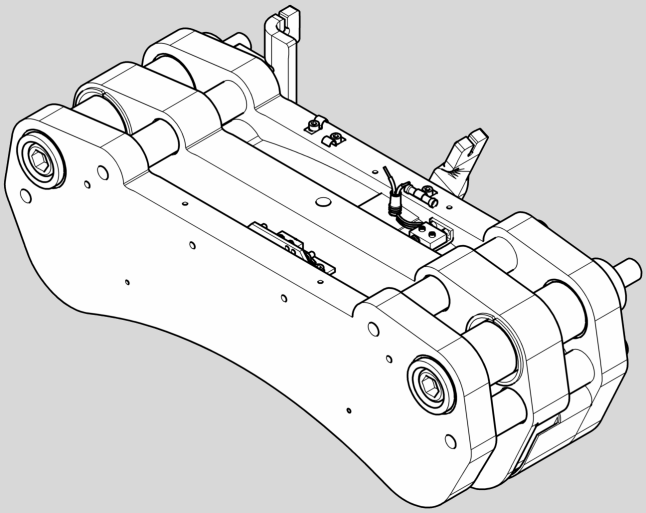
INTORQ BFK466-80

Electromagnetically released spring-applied brake

Operating Instructions



INTORQ

setting the standard

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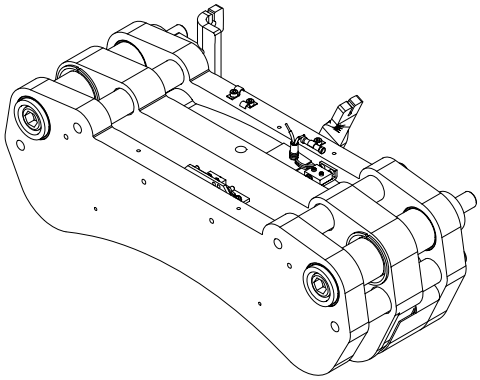
This documentation applies to ...

BFK466-80



BFK46680-003.iso/dms

Product key

Product key **INTORQ** **B** **FK** **466** - **□□**

A

B

C

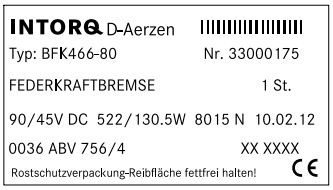
D

Legend for the INTORQ BFK466 product key

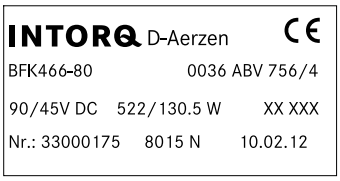
A	Product group	Brakes
B	Product family	Spring-applied brake
C	Type	466
D	Size	80

Not coded: supply voltage, hub bore, options

Identification

Package label				Example
Manufacturer			Bar code	
Name			Type No.	
Type (see product key)			Quantity per box	
Rated voltage	Rated power	Rated torque	Packing date	
Model identification			Desired customer no.	
Additional information			CE designation	

BFK46680_001.iso/dms

Nameplate				Example
Manufacturer			CE designation	
Type (see product key)			Model identification	
Rated voltage		Rated power	Desired customer no.	
Type No.		Rated torque	Production date	

BFK46680_002.iso/dms

Document history

Material number	Version			Description
33001612	1.0	02/2012	TD09	First edition

i Contents

i Contents

1 Preface and general information

1.1 About these Operating Instructions

- These Operating Instructions will help you to work safely on and with the multi-pole spring-applied brake. They contain safety instructions that must be followed.
- All persons working on or with the multi-pole spring-applied brake must have these Operating Instructions available and observe the information and notes relevant for their work.
- The Operating Instructions must always be in a complete and perfectly readable condition.

1.2 Terminology used

Term	In the following text used for
Spring-applied brake	Multi-pole spring-applied brake
Drive system	Drive systems with spring-applied brakes and other drive components

1.3 Conventions used

This documentation uses the following conventions to distinguish different types of information:

Spelling of numbers	Decimal separator	Point	The decimal point is always used. For example: 1234.56
Symbols	Page reference	🕮	Reference to another page with additional information For example: 🕮 16 = see page 16
	Document reference	🖳	Reference to another documentation with additional information For example: 🖳 software manual

1 Preface and general information

1.4 Abbreviations used

Abbreviation	Unit	Name
I	[A]	Current
I_{rated}	[A]	Rated current
M_a	[Nm]	Tightening torque
n_{max}	[rpm]	Maximum speed
P_{20}	[kW]	Electrical power at 20°C
Q	[J]	Calculated friction work per operation
Q_{perm}	[J]	Max. permissible friction work per operation
R_{20}	[Ohm]	Coil resistance at 20°C
S_h	[h^{-1}]	Operating frequency, i.e. the number of periodical brakings
$s_{Lü}$	[mm]	Rated air gap
$S_{hü}$	[h^{-1}]	Transition operating frequency, i.e. the maximally permissible number of brakings per unit time
t_1	[ms]	Engagement time, $t_1 = t_{11} + t_{12}$
t_2	[ms]	Disengagement time (time from the beginning of the torque drop to reaching 0.1 M_K)
t_{11}	[ms]	Delay during engagement (time from switching off the supply voltage to the beginning of the torque rise)
t_{12}	[ms]	Torque rise time
U	[V]	Voltage

1.5 Scope of supply

- The spring-applied brakes are delivered preassembled, the brake disc is not included in the scope of supply.
- After receipt of the delivery, check immediately whether the items delivered match the accompanying papers. INTORQ does not accept any liability for deficiencies claimed subsequently. Claim
  - visible transport damage immediately to the forwarder.
  - visible deficiencies / incompleteness immediately to INTORQ GmbH & Co. KG.

1.6 Disposal

The spring-applied brake consists of different types of material.

- Recycle metals and plastics.
- Ensure professional disposal of assembled PCBs according to applicable environmental regulations.

1 Preface and general information

1.7 Drive systems

1.7.1 Labelling

Drive systems and drive components are clearly labelled and defined by the indications on the nameplates.

Manufacturer: INTORQ GmbH & Co KG, Wülmser Weg 5, D-31855 Aerzen

1.8 Legal regulations

Liability

- The information, data and notes in these Operating Instructions met the state of the art at the time of printing. Claims referring to drive systems which have already been supplied cannot be derived from the information, illustrations and descriptions.
- We do not accept any liability for damage and operating interference caused by:
  - inappropriate use
  - unauthorised modifications to the drive system
  - improper working on and with the drive system
  - operating faults
  - disregarding these Operating Instructions

Warranty

- Terms of warranty: see terms of sale and delivery of INTORQ GmbH & Co. KG.
- Warranty claims must be made to INTORQ immediately after detecting defects or faults.
- The warranty is void in all cases where liability claims cannot be made.

