



INTORQ

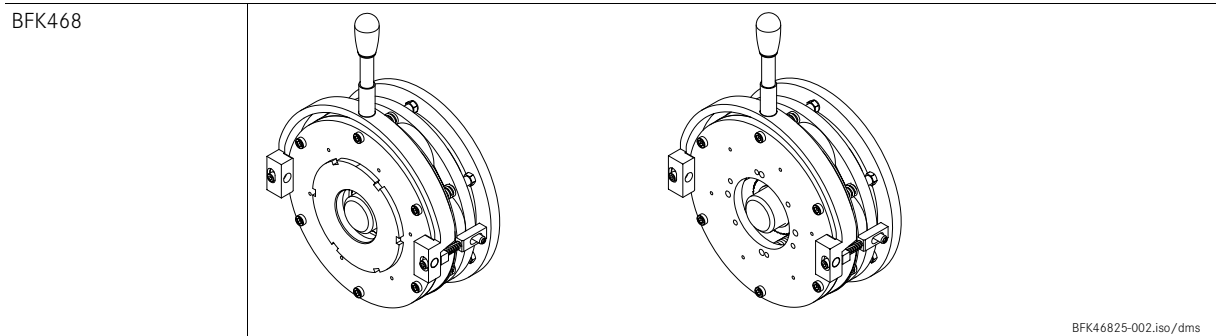
setting the standard

INTORQ BFK468

Electromagnetically released spring-applied brake

Operating Instructions

This documentation applies to ...



Product key

Product key	INTORQ	B	FK	□□□	-	□□	□
A <hr/> B <hr/> C <hr/> D <hr/> E							

Legend for INTORQ BFK468 product key

A	Product group	Brakes
B	Product family	Spring-applied brake
C	Type	468
D	Size	18, 20, 25, 31
E	Design	E - adjustable (brake torque can be reduced via adjuster nut) N - not adjustable

Not coded: Supply voltage, hub bore, options

Identification

Package label			Example		
Manufacturer		Bar code			
Type (see product key)		Type No.			
Name	Rated torque	Quantity per box			
Release/holding voltage	Release/holding power	Packing date			
Additional information		CE designation			

BFK458-002.iso/dms

Nameplate			Example		
Manufacturer		CE designation			
Type (see product key)					
Rated voltage	Rated power	Hub diameter			
Type No.	Rated torque	Production date			

BFK468-001.iso/dms

Document history

Material number	Version			Description
13190474	1.0	01/2007	TD09	First edition
33002357	2.0	11/2012	TD09	Complete revision

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1 Preface and general information

1.1 About these Operating Instructions






- These Operating Instructions will help you to work safely on and with the spring-applied brake with electromagnetic release. They contain safety instructions that must be followed.
- All persons working on or with the electromagnetically released spring-applied brakes must have the Operating Instructions available and observe the information and notes relevant for them.
- 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	Spring-applied brake with electromagnetic release
	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:  Operating instructions
	Wildcard		Wildcard for options, selections For example: BFK458-   = BFK458-10

1 Preface and general information

1.4 Abbreviations used

Abbreviation	Unit	Name
I	[A]	Current
I_N	[A]	Rated current at 20 °C and rated voltage
M_A	[Nm]	Tightening torque of the fixing screws
M_N	[Nm]	Characteristic torque of the brake / clutch
n_{max}	[r/min]	Maximum speed during the slipping time t_3
P_N	[W]	Rated coil power at rated voltage and at 20 °C
Q	[J]	Quantity of heat/energy
Q_E	[J]	Maximally permissible friction energy for one-time switching
Q_R	[J]	Braking energy, friction energy
Q_{Smax}	[J]	Maximally permissible friction energy for cyclic switching
R_N	[Ohm]	Rated coil resistance at 20 °C
S_h	[1/h]	Operating frequency, i.e. the number of periodical switching operations
S_{hue}	[1/h]	Transition operating frequency for thermal characteristic of the brake / clutch
S_{hmax}	[1/h]	Maximally permissible operating frequency, depending on the friction energy per switching operation
s_L	[mm]	Air gap, i.e. lift of the armature plate while the brake is switched, or lift of the armature part when the clutch is switched
s_{LN}	[mm]	Rated air gap
s_{Lmin}	[mm]	Minimum air gap
s_{Lmax}	[mm]	Maximum air gap
t_1	[s]	Engagement time, i.e. sum of the delay time and the braking torque exit time $t_1 = t_{11} + t_{12}$
t_2	[s]	Disengagement time, i.e. time between switching the stator and reaching 0.1 M_K
t_{11}	[s]	Slipping time, i.e. engagement time of the brake (after t_{11}) until standstill
t_{11}	[m]	Delay during engagement, i.e. time from switching off the supply voltage to the beginning of the torque rise
t_{12}	[m]	Rise time of the braking torque, i.e. time from the start of the torque rise until reaching the braking torque
U	[V]	Voltage
U_N	[V]	Rated coil voltage

