamps and ground straps.	Reduces emissions.
Do not install switching elements in motor cables or encoder cables.	Reduces interference.
Route the motor cable at a distance of at least 20 cm from the signal cable or use shielding plates between the motor cable and signal cable.	Reduces mutual interference
Route the motor cable and encoder cable without cutting them. ¹⁾	Reduces emission.

1) If a cable is cut for the installation, take appropriate measures for uninterrupted shielding (such as a metal housing) at the point of the cut. Connect a large area of the cable shield to the metal housing at both ends of the cut.

Pre-assembled connection cables (accessories) Use pre-assembled cables to reduce the risk of wiring errors, see chapter "7 Accessories and spare parts".

Place the female connector of the motor cable onto the male connector and tighten the union nut. Proceed in the same manner with the connection cable of the encoder system. Connect the motor cable and the encoder cable to the drive according to the wiring diagram of the drive.

Equipotential bonding conductors Potential differences can result in excessive currents on the cable shields. Use equipotential bonding conductors to reduce currents on the cable shields.

The equipotential bonding conductor must be rated for the maximum current flowing. Practical experience has shown that the following conductor cross sections can be used:

- 16 mm² (AWG 4) for equipotential bonding conductors up to a length of 200 m
- 20 mm² (AWG 4) for equipotential bonding conductors with a length of more than 200 m

4.3 Mounting the motor

WARNING

UNEXPECTED MOVEMENT CAUSED BY ELECTROSTATIC DISCHARGE

In rare cases, electrostatic discharge to the shaft may cause incorrect operation of the encoder system and result in unexpected motor movements and damage to the bearing.

- Use conductive components (such as antistatic belts) or other suitable measures to avoid static charge by motion.

Failure to follow these instructions can result in death, serious injury or equipment damage.

WARNING

UNINTENDED BEHAVIOR CAUSED BY MECHANICAL DAMAGE TO THE MOTOR

If the maximum permissible forces at the shaft are exceeded, this will result in premature wear of the bearing, shaft breakage or damage to the encoder.

- Do not exceed the maximum permissible axial and radial forces.
- Protect the shaft from impact.
- Do not exceed the maximum permissible axial force when pressing on components.

Failure to follow these instructions can result in death, serious injury or equipment damage.

WARNING

HOT SURFACES

The heat sink at the product may heat up to over 100°C (212°F) during operation.

- Avoid contact with the hot heat sink.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity.
- Consider the measures for heat dissipation described.

Failure to follow these instructions can result in death or serious injury.

▲ WARNING**LOAD FALLS DURING SWITCHING ON**

When the holding brake of stepper motor drives is released and external forces are applied (vertical axes), the load may fall if the friction is low.

- In such applications, limit the load to a maximum of 25% of the static holding torque.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Mounting position The following mounting positions are defined and approved as per IEC 60034-7:

- IM B5 drive shaft horizontal
- IM V1 drive shaft vertical, shaft end down

Mounting When the motor is mounted to the mounting flange, it must be accurately aligned axially and radially and evenly contact the surface. All mounting screws must be tightened with the specified torque. There must be no tension. See chapter "3 Technical Data" for data, dimensions and degrees of protection (IP).

Mounting output components If output components are not properly mounted, the motor may be damaged. Output components such as pulleys, couplings must be mounted with suitable equipment and tools. The maximum axial and radial forces acting on the shaft must not exceed the maximum shaft load values specified, see "3.2.3 Shaft load".

Observe the mounting instructions provided by the manufacturer of the output component. Motor and output component must be accurately aligned both axially and radially. Failure to follow the instructions will cause runout, damage to the rolling bearings and premature wear.

Installing the drive Power stage, switches, fuses or thermistor monitoring devices must be installed outside the hazardous area / Ex zone.

4.4 Electrical installation

⚠ DANGER**EXPLOSION HAZARD CAUSED BY INCORRECT HANDLING**

- Do not modify or repair the product.
- Do not open the connection compartment in the presence of an ignitable mixture. Even a movement of the shaft can cause a spark with the terminal compartment open.
- Prevent damage to housing components that are part of the explosion protection gap. Do not use sharp-edged tools to open the connection compartment.
- Close the connection compartment according to the instructions.
- Use the product in the approved Ex zones only.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER**EXPLOSION HAZARD CAUSED BY INCORRECT USE**

- Use the product only with a thermistor monitoring device approved for ATEX.

Failure to follow these instructions will result in death or serious injury.

