

# Operating Manual

NORDENHAM

Flame-proof motors  
II 2G Ex db(eb) IIC(B) T3-T6 Gb  
II 2D Ex tb IIIC T120-85 °C Db



**NTB** NORDENHAM  
Technology in Motion  
**SCHORCH**

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### **IMPORTANT INFORMATION – ADDITION OF 01.08.2024**

The foundations have to meet the demands and evaluations of ISO 20816-3 and IEC 60034-14. They must either be rigid or elastic in accordance with the above mentioned standards. Alternate solutions are not permissible.

For shafts that exceed the dimensions according to IEC 60072-11 or where the external forces impacting the shaft are either unknown or not approved by ATB Nordenham GmbH, no warranty can be claimed for any resulting damage (e.g. shaft breakage, seizure in the Ex-gap or other such damages) or consequential damage (e.g. bearing damage). The above exclusion of warranty also applies to shafts or shaft blanks provided by customers.

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2. 2002 Edition, Date of Publication 03/ 02
3. 2003 Edition, Date of Publication 06/ 03
4. 2004 Edition, Date of Publication 04/ 04
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Author: Wolfgang Sobel  
Changes: Vladislav Desch, Dirk Pohlmann

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## Warning!

Hazardous electrical current!  
Ensure protection against explosions!

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### Before installing

- Switch off the power to the device.
- Make sure that device cannot be switched on again by accident.
- Make sure that the device is de-energized.
- Connect to earth and short out.
- Cover or close off any neighbouring live parts with a barrier.
- Follow carefully the assembly instructions provided for the device.
- Only qualified personnel as per EN 50110-1/-2 (VDE 0105, part 100) can perform any work on this device/system.
- The electrical connections are to be made as per the relevant specifications (e.g. cross-section of the supply line, fuses, protective connection).
- Opening the motor - save for the terminal box - during the warranty period without the manufacturer's permission shall lead to the termination of the warranty.
- Original spare parts must be used for all repairs
- Live and rotating parts of electrical motors can cause major or deadly injuries.
- All work involving transport, installation, start-up and maintenance must be carried out by qualified experts. Please pay attention to the applicable explosion protection standards and the national accident prevention regulations.
- As regards any equipment subject to these guidelines, it is important to adopt the necessary safety precautions to protect the personnel against possible injuries.
- The personnel must be duly instructed to proceed with caution and according to regulations during shipping, hoisting, and positioning and while repairing the motor.
- Do not lift the motor together with the drive equipment by the motor lifting eyebolts.
- Do not use the supplied lifting eyebolts at ambient temperatures below  $-20^{\circ}\text{C}$ , in accordance with DIN 580. The eyebolts may break at lower temperatures.
- Do not load the eyebolts as per DIN 580 no more than  $45^{\circ}$  compared to the screwing direction. The use of crossbeams is recommended. See the operating instructions for the layout dimensions of the lifting eyebolts and the minimum dimensions of the loading crossbeams and chain lengths.
- In the case of motors with built-in brake appropriate safety measures are to be adopted against the possible failure of the brake especially in applications involving the pulling of loads.
- Operating the motor with the supplied shaft protection cover alone is forbidden.
- Contact with the capacitor for the start-up and running of single-phase motors is to be avoided until the unloading procedure is carried out securely.
- If a high-voltage test is necessary, the procedures and precautionary measures set forth in accident prevention regulations are to be followed.

# Table of Contents

---

About this Manual	4
Target audience	4
Abbreviations and symbols	4

---

1 Explosion-protected Motors	6
Intended use	6
Liability and Warranty Guarantee	6
Servicing	7
– Spare parts	7
Delivery, Storage, Transport, Disposal	7
– Delivery	7
– Storage	8
– Transport	8
– Disposal	9

---

2 Installation	10
Mechanical checks	10
Site	10
Mounting	12
Mains supply and connections	15
– Mains connection of explosion-protected motors	15
– Motors with direct line lead-in	16
– Terminal box	16
– Terminal boxes with entry plate	18
– Cable and line lead-ins	18
– Mains and guard circuit connection	21
– Motors with unidirectional fan	24
– Motors with separate cooling via separately powered external fans	25
– Motors with temperature monitoring	25
– Motors with space heater	25
– Motors for operating on frequency converters	26
– Torque curves on frequency operation	29
– Motors with built-in frequency converter (compact drive)	30
– Motors with brake	38
– Motors with water cooling	39
Connection diagrams	40

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3	Operation and Repairs	43
	Duty types and thermal protection	43
	Special operating conditions	43
	– Ambient temperature	43
	– Motors with backstop	44
	– Heat input through the driven machine	44
	– Motors with drain screws	44
	Start-up	45
	Maintenance	46
	– Inspection	46
	– Storage/Lubrication	47
	Explosion protection	48
	– Special conditions for ensuring explosion protection during operation	49
	Repairs	50

---

4	Additional dust protection requirements	51
	Intended use	51
	Installation and Operation	51
	– Cable and line lead-ins	51
	– Operation and Repairs	51

# About this Manual

These operating instructions apply to explosion-proof three-phase current motors in model series CD...; dCD...; CEIGL...; BD... and dBD....

Besides the general assembly instructions, these guidelines are to be followed for the installation, start-up and maintenance of explosion-protected AC motors with a degree of protection of "pressure-resistant encapsulation" marked:  $\text{Ex}(\text{II}.)$ , Ex db eb II. T. Gb respectively Ex db II. T. Gb and Ex tb III. T. Db as well as the general installation instructions.

Any independent manufacturing equipment mounted on or built into the motors like brakes, rotary encoders or frequency converters, etc. have their own operating instructions which are to be duly followed.

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Target audience	This manual is addressed to the specialists in charge of installing, operating and servicing the motors. Besides conventional technical training they must possess knowledge in the field of explosion protection.
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Abbreviations and symbols	This manual uses abbreviations and symbols having the following meanings:
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► indicates action instructions



draws your attention to interesting tips and additional information



Attention!  
warns against minor damages to property.



Caution!  
warns against major damages to property and minor injuries.



Warning!  
warns against major damages to property and major injuries or death.

All of the dimensions are in mm unless otherwise specified.

In order to ensure clarity, at the top of every page you will find the name of the chapter on the left hand and the current section on the right hand; the only exceptions are the first page of each chapter and the blank pages at the end of the chapter.

# 1 Explosion-protected Motors

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Intended use	<p>The motors are to be operated only according to the data specified on the rating plate. According to the relevant marking on the rating plate, the motors are fit for use in areas subject to explosion hazards.</p> <p>The motors are fit to be built into another machine. Putting the motor into service in Europe is forbidden until the conformity of the final product with directive 2006/42/EC has been determined. In non-European countries, the relevant national regulations must be observed.</p> <p>If the test certificate number on the rating plate is followed by an "X", the "Special Requirements" specified in these operating instructions for safe operation and the supplements to these requirements must be complied with.</p> <p>(→ Section „Explosion protection“, Page 47)</p>
Liability and Warranty Guarantee	<p>We cannot be held liable for any damage or malfunctions resulting from assembly errors, the failure to follow these operating instructions or improper repairs.</p> <p>Original spare parts are manufactured and tested specifically for these motors.</p> <p>We recommend that you obtain any spare parts and accessories only from the manufacturer.</p> <p>We hereby specify that any spare parts and accessories not supplied by the manufacturer require our approval.</p> <p>Under any circumstances the mounting and use of third-party products can negatively affect the motor's original structural properties and impair the safety for persons, the motor or other real values (explosion protection).</p> <p>The manufacturer shall not be liable for any damages resulting from the use of spare parts or accessories not authorized by the manufacturer.</p> <p>Any unauthorized conversions and alterations to the motor shall not be approved for safety reasons and the manufacturer cannot be held liable for any resulting damage.</p>

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**Servicing**

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**Servicing**

The customer service department is available to provide any technical information about these motors.

Should any difficulties with our motors be encountered, please contact our factory or local branch office. Log on to our website to find at the address of our local branch office nearest you.

ATB Nordenham GmbH  
Helgoländer Damm 75  
D-26954 Nordenham, Germany  
Tel.: +49 (0)4731/365-0  
Fax: +49 (0)4731/365-159  
E-Mail: [info@atb-nordenham.de](mailto:info@atb-nordenham.de)  
Internet: [www.atb-nordenham.de](http://www.atb-nordenham.de)

**Spare parts**

When ordering spare parts, besides the name of the required part, specify also the motor type and serial number.

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**Delivery, Storage, Transport, Disposal****Delivery**

- ▶ Check the motor for damages during transportation.

In case of damage during transportation an investigation of fault is to be performed by the forwarding agent.

- ▶ Report any covert damages to the forwarding agent or manufacturer no later than seven days from the transfer of the motor.

The entire packaging material can be recycled by means of the Dual System.

## 1 Explosion-protected Motors

### Storage

Motors can be stored for a maximum of 36 months after delivery under the following conditions.

- The cable lead-ins must be sealed with closed screw fittings (the provided cable glands are not impervious to rain!).
- The environment must be dry and dust-free.
- The room temperatures must not drop below +5 °C or exceed +30 °C with an air humidity of <70 % and register changes in temperature greater than 10 °C/day.
- In order to prevent bearing damage, any oscillation that occurs must amount to  $V_{eff} < 0.2$  mm/s.
- For motors with regreasing systems that are being stored for longer than 6 months, repress an amount of grease double that specified on the motor at standstill before storage.



#### Attention!

In case of storage conditions deviating from those specified above the measures set forth in the separate AR9 storage instructions must be adopted.

### Transport

Do not lift the motor together with mounted driven machines such as, pumps, gearing, etc. by the motor lifting eyebolts.