1 Preface and general information

1.5 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

1 Preface and general information

1.6 Scope of supply

After receipt of the delivery, check immediately whether it corresponds to the accompanying papers. INTORQ does not grant any warranty for deficiencies claimed subsequently.

- Claim visible transport damage immediately to the forwarder.
- Claim visible deficiencies / incompleteness immediately to INTORQ GmbH & Co.KG.

1.7 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.

1.8 Drive systems

Labelling

Drive systems and components are unambiguously designated by the indications on the nameplate.

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

- The spring-applied INTORQ brake is also delivered in single modules and individually combined to its modular design. The data - package labels, nameplate, and type code in particular - apply to one complete stator.
- If single modules are delivered, the labelling is missing.

1 Preface and general information

1.9 Legal regulations

Liability

- The information, data and notes in this documentation met the state of the art at the time of printing. Claims referring to products 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 product
 - improper working on and with the product
 - operating faults
 - disregarding the documentation

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.
- All specifications of the corresponding enclosed documentation must be observed.
This is vital for a 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

- INTORQ components ...
 - ... 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
 - In case of formation of condensed water and moisture: provide for appropriate ventilation to ensure that all components will dry quickly.
- Ambient temperature:
 - -20 °C to +40 °C (standard)
- At high humidity and low temperature:
 - Take measures to protect armature plate and rotor from freezing.
- Protect electrical connections against contact.

3 Technical data

3.1 Product description

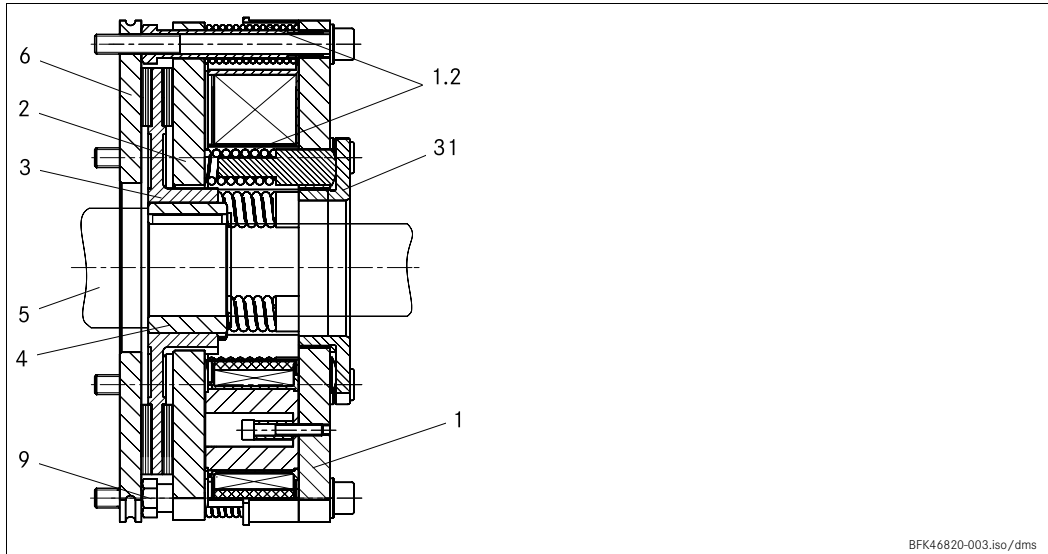


Fig. 1 Design of the BFK468 spring-applied brake: basic module E (complete stator) + rotor + hub + flange

1	Complete stator	3	Complete rotor	6	Flange
1.2	Compression springs	4	Hub	9	Sleeve bolts
2	Armature plate	5	Shaft	31	Torque adjustment ring