4.4.1 Cable connection

Cable specifications Cable requirements as per IEC 60079-14:

- Shielded motor cable with 4*1.5 mm² and 2*0.5 mm² wires, separate shield for the signal wires
- Shielded encoder cable for incremental encoder with 5 (2*0.25 mm²) and 1 (2*0.5 mm²) twisted pair wires
- CAN cable upon request
- Continuous temperature resistance: -20 °C to 110 °C
- The cable diameter must be between 6 mm and 12 mm (clamping range of the cable entry)

Tightening torques NOTE: The property class and the tightening torque of the housing screws are part of the approval.

Property class of housing screws	H	8.8
Tightening torque of motor terminals	[Nm] (lb•in)	0.6 (5.31)
Tightening torque of encoder terminals	[Nm] (lb•in)	0.25 (2.22)
Tightening torque cable entry body	[Nm] (lb•in)	7 (62)
Tightening torque cable entry inner cap	[Nm] (lb•in)	12.5 (110.63)
Tightening torque cable entry outer cap	[Nm] (lb•in)	12.5 (110.63)
Tightening torque of housing screws M5	[Nm] (lb•in)	5.8 (51.33)

4.4.1.1 ExRDM39xN- and ExRDM39xNEi

Connection assignment

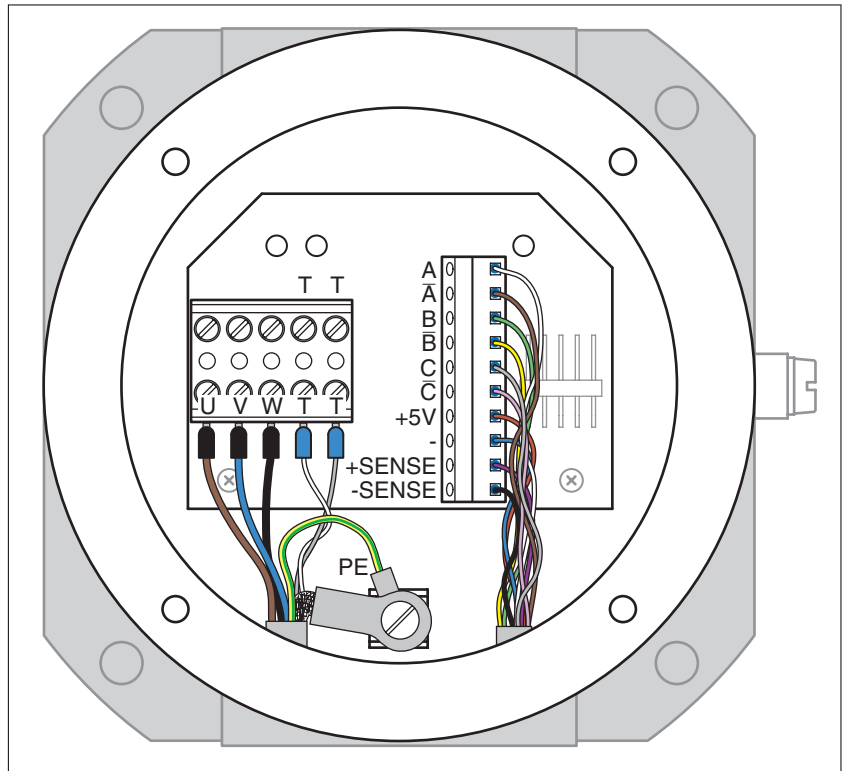


Figure 6: Connections with wiring for incremental encoder

Motor connection

The motors are not designed for direct connection to mains power; they may only be operated with an approved power stage.

It is recommended to use ring-type cable lugs for connecting the protective ground conductor and the shield with PE (ground).

For information on mounting the cable entry, see the product insert for the cable entry and "4.4.2 Cable entries - ATEX".

CN1 pin	Meaning	Cable color (IEC 757)
U	Motor phase	Brown (BN)
V	Motor phase	Blue (BU)
W	Motor phase	Black (BK)
PE	Protective ground conductor	Green/yellow (GN/YE)
	External cable shield to PE (ground)	
T	Thermistor	White (WH)
T	Thermistor	Gray (GY)
	Internal cable shield around T to PE (ground)	

Connection of incremental encoder

- ▶ Verify that wiring, cables and connected interfaces meet the PELV requirements.
- ▶ Check whether the power supply has a suitable current limitation or must be separately fused.