2 Safety instructions

2.1 General safety information

- INTORQ components ...
  - ... must only be applied as directed.
  - ... must not be commissioned if they are noticeably damaged.
  - ... must not be technically modified.
  - ... must not be commissioned if they are mounted incompletely.
  - ... must not be operated without the required covers.
  - ... can hold live as well as moving or rotary parts during operation according to their degree of protection. Surfaces may be hot.
- For INTORQ components ...
  - ... the documentation must always be kept at the installation site.
  - ... only permitted accessories are allowed to be used.
  - ... only original spare parts of the manufacturer are allowed to be used.
- Observe all specifications given in the attached documentation.
  - This is the prerequisite for safe and trouble-free operation and for achieving the specified product features.
- Only qualified, skilled personnel are permitted to work on and with INTORQ components.

  In accordance with IEC 60364 or CENELEC HD 384, qualified, skilled personnel are persons ...
  - ... who are familiar with the installation, mounting, commissioning, and operation of the product.
  - ... who have the qualifications necessary for their occupation.
  - ... who know and apply all regulations for the prevention of accidents, directives, and laws relevant on site.
- Risk of burns!
  - Surfaces may be hot during operation! Provide for protection against accidental contact.
- Risk of injury due to a rotating shaft!
  - Wait until the motor is at standstill before you start working on the motor.
- The friction lining and the friction surfaces must by no means have contact to oil or grease since even small amounts reduce the brake torque considerably.
- The brake is designed for operation under the environmental conditions that apply to IP54. Because of the numerous possibilities of using the brake, it is however necessary to check the functionality of all mechanical components under the corresponding operating conditions.

2 Safety instructions

2.2 Application as directed

- Drive systems
  - are intended for use in machinery and systems.
  - must only be used for the purposes ordered and confirmed.
  - must only be operated under the ambient conditions prescribed in these Operating Instructions.
  - must not be operated beyond their corresponding power limits.

Any other use shall be deemed inappropriate!

Possible applications of the INTORQ spring-applied brake

- Humidity: no restrictions
- Ambient temperature:
  - -5°C to +40°C (standard)
- At high humidity and low temperature:
  - Take measures to protect friction surfaces from freezing.
- Protect electrical connections against contact.

2 Safety instructions

2.3 Notes used

The following pictographs and signal words are used in this documentation to indicate dangers and important information:

Safety instructions

Structure of safety instructions:

Danger!

Characterises the type and severity of danger

Note

Describes the danger

Possible consequences:

- List of possible consequences if the safety instructions are disregarded.

Protective measure:

- List of protective measures to avoid the danger.

Pictograph and signal word	Meaning
Danger!	**Danger of personal injury through dangerous electrical voltage** Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
Danger!	**Danger of personal injury through a general source of danger** Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
Stop!	**Danger of property damage** Reference to a possible danger that may result in property damage if the corresponding measures are not taken.

Application notes

Pictograph and signal word	Meaning
Note!	Important note to ensure troublefree operation
Tip!	Useful tip for simple handling
	Reference to another documentation

3 Technical data

3.1 Product description

3.1.1 Structure and function

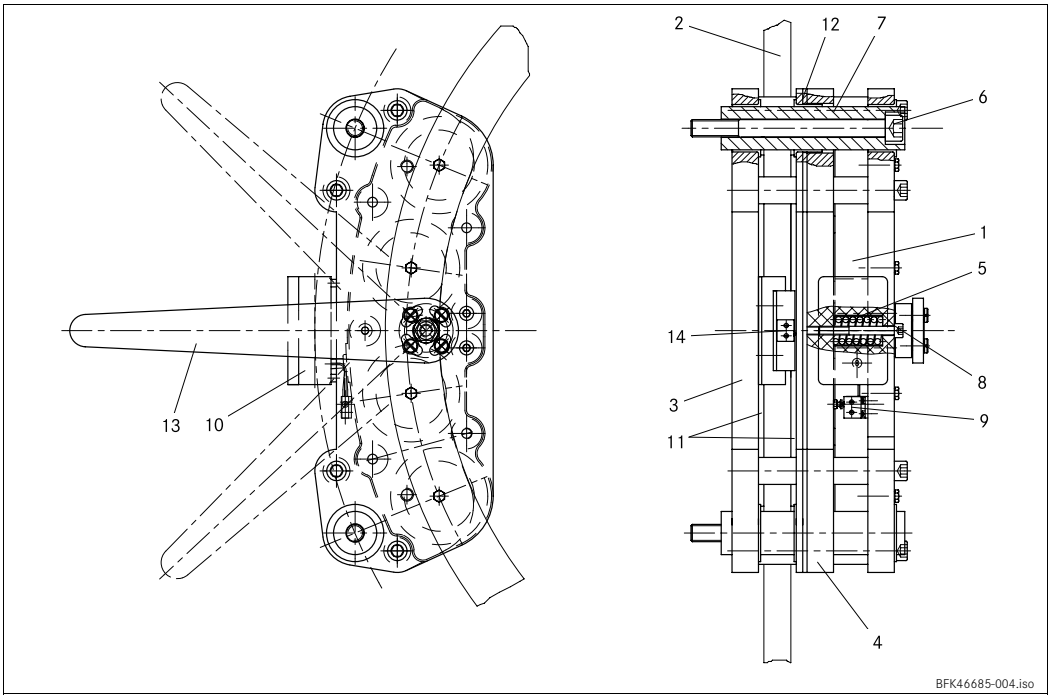


Fig. 1 Design of a BFK466-80 spring-applied brake

1	Stator	6	Cheese head screw	11	Friction lining
2	Brake disk	7	Guide sleeve	12	Support of friction lining
3	Flange	8	Cheese head screw	13	Manual release lever (detachable)
4	Armature plate	9	Microswitch (release monitoring)	14	Microswitch (wear monitoring)
5	Compression spring	10	Terminal box		

3.1.2 General information

This spring-applied brake is designed as a floating caliper brake for mounting on direct drive motors. The brake disk (2) is not included in the scope of supply. By using two or more spring-applied brakes on one brake disk, the demand for redundancy can be fulfilled for special applications such as lift and stage technology.

The braking torque is generated by the pressure of several compression springs (5) via friction locking between the two friction linings (11) of the friction lining support (12) and the flange (3) and the brake disc (2). The brake is released electromagnetically. For this, an overexcitation voltage is applied to the brake for approx. 1...2 seconds. Then, the voltage is decreased to 50%. Thus, the medium electrical brake power is reduced.

The BFK466 spring-applied brake is designed for converting mechanical work and kinetic energy into heat energy. Thanks to the static breakaway torque, loads can be held at standstill.

Emergency braking at higher speeds is possible. Here, the maximally permissible speed must not be exceeded. (🕮 15).

3 Technical data

The stator (1) is designed to be of thermal class F. The limit temperature of the coils is 155°C.

The spring-applied brake is designed for a maximum operating time of 60%.