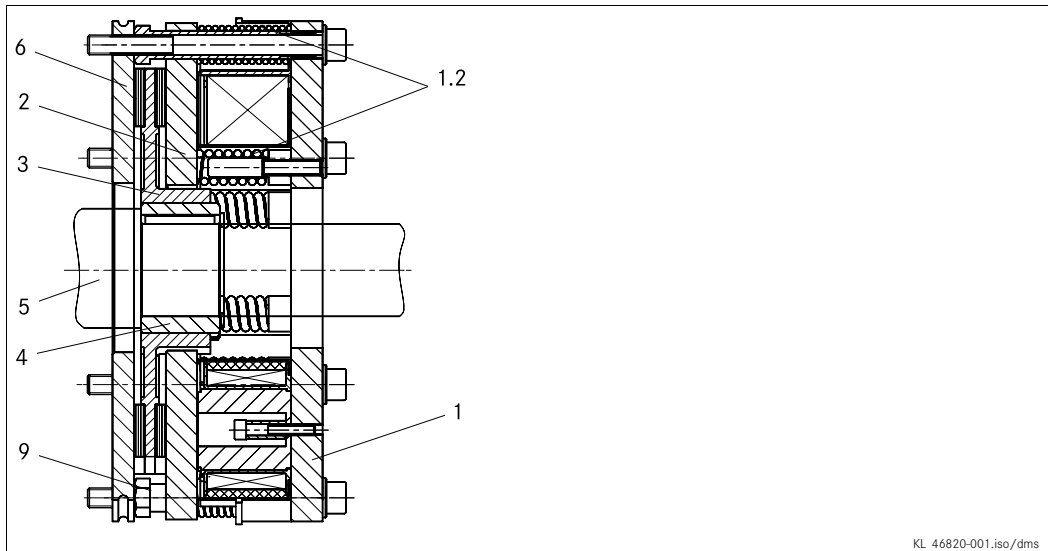





Fig. 2 Design of the BFK468 spring-applied brake: basic module N (complete stator) + rotor + hub + flange

1	Complete stator	3	Complete rotor	6	Flange
1.2	Compression springs	4	Hub	9	Sleeve bolts
2	Armature plate	5	Shaft		

3 Technical data

3.1.1 General information

The spring-applied brake is designed for the conversion of mechanical work and kinetic energy into heat. Due to the static brake torque, the brake can hold loads without speed difference. Emergency braking is possible at high speed. The more friction work, the higher the wear. (Operating speeds  16)

The BFK468-  spring-applied brake is a single-disk brake with two friction surfaces. Several compression springs (1.2) generate the braking torque by friction locking. The brake is released electromagnetically by a reduction of the holding current via an INTORQ bridge half-wave rectifier.

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


3.1.2 Braking

During braking the rotor (3) axially slidable on the hub (4) is pressed against the friction surface by the inner and outer springs (1.2) via the armature plate. The asbestos-free friction linings ensure a high braking torque and low wear. The braking torque transmission between hub (4) and rotor (3) is effected by means of toothing.

3.1.3 Brake release

In braked state, there is an air gap "s_L" between the stator (1.1) and the armature plate (2). To release the brake, the coil of the stator (1.1) is excited with the DC voltage provided. The magnetic force generated attracts the armature plate (2) towards the stator (1.1) against the spring force. The rotor (3) is then released and can rotate freely.

3.1.4 Brake torque reduction

For basic module E (adjustable), the spring force and thus the brake torque can be reduced by unscrewing the adjuster nut (8), ( 38).

3.1.5 Manual release (optional for sizes 18 to 25)

The manual release is optionally available for short-term releases when no voltage is applied. The manual release can be retrofitted.

3 Technical data

3.1.6 Microswitch (optional)

The manufacturer offers the microswitch for air-gap or wear monitoring. The user must provide the corresponding electrical connection (☞ 31et seqq.).

When air-gap monitoring, the motor does not start before the brake has been released. With this set-up, all possible faults are monitored. For example, in the event of defective rectifiers, interrupted connection cables, defective coils, or excessive air gaps the motor will not start.

When checking the wear, no current will be applied to the brake and the motor if the air gap is too large.