Signal	Cable color (IEC 757)
A	White (WH)
\bar{A}	Brown (BN)
B	Green (GN)
\bar{B}	Yellow (YE)
C	Gray (GY)
\bar{C}	Pink (PK)
+5V	Red (RD)
-5VGND	Blue (BU)
+SENSE	Violet (VT)
-SENSE	Black (BK)
	External cable shield to PE (ground)

4.4.1.2 ExRDM39xNEa

Connection assignment

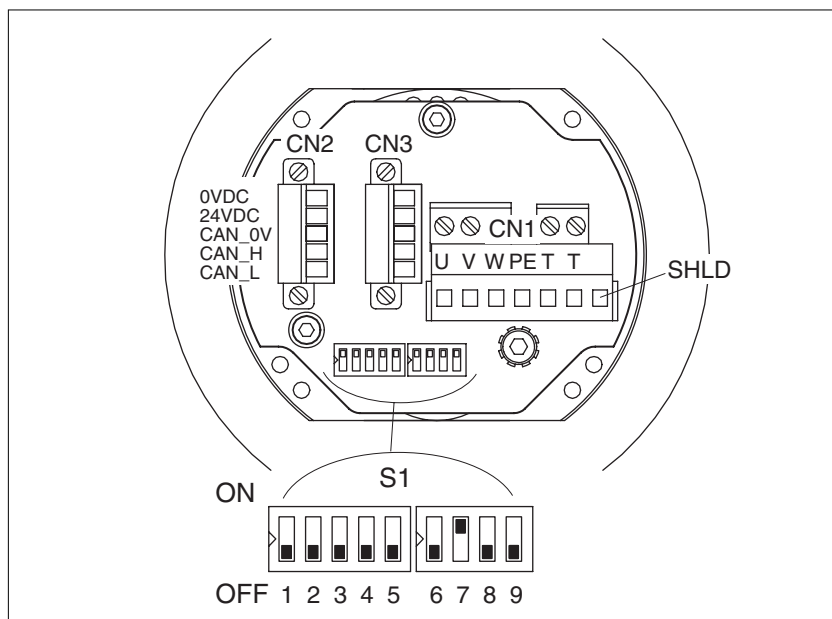


Figure 7: Connection assignment for absolute encoder

S1 (DIP switch)	Meaning
1-5	Basic ID
6	Memory function 0: Parameters are saved. 1: Parameters are not changed. After Power Off/On, the old values become valid again.
7	Baud rate 0: 250 kBaud 1: 500 kBaud
8	Counting direction 0: Bus parameter index 6000 is valid 1: Bus parameter index 6000 is inverted
9	CAN bus termination (terminating resistor 120 Ω ±5%) 0: Off 1: On

The switch S1 is evaluated once after Power On. Subsequent changes of a DIP switch have no effect.

Encoder type: ECE-BA

The absolute encoder is a product of TR Electronic GmbH. Additional information can be found on the Internet at:

<http://www.schneider-electric.com>.

Connections with wiring

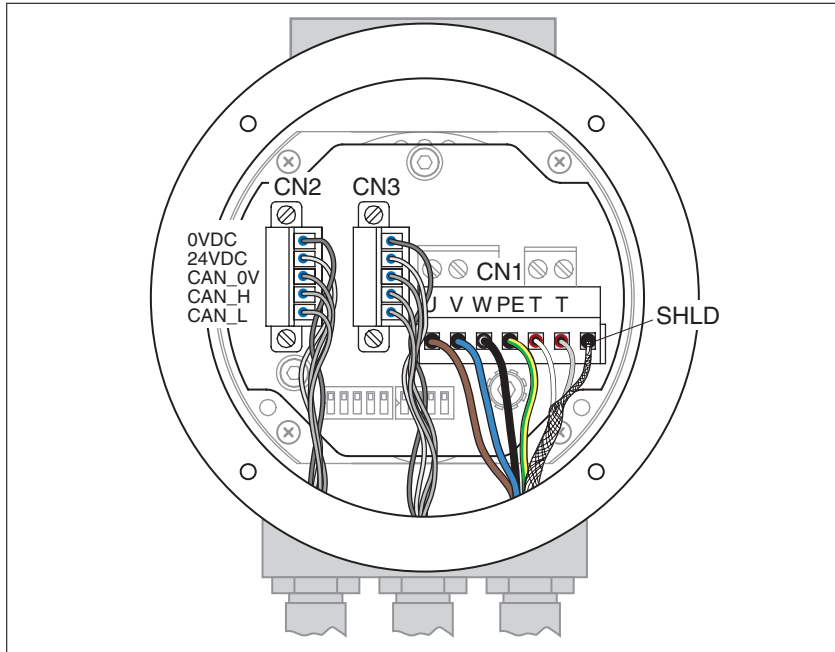


Figure 8: Connections with wiring for absolute encoder

Motor connection

The motors are not designed for direct connection to mains power; they may only be operated with a suitable power stage.