Do not use eyebolts as per DIN 580 at ambient temperatures lower than -20 °C. At these temperatures the eyebolts may break and hence injure the personnel and/or damage the machinery.

Do not load the eyebolts as per DIN 580 no more than 45° compared to the screwing direction. The use of crossbeams is recommended. Layout dimensions of the lifting eyebolts and the minimum dimensions of the loading crossbeams and chain lengths (→ Figure 1).

Do not remove the shaft transport protection until the motor is standing on the provided foundation. The transport protection must be fitted again in the event of subsequent further transportation in order to protect the bearings.

**Delivery, Storage,  
Transport,**



**Attention!**

When mounting vertical motors from the horizontal position, the shaft must not touch the floor to avoid damaging the bearings.

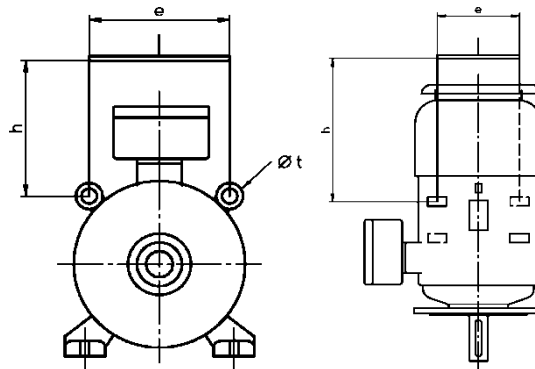


Figure 1: Eyebolt dimensions

Table 1: Minimum dimensions for lifting eyebolts and crossbeams

Frame size	Ø t	horizontal e	h	vertical e	h
90	20	167	100	220	187
100	20	185	112	242	201
112	20	202	103	262	236
132	25	243	170	307	247
160	30	262	206	314	293
180	30	294	223	402	372
200	35	390	219	451	399
225	40	366	230	510	490
250	40	435	282	546	548
280	40	498	301	600	574
315	50	640	337	700	595
355	60	629	397	816	893
400	60	790	312	890	771
450	60	833	317	980	660



**Disposal**

The motors must be disposed of according to their nature and in accordance with local regulations.

## 2 Installation

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### Mechanical checks

After removing the shipping braces and shaft blocks (see also the marking on the motor), the motor shaft must be rotated by hand. In the case of brake motors, the brake must be vented at standstill (maximum of 10 min). This must be performed after applying voltage as per the circuit diagram from page 40.



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**Attention!**

Save the shipping braces and shaft blocks for subsequent transportation, as the bearings risk being damaged during transportation.

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### Site

The completely closed motors are intended for operating sites in which they are exposed to soiling, humidity and other open air conditions as per the relevant degree of protection.

The motors must be installed in a place with ambient temperatures of -20 °C to a maximum of +40 °C and a max. of 1000 m above sea level. Any permissible ambient temperatures ( $T_{amb}$ ) and heights (MSL) other than those indicated above must be specified on the rating plate.

The motors must not be allowed to stand in direct sunlight at ambient temperatures of above 30 °C.



---

**Attention!**

The ventilator hood air inlet and outlet must not be obstructed, as there is the risk of heating beyond the permissible temperature class and of reducing the life of the winding insulation  
(→ Figure 2 and → Table 2).

This applies in particular to the use of soundproof covers. The air ducts must be checked and cleaned regularly in factories with heavy soiling.

Site

Table 2: Minimum distance (LE) of an obstacle from the air opening. → Figure 2

Shaft height	LE [mm]
up to 160	35
180 to 225	85
over 250	125

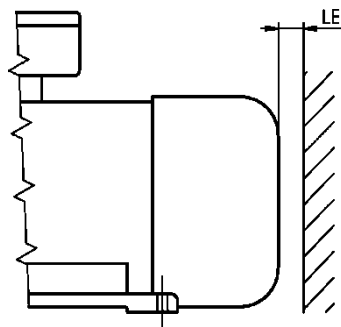


Figure 2: Minimum distance of obstacles from the air opening

The motors are intended for use in areas subject to explosion hazards. The following information on the rating plate identifies the motor as explosion-protected equipment and provides information about using the equipment for its correct purpose.

- Device group
- Device category
- Degree of protection
- Protection class IP
- max. Surface temperature (Temperature class)
- Equipment Protection Level

This information assigns the motor to the relevant zone of the operating site.

## 2 Installation

### Mounting

The motors are mounted either on the motor feet or on the flange at the installation site. All motors with shaft heights of up to 355 mm can be mounted either horizontally or vertically thanks to their bearing layout. This applies also for motors to be mounted with the feet on roofs and side walls. Motors with cylindrical roller bearings (→ see note on motor) must be operated with a minimum load to ensure that the anti-friction bearings operate correctly (→ Table 3).

Table 3: Minimum load on the shaft collar for motors with anti-friction bearings

Shaft height	Minimum load	Shaft height	Minimum load	Shaft height	Minimum load
112	280N	200	1100N	315	2300N
132	480N	225	1300N	355	3000N
160	600N	250	1800N	400	3700N
180	750N	280	2100N	450	4400N

The bearings may be damaged if the minimum load is exceeded. Even test runs in an unloaded condition can cause damage.

The max. permissible loads can be found in our technical documentation "Pressure-resistant encapsulated AC Motors" or requested from the manufacturer.

Align the motors according to the requirements of the coupling or pulley manufacturer. The feet are to be positioned evenly and, if necessary, lined.



#### Attention!

Make sure that the fastening screws are duly dimensioned.

The foundations must be compliant with DIN 4024. The machine vibration must be evaluated in accordance with ISO 10816-3. However, because of the pressure-resistant design of the motors, a maximum vibration speed of 2.8 mm/s is permitted.

Data on the foundation loading generated by the motor can be requested from the manufacturer by specifying the motor number. The fastening screws must be duly tightened according to their layout and secured to prevent loosening during operation and hence the damaging of the drive

(→ Table 4, Page 17).

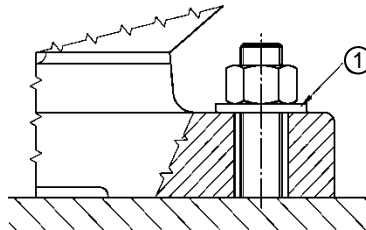


Figure 3: Motor Fastening

1 Large-surface washer

In order to achieve an adequately large contact surface, apply a large-surface washer under each nut or screw head (→ Figure 3).



Alternatively use flange nuts or bolts.

If the motors shaft end points up or down (vertical mounting arrangement), it is necessary to fit an appropriate cover to prevent any foreign bodies from dropping in the driven machine through the air inlet and outlet openings in the ventilator hood.



**Attention!**

The flow of cooling air through the motor must not be limited by said cover →p Section "Site", Page 10).

The balance of the motors is specified on the shaft end plate and/or on the rating plate after the motor number (H = half key, F = full key, N = no key).

The design of the coupling or pulley must match the motor's balance.

## 2 Installation



### Attention!

If balancing with half key (H), work on the vertical (visible) key components on the shaft diameter or cover these with washers with keyway along the relevant length.

If the coupling is longer than the key, the keyway in the remaining part of the coupling must be filled.

In case of failure to comply with the foregoing, out-of-balances liable of causing excessive vibrations may occur.



### Attention!

The pulleys or couplings must only be mounted using the threaded bores in the shaft end to avoid damaging the anti-friction bearings

(→ Figure 4).

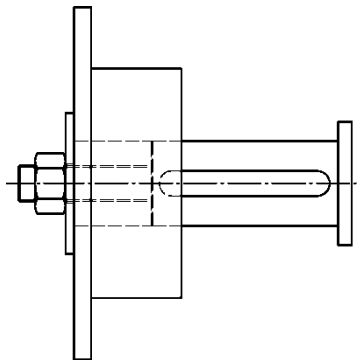


Figure 4: Fastening of the pulley or coupling

- ▶ Screw the threaded bolts in the threaded bore.
- ▶ Then mount the pulley or coupling on the shaft end: make sure to screw a nut with a washer having at least the same diameter of the pulley hub or coupling on the threaded bolt.

Use the utmost care in mounting dynamically balanced pulleys or couplings on the shaft end. Machines to be connected to the motor by means of couplings are to be aligned according to the specifications of the coupling's manufacturer.





Only use flexible couplings!

**Mains supply and connections**

The motors operate in accordance with EN/IEC 60034 with mains voltage oscillations of up to  $\pm 10\%$  or frequency oscillations of up to  $-5\%$  to  $+3\%$ . The mains ratings must match the voltage and frequency data specified on the ratings plate.

Connect the motors according to the connection diagrams attached to the terminal box

( $\rightarrow$  Figure 11 , From page 35). Use only the supplied original connection components, ( $\rightarrow$  mains and guard circuit connection, Page 21)



**Attention!**

Carry out the motor, controller, overload protection and earthing connection operations in compliance with local installation requirements.

Adequate earthing is absolutely essential, otherwise explosion protection cannot be ensured!



**Attention!**

A monitoring device that has been activated must not switch itself on again automatically.

**Mains connection of explosion-protected motors**

As well as any general installation regulations, EN/IEC 60079-14 must be complied with. Suitable overload protection must be subsequently provided either with a motor circuit breaker or similar protective devices.

Function-tested tripping devices with an IIC or IIB marking are considered to be such ( $\rightarrow$  Section "Motors with temperature monitoring", Page 25). These must be specified on the rating plate together with a tripping time  $t_A$ .

If the test certificate number on the rating plate is followed by an "X", the "Special Requirements" specified in these operating instructions for safe operation and the supplements to these requirements must be complied with.