3.1.7 Encapsulated design (optional)

This design not only avoids the penetration of spray water and dust, but also the spreading of abrasion particles outside the brake. This is achieved by:

- a cover seal over the armature plate and rotor,
- a cover in the adjuster nut,
- a shaft seal in the adjuster nut for continuous shafts (option).

3 Technical data

3.2 Brake torques






Stop!



Please observe that engagement times and disengagement times change depending on the brake torque.

Size	18		20		25		31
	Characterist ic torque	Torque reduction E per detent position	Characterist ic torque	Torque reduction E per detent position	Characterist ic torque	Torque reduction E per detent position	Characterist ic torque
	[Nm]	[Nm]	[Nm]	[Nm]	[Nm]	[Nm]	[Nm]
Rated torques [Nm], relating to the relative speed $\Delta n =$ 100 rpm Depending on the rated torque (spring assembly), the angle of rotation for the braking torque reduction can be 60°, 120° or 180° for basic module E.					230 N		
	100 N/E	6.4	170 N/E	19.8	260 N/E	16.5	
	115 N/E	6.4	200 N/E	19.8	300 N/E	8.2	720 N
	130 N/E	6.4	230 N/E	9.9	350 N/E	8.2	960 N
	150 N/E	3.2	260 N/E	9.9	400 N/E	8.2	1200 N
	165 N/E	3.2	300 N/E	19.8	445 N/E	16.5	1440 N
	185 N/E	6.4	345 N/E	19.8	490 N/E	8.2	1680 N
	200 N/E	6.4	400 N/E	19.8	520 N/E	16.5	1920 N
	235 N/E	6.4	440 N/E	19.8	600 N/E	16.5	2160 N
	265 N/E	6.4	480 N/E	19.8	700 N/E	16.5	2400 N
300 N/E	6.4	520 N/E	19.8	800 N/E	16.5		

**Tab. 1 N.....Brake torque for module N (without torque adjustment ring)
E.....Brake torque for module E (with torque adjustment ring)**

	Holding brake with emergency stop operation ($s_{L \max}$ approx. $2.0 \times s_{LN}$)
	Service brake ($s_{L \max}$ approx. $4.0 \times s_{LN}$)
	Standard braking torque

3.2.1 Basic module E, brake torque reduction

For basic module E, the braking torque can be reduced by means of the torque adjustment ring in the stator. The torque adjustment ring must only be screwed out up to the maximum projection " $h_{E\max}$ ",  16 and  38.

3 Technical data

3.2.2 Brake torques depending on the speed and permissible limit speeds

Type	Rated torque at $\Delta n = 100$ rpm [%]	Braking torque at Δn_0 [rpm] [%]			max. speed Δn_{0max} . with horizontal mounting position [rpm]
		1500	3000	maximum	
BFK468-18	100	77	70	66	4400
BFK468-20		75	68		3700
BFK468-25		73	66		3000
BFK468-31		69	—		2300

Tab. 2 Brake torques depending on the speed and permissible limit speeds

3.3 Rated data

Type	s_{LN} +0.1 mm -0.05 mm [mm]	s_L max. service brake [mm]	s_{Lmax} . holding brake [mm]	Max. adjustment, permissible wear distance [mm]	Rotor thickness		Excess of the torque adjustment ring h_{Emax} . [mm]
					min. ¹⁾ [mm]	max. [mm]	
BFK468-18	0.4	1.0	0.6	3.0	10.0	13.0	15
BFK468-20				4.0	12.0	16.0	17
BFK468-25	0.5	1.25	0.75	4.5	15.5	20.0	19.5
BFK468-31				3.0	15.0	18.0	—

1) The friction lining is designed such that the brake can be adjusted at least 5 times.

Type	Pitch circle		Tightening torque		Weight of complete stator [kg]
	[mm]	Thread	Screws [Nm]	Complete lever [Nm]	
BFK468-18	196	6 x M8	36.1	23	13.4
BFK468-20	230	6 x M10	71	40	20.0
BFK468-25	278				31.0
BFK468-31	360	8 x M16	302	—	55.1

Tab. 3 Characteristics of BFK468 spring-applied brake

3 Technical data

Type	Electrical power P ¹⁾	Release voltage/holding voltage U	Coil resistance R _N ±8 %
	[W]	[V]	[Ω]
BFK468-18	85 / 340	205 / 103	123.5
		360 / 180	381.5
BFK468-20	100 / 408	205 / 103	106.1
		360 / 180	317.6
BFK468-25	132 / 528	205 / 103	79.6
		360 / 180	245.5
BFK468-31	230 / 920	360 / 180	140.9

¹⁾ Coil power at 20 °C

Tab. 4 Coil voltage/coil resistance of BFK468

3.3.1 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.