For information on mounting the cable entry, see the product insert for the cable entry and "4.4.2 Cable entries - ATEX".

CN1 pin	Meaning	Cable color (IEC 757)
U	Motor phase	Brown (BN)
V	Motor phase	Blue (BU)
W	Motor phase	Black (BK)
PE	Protective ground conductor	Green/yellow (GN/YE)
	External cable shield to shield connection in the cable entry	
T	Thermistor	White (WH)
T	Thermistor	Gray (GY)
SHLD	Internal cable shield around T	

- ▶ Verify that the shield cannot contact switch S1.
- ▶ Check the distance between the connections and the cover. The wires must not be damaged by the cover.

Connection of absolute encoder

⚠ WARNING
DAMAGE TO SYSTEM COMPONENTS AND LOSS OF CONTROL
Interruptions of the negative connection of the controller supply voltage can cause excessively high voltages at the signal connections.
<ul style="list-style-type: none"> • Do not interrupt the negative connection between the power supply unit and load with a fuse or switch. • Verify correct connection before switching on. • Do not connect the controller supply voltage or change its wiring while the supply voltage is present.
Failure to follow these instructions can result in death, serious injury or equipment damage.



Connect the center cable entry first because it is difficult to access otherwise.

- ▶ Verify that wiring, cables and connected interfaces meet the PELV requirements.
- ▶ Check whether the power supply has a suitable current limitation or must be separately fused.

CN2/CN3	Signal	Meaning	Type (I/O)
1	0VDC	Reference potential encoder	
2	24VDC	Encoder supply	E
3	CAN_OV	Reference potential CAN	
4	CAN_H	Data	CAN level
5	CAN_L	Data, inverted	CAN level
		External cable shield to shield connection in the cable entry	

4.4.2 Cable entries - ATEX

Only the following cable entries are approved for this product; other cable entries must not be used:

Type	Thread	Notes
CAPRI ADE4F	M20*1.5	With shield connection, included in scope of supply
CAPRI ADE4F	M16*1.5	With shield connection, separate accessories for ExRDM 3913 NEa



To avoid twisting of the wires, the screws of the cable entry should be tightened in the sequence indicated below. When the outer cap (3) and the inner cap (2) are loosened, the body (1) must be arrested so it cannot come loose.

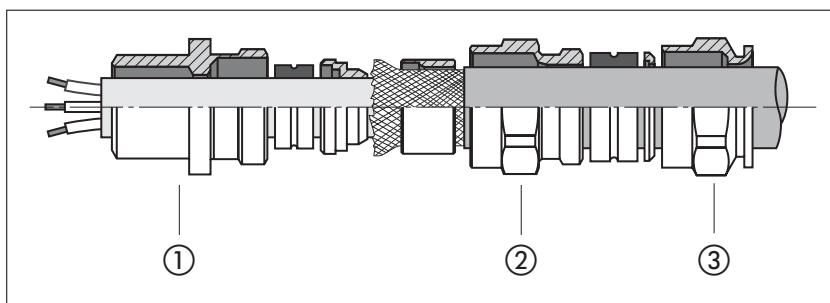


Figure 9: Design of the ATEX cable entry ADE 4F

- (1) Body
- (2) Inner cap
- (3) Outer cap

Tightening torques

NOTE: The property class and the tightening torque of the housing screws are part of the approval.

Property class of housing screws	H	8.8
Tightening torque of motor terminals	[Nm] (lb•in)	0.6 (5.31)
Tightening torque of encoder terminals	[Nm] (lb•in)	0.25 (2.22)
Tightening torque cable entry body	[Nm] (lb•in)	7 (62)
Tightening torque cable entry inner cap	[Nm] (lb•in)	12.5 (110.63)
Tightening torque cable entry outer cap	[Nm] (lb•in)	12.5 (110.63)
Tightening torque of housing screws M5	[Nm] (lb•in)	5.8 (51.33)

If the motor is used in a drag chain application, the cables must be fastened close to the motor so that bending forces do not act on the cable entry.

See the information sheet "Cable Entry" for for additional information on mounting the cable entry.