( $\rightarrow$  Section „Explosion protection“, Page 47)

## 2 Installation

### Motors with direct line lead-in

The free end of the cable inserted in the motor must be connected according to the regulations in force concerning the connection area. If the line lead-in used on the motor is provided with pull relief, the cable can be laid freely; otherwise the cable must be secured with a pull relief device in the near vicinity.

The maximum operating temperature of the line that is used must not be exceeded.

### Terminal box

Open the box by loosening the screws on the cover (Figure 5) or in version with grub screw (Figure 6) by turning the grub screw counter-clockwise and then loosening the tapped cover. Close the terminal box again after connecting the mains by following the same instructions in the opposite order.

In order to change the position of the cable and line lead-ins, the terminal box can be rotated by 4 x 90°.

- ▶ Loosen either
  - the four fastening screws (p Figure 5) or
  - the anti-rotation pins by means of the grub screw (p Figure 6).The screws are secured using anaerobic adhesive. This can be released with a hammer blow to the head of the screw.
- ▶ Turn the terminal box to the desired position.



### Attention!

This must not be rotated in motors with single-conductor bushings rather than a terminal board, since the supply cables inside the motor would otherwise become damaged.



### Attention!

Terminal boxes fastened as per Fig. 6 are to be turned counter-clockwise by a maximum of one turn away from the thread end stop.

- ▶ Then tighten the fastening components to the relevant torque, see the following Table 4.
- ▶ Secure the screws with a low-strength anaerobic screw locking adhesive.

**Mains supply and connections**

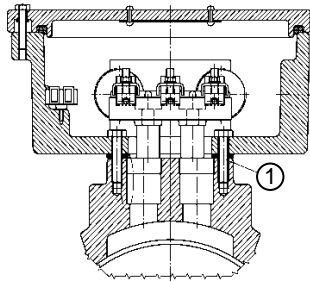


Figure 5: Terminal box EAR 132 with fastening screw 1

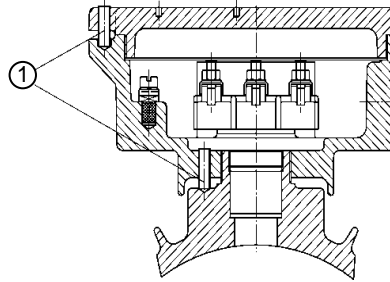


Figure 6: Terminal box CAR 80 with grub screw 1

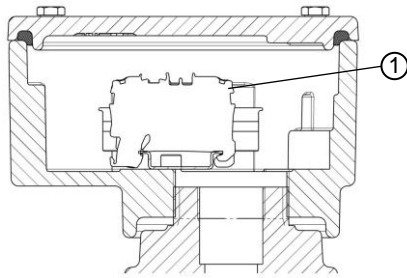


Figure 7: Terminal box EAR 80 with terminal blocks 1

Table 4: Tightening torques for screws of quality 8.8 / A4-80 and A2-70

Thread size	Torque	
	8.8 & A4-80	A2-70
M5	6 Nm	3,5 Nm
M6	10 Nm	6 Nm
M8	25 Nm	16 Nm
M10	49 Nm	32 Nm
M12	85 Nm	56 Nm
M16	210 Nm	135 Nm
M20	425 Nm	280 Nm
M24	710 Nm	485 Nm
Tightening torques of other screws on request		

## 2 Installation



### Attention!

The grub screws as anti-rotation protection for the terminal box are a constituent of the explosion protection and may only be replaced with genuine spare parts.



### Attention!

Screwed-on covers must also be secured to prevent them from unintentionally working themselves open.

The surfaces of flash-proof gaps, particularly at terminal box covers with ignition protection type "pressure-resistant encapsulation, marking Ex db IIC(B)" must be protected from corrosion.

(→ Section „Explosion protection“, Page 47)



### Attention!

In the case of "increased safety" and "dust protection" terminal boxes the gaskets used are included in the approval. Only original gaskets are to be used.

When terminal boxes are being closed up, the cover screws must be tightened cross-wise.



### Attention!

Do not damage the flat surface of the Ex-gap with sharp tools (screwdrivers) when opening the cover of terminal boxes with "pressure-resistant encapsulation". Use jacking screws.

### Terminal boxes with entry plate

The gasket of the entry plate is only intended for one-off use. After opening the plate, the round cord must be replaced with an original gasket.

During installation, please ensure that the sealing edge of the plate and the box are on the same level.

Cut the gasket flush after installing the plate or protruding by max. 0.5 mm.

### Cable and line entries

Connect motors with cable and line lead-ins or via duct systems as per EN/IEC 60079-14. These must meet the following requirements:

## Mains supply and connections

- EN/IEC 60079-7 for wiring spaces with a degree of protection of "increased safety", (Ex eb II marking on the component)
- EN/IEC 60079-1 for a degree of protection of "pressure-resistant encapsulation", (Ex db IIC(B) marking on the component)

Appropriate separate certificates must be available for the cable and line entries.



### Attention!

Any openings that are not used must be closed with sealing plugs for which the relevant test certificates and/or the aforementioned markings must be provided according to guideline 2014/34/EC or according to the regulations of the respective country.



### Attention!

The supplied sealing plugs for the line lead-ins serve only as protection during transportation and are not an approved sealing means. This applies also for the storage of motors outdoors. In this case additional rain protection is required.

The lead-ins supplied as a standard (version 1) are used for the insertion of firmly secured lines.

Version 3 available as a special accessory, with additional pull relief, is used for the insertion of lines in movable motors.



### Attention!

Cable lead-ins and sealing plugs that fail to meet these requirements are prohibited. The cable and line diameters used must comply with the clamping range specified on the lead-in.

Follow carefully the operating instructions of the cable and line lead-ins.

Motors with terminal boxes whose mains lead is located in the layer separating the upper and lower parts

Use only the supplied original gaskets to ensure compliance with the "Ex eb II" degree of protection.

## 2 Installation

Depending on the type (see marking on the plug), the plugs are suitable for the following cable diameters (→ Table 5).

Follow carefully the operating instructions for the lead-in parts and sealing plugs.

Table 5: Cable diameter

Type	Cable diameter
RS-75	26 to 48 mm
RS-100	48 to 70 mm

- ▶ After connecting the mains lead close the terminal box with the upper part.
- ▶ Strip the skins of the plugs so that the following condition is fulfilled:  
By stripping the skin, the plugs are adapted to the cable diameter so that a gap of less than 1 mm is obtained between the cable and the plug applied on the cable. Therefore, an extra layer of skin must be removed from one half of the module compared to other.
- ▶ Lubricate the cutting edge and the sealing surfaces of the plug with the supplied grease.
- ▶ Insert the plug halves over the cable and completely in the bushing opening.
- ▶ Brace it with the screws until a perceivable resistance (maximum torque: 6 Nm) is achieved.

## Mains supply and connections

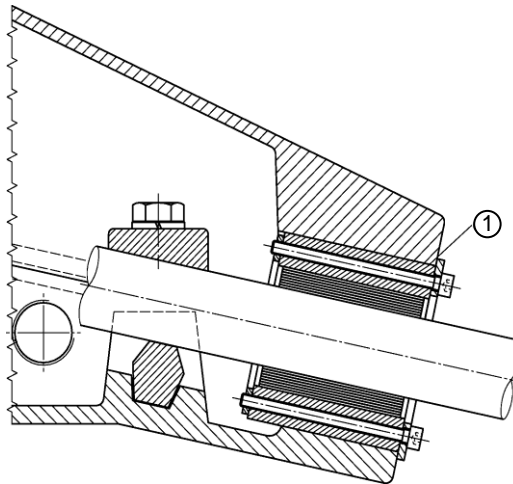


Figure 7: Cable lead-in

1 Maximum of two line lead-ins,  
Company Roxtec, Plug type RS

### Mains and guard circuit connection

The mains can be connected either with or without cable lug both in models with terminal board (→ Figure 8) or in those with single-conductor bushings (→ Figure 9). Cable lugs that are specially designed for the terminal board must be used for motors with an axis height of 63 to 112.

(→ Section "Connection diagrams", Page 40).

For versions with terminal blocks, insert a suitable screwdriver into the opening at the top to connect fine-stranded conductors and open the respective contact. Insert the wire into the terminal as far as it will go and pull the screwdriver out again. Single-wire conductors or conductors with ferrules can be inserted without prior opening the contact. Make sure that no bare spots are visible. Check each wire for tightness.

- Connect the power line to the relevant terminals as per the supplied wiring diagram.

## 2 Installation

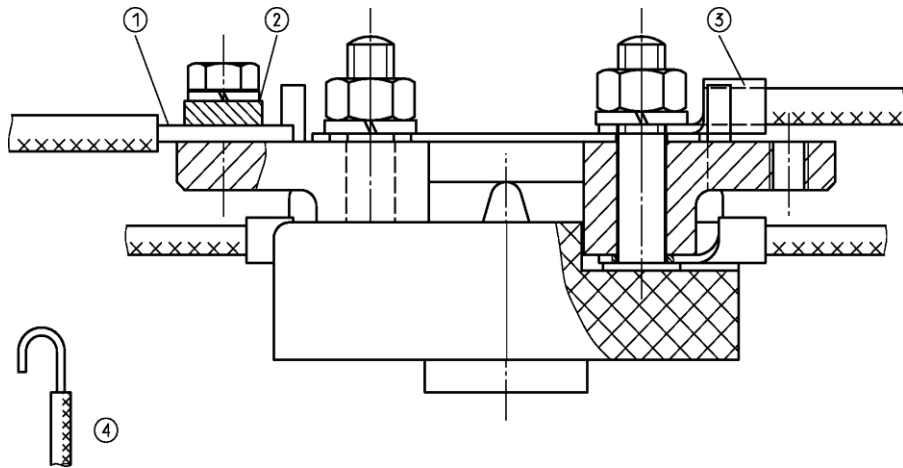


Figure 8: Line connection

- 1 Connection without cable lug
- 2 Clamp
- 3 Connection with cable lug
- 4 Single-wire conductor without cable lug with terminals with one screw only

► When connecting a single-wire conductors without cable lugs to terminals with just one screw, bend the conductor end as illustrated 4.