3.1.3 Braking

During braking, the support of the friction lining (12) and the affixed friction lining (11) are pressed against the axially fixed brake disc (2). Nearly at the same time, the caliper moves on the guide sleeves (7) in the opposite direction, so that the friction lining (11) on the flange (3) is pressed against the brake disc, too. The braking torque is supported by the mounting flange via the guide sleeves (7). The asbestos-free friction linings ensure a high braking torque with low wear.

3.1.4 Brake release

When the brake is applied, there is an air gap "$s_{Lü}$" between the armature plate (4) and the pole faces of the stator (1). To release the brake, the respective switching device supplies the coils of the stator (1) with the overexcitation voltage. The resulting magnetic force draws the armature plate (4) against the spring force towards the pole faces of the stator (1). Now, the spring force is taken from the support of the friction lining (12). The caliper can move on the guide sleeves (7) until the brake disk (2) is relieved and can rotate freely. After approx. 1...2 seconds, the supply voltage is decreased to 50%.

3.1.5 Release monitoring

The INTORQ BFK466 spring-applied brake is equipped with a microswitch (changeover contact) which monitors the switching status. During brake release, the microswitch (9) changes over. This must exclude drive operation against the applied brake.

3.1.6 Wear monitoring

An additional microswitch (14) is used to monitor the wear status of this spring-applied brake. The microswitches can be used as NC contacts (series connection) or as NO contacts (parallel connection).

3.1.7 Emergency release option

An optional manual release is available for short-time release of the brake. This allows for lowering the load in case of a power failure.

3 Technical data

3.1.8 Project planning notes

- The brakes are dimensioned in such a way that the given characteristic torques are reached safely after a short run-in process.
- Due to the fluctuating properties of the organic friction linings used and the alternating environmental conditions, deviations of the given braking torques may occur. These must be considered by corresponding safety measures in the dimensioning process. Especially with humidity and alternating temperatures, an increased breakaway torque may occur after a long downtime.
- Check the braking torque if the brake is inserted on the customer's friction surfaces.
- If the brake is used as a pure holding brake without dynamic load, the friction lining must be reactivated regularly.

Stop!

Stable properties of the organic friction lining are only achieved in the case of continuous use. The readiness for operation of the brake has to be ensured with a braking energy that is equivalent to one emergency stop per week. Unplanned emergency stops occurring at a sufficient frequency have the same effect.

3 Technical data

3.2 Rated data

Type	Friction force	Brake disk radius	Max. sliding speed	Voltage [1]	Power [2]	Coil resistance	Max. current	Overexcitation time
	F_R [N]	R_a [mm] min. / max.	$V_{max.}$ [m/s]	U ±10% [V] DC	P_{20} [W]	R20±5% [Ω]	$I_{max.}$ [A]	sec.
BFK466-80	8015	300 / 600	16.4	90/45 110/55 205/103	522/130.5 522/130.5 550/137.5	15.52 23.18 76.41	5.8 4.75 2.68	1...2

Type	Air gap	Max. air gap	Fixing screws	Tightening torque	Max. perm. switching energy	Transition operating frequency	Weight (without brake disk)
	$s_{Lü}$ [mm]	$s_{Lü\ max.}$ [mm]		M_a [Nm]	Q_E [J]	S_{fo} [h^{-1}]	m [kg]
BFK466-80	0.4± 0.1	0.7	2 x M16	195	250000	24	45

1) Voltage for releasing / holding
2) Coil power at 20°C when releasing / holding

3.3 Operating times

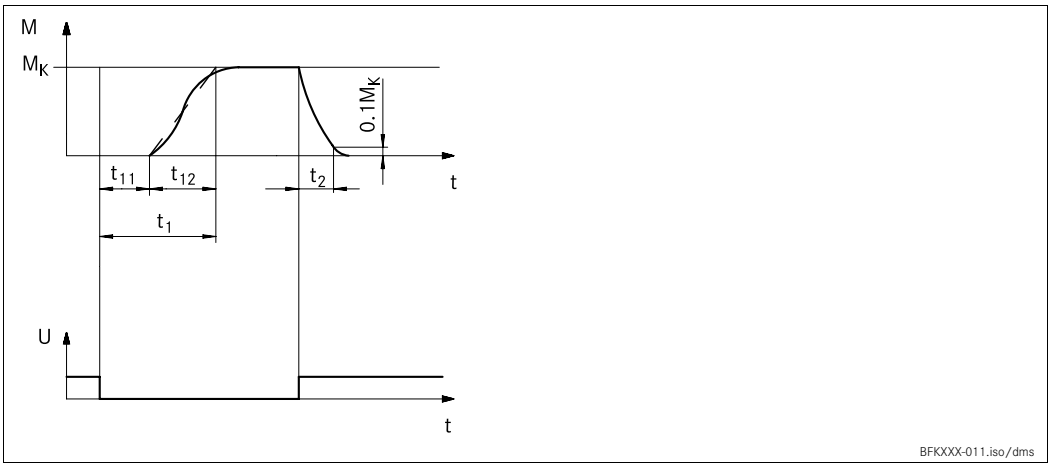


Fig. 2 Operating times of the spring-applied brakes

t_1	Engagement time	t_{11}	Delay time during engagement
t_2	Disengagement time (up to M = 0.1 M_r)	t_{12}	Rise time of the brake torque
M_{rated}	Braking torque	U	Voltage

Type	Operating times [ms] at $s_{Lürated}$			
	Engage			Disengage
	t_{11}	t_{12}	t_1	t_2
BFK466-80	28	152	180	380

Tab. 1 Switching energy - operating frequency - operating times

3 Technical data

Disengagement time

The disengagement time is not affected by DC or AC switching. The indicated disengagement time applies to an air gap of 0.4 mm. When the air gap is larger (as a result of wear), the disengagement time increases.

Engagement time

Short brake engagement times are vital for emergency braking. DC switching together with a suitable spark suppressor must therefore be provided.

If the drive system includes a frequency inverter so that the brake is deenergised only when the motor is at standstill, switching on the AC side is also possible (not valid for emergency braking). In this case, engagement times will be 5 times longer.