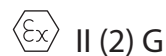
4.4.3 Temperature monitoring

⚠ DANGER**EXPLOSION HAZARD CAUSED BY INCORRECT USE**

- Use the product only with a thermistor monitoring device approved for ATEX.

Failure to follow these instructions will result in death or serious injury.

In the case of motor overtemperature, an approved thermistor monitoring device must disconnect all power to the power stage. The device must have the following label:



Temperature sensors (PTC as per DIN 44082) are integrated in the motor winding. The temperature sensors do not have a protective separation; they are only isolated from the motor winding by the basic insulation.

The motor nameplate shows the switch-off time t_A . See chapter "1.1 Nameplate", page 8, for information on the nameplate.

- ▶ Set the switch-off time t_A according to the information shown on the motor nameplate.

The following products are recommended:

- Berger Lahr power stage I902 with integrated thermistor monitoring device BLS242
- Dold MK 9003.12/11120 ATEX 230 VAC
Available at www.dold.com
- Möller EMT 6 DBK
Available at www.moeller.net

5 Commissioning

5

WARNING

UNEXPECTED MOVEMENT

Drive systems may perform unexpected movements because of incorrect connection or other errors.

- Operate the motor with approved power stages only. Even if the connectors of a different power stage match, this does not imply compatibility.
- Verify proper wiring.
- Only start the system if there are no persons or obstructions in the hazardous area.
- Perform the first test runs without coupled loads.
- Do not touch the motor shaft or the mounted output components.

Failure to follow these instructions can result in death, serious injury or equipment damage.

WARNING

ROTATING PARTS

Rotating parts may cause injuries and may catch clothing or hair. Loose parts or parts that are out of balance may be catapulted away.

- Verify correct mounting and installation of all rotating parts.
- Use a cover to help protect against rotating parts.

Failure to follow these instructions can result in death, serious injury or equipment damage.

WARNING

FALLING PARTS

The motor may move, tip and crash down as a result of the reaction torque.

- Mount the motor securely so it will not break loose during strong acceleration.

Failure to follow these instructions can result in death, serious injury or equipment damage.

▲ WARNING**HOT SURFACES**

The heat sink at the product may heat up to over 100°C (212°F) during operation.

- Avoid contact with the hot heat sink.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity.
- Consider the measures for heat dissipation described.

Failure to follow these instructions can result in death or serious injury.

Commissioning procedure:

- ▶ Check the mechanical installation.
- ▶ Check the electrical installation.

In particular, verify proper connection of the protective ground conductors. Check wiring and connection of all cables and system components. Verify that all cable glands are properly tightened.

- ▶ Check the ambient conditions.

Verify that the ambient conditions specified are met.

- ▶ Check the output components.

Verify that any output components installed are balanced and accurately aligned.

- ▶ Check the parallel key at the shaft end of the motor.

If you have a motor with a parallel key groove and parallel key, the parallel key must not be inserted during commissioning without output component or it must be appropriately secured.



Observe the information on commissioning in the product manual of the drive.

Absolute encoder

Encoder type: ECE-BA

The absolute encoder is a product of TR Electronic GmbH. Additional information can be found on the Internet at:

<http://www.schneider-electric.com>.

6 Diagnostics and troubleshooting

6

6.1 Diagnostics and troubleshooting

6.1.1 Mechanical problems

Error	Cause	Troubleshooting
Excessive heat	Overload Holding brake not released Heavy pollution	Reduce load Check the holding brake controller Clean the motor
Whistling or knocking noise	Rolling bearings	Contact service
Grinding noise	Rotating output component grinds	Align output component
Radial oscillation	Poor alignment of output component Output component out of balance Shaft bent Resonance with mounting elements	Align output component Balance output component Contact service Check the stiffness of the motor mounting
Axial oscillation	Poor alignment of output component Shocks of the output component Resonance with mounting elements	Align output component Check output component Check the stiffness of the motor mounting

6.1.2 Electrical problems

Error	Cause	Troubleshooting
Motor does not start or starts with problems	Overload Unsuitable settings for the drive Cable damaged	Reduce load Check drive settings Check cables and connections
Excessive heat	Overload	Reduce power
Heat at the connection terminals	Connector loose or not tightened	Tighten connector