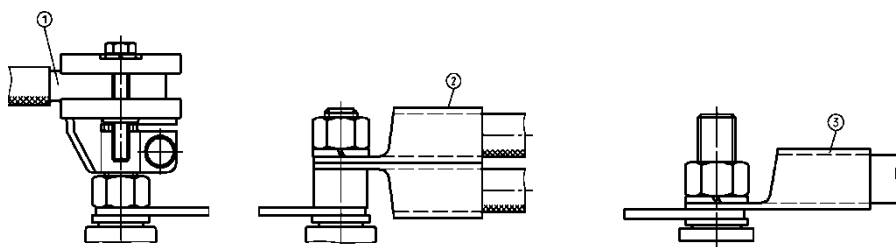


Figure 9: Conductor bushing

- 1 Connection without cable lug
- 2 Connection with two cable lugs
- 3 Connection with one cable lug



## Mains supply and connections

Take note of the maximum connectable conductor cross-section for the terminals. If no other data is available on the terminals, refer to the following table.

Table 6: Rated cross-sections

Shaft height	Rated cross-section [mm <sup>2</sup> ]
63 to 112	4
63 to 112	2,5 mm <sup>2</sup> with terminal blocks only additional terminals
132 to 160	10 (r)
180 to 225	70
250 to 280	120
315	150/ 300 (depending on the model)
over 355	300

In the case of "increased safety" terminal boxes, make sure to comply with the clearances specified in EN/IEC 60079-7 (→ Table 7) between conductive parts having different potentials. Tighten the screws and nuts on the live parts to the specified torque (→ Table 8).

Table 7: Clearances

Rated voltage <i>U</i> [V]	Minimum clearance [mm]
175 k UK 275	5
275 k UK 440	6
440 k UK 550	8
550 k UK 690	10
690 k UK 880	12
880 k UK 1100	14
2750 k UK 3500	36
5500 k UK 6900	60
8800 k UK 11000	100

Table 8: Torques and current intensities for live pins

Thread size	Torque [Nm]	Permissible continuous current [A]	
		Brass	Copper
M4	1.2	16	-
M5	2	25	-
M6	3	63	-
M8	6	100	-
M10	10	160	200
M12	15.5	250	315
M16	30	315	400
M20	52	400	630

## 2 Installation

Depending on the model, additional terminals for instance for temperature monitoring or space heater are located either in the main terminal box or in additional terminal boxes; see the supplied wiring diagram.



**Attention!**

Take note of the rating data imprinted on the terminals.



**Attention!**

Only use separately approved components according EN IEC 60079-7 inside Ex e housings.



**Attention!**

For versions with terminal blocks, insert unused jumpers into the jumper collector provided or remove it from the terminal box and keep it together with the documents belonging to the system.



**Attention!**

Keep the wiring diagram supplied in the terminal box in the enclosure with the documents belonging to the drive.

**Motors with unidirectional fan**

Make sure that the fan's direction of rotation matches that of the motor.

---

## Mains supply and connections


### Motors with separate cooling via separately powered external fans

Make sure by means of the electric control that the main motor can be operated with the motor switched-on for separate cooling.

### Motors with temperature monitoring

Terminals 1TP1-1TP2 or 2TP1-2TP2

The motors are equipped with PTC's in accordance with DIN VDE V 0898-1-401 or other temperature sensors. Please note the specifications on the rating plate.

Connect the PTCs to an approved tripping device with marking  II(2) GD.



---

#### Attention!

Pay attention to the tripping device operating instructions.

Being the only overload protection as set forth in EN/IEC 60079-14, the temperature sensors described herein can be used together with an approved tripping device only if the tripping time  $t_A$  is specified on the motor rating plate. (Refer to Section 3, "Operation & Repairs", Page 43.)

### Motors with space heater

The rating data for the space heater is specified on a plate on the motor. Depending on the model, there are two heating variants:

- by means of heater bands powered via terminals HE1-HE2 or
- by means of the stator winding by feeding AC voltage to terminals U1-V1.

Depending on the design, the heater bands are suitable for preventing condensation, terminals 1HE. or providing protection from motor temperatures below -20 °C, terminals 2HE.



---

#### Attention!

Make sure by means of the electric control that the motor voltage and the heater voltage are not fed simultaneously.

## 2 Installation



If the heater is designed to provide protection from motor temperatures below  $-20\text{ °C}$ , the built-in temperature sensor (PT100), terminals 20R1 - 20R2, must be connected. The motor may only be switched on with a measurement of above  $-20\text{ °C}$ . The temperature limit up to which the heater is suitable with no wind is specified on the rating plate (only suitable for installation indoors).



The heater bands that are used are made from a self-limiting semiconductor material. It is not possible to perform a function test using a resistance measurement. The testing takes place by measuring the activation current. The motor-specific setpoints must be obtained from the manufacturer.

### **Motors for operating on frequency converters**

For operating on frequency converters, motors with temperature monitoring must be protected by PTC temperature sensors  
(→ Section "Motors with temperature monitoring", Page 25) for example. The rating data for this operating mode are specified either on the rating plate or on a separate plate. If the separate plate is missing, the specifications in our technical documentation "Pressure-resistant encapsulated AC motors" apply.  
(→ Torque curves see diagrams 1–6, Page 29f)  
The converter must be parameterized according to this data.

For an EMC-compliant installation according to Directive 2014/30/EU, only use shielded cables and cable entries suitable for EMC to ground the shielding braid. The safe grounding of the screen is also necessary to prevent sparks from tip contacts.

Check the drive's "electromagnetic compatibility" as per EMC directive no. 89/336/EEC when operating on frequency converters.

Output filters must be used in accordance with the line length at the motor side of the converter. The information from the converter manufacturer is decisive for filter selection and the maximum line length.

Make sure when operating motors on frequency converters that the admissible voltage peak value named below are not exceeded by the periodically occurring commutation voltage peaks (threshold value for terminals and winding insulation).

1. Terminals have effective clearance and creepage distances to withstand a voltage of 690V based on DIN EN/IEC 60079-7 - increased safety type "e". The maximum transient over voltage from the frequency inverter to the motor is 2.15 kV (phase to phase and phase to earth).
2. Standing winding for 230/400 V and 500 V can withstand a peak voltage of 1.6 kV (phase to phase and phase to earth) with winding temperature rise corresponding to class F, our standard windings can be used with frequency inverters without the need for additional filter.
3. Standing winding for 400/690 V can withstand a peak voltage of 1.6 kV (phase to phase and phase to earth) with winding temperature rise corresponding to class F, our standard windings can be used with frequency inverters with additional filter.
4. Special winding for a single nominal voltage of 690 V can withstand a peak voltage of 2.15 kV (phase to phase and phase to earth) with winding temperature rise corresponding to class F, this windings can be used with frequency inverters without the need for additional filter. These motors will be marked with an "U" in the type code on the rating plate. The efficiencies correspond to the manufacturer's standard and are therefore only available as a replacement for motors that are already in operation starting July 1st, 2021.

In the case of a converter output non-galvanically separated from the mains and with current limitation, follow the requirements of EN IEC 62477-1 (equipment of high voltage installations with electronic devices) on the overload protection of the protective earth conductor.

In rating the protective device in the outer conductors, bear in mind that the protective earth conductor current can be greater than the outer conductor current in fault

## 2 Installation

condition. The protective earth conductor is to be dimensioned according to this fault current. Take note of all of the data of the converter manufacturer for said fault condition.

To avoid impermissible bearing currents, large-area network braids must be used to ground the motor. Permanently good contact must be ensured.

Torque curves on frequency operation  
 $2p=2$   
 50 Hz

Diagram 1: frame size 63 - 160

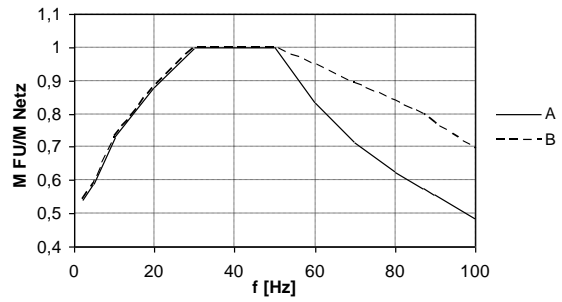


Diagram 2: frame size 180 - 225

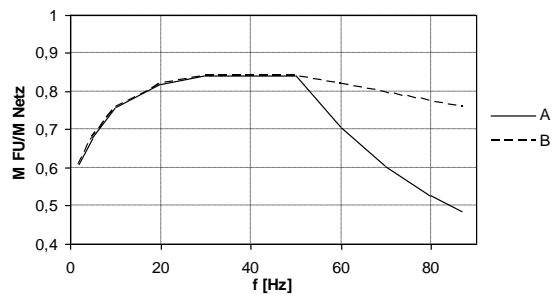
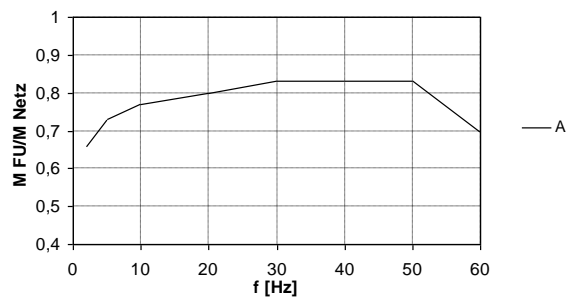