3.4 Operating frequency / friction work

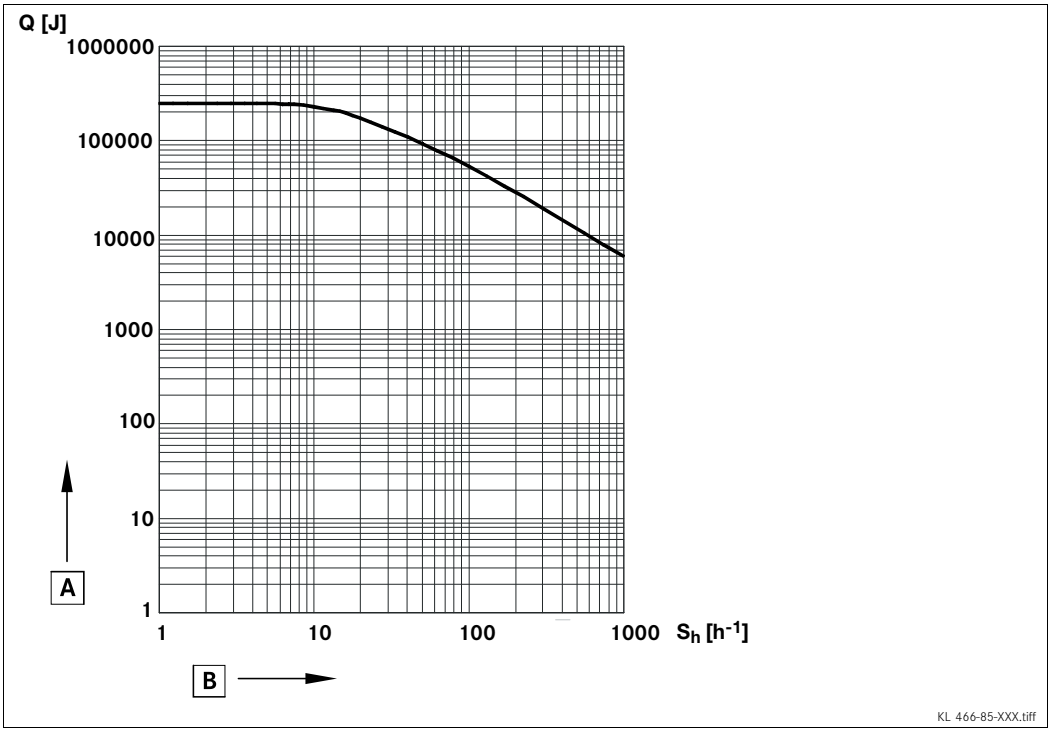


Fig. 3 Switching energy as a function of the operating frequency

A Switching energy B Operating frequency

$$S_{fperm} = \frac{-S_{fo}}{\ln\left(1 - \frac{Q}{Q_E}\right)} \qquad Q_{perm} = Q_E\left(1 - e^{\frac{-S_{fo}}{S_f}}\right)$$

The permissible operating frequency "S_{fperm}" depends on the friction work "Q" (see Fig. 3). At a preset operating frequency "S_f", the permissible friction work is "Q_{perm}".

For "S_{fo}" and "Q_E", please see chapter 3.2.

3 Technical data

3.5 Emission

Heat

Since the brake converts kinetic energy as well as mechanical and electrical energy into heat, the surface temperature varies considerably, depending on the operating conditions and possible heat dissipation. Under unfavourable conditions, the surface temperature can reach 130°C.

Danger!

Risk of burns on brake and brake disc!

Noise

The switching noise during engagement and disengagement varies depending on the air gap "s_{air}" and the brake size. It is between approx. 55 and 60 dB [A].

Others

Abrasion due to braking occurs in the form of dust.

In case of high load, the friction face will become so hot that odours may occur.

4 Mechanical installation

4.1 Important notes

Stop!

- Do not lubricate the screws with oil or grease.

4.2 Necessary tools

Type	Torque key	Insert for hexagon socket screws	Transport screw	Crosstip screwdriver
				
	Measuring range [Nm]	Wrench size [mm]	Wrench size [mm]	Crosstip size
BFK466-80	250	14 x 1/2” square	6 x 1/4” square	2

Feeler gauge	Caliper gauge	Multimeter
		

4 Mechanical installation

4.3 Mounting

4.3.1 Preparation

1. Unpack spring-applied brake.
2. Check for completeness.
3. Check nameplate data, especially rated voltage.

4.4 Installation

The brake is delivered preassembled with two transport safety bolts (17).

1. Fit the guide sleeve (19) on the drive and tighten it lightly with the fixing screw (21).
2. Use a through-hole and push the brake onto the guide sleeve until the friction faces are in alignment with the brake disc (20).
3. Turn the brake around the guide sleeve (19) and position the brake radially over the brake disc (20).
4. Push the second guide sleeve (19) into the second through-hole of the brake and tighten it with the fixing screw (21).

Stop!

The sum total of the distances measured must not exceed "$s_{Lü\ max}$"!

5. Tighten both fixing screws (21) with the given torque (📖 15).
6. Remove the transport safety bolts (17)!
7. Switch the current on and off several times, checking the movability of the brake on the guide sleeves.
8. Check the clearance of the brake disc and the air gap "$s_{Lü}$" between the two friction linings (3.2) and the brake disc (20) with a feeler gauge (24).

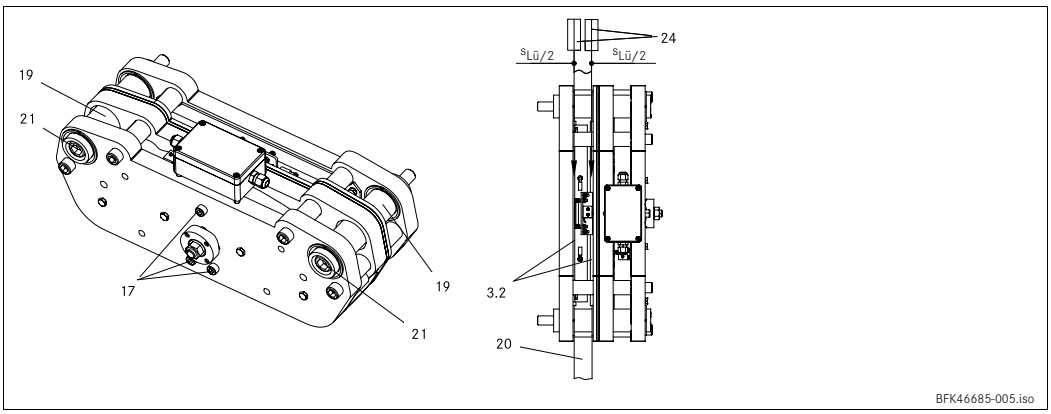


Fig. 4 Installation of the BFK466-80 spring-applied brake

5 Electrical installation

5.1 Important notes

Danger!

- Electrical connection must only be carried out by skilled personnel!
- Connections must only be made when the equipment is de-energised! Danger through unintended starts or electric shocks.

Stop!

- It must be ensured that the supply voltage corresponds to the nameplate data.
- Voltages must be adapted to the local environment!

Stop!

- If emergency switching off is carried out without the required suppressor circuit, the control unit may be destroyed.
- Observe the correct polarity of the suppressor circuit!

5.2 Electrical connection

Earthing

Use the PE screw in the terminal box (Fig. 6 and Fig. 8) for PE connection.

PE connection via the fixing screws on the motor is not permitted because there is no electrically conductive connection between the brake and the guide sleeves!

Temperature sensor connection (optional)

The spring-applied brake can be delivered with PTC sensors according to DIN 44082 for temperature monitoring (reference temperature 130°C). The signal is evaluated via a PTC thermistor tripping device provided by the customer.