7 Accessories and spare parts

7

7.1 Accessories

Designation	Order no.
Motor cable for explosion-protected motors, unassembled, 5 m	0062501331005
Motor cable for explosion-protected motors, unassembled, 10 m	0062501331010
Motor cable for explosion-protected motors, unassembled, 15 m	0062501331015
Motor cable for explosion-protected motors, unassembled, 20 m	0062501331020
Motor cable for explosion-protected motors, unassembled, 30 m	0062501331030
Motor cable for explosion-protected motors, unassembled, 50 m	0062501331050
Motor cable for explosion-protected motors, unassembled, 75 m	0062501331075
Motor cable for explosion-protected motors, unassembled, 100 m	0062501331100
Motor cable for explosion-protected motors, unassembled, 200 m	0062501331200
Encoder cable for explosion-protected motors, unassembled (for ...NEi), 5 m	0062501486050
Encoder cable for explosion-protected motors, unassembled (for ...NEi), 10 m	0062501486010
Encoder cable for explosion-protected motors, unassembled (for ...NEi), 15 m	0062501486015
Encoder cable for explosion-protected motors, unassembled (for ...NEi), 20 m	0062501486020
Encoder cable for explosion-protected motors, unassembled (for ...NEi), 30 m	0062501486030
Encoder cable for explosion-protected motors, unassembled (for ...NEi), 50 m	0062501486050
Encoder cable for explosion-protected motors, unassembled (for ...NEi), 75 m	0062501486075
Encoder cable for explosion-protected motors, unassembled (for ...NEi), 100 m	0062501486100
Encoder cable for explosion-protected motors, unassembled (for ...NEi), 200 m	0062501486200
Cable entry M16*1.5 (1 piece) (for ...NEa)	0098050010164
Screw plug M16*1.5 (1 piece) (for ...NEa)	0098132210015
Dual power stage I902 with ATEX BLS242, CANopen slave	0086200237001

8 Service, maintenance and disposal

8

DANGER

EXPLOSION HAZARD CAUSED BY INCORRECT HANDLING

- Do not modify or repair the product.
- Do not open the connection compartment in the presence of an ignitable mixture. Even a movement of the shaft can cause a spark with the terminal compartment open.
- Prevent damage to housing components that are part of the explosion protection gap. Do not use sharp-edged tools to open the connection compartment.
- Close the connection compartment according to the instructions.
- Use the product in the approved Ex zones only.

Failure to follow these instructions will result in death or serious injury.

8.1 Service address



If you have any questions please contact your sales office. Your sales office staff will be happy to give you the name of a customer service office in your area.

<http://www.schneider-electric.com>

8.2 Storage

The motors must be transported and stored in a dry, dust-free and vibration-free environment. The ambient conditions and application conditions specified in chapter "3.1 ExRDM General" must be met; in case of doubt you must air-condition the storage location.

The storage time is primarily determined by the service life of the lubricants; do not store the product for more than 36 months. It is recommended to periodically operate the drive solution to maintain its operability.

8.3 Maintenance

Repairs may only be made by the manufacturer. No warranty or liability is accepted for repairs made by unauthorized persons.

Repairs cannot be made with the device installed.



Prior to any type of work on the drive system, consult the chapters on Installation and Commissioning for information on the precautions and processes to be observed.

Include the following points in the maintenance plan of your machine.

Connections and fastening

- ▶ Check all connection cables and connectors regularly for damage. Replace damaged cables immediately.
- ▶ Check that all output elements are firmly seated.
- ▶ Tighten all mechanical and electrical threaded connections to the specified torque. Check the union nuts at the connection cables.

Lubricating the shaft sealing ring

In the case of motors with shaft sealing ring, lubricant must be applied to the space between the sealing lip of the shaft sealing ring and the shaft with a suitable non-metallic tool. If the shaft sealing rings are allowed to run dry, the service life of the shaft sealing rings will be significantly reduced.

Cleaning

▲ WARNING
UNEXPECTED MOVEMENT
If the permissible ambient conditions are exceeded, external substances from the environment may penetrate and cause unexpected movement or equipment damage.
<ul style="list-style-type: none"> • Verify that the ambient conditions are met. • Do not allow seals to run dry. • Keep liquids from getting to the shaft bushing (for example in mounting position IM V3). • Do not expose the shaft sealing rings and cable entries to the direct spray of a pressure washer.
Failure to follow these instructions can result in death, serious injury or equipment damage.

Clean dust and dirt off the product at regular intervals. Insufficient heat dissipation to the ambient air may excessively increase the temperature.

Motors are not suitable for cleaning with a pressure washer. The high pressure may force water into the motor.

When using solvents or cleaning agents, verify that the cables, cable entry seals, O-rings and motor paint are not damaged.