Diagram 3: frame size 250 - 400



A: Field weakening range above 50 Hz  
 B: Field weakening range above 87 Hz

## 2 Installation

Torque curves on frequency  
operation  
2p=4 bis 2p=8  
50 Hz

Diagram 4: frame size 63 - 160

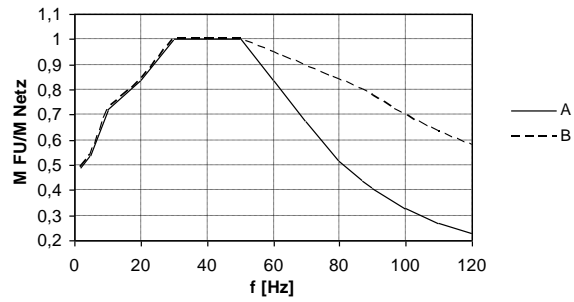


Diagram 5: frame size 180-200

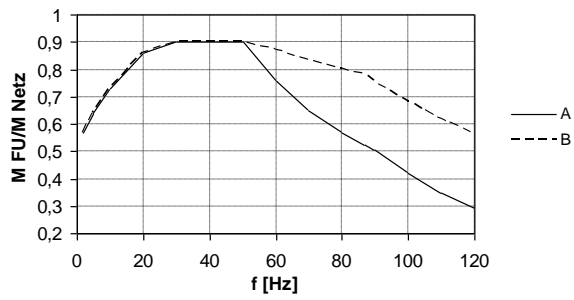
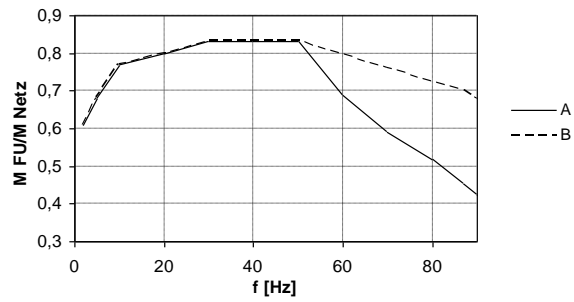


Diagram 6: frame size 225-450



A: Field weakening range above 50 Hz  
B: Field weakening range above 87 Hz



**Motors with built-in frequency converter (compact drive)**



**Attention!**

Wait at least 3 min. after disconnecting the drive from the mains before connecting it again; otherwise there is the risk of damaging the input current limitation.



**Warning!**

After disconnecting the drive from the mains, the conductive parts of the frequency converter and the connected conductor may still be live for up to 180 sec. Wait at least 3 min. after disconnecting before opening the casing or touching the drain screw. Follow the operating instructions or the instructions provided in the converter's manual as well as the relevant safety regulations.

In some models an automatic restarting of the drive takes place after a power failure.

**Parameter setting**

The parameters of the incorporated converter were set by the manufacturer for the relevant application.

This setting does not correspond to the original factory setting made by the converter manufacturer. A list of parameters is found in the attached converter manual. Changing specific parameters can cause a drive operation in a critical area. This may lead to a fault trip of the converter or the tripping of the PTC temperature monitoring. A change in the motor voltage and clock frequency parameters is prohibited. The motors can be operated in a frequency range of 2 Hz (limited torque) to 100 Hz. The converter's clock frequency amounts to 4 kHz.

The parameters can be changed with the keypad according to the instructions provided in the converter manual. Insert the keypad plug in the test socket of terminals 5-6-15-16.

## 2 Installation

The keypad is not approved for use in the area subject to explosion risk.

### Operating on unearthed network (IT)

Motors with an incorporated frequency converter type ...IT type frequency converter can be operated on the IT network. In case of a short circuit in the drive the tripping must take place as quickly as possible.

### Explosion protection

The explosion protection is ensured in all conditions, since the motor and converter are to be monitored by the PTC temperature sensors (→ Section „motors for operating on frequency converters“, Page 26).

In the case of motors with incorporated frequency converter equipped with a PTC tripping device and relay, said protection is provided for without external tripping.

All screws on the inverter housing must be tightened with the prescribed torque (→ Table 4, Page 17) and present in a quantity that matches the number of securing holes. Any damaged screws must be replaced with screws of the same dimensions and quality (at least 8.8 or A2-70).

### Relay and PTC tripping device

Motors with incorporated frequency converters can be equipped either with a relay and a PTC tripping device to ensure protection against overheating as required by EN/IEC 60079-14. The PTC tripping device is accessible by means of a hexagon locking screw (SW 67) on the top of the pressure-resistant casing. The locking screw must be completely screwed in during operation and is to be secured with anaerobic adhesive for screws.

**Mains supply and connections**

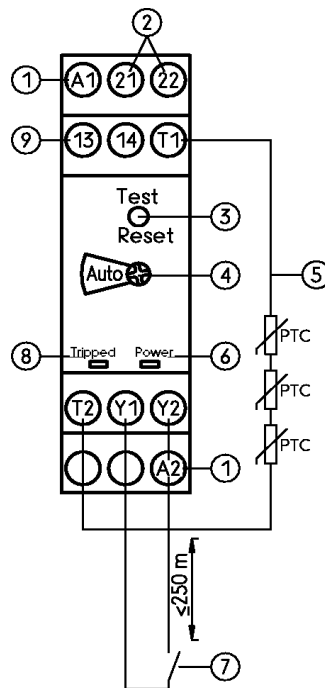


Figure 10: PTC tripping device

- 1 Rated control supply voltage (A1-A2)
- 2 Normally closed auxiliary contacts (21-22)
- 3 Test/Reset
- 4 Manual/automatic reset
- 5 Thermistor (T1-T2)
- 6 Mains LED (green)
- 7 Remote reset (Y1-Y2)
- 8 Trip LED (red)
- 9 Normally open auxiliary contact (13-14)

In case of a device with shared power and control voltage supply (→ Figure 12) after a power failure or triggering of the circuit breaker there is no automatic restart of the drive.

## 2 Installation



### **Caution!**

In case of a device with separate control voltage supply (→ Figure 13) after a power failure there is no automatic restart of the drive.

After a power failure in the control voltage supply there is no automatic restart of the drive.

A failure in the control voltage triggers the reset of the PTC tripping device.



### **Warning!**

The compact drive feeds voltage also when the device is off. Before performing work on the device or external control unit, disconnect the mains line.

**Mains supply and connections**

G1: Frequency converter  
 R: approx. 0 Ω in version for TN and TT network  
 R = 10 MΩ with IT network version  
 L1, L2, L3: Power supply input  
 K11, K12, K14: Converter relay outputs  
 Br 1, Br 2: Brake rheostat  
 2TP1, 2TP2: PTC connection  
 5, 6, 15, 16: Keypad connection (parameter setting)

- 1 optionally PROFIBUS-DP
- 2 optionally system bus (CAN)
- 3 optionally Interbus
- 4 optionally standard I/O
- 5 optionally applications I/O

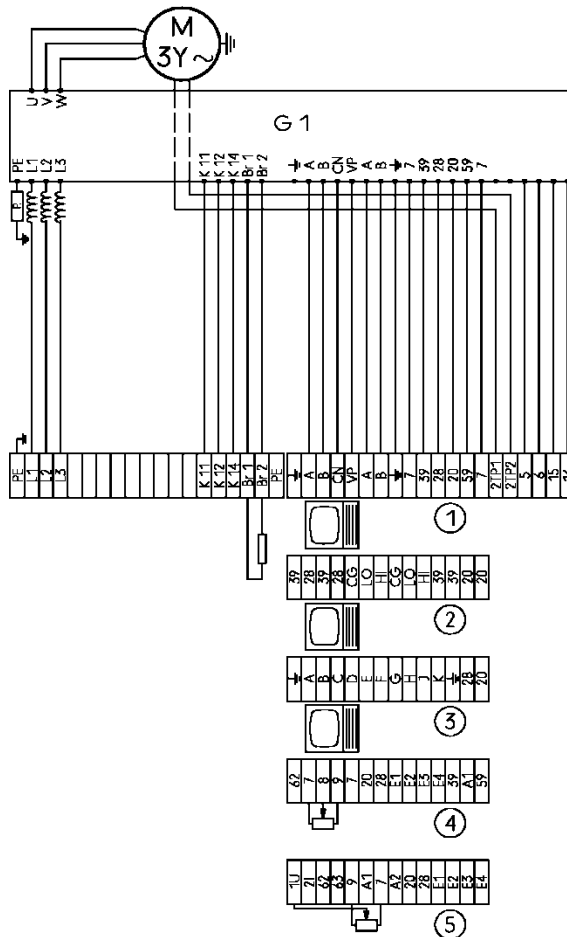


Figure 11: Overview circuit diagram of the compact drive without relay and PTC tripping device for all network versions.