Connection: AWG 26 blue/blue

5 Electrical installation

5.3 Microswitch

Note!

Application range recommended for the microswitch

- DC current: 10 mA to 100 mA at 12 V
- AC current: 10 mA to 5 A at 12 V / max. 250 V

5.3.1 Microswitch as NC contact (series connection)

Danger!

- Perform electrical connection only when no voltage is applied.
- If an ”emergency stop” is carried out without the protective circuit provided, the control device may be destroyed. Observe the correct polarity of the protective circuit!

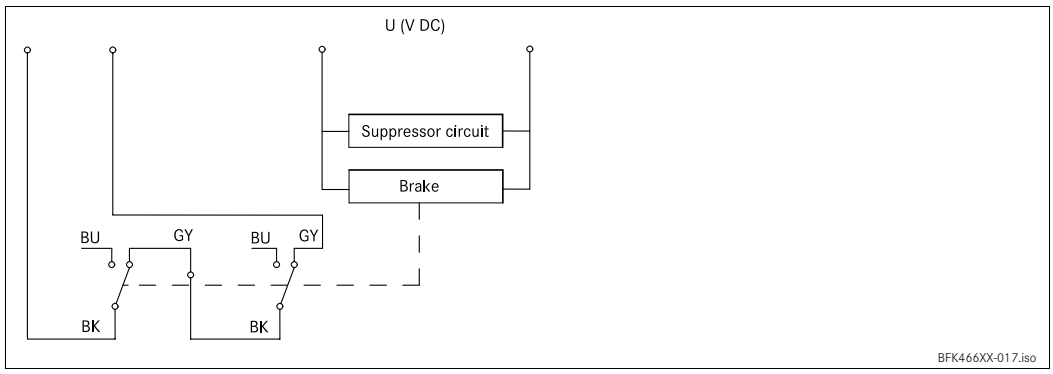


Fig. 5 BFK466 connection diagram (circuit proposal for series connection)

Pin assignment for microswitch

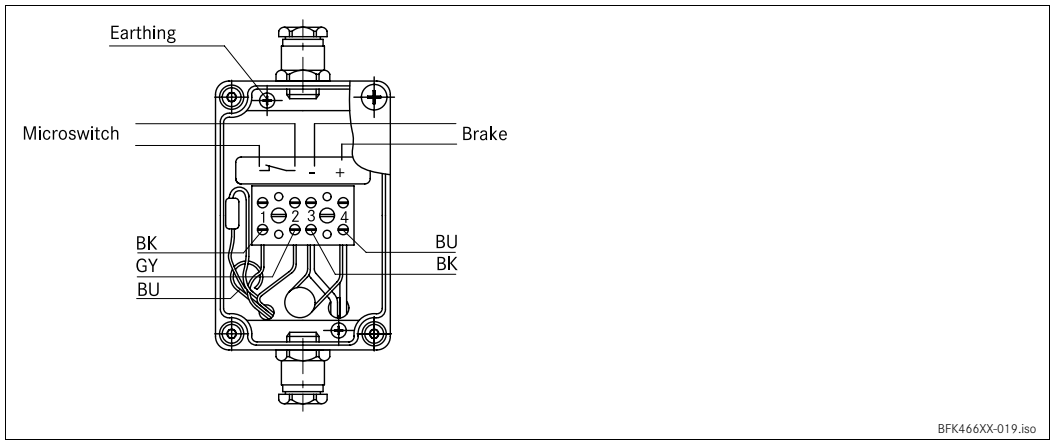


Fig. 6 BFK466 terminal box (as option: series connection with integrated varistor)

Microswitch:	Input connection	BK
	NO contact	BU
	NC contact	GY

5 Electrical installation

When current is fed to the spring-applied brake, the armature plate is released. The microswitch (NC contact) is actuated and gives the signal “Spring-applied brake released”.

When the maximum working air gap is exceeded, the release monitoring circuit is opened by the wear monitoring microswitch connected in series. In this case, the signal ”Spring-applied brake applied” will not be given when the brake is deenergised.

Microswitch (NC contact, series connection)		
Brake released	**Brake worn-out**	**Circuit**
no	no	closed
yes	no	open
no	yes	open
yes	yes	open

5 Electrical installation

5.3.2 Microswitch as NO contact (parallel connection)

Danger!

- Perform electrical connection only when no voltage is applied.
- If an ”emergency stop” is carried out without the protective circuit provided, the control device may be destroyed. Observe the correct polarity of the protective circuit!

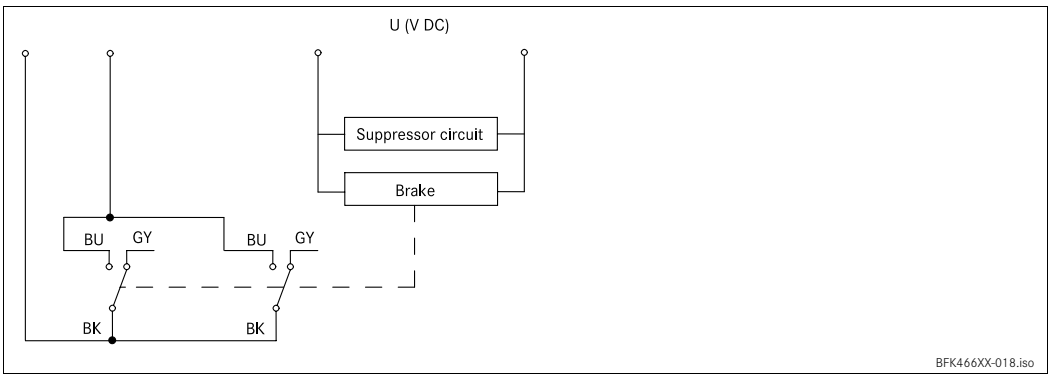


Fig. 7 BFK466 connection diagram (circuit proposal for parallel connection)

Pin assignment for microswitch

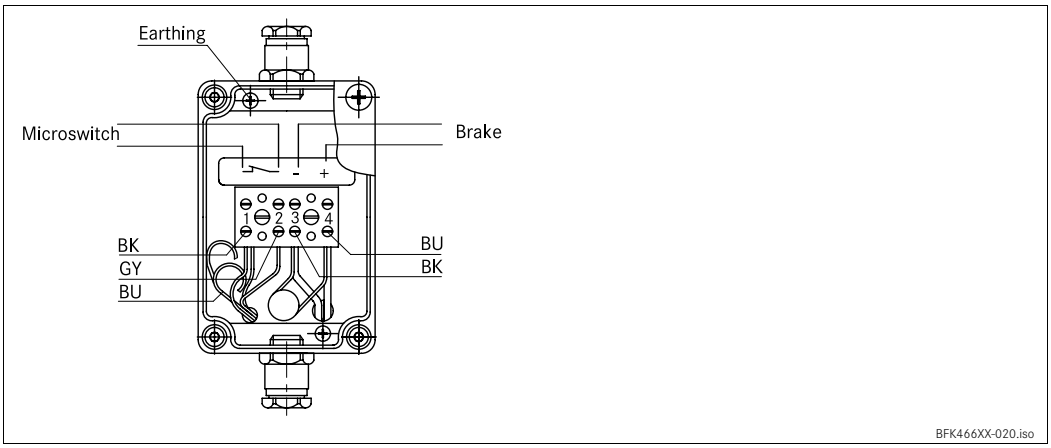


Fig. 8 BFK466 erminal box (optional with integrated varistor)

Microswitch:	Input connection	BK
	NO contact	BU
	NC contact	GY

When current is fed to the spring-applied brake, the armature plate is released. The microswitch (NO contact) is actuated and gives the signal “Spring-applied brake released”.