3 Technical data

3.4 Operating times

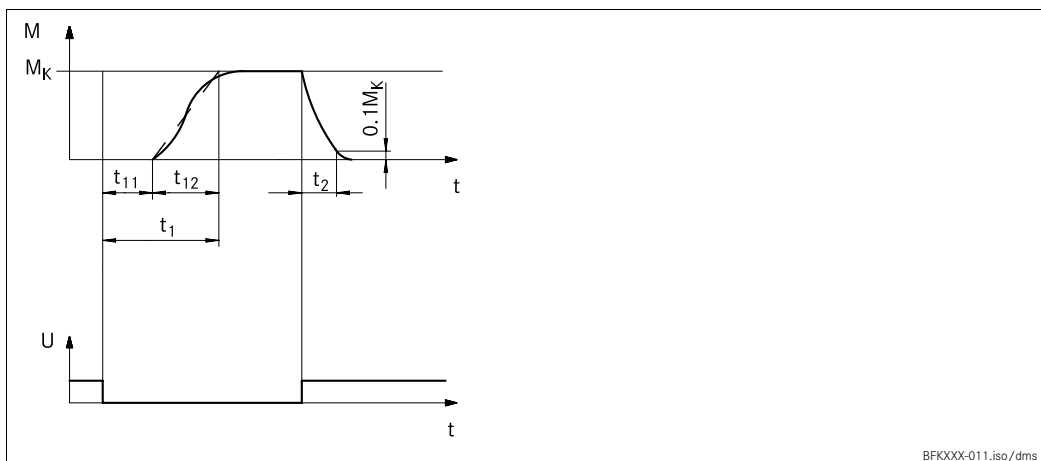


Fig. 3 Operating times of the spring-applied brakes

- t_1 Engagement time
- t_2 Disengagement time (up to $M = 0.1 M_r$)
- M_K Characteristic torque
- t_{11} Reaction delay during engagement
- t_{12} Rise time of the brake torque
- U Voltage

Type	Rated torque at $\Delta n = 100 \text{ rpm}$	Max. permissible friction work per operation only	Transition operating frequency	Operating times [ms] at s_{LN}					
				M_K 1)	Q_E	s_{hue}	DC engagement		Disengage
							[Nm]	[J]	[h ⁻¹]
BFK468-18	150	60000	20	26	30	56	70		
BFK468-20	260	80000	19	102	112	168	106		
BFK468-25	400	120000	15	60	135	197	120		
BFK468-31	1200	300000	13	65	133	198	250		

1) Minimum braking torque when all components are run in

Tab. 5 Switching energy - operating frequency - operating times

Engagement time

The transition from brake-torque free state to holding braking torque is not free of time lags.

A braking torque reduction via the torque adjustment ring prolongs the engagement time and reduces the disengagement time.

- The engagement times are valid for **DC switching** with a spark suppressor.
 - Spark suppressors are available for the rated voltages.
 - Connect the spark suppressors in parallel to the contact. If this is not admissible for safety reasons, e.g. with hoists and lifts, the spark suppressor can also be connected in parallel to the brake coil.
 - Circuit proposals: 31, Fig. 15
- The engagement times are approx. 5 times longer with **AC switching**.
 - Connection: 31, Fig. 14

3 Technical data

Disengagement time

The disengagement time is the same for DC and AC switching.