For details, see the converter installation instructions and the circuit diagram for functional unit 1–5

## 2 Installation

G1: Frequency converter  
 G2: Relay  
 G3: PTC tripping device  
 L1, L2, L3, N: Power supply input: converter, relay, PTC tripping device  
 14, 13/32, 31: I/O keys  
 Y1, Y2: PTC tripping device reset  
 21, 2N: "Failure" message  
 14, 2N: "On" message  
 K11, K12, K14: Converter relay outputs  
 Br 1, Br 2: Brake rheostat  
 5, 6, 15, 16: Keypad connection (parameter setting)

- 1 optionally PROFIBUS-DP
- 2 optionally system bus (CAN)
- 3 optionally Interbus
- 4 optionally standard I/O
- 5 optionally Applications I/O

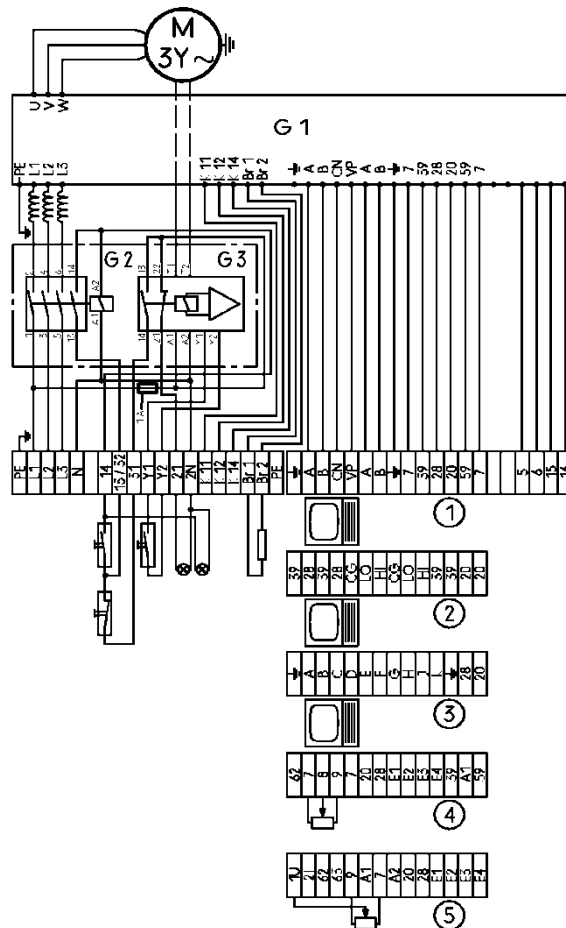
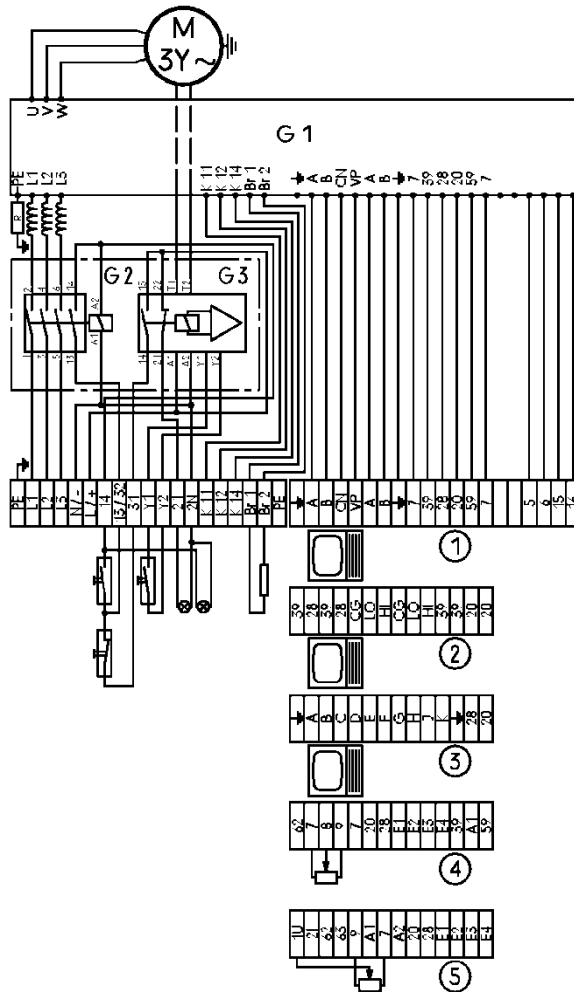


Figure 12: Overview circuit diagram of the compact drive with relay, PTC tripping device and internal control voltage supply for the TN network.

For details, see the converter installation instructions and the circuit diagram for functional unit 1–5

**Mains supply and connections**

- G1: Frequency converter
- R: approx. 0 Ω in version for TN and TT network
- R = 10 MΩ with IT network version
- G2: Relay
- G3: PTC tripping device
- L1, L2, L3: Power supply input: power and control
- N/-, L/+: Control voltage 220 to 240 V, or 24 V,
- Fuse maximum 16A
- 14, 13/32, 31: I/O keys
- Y1, Y2: PTC tripping device reset
- 21, 2N: "Failure" message
- 14, 2N: "On" message
- K11, K12, K14: Converter relay outputs
- Br 1, Br 2: Brake rheostat
- 5, 6, 15, 16: Keypad connection (parameter setting)



- 1 optionally PROFIBUS-DP
- 2 optionally system bus (CAN)
- 3 optionally Interbus
- 4 optionally standard I/O
- 5 optionally Applications I/O

Figure 13: Overview circuit diagram of the compact drive with relay, PTC tripping device and separate power supply of the control voltage for all of the network versions.

For details, see the converter installation instructions and the circuit diagram for functional unit 1–5

## 2 Installation

### Motors with brake

The mains line in the version with incorporated brake is connected in the motor terminal box and in the version with the built-on brake in the separate brake terminal box. Observe the supplied connection diagram and the rated voltage visible on the rating plate. In the presence of an AC connection the brake coil is energized by means of a silicon rectifier accommodated inside the explosion-proof encapsulation.

Brake torque tolerance +30%/-10% after small amount of grinding in.



The temperature sensors that are always attached to the motor and the brake must be connected as described in section "Motors with temperature monitoring", Page 25.

Motors with brake or tachometer mounted under the ventilator hood

In order to connect brakes or tachometers mounted under the motor ventilator hood, the latter must be disassembled. Unscrew any shock pulse sensors or regreasing devices. Loosen the fastening screws on the hood and remove the hood from the motor.

Connect the brake or tachometer as per the attached circuit diagram and pass the cable along the shortest route through the motor fins towards the main terminal box. It is recommended to insert a protective tube over the connection cable in the fin area to prevent wearing.

Fit the ventilator hood back on the motor and check the position of the boreholes for any shock pulse sensors and regreasing devices. In the case of motors with an axial fan running into a nozzle, make sure that there is a uniform air gap all around between the fan and nozzle. Secure the hood with the fastening hoods, (torque as per Table 4, Page 17).

Check manually that the fan runs freely once installation is complete.



### **Motors with water cooling**

The water connections are to be connected according to the signs on the motor.

The quantity of cooling water necessary for cooling the motor can be found on the signs on the motor. There is a bleed valve on top of the motor for eliminating any entrapped air.

The water chambers must be cleaned regularly depending on the content of deposits. They can be cleaned without disassembling the motor. Depending on the version, after unscrewing the sealing plug or sealing ring at the counter-drive side of the motor casing it is possible to clean the casing. The explosion protection is not affected by opening the water chamber, since the water chamber is not located in the pressure-resistant section.

For operation purposes, motors with temperature monitoring must be protected by PTC temperature sensors (→ Section "Motors with temperature monitoring", Page 25).

Make sure by means of the electric control that the motor can be operated only with the water flow on and that the water jacket is always perfectly vented.

The maximum water inlet temperature is 30 °C, the maximum deposit content is 30 mg/l and the maximum water pressure is 4 bar.

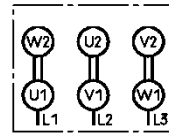
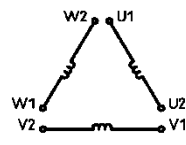
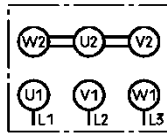
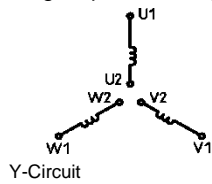
At temperatures below 5 °C, frost protection must be provided according to the site conditions.

## 2 Installation

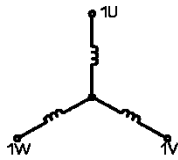
Connection diagrams

The circuit diagram on the motor is to be followed.

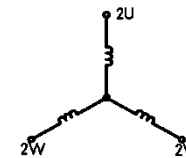
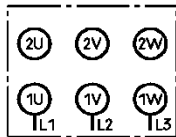
Single-speed – one pole



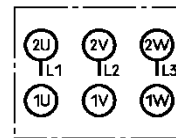
Pole changing



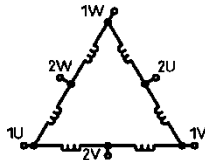
Low rpm



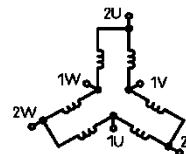
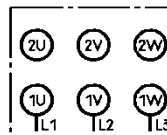
High rpm



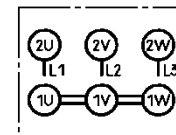
Dahlander connection



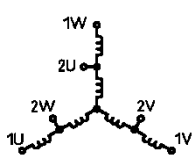
Low rpm



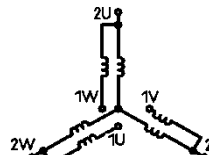
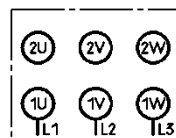
High rpm



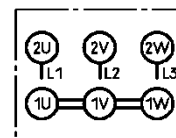
Dahlander connection



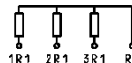
Low rpm



High rpm



1TP1-1TP2	Pre-alarm PTC	U > 2.5 V not allowed	Use tripping device with PTB number or marking II (2)G/D
2TP1-2TP2	Tripping PTC		
1R1-R2	PT 100 resistance temperature sensor	U > 15 V not allowed	

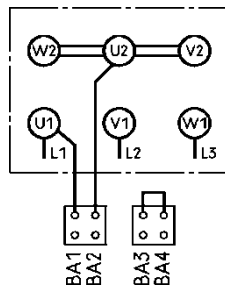


1HE1-1HE2	Stationary heating via heating band to prevent condensation
2HE1-2HE2	Stationary heating via heating band to protect from temperatures below -20 °C

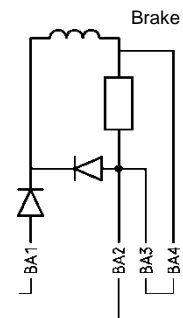
Connection diagrams

**Brake motors with incorporated brake**  
**Brake connection via motor winding**

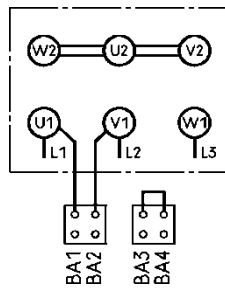
Y-Circuit



Terminals BA1-BA2 can be connected directly to the motor terminals to supply the brake. Compare the motor/brake voltages to determine whether the connection is to be made on U1-U2 or U1-V1. Terminals BA3-BA4 must be bridged.