When the maximum working air gap is exceeded, the wear monitoring circuit is closed. In this case, the signal ”Spring-applied brake released” will also be given when the brake is deenergised.

5 Electrical installation

Microswitch (NO contact, parallel connection)		
Brake released	**Brake worn-out**	**Circuit**
no	no	open
yes	no	closed
no	yes	closed
yes	yes	closed

6 Commissioning and operation

6.1 Important notes

Danger!

The brake must be free of residual torque. The motor must not rotate.

Danger!

Live connections must not be touched.

- The brakes are dimensioned in such a way that the given characteristic torques are reached safely after a short run-in process.
- Due to the fluctuating properties of the organic friction linings used and the alternating environmental conditions, deviations of the given braking torques may occur. These must be considered by corresponding safety measures in the dimensioning process. Especially with humidity and alternating temperatures, an increased breakaway torque may occur after a long downtime.
- Check the braking torque if the brake is inserted on the customer's friction surfaces.
- If the brake is used as a pure holding brake without dynamic load, the friction lining must be reactivated regularly.

Stop!

Stable properties of the organic friction lining are only achieved in the case of continuous use. The readiness for operation of the brake has to be ensured with a braking energy that is equivalent to one emergency stop per week. Unplanned emergency stops occurring at a sufficient frequency have the same effect.

6 Commissioning and operation

6.2 Function checks before commissioning

6.2.1 Release / voltage check

Danger!

Disconnect the drive from the load to prevent accidents. During the next inspection steps of the spring-applied brake, the motor must not run!

1. Remove two bridges from the motor terminals. Do not switch off the voltage supply for the brake.
2. Measure the AC voltage at the motor terminals. It must be zero!
3. Switch on the current for the brake.
4. Measure the AC voltage at the motor terminals. It must be equal to the mains voltage!
5. Check the air gap "$s_{Lü}$" between the brake disk and the friction lining. Altogether it must be 0.4 ±0.1 mm. The brake disk must rotate freely!
6. Switch off the current.
7. Bolt bridges to the motor terminals.

6.2.2 Microswitch

These spring-applied brakes are equipped with two microswitches. One for release monitoring and one for wear monitoring (see Fig. 1). The microswitches are either connected in series (NC contacts, black and grey connections) or in parallel as NO contacts (black and blue connections).

Note!

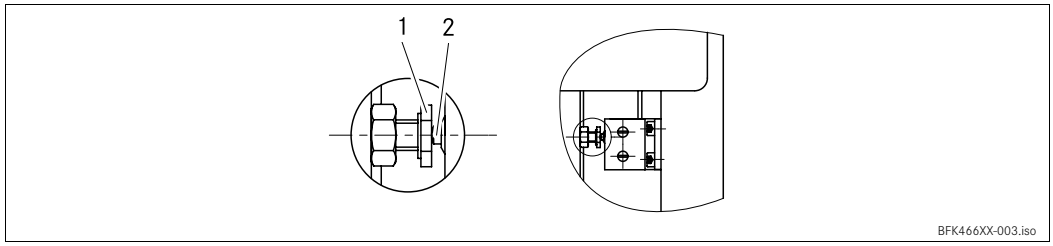
The microswitches are checked for correct operation when the brake is applied (not actuated). During the check, the other microswitch must not be actuated.

Checking the release control

Note!

The brake is deenergised, the transport screws are removed.

6 Commissioning and operation

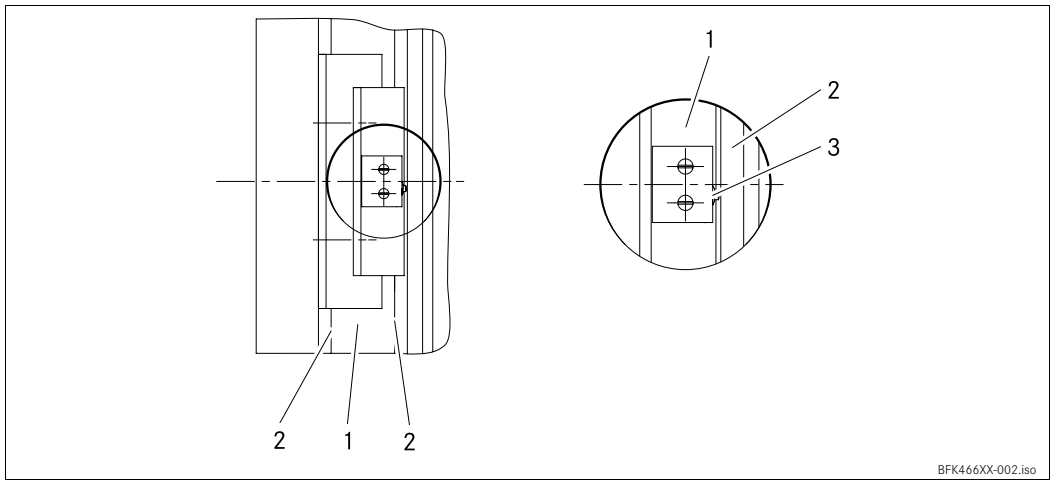


1 Hexagon head cap screw
2 Microswitch tappet

Check the setting of the microswitch for release monitoring using a feeler gauge with thickness "$Y_{max.}$ and $Y_{min.}$" between hexagon head cap screw (1) and microswitch tappet (2).

Feeler gauge thickness	NC contact	NO contact
$Y_{max.} = s_{Lü} - 0.10$	Switch open	Switch closed
$Y_{min.} = s_{Lü} - 0.25$	Switch closed	Switch open

Checking the wear monitoring



1 Brake disk
2 Support of friction lining
3 Microswitch tappet

1. Measure the air gap "$s_{Lü}$" between brake disk (1) and friction linings (2) using a feeler gauge (brake energised, (🕮 26).
2. Switch off the voltage supply
3. Calculate the thickness "X" of the feeler gauge: **0.75 - "$s_{Lü}$" = X**
4. Insert a feeler gauge of thickness "X" between microswitch tappet (3) and support of friction lining (2) (brake deenergised). The feeler gauge must be fitted evenly. The switch must be actuated.
5. Use a feeler gauge with a thickness lower by 0.05 mm and check if the switch remains in the original switch position. The feeler gauge must be fitted evenly.