3.5 Friction work / operating frequency

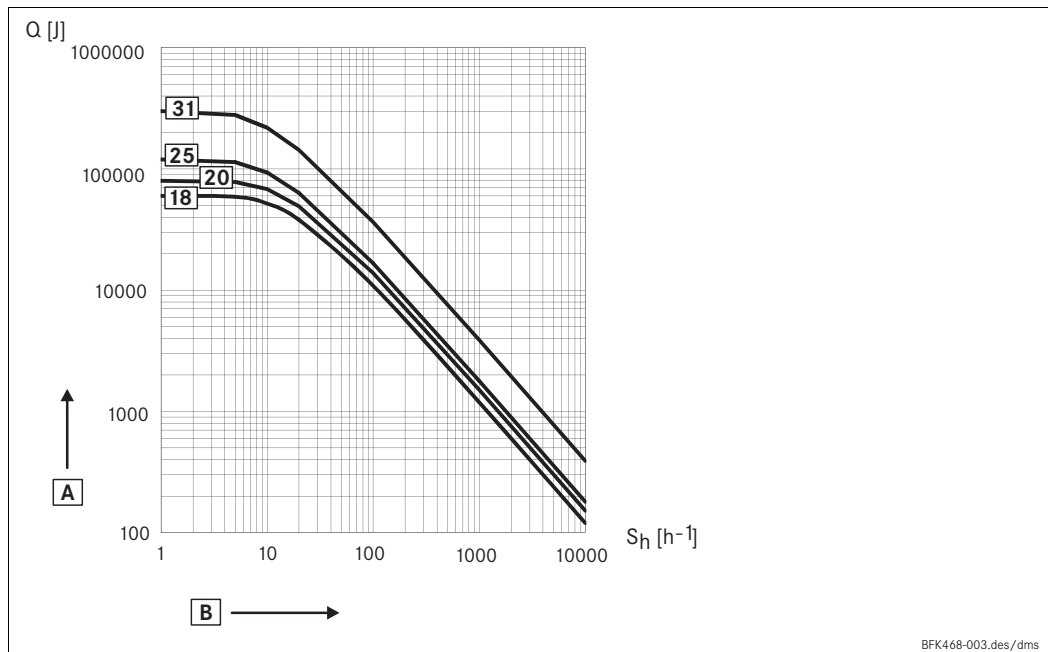


Fig. 4 Switching energy as a function of the operating frequency

A Switching energy Q

B Operating frequency S_h

$$S_{h\max} = \frac{-S_{hue}}{\ln\left(1 - \frac{Q_R}{Q_E}\right)} \quad Q_{s\max} = Q_E \left(1 - e^{-\frac{S_{hue}}{S_h}}\right)$$

The permissible operating frequency " $S_{h\max}$ " depends on the heat quantity " Q_R " (see Fig. 4). If the operating frequency " S_h " is given, the permissible heat quantity " $Q_{s\max}$ " can be calculated.

With high speed and friction work, the wear increases strongly, because very high temperatures occur at the friction faces for a short time.

3 Technical data

3.6 Emission

Electromagnetic compatibility

**Note!**

The user must ensure compliance with EMC Directive 2004/108/EC using appropriate controls and switching devices.

If an INTORQ rectifier is used for the DC switching of the spring-applied brake and if the operating frequency exceeds five switching operations per minute, the use of a mains filter is required.

If the spring-applied brake uses a rectifier of another manufacturer for the switching, it may become necessary to connect a spark suppressor in parallel with the AC voltage. Spark suppressors are available on request, depending on the coil voltage.

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.

Geräusche

Das Schaltgeräusch beim Verknüpfen und Trennen ist unterschiedlich groß. Einflussgrößen sind Lüftweg, Bremsmoment und Bremsengröße.

Je nach Eigenschwingung im eingebauten Zustand, Betriebsbedingungen und Zustand der Reibflächen kann Quietschen während des Abbremsvorganges auftreten.

Others

The abrasion of the friction parts produces dust.

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

4 Mechanical installation



Stop!

Toothed hub and screws must not be lubricated with grease or oil!

4.1 Necessary tools

Type	Torque key Insert for hexagon socket screws		Wrench size of open-jawed spanner [mm]			Hook wrench DIN 1810 design A	Box spanner for flange installation, outside
	Measuring range [Nm]	Wrench size [mm]	Sleeve bolts	Nuts / bolts	2kt lever	Diameter [mm]	Wrench size [mm]
BFK468-18	20 - 100	6 x 1/2" square	15	- / 10	10	110 - 115	13 x 1/2" square
BFK468-20		8 x 1/2" square	17		12	135 - 145	17 x 1/2" square
BFK468-25			14		155 - 165		
BFK468-31	40 - 200	14 x 1/2" square	24	- / -	—	—	24 x 1/2" square