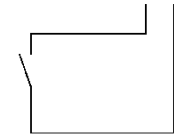
Y-Circuit



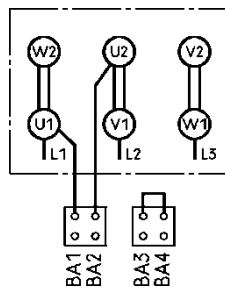
An external power supply can be applied on terminals BA1-BA2. Check the voltage data on the rating plate. Terminals BA3-BA4 must be bridged.



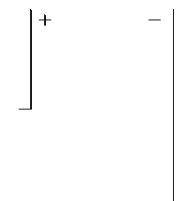
For a rapid engagement of the brake (DC-voltage side tripping) bridge BA3-BA4 can be replaced by a contact. The contact must be tripped simultaneously with the brake power supply.



D-Circuit



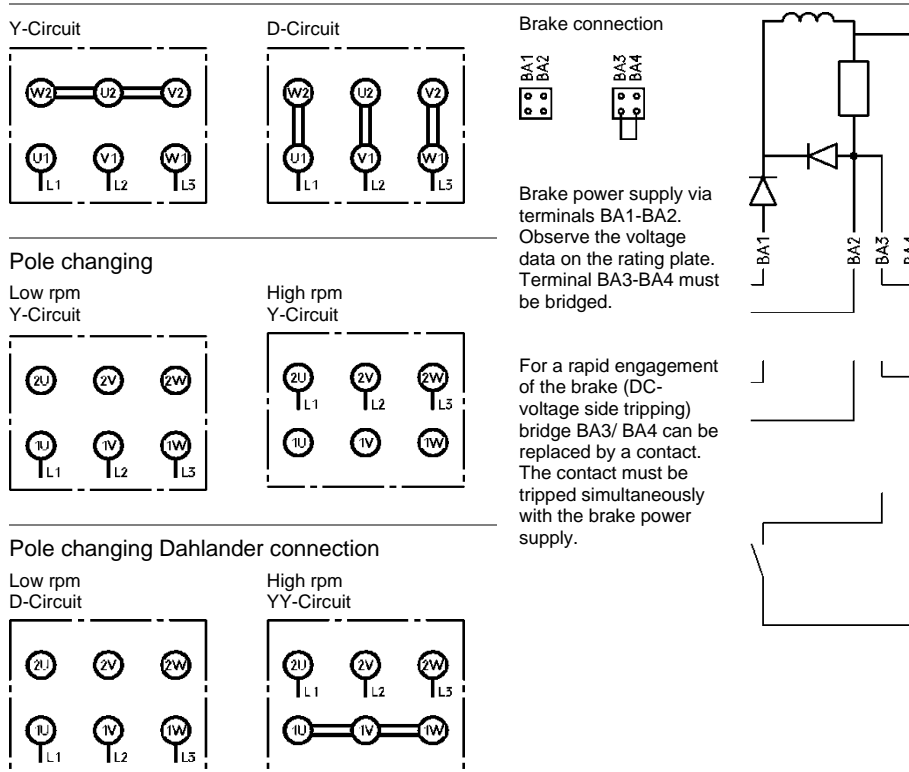
In order to provide for the emergency venting of the brake, e.g. to turn the motor manually, you can apply a DC voltage source to terminal BA1 + BA4 (remove any other wiring beforehand and observe the polarity).  
Voltage  $U_1 = U \cdot 0,45$   
Voltage  $U$  . see brake voltage on the rating plate.



BA1-BA4	Brake		
1TP1-1TP2	Pre-alarm PTC	U>2.5 V not allowed	Use tripping device with PTB number or marking II (2)G/D
2TP1-2TP2	Tripping PTC		
1HE1-1HE2	Stationary heating via heating band to prevent condensation		
2HE1-2HE2	Stationary heating via heating band to protect from temperatures below -20 °C		
TB1-TB2	Temperature monitoring: Microtherm T 10		

## 2 Installation

### Brake motors with incorporated brake Brake connection via external power supply



BA1-BA4	Brake (V.)		
BD1-BD2	Brake (V.)		
1TP1-1TP2	Pre-alarm PTC	U>2.5V not allowed	Use tripping device with PTB number or marking II(2)G
2TP1-2TP2	Tripping PTC		
1HE1-1HE2	Stationary heating via heating band to prevent condensation		
2HE1-2HE2	Stationary heating via heating band to protect from temperatures below -20 °C		
TB1-TB2	Temperature monitoring: Microtherm T 10		

## 3 Operation and repairs

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### Duty types and thermal protection

- In S1 duty class motors a temperature sensor (TS) can be used in addition to the motor circuit breaker as required by EN/IEC 60079-14.
- If in S1 duty cycle motors protection is to be provided against overheating only by means of the TS, a proven combination of TS and tripping device is to be used for said purpose.
- In the case of non-S1 duty cycle motors proven combinations of TS and tripping device must be used as protection against overheating.
- The supplying of power to the motors via the frequency converter is permissible only if a proven combination of TS on the windings and tripping device is used.

The temperature sensors must be connected as described in the section "Motors with temperature monitoring", Page 25 .



#### **Attention!**

A monitoring device that has been activated must not switch itself on again automatically.

---

### Special operating conditions

#### **Ambient temperature**

Operating the motors at ambient temperatures outside the generally valid range of  $-20$  to  $+40$  °C is allowed also without heater if an appropriate temperature range – e.g.  $55$  °C K  $T_{amb}$  K  $60$  °C is specified on the rating plate.

Operation at less than  $-20$  °C is also possible if the temperature of the motor is kept to at least  $-20$  °C using a stationary heater. When doing this, pay attention to the rating data for the heater and the minimum permissible ambient temperature on the rating plate of the motor (→ Section "Stationary heater", Page 25)

### 3 Operation and repairs

#### Motors with backstop

Motors with built-in backstop must be operated at a minimum rpm higher than the value specified on the rating plate – e.g. FXM 850 min<sup>-1</sup> – to prevent excessively high temperatures.

#### Heat input through the driven machine

It must be ensured that no quantities of heat greater than the maximum heating values specified in Table 9 table are conveyed from a mounted machine to the interface with the motor (e.g. shaft and motor flange). This way it is guaranteed that no point of the motor exceeds the temperature class.

Table 9: Permissible surface heating at an ambient temperature of 40°C

	Temperature class		
	T6 = 85 °C	T5 = 100 °C	T4 =135 °C
Permissible heating on the shaft	30K	45K	65K
Permissible heating on the flange	30K	45K	65K

#### Motors with drain screws

Condensation that has collected in the motor can be drained by unscrewing the drain screws. This opens the pressure-resistant housing. When the motor has been switched off, a waiting time as specified by the signs on the motor must elapse before it is unscrewed. The motors must only be operated if the drain screw is tightly closed. Tightening torque as per table 4. Drain screw M6x12.



**Attention!**

Before mounting or start-up the insulation resistance is to be measured by qualified technicians. With  $U_N > 500$  V the resistance should be greater than 1 MO and with  $U_N \leq 500$  V it should be greater than 0.5 MO. If this value is not reached, the motors must be dried.

The best way to do it is in an oven at temperatures up to 100 °C. To eliminate any humidity, open the motor. To be entitled to any warranty claims, contact the manufacturer in advance.

These works must be carried out by qualified technicians; in the course of said works the manufacturer shall instruct said technicians on how to ensure the explosion protection during reassembly. For assembly and disassembly, see the relevant repair instructions and notes in chapter repair.

- Check the direction of rotation and operation during idle running. In case of unidirectional external fans (axial fans) observe the sign for the direction of rotation on the motor. If the direction of rotation needs to be changed, invert the two power lines and the fan.
- If the motor was stored and an additional quantity of grease was applied in the anti-friction bearings, the motor must be run with no load for at least 0.5 h to ensure an adequate distribution of the grease and to avoid the overheating of the anti-friction bearings.
- Make sure that the operating current matches the specified current values on the rating plate.  
The protective equipment required as per EN/IEC 60079-14 must be set according to the motor rating values specified on the rating plate. The specified current value on the rating plate must not be exceeded in continuous duty conditions.

### 3 Operation and repairs

**Attention!**

Run the motor with load for at least 1 hour and check that there is no unusual noise or heating exceeding the specified temperature class values.

Relubricate motors with regreasing equipment with the specified amount of grease during start-up. Vibration severity values of  $V_{\text{eff}} < 2.3$  mm/s for rigid foundations and  $V_{\text{eff}} < 3.5$  mm/s for flexible foundations in accordance with EN/IEC 60034-14 are harmless in coupled operating mode. In the event of changes to normal operation – e.g. higher temperatures, noise, vibration – determine cause and consult the manufacturer if necessary.

**Attention!**

The protective equipment must always be kept in service also during trial runs. In case of doubt switch off the machine.

#### Maintenance

#### Inspection

- The motors are to be constantly monitored depending on the operating conditions.
- Keep the motors clean and the venting openings free (→ Section "Site", Page 10)

The national regulations that apply to the servicing/maintenance of electrical operating materials in potentially explosive areas must be adhered to, e.g. EN/IEC 60079-17 and -19 etc. in Germany, particularly the "Operating Safety Legislation".