Replacing the rolling bearing

The customer must not replace the rolling bearing. The motor will be partially demagnetized by this procedure and lose power.

8.4 Changing the motor

WARNING

UNINTENDED MOVEMENT DUE TO CHANGED ABSOLUTE POSITION

If you replace the motor, the absolute position of the encoder changes.

- Reset the absolute position of the encoder after having replaced the motor.

Failure to follow these instructions can result in death, serious injury or equipment damage.

- ▶ Switch off all supply voltages. Verify that no voltages are present (safety instructions).
- ▶ Label all connections and uninstall the product.
- ▶ Note the identification number and the serial number shown on the product nameplate for later identification.
- ▶ Install the new product as per chapter "4 Installation".
- ▶ Commission the product as per chapter "5 Commissioning".

8.5 Shipping, storage, disposal

Note the ambient conditions in chapter "3.1 ExRDM General".

- Shipping* The product must be protected against shocks during transportation. If possible, use the original packaging for shipping.
- Storage* The product may only be stored in spaces where the specified permissible ambient conditions are met.
Protect the product from dust and dirt.
- Disposal* The product consists of various materials that can be recycled. Dispose of the product in accordance with local regulations.

9 Glossary

9

9.1 Units and conversion tables

The value in the specified unit (left column) is calculated for the desired unit (top row) with the formula (in the field).

Example: conversion of 5 meters [m] to yards [yd]
 $5 \text{ m} / 0.9144 = 5.468 \text{ yd}$

9.1.1 Length

	in	ft	yd	m	cm	mm
in	-	/ 12	/ 36	* 0.0254	* 2.54	* 25.4
ft	* 12	-	/ 3	* 0.30479	* 30.479	* 304.79
yd	* 36	* 3	-	* 0.9144	* 91.44	* 914.4
m	/ 0.0254	/ 0.30479	/ 0.9144	-	* 100	* 1000
cm	/ 2.54	/ 30.479	/ 91.44	/ 100	-	* 10
mm	/ 25.4	/ 304.79	/ 914.4	/ 1000	/ 10	-

9.1.2 Mass

	lb	oz	slug	kg	g
lb	-	* 16	* 0.03108095	* 0.4535924	* 453.5924
oz	/ 16	-	* $1.942559 \cdot 10^{-3}$	* 0.02834952	* 28.34952
slug	/ 0.03108095	/ $1.942559 \cdot 10^{-3}$	-	* 14.5939	* 14593.9
kg	/ 0.45359237	/ 0.02834952	/ 14.5939	-	* 1000
g	/ 453.59237	/ 28.34952	/ 14593.9	/ 1000	-

9.1.3 Force

	lb	oz	p	dyne	N
lb	-	* 16	* 453.55358	* 444822.2	* 4.448222
oz	/ 16	-	* 28.349524	* 27801	* 0.27801
p	/ 453.55358	/ 28.349524	-	* 980.7	* $9.807 \cdot 10^{-3}$
dyne	/ 444822.2	/ 27801	/ 980.7	-	/ $100 \cdot 10^3$
N	/ 4.448222	/ 0.27801	/ $9.807 \cdot 10^{-3}$	* $100 \cdot 10^3$	-

9.1.4 Power

	HP	W
HP	-	* 746
W	/ 746	-

9.1.5 Rotation

	min ⁻¹ (RPM)	rad/s	deg./s
min ⁻¹ (RPM)	-	* $\pi / 30$	* 6
rad/s	* $30 / \pi$	-	* 57.295
deg./s	/ 6	/ 57.295	-

9.1.6 Torque

	lb·in	lb·ft	oz·in	Nm	kp·m	kp·cm	dyne·cm
lb·in	-	/ 12	* 16	* 0.112985	* 0.011521	* 1.1521	* $1.129 \cdot 10^6$
lb·ft	* 12	-	* 192	* 1.355822	* 0.138255	* 13.8255	* $13.558 \cdot 10^6$
oz·in	/ 16	/ 192	-	* $7.0616 \cdot 10^{-3}$	* $720.07 \cdot 10^{-6}$	* $72.007 \cdot 10^{-3}$	* 70615.5
Nm	/ 0.112985	/ 1.355822	/ $7.0616 \cdot 10^{-3}$	-	* 0.101972	* 10.1972	* $10 \cdot 10^6$
kp·m	/ 0.011521	/ 0.138255	/ $720.07 \cdot 10^{-6}$	/ 0.101972	-	* 100	* $98.066 \cdot 10^6$
kp·cm	/ 1.1521	/ 13.8255	/ $72.007 \cdot 10^{-3}$	/ 10.1972	/ 100	-	* $0.9806 \cdot 10^6$
dyne·cm	/ $1.129 \cdot 10^6$	/ $13.558 \cdot 10^6$	/ 70615.5	/ $10 \cdot 10^6$	/ $98.066 \cdot 10^6$	/ $0.9806 \cdot 10^6$	-