* for flange mounting insertion with journal guide

Feeler gauge	Caliper gauge	Multimeter

4 Mechanical installation

4.2 Mounting

4.2.1 Preparation

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

4.3 Installation

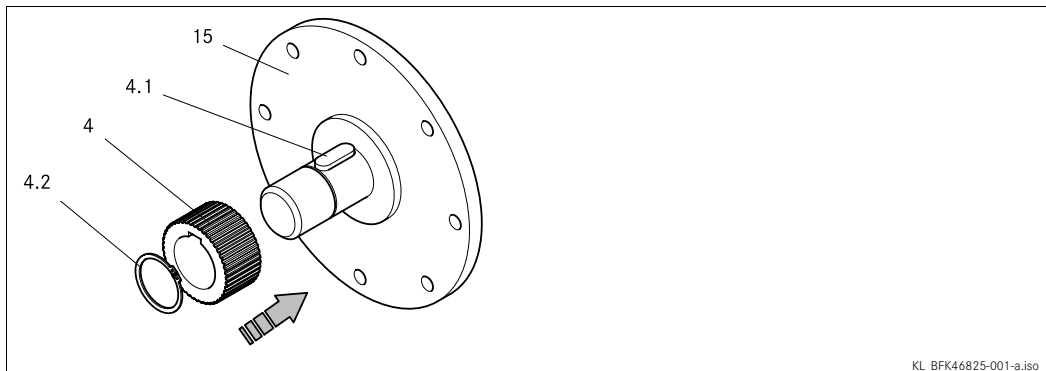
When you have ordered a version with manual release or flange, attach these units first.

4.3.1 Installation of the hub onto the shaft



Stop!

In reverse operation, it is recommended to additionally glue the hub to the shaft!



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Fig. 5 Mounting the hub onto the shaft

4	Hub	4.2	Circlip	15	End shield
4.1	Keyway				

1. Press hub (4) onto the shaft.
2. Secure hub against axial displacement, e.g. using a circlip (4.2).

4 Mechanical installation

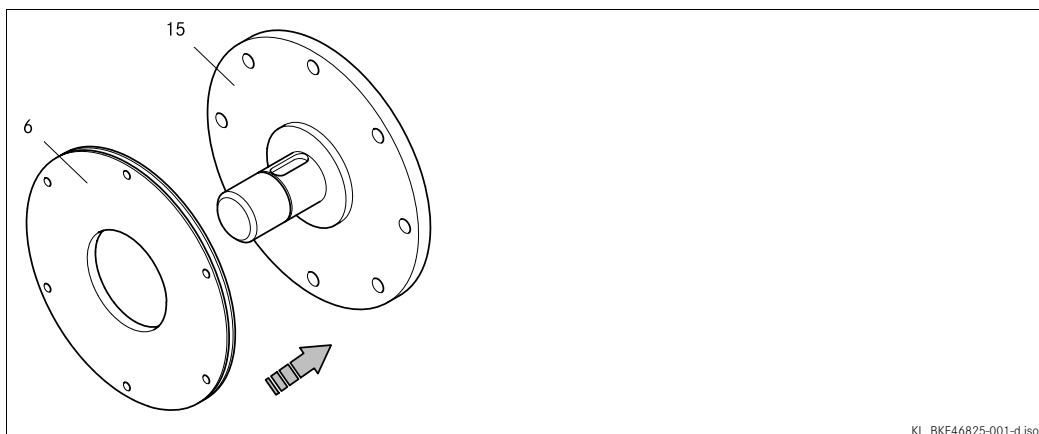
4.3.2 Installation of the brake



Stop!

- Minimum requirement of the end shield (15):
 - Material S235 JR or C15 (other materials after consultation with INTORQ),
 - Levelness 0.10 mm,
 - Axial runout 0.10 mm,
 - Roughness Rz 10 to Rz 16
- When dimensioning the thread depth in the end shield (15), the permissible wear distance must be taken into consideration, 16.
- Condition of the end shield (15):
 - It has to be free of grease and oil.

Mounting the flange without additional screws



KL BKF46825-001-d.iso

Fig. 6 Flange assembly BFK468

6 Flange

15 End shield

1. Hold the flange (6) against the end shield (15) and check the pitch circle and retaining screw drill hole threading.
2. Assemble the brake with the corresponding screw set (see chapter 4.3.2).