During maintenance especially those parts on which the degree of protection depends must be checked; these include, for instance, the integrity of the lead-in components and gaskets.



## Storage/Lubrication



### Attention!

In order to avoid damage the bearings and grease must be kept clean.

The mathematical service life of the bearings is 50,000 operating hours with coupling operation only. The maximum permitted radial and axial loads can be found in our technical documentation "Pressure-resistant encapsulated AC motors". The motors are equipped with deep groove ball bearings as standard, and with reinforced bearings (roller bearings) the bearing type is specified on the rating plate.

The deep groove ball bearings of motors with a frame size of up to 280 are sealed at both sides as standard and filled by the bearing manufacturer with a grease that is sufficient for 40000 operating hours at ambient temperatures of up to 40 °C for horizontally installed motors with 4 poles or more, and 20000 operating hours for 2-pole motors. The shaft seals must also be changed when the bearings are replaced. Disassembly and assembly as per the specific manufacturer repair instructions.

Motors starting from frame size 315 and motors with reinforced bearings are to be equipped with regreasing devices. The bearings are regreased via the grease nipples located at the bearing plates or bearing caps, preferably with the motor running.

The drip space in the bearing cap for outflowing old grease is large enough to collect the old grease during the nominal bearing service life with state-of-the-art regreasing.

The specified lubricating intervals and the type and quantity of grease to be used can be found on the plate on the motor.

The manufacturer normally uses Mobil Unirex N3, a lithium complex soap/mineral oil grease.

Table 10: Re-greasing intervals in hours for horizontal designs.

Ambient temperature	Speed up to 1800 <sup>rpm</sup>	Speed up to 3600 <sup>rpm</sup>
40 °C	5000 h	2500 h
50 °C	2500 h	1000 h
60 °C	2000 h	500 h

### 3 Operation and repairs



#### Attention!

In motors with enhanced performance (motor type ...X), in heavy drive conditions like belt and gear drive with additional bearing loads and in vertical designs the values in the table must be reduced by 50%. Observe the specified quantity of grease. Overgreasing can lead to a sharp increase in the bearing temperature and hence to the failure of the bearing.




#### Caution!

If regreasing is carried out while the motor is running, provide for adequate protection against rotating parts! Only resin-free and acid-free anti-friction bearing grease with a drop point of approx. 200 °C is to be used.



Long stop times must be taken into consideration in the usage period for the grease. This can be reduced considerably depending on the external load. This also applies to bearing with lifetime greasing, whereby replacement is recommended after 5-6 years. In the event of long stop times, the shaft must be turned once per month to avoid bearing damage.

#### Explosion protection

Markings such as  (II2G), Ex db eb IIC T4 Gb indicates where the motor may be used and that it has been designed, built and approved according to the relevant IEC and European standards required for operation in potentially explosive areas.



#### Attention!

The motor must not be altered in any way whatsoever and the operating instructions set forth herein must always be complied with.

If the motor is altered or repairs need to be made, these are to be performed by the manufacturer or by repair workshops that possess the necessary explosion protection know-how. Before starting the motors again, conformity with the requirements of EC directives 2014/34/EC and 1999/92/EC (or according to the regulations of the respective country) by said sites is to be ascertained and confirmed by means of an appropriate

marking on the motor or by issuing a test report.

If these requirements are not met, the motor is no longer classified as explosion-protected and the marking - see above - is to be removed.

### **Special conditions for ensuring explosion protection during operation**

- All of the contact screws and nuts of the electrical connections are to be tightened securely to prevent excessively high contact resistance values that may lead to an excessive degree of overheating of the contact point; torque values (→ Table 8, Page 23).
- Use the utmost caution when connecting the mains cable. Observe the creep distances and clearances. Use duly the sealing parts of the cable lead-ins and connections spaces as well as the lead-in parts envisaged for the pull relief or as protection against torsion in order to maintain the degree of protection of the connection spaces  
(→ mains and guard circuit connection, Page 21)
- Eliminate any damages immediately and use only original spare parts. A designated body must check that the work has been properly carried out in accordance with the relevant EC directives. In Germany this must be carried out by a qualified expert as per the "Operating Safety Legislation", and in other countries in accordance with the applicable national regulations and confirmed by means of an appropriate marking on the motor or by issuing a test report.
- In order to avoid electrostatic charging of the painted surface of the motor, in accordance with EN/IEC 60079-0 for group IIC the thickness of the coating must either be no more than 200 µm or appropriate proof that it cannot be charged must be provided. Original motors fulfil these requirements. Subsequent overpainting with any coating system is possible up to a maximum total coating thickness of 200 µm. Thicker coatings are only possible using the original coating systems after consulting the manufacturer. Processes that generate extreme amounts of charging must be avoided with offshore special and NORSOK systems when used in zone 1 and zone 2.
- The surfaces of ignition-protected gaps must not be reworked and must be protected from corrosion. Grease

### 3 Operation and repairs

used for protecting the surfaces of the joints against corrosion must not harden with age, must not contain volatile solvents and must not cause the surfaces to corrode. The motor manufacturer uses Fuchs Renolit LX-PEP 1/2 or OKS 245, for example. Other approved sealing materials are: Hylomar, by Marston-Domsel or Admosit and Fluid-D, by Teroson (follow the manufacturer's usage instructions). This must be observed in particular for the openings in the cover for connection spaces having a pressure-resistant encapsulation degree of protection, marking Ex db IIC(B).

- All screws must be tightened with the prescribed torque (→ Table 4, Page 17) and present in a quantity that matches the number of securing holes. Any damaged screws must only be replaced with screws of the same dimensions and quality (at least A2-70) unless otherwise specified on the type plate.
- If insulated bearings were used by the manufacturer (see marking on the motor), appropriate bearings must be used again when changing bearings to avoid impermissible bearing currents.

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#### Repairs

Repairs and changes to explosion-protected machines are to be carried out by one of the aforementioned sites as per EC directives 2014/34/EC and 1999/92/EC, in Germany (or according to the regulations of the respective country) in compliance with the "Operating Safety Legislation" as well as with the safety regulations and requirements of our repair instructions.

Any works relating to the explosion protection must be carried out by the manufacturer or by a specialized workshop for electrical machinery. If said works are not performed by the manufacturer, these must be surveyed by an authorized qualified person.

Written confirmation as per the "Operational Safety Legislation" is required for restarting in Germany. In foreign countries the applicable national regulations must be complied with.


Repairs to the flash-proof joint may only be carried out in accordance with the manufacturer's design specification.

Repairs in accordance with the values in Tables 2 and 3 of EN/IEC 60079-1 are not permitted.

## 4 Additional dust protection requirements

(application in zones 21 and 22)

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Intended use	The labelling  (II 2D) Ex tb IIIC T... °C Db must be found on the motor's rating plate.
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Installation and Operation	<p><b>Cable and line entries</b> Separately approved entries according to Directive 2014/34/EC with the type of protection through housing "tb" with at least IP 65 must be used. Any openings that are not used are to be closed with duly approved plugs.</p> <p><b>Operation and Repairs</b> The motors must be operated in accordance with the requirements of EN/IEC 60079-31. They must not be operated with excessive dust deposits, as these may lead to the exceeding of the admissible surface temperature. Regular cleaning must be performed.</p> <p>The radial shaft seal rings are included in the approval. Only original gaskets are to be used.</p> <p>In motors with a roller bearing re-greasing facility, it must be ensured that the greasing channels are always filled with grease, since otherwise the explosion protection will be null and void.</p> <p>Processes that generate extreme amounts of charging must be avoided with offshore special and NORSOK coating systems when used in zone 21.</p>
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**Dansk:** Hvis denne brugsanvisning ikke er skrevet på et sprog, som du forstår, så henvend dig venligst til fabrikanten.

**Suomi:** Ellette pysty lukemaan tämän käyttöohjeen tietoja olemassa olevalla kielellä, ottakaa yhteyttä valmistajaan.

**Français:** Si vous ne pouvez pas lire la langue dans laquelle sont écrites les indications contenues dans les présentes instructions de service, veuillez vous adresser au fabricant.

**Español:** Si no puede leer las indicaciones en estas instrucciones de funcionamiento editadas en el presente idioma, diríjase por favor a la empresa fabricante.

**Elinika:** Εάν δεν μπορείτε να διαβάσετε στην υπάρχουσα γλώσσα τα στοιχεία σε αυτές τις οδηγίες λειτουργίας, σας παρακαλούμε να απευθυνθείτε στον κατασκευαστή.

**English:** If you cannot understand the operating instructions in the language provided please contact the manufacturers.

**Italiano:** Se non potete leggere le informazioni contenute nelle istruzioni per l'uso nella lingua in cui sono formulate, vi preghiamo di rivolgervi allo stabilimento di produzione.

**Nederlands:** Wanneer u op grond van de gebruikte taal de gegevens in deze bedrijfshandleiding niet kunt lezen, verzoeken wij u om contact op te nemen met de fabrikant.

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**Български:** Ако не можете да разберете инструкциите за експлоатация на дадения език, моля обърнете се към производителите.

**Română:** Dacă nu înțelegeți instrucțiunile de exploatare în limba în care sunt furnizate, vă rugăm să contactați producătorul.

ATB NORDENHAM GmbH

Helgoländer Damm 75  
26954 Nordenham, Deutschland  
Tel. +49 4731 365 – 0  
Fax: +49 4731 365 – 159  
E-Mail: [info@atb-nordenham.de](mailto:info@atb-nordenham.de)  
Web: [www.atb-motors.com](http://www.atb-motors.com)

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