6 Commissioning and operation

6.2.3 Checking the manual release function

Stop!

This operational test is to be carried out additionally!

Danger!

The drive system must be load-free. The motor must not rotate.

Stop!

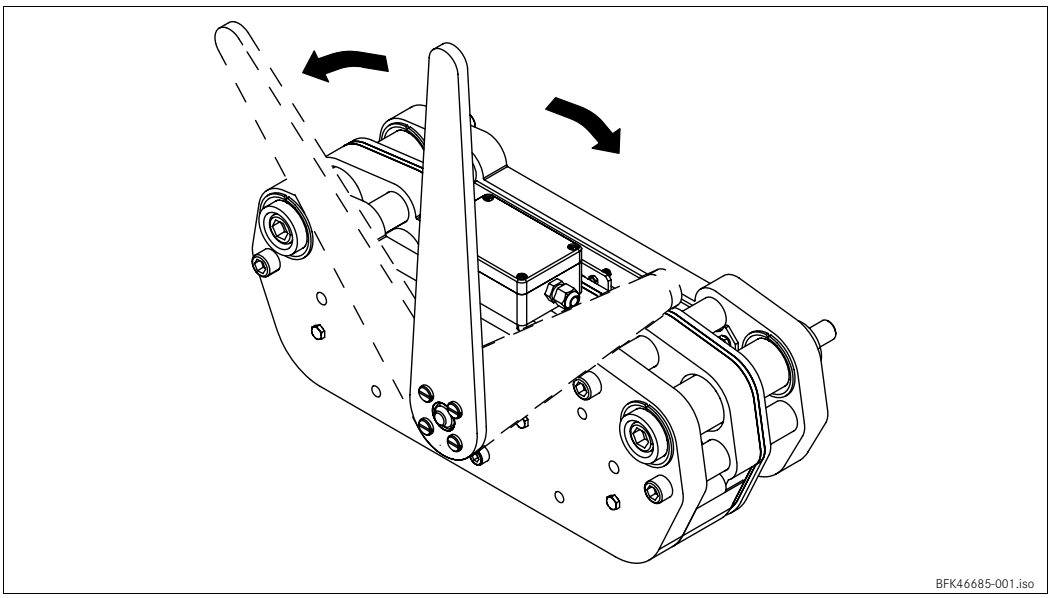
If the brake is operated above the maximally permissible working air gap "$s_{Lü\ max}$" (📖 15), the braking torque is considerably reduced by the manual release. The function of the brake is not guaranteed anymore.

Manual release with lever

The installed manual release is designed for manual operation in two directions. The lever is detachable.

Motor and brake deenergised.

1. Pull the lever with approx. 270 N until the resistance significantly increases.
2. Release the lever.

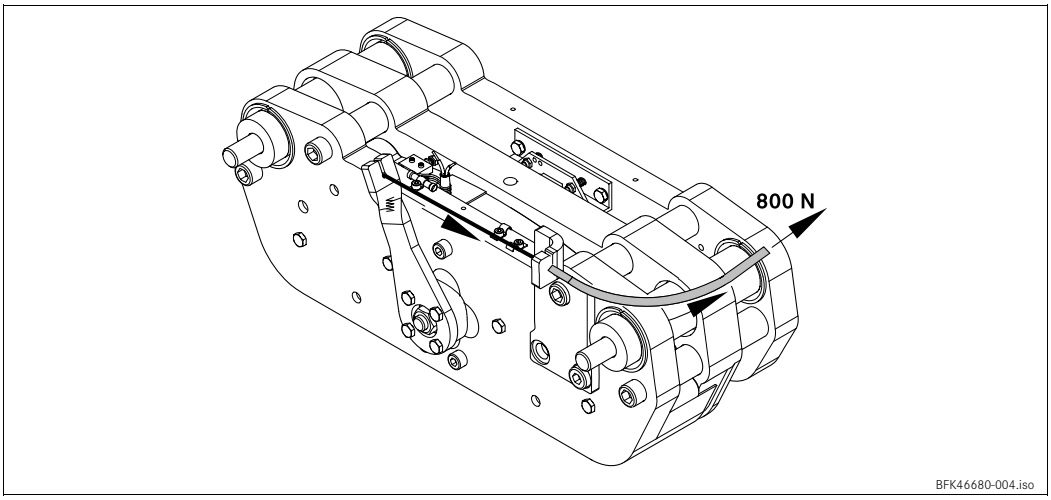


6 Commissioning and operation

Manual release with bowden cable (optional)

Note!

The manual release is designed for operation using a bowden cable.



Motor and brake deenergised.

1. Suspend bowden cable (not included in the scope of supply) and pull with approx. 800 N.
   – The drive must rotate freely. A small residual torque is permissible.
2. Release lever.
   – Torque must be available!

The preparations for commissioning are completed.

6.3 Commissioning

1. Switch on drive system.
2. Carry out a braking test.

6 Commissioning and operation

6.4 During operation

Danger!

Live connections must not be touched.

- Check the brake regularly during operation. Take special care of:
  - unusual noises or temperatures
  - loose fixing elements
  - the condition of the electrical cables.
- The armature plate must be attracted and the drive must move without residual torque.
- Measure the DC voltage at the brake.
  - Compare the DC voltage measured with the voltage specified on the nameplate. A ±10 % deviation is permissible.
- If faults should occur, go through the error search table (📖 35). If the fault cannot be eliminated, please contact your customer service.

7 Maintenance/repair

7.1 Wear of spring-applied brakes

INTORQ spring-applied brakes are wear-resistant and designed for long maintenance intervals. The friction lining and the mechanical brake components are subject to function-related wear. For safe and trouble-free operation, the brake must be checked at regular intervals, and, if necessary, be replaced.

The following table describes different causes of wear and their effects on the components of the spring-applied brake. For calculating the service life of rotor and brake and determining the maintenance intervals to be observed, the relevant factors of influence must be quantified. The most important factors are the friction work, initial speed of braking and the operating frequency. If several of the causes of wear indicated for the friction lining occur in an application at the same time, the influencing factors must be added for calculating the wear. The INTORQ Select dimensioning program can be used to calculate the maintenance intervals.