9.1.7 Moment of inertia

	lb·in ²	lb·ft ²	kg·m ²	kg·cm ²	kp·cm·s ²	oz·in ²
lb·in ²	-	/ 144	/ 3417.16	/ 0.341716	/ 335.109	* 16
lb·ft ²	* 144	-	* 0.04214	* 421.4	* 0.429711	* 2304
kg·m ²	* 3417.16	/ 0.04214	-	* $10 \cdot 10^3$	* 10.1972	* 54674
kg·cm ²	* 0.341716	/ 421.4	/ $10 \cdot 10^3$	-	/ 980.665	* 5.46
kp·cm·s ²	* 335.109	/ 0.429711	/ 10.1972	* 980.665	-	* 5361.74
oz·in ²	/ 16	/ 2304	/ 54674	/ 5.46	/ 5361.74	-

9.1.8 Temperature

	°F	°C	K
°F	-	(°F - 32) * 5/9	(°F - 32) * 5/9 + 273.15
°C	°C * 9/5 + 32	-	°C + 273.15
K	(K - 273.15) * 9/5 + 32	K - 273.15	-

9.1.9 Conductor cross section

AWG	1	2	3	4	5	6	7	8	9	10	11	12	13
mm ²	42.4	33.6	26.7	21.2	16.8	13.3	10.5	8.4	6.6	5.3	4.2	3.3	2.6

AWG	14	15	16	17	18	19	20	21	22	23	24	25	26
mm ²	2.1	1.7	1.3	1.0	0.82	0.65	0.52	0.41	0.33	0.26	0.20	0.16	0.13

9.2 Terms and Abbreviations

See chapter "2.5 Standards and terminology" for information on the pertinent standards on which many terms are based. Some terms and abbreviations may have specific meanings with regard to the standards.

<i>Axial forces</i>	Tension or compression forces acting longitudinally on the shaft
<i>Size</i>	In the type code, the size is defined in terms of the flange size.
<i>Length</i>	In the type code, the length is defined in terms of the number of stacks.
<i>DOM</i>	Date of manufacturing: The nameplate of the product shows the date of manufacture in the format DD.MM.YY or in the format DD.MM.YYYY. Example: 31.12.09 corresponds to December 31, 2009 31.12.2009 corresponds to December 31, 2009
<i>Direction of rotation</i>	Rotation of the motor shaft in a positive or negative direction of rotation. Positive direction of rotation is when the motor shaft rotates clockwise as you look at the end of the protruding motor shaft.
<i>EMC</i>	Electromagnetic compatibility
<i>Encoder</i>	Sensor that converts a measured distance or angle into an electrical signal. This signal is evaluated by the drive to determine the actual position of a shaft (rotor) or a driving unit.
<i>Error</i>	Discrepancy between a detected (computed, measured or signaled) value or condition and the specified or theoretically correct value or condition.
<i>Fatal error</i>	In the case of fatal error, the product is no longer able to control the motor so that the power stage must be immediately disabled.
<i>Fault</i>	Fault is a state that can be caused by an error. Further information can be found in the pertinent standards such as IEC 61800-7, ODVA Common Industrial Protocol (CIP).
<i>Fault reset</i>	A function used to restore the drive to an operational state after a detected error is cleared by removing the cause of the error so that the error is no longer active.
<i>Error class</i>	Classification of errors into groups. The different error classes allow for specific responses to errors, for example by severity.
<i>PELV</i>	Protective Extra Low Voltage, low voltage with isolation. For more information: IEC 60364-4-41
<i>PTC</i>	Resistor with positive temperature coefficient. Resistance value increases as the temperature rises.
<i>Radial forces</i>	Forces that act radially on the shaft
<i>Degree of protection</i>	The degree of protection is a standardized specification for electrical equipment that describes the protection against the ingress of foreign objects and water (for example: IP 20).
<i>Warning</i>	If the term is used outside the context of safety instructions, a warning alerts to a potential problem that was detected by a monitoring function. A warning does not cause a transition of the operating state.
<i>Centering collar</i>	Centering device at the motor flange that allows for accurate motor mounting.

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