Component	Cause	Effect	Influencing factors
Friction lining	Braking during operation	Wear of friction lining	Friction work
	Emergency stops		
	Overlapping wear during start and stop of drive		
	Active braking via the drive motor with support of brake (quick stop)		
	Starting wear in case of motor mounting position with vertical shaft, even when the brake is not applied		Number of start/stop cycles
Armature plate and flange	Rubbing of brake lining	Armature plate and flangeare run in	Friction work
Brake support	Load alternation and jerks in the backlash between armature plate, sleeve bolts and guide bolt	Breaking of armature plate, sleeve bolts and guide bolt	Number of start/stop cycles, braking torque
Springs	Axial load cycle and shear stress of springs through radial backlash on reversal of armature plate	Reduced spring force or fatigue failure	Number of switching operations of brake

Tab. 2 Causes for wear

7 Maintenance/repair

7.2 Inspections

7.2.1 Important notes

To ensure safe and trouble-free operation, spring-applied brakes must be checked and maintained at regular intervals. Servicing can be made easier if good accessibility of the brakes is provided in the plant. This must be considered when installing the drives in the plant.

Primarily, the necessary maintenance intervals for industrial brakes result from the load during operation. When calculating the maintenance interval, all causes for wear must be taken into account, ((🕮 31). For brakes with low loads such as holding brakes with emergency stop, we recommend a regular inspection at a fixed time interval. To reduce the cost, the inspection can be carried out along with other regular maintenance work in the plant if necessary.

Stop!

Stable properties of the organic friction lining are only achieved in the case of continuous use. The readiness for operation of the brake has to be ensured with a braking energy that is equivalent to one emergency stop per week. Unplanned emergency stops occurring at a sufficient frequency have the same effect.

If the brakes are not maintained, failures, production losses or damage to the system may occur. Therefore, a maintenance concept adapted to the particular operating conditions and brake loads must be defined for every application. For the spring-applied brakes, the maintenance intervals and maintenance operations listed in the below table must be provided. The maintenance operations must be carried out as described in the detailed descriptions.

7.2.2 Maintenance intervals

The spring-applied brake must be checked during the prescribed inspections of the drive system in which it is installed.

- The service life of the brake before replacement does not only depend on the number of emergency brakings.
- The wear of the brake friction linings varies depending on the operating conditions.
- The friction work possible before replacement decreases with every braking when friction work increases.

7 Maintenance/repair

7.2.3 Air gap check

Danger!

Disconnect the drive from the load to prevent accidents. During the next inspection steps of the spring-applied brake, the motor must not run!

1. Switch on the current for the brake(📖 26).
2. Measure the air gap “sLü” between the brake disk and the friction lining with a feeler gauge. It must not exceed the maximally permissible air gap “$s_{Lü\ max.}$” specified in the table. (📖 15).
3. Switch off the current.
4. Reconnect the motor.

7.2.4 Braking torque / delay check

In case of drives with several brakes, one brake at a time can be released with the cheese head screws of the transport safety device or the manual release when checking redundancy. The cheese head screws of the transport safety device must be removed again after checking.

Stop!

The screws of the transport locking device must not be used for releasing the brake during evacuation!

The stopping distances of the drive must be within the permissible tolerance range of the corresponding system (documentation for the system).

7 Maintenance/repair

7.3 Maintenance operations

The brake does not require any maintenance when it is being used as a holding brake. The brake is replaced in the reverse order to assembly (📖 19).

Danger!

Disconnect the drive from the load to prevent accidents. During the next inspection steps of the spring-applied brake, the motor must not run!

1. Screw in the transport screws (17; DIN912 M8x70) (📖 19).
2. Switch off the power supply and disconnect the connecting cables.
3. Loosen a fixing screw (4) and remove the guide sleeve (2) from the through-hole.
4. Turn the brake around the second guide sleeve (2) away from the brake disc (3).
5. Remove the brake from the guide sleeve (2).

7.4 Spare parts order

INTORQ BFK466spring-applied brake

Order quantity	_____ Pc.		
Size	☐ 80		
Voltage	☐ 90/45 VDC	☐ 110/55 VDC	☐ 205/103 VDC
Cable length	☐ Standard		
	_____ mm	(from 100 mm - 1000 mm in steps of 100 mm, from 1000 mm - 2500 mm in 250 mm steps)	
Terminal box mounted	☐		
PTC sensor	☐		
Manual release	☐ Lever detachable		
	☐ Lever for bowden cable		

8 Troubleshooting and fault elimination

If any malfunctions should occur during operation of the drive system, please check the possible causes using the following table. If the fault cannot be eliminated by one of the listed measures, please contact the aftersales service.

Fault	Cause	Remedy
Brake cannot be released, air gap is zero	Coil interruption	▮ Measure coil resistance using multimeter: – Compare the measured resistance with the rated resistance, 📖 15. – Replace the brake when the resistance is too high.
	Coil has interturn fault or short circuit to ground	▮ Measure coil resistance using multimeter: – Compare the measured resistance with the rated resistance, 📖 15. Replace the brake when the resistance is too low. ▮ Check coil for short circuit to ground using a multimeter: – Replace the brake in case of short circuit to ground. ▮ Check brake voltage (see "defective rectifier, voltage too low").
	Wiring incorrect or defective	▮ Check and correct wiring. ▮ Check cable continuity using a multimeter: – Replace defective cable.
	Rectifier defective or wrong	▮ Measure rectifier DC voltage using a multimeter. If DC voltage is zero: ▮ Check AC rectifier voltage. If AC voltage is zero: – Apply voltage, – check fuse, – check wiring – Check microswitch If AC voltage is ok: – Check rectifier – replace defective rectifier Measure the DC voltage: – Overexcitation 90 V (approx. 1 sec.) holding voltage 45 V (tolerance ±10 %) ▮ Check coil for fault between turns and short circuit to ground. ▮ If the rectifier defect occurs again, replace the brake even if you cannot find any fault between turns or short circuit to ground. The defect may occur later during heating-up.
	Air gap too large	Brake replacement. 📖 34
Brake disc cannot rotate freely	Air gap "$s_{Lü}$" too small	▮ Check the air gap "$s_{Lü}$" and replace the brake if necessary. ▮ Check the thickness of the brake disc and replace the brake disc, if necessary. ▮ Check the movability of the brake on the guide sleeves and, if necessary, replace the guide sleeves.
Brake cannot be released with manual release	Wrong setting of manual release	Replace the brake and complain about the manual release setting to the manufacturer.
Microswitch furnishes wrong signal despite correct function of the brake	Incorrect microswitch wiring	Check microswitch wiring and correct it.
	Defective microswitch or incorrect setting	Replace the brake and send the defective brake to the manufacturer.

8 Troubleshooting and fault elimination

Fault	Cause	Remedy
Voltage too high	Supply voltage too high	Adapt the coil voltage to the supply voltage
	Rectifier defective	Replace rectifier
	Bridge rectifier used instead of bridge/half-wave rectifier	Replace the bridge rectifier by a bridge/half-wave rectifier.
Voltage too low	Supply voltage too low	Adapt the coil voltage to the supply voltage
AC voltage is not mains voltage	Fuse is missing or defective	Select a connection with proper fusing.
	Incorrect microswitch wiring	Check microswitch wiring and correct it.
	Defective microswitch or incorrect setting	Replace the brake and send the defective brake to the manufacturer.

Notes

Notes

Notes

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