4 Mechanical installation

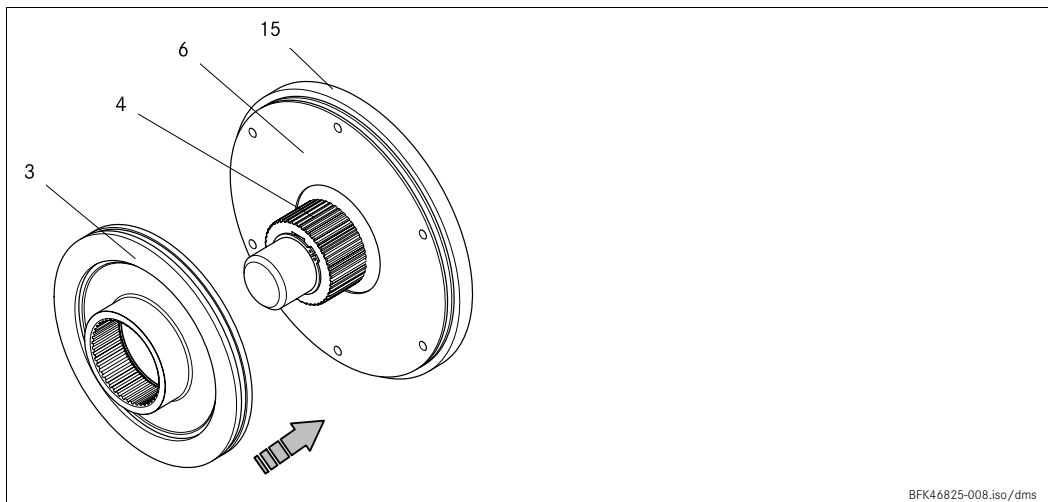


Fig. 7 Mounting the brake

3	Complete rotor	6	Flange	15	End shield
4	Hub				

1. Push the rotor (3) onto the hub (4) and check whether it can be moved by hand (Fig. 7).



Stop!

Please note the following for the version "brake with shaft sealing ring in torque adjustment ring":

2. Lightly lubricate the lip of the shaft seal with grease.
3. When assembling the stator (1), push the shaft sealing ring carefully over the shaft.
 - The shaft should be located concentrically to the shaft seal.

4 Mechanical installation

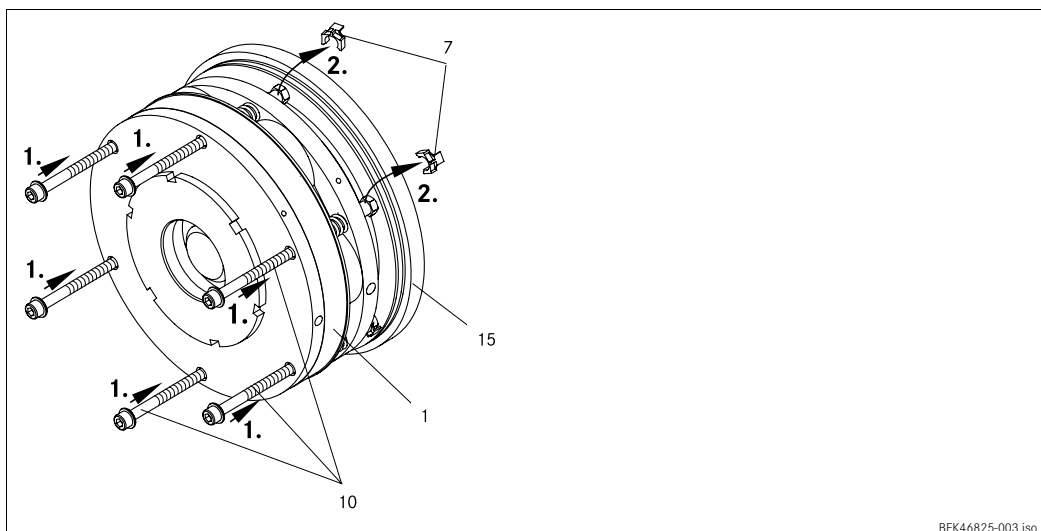


Fig. 8 Mounting of the complete stator

- | | | | |
|----|-------------------|----|-----------------|
| 1 | Complete stator | 7 | Connector block |
| 10 | Cheese head screw | 15 | End shield |

- Screw the complete stator (1) onto the end shield (15) using the set of screws (10) provided and a torque key.
- Remove and dispose of the connector blocks (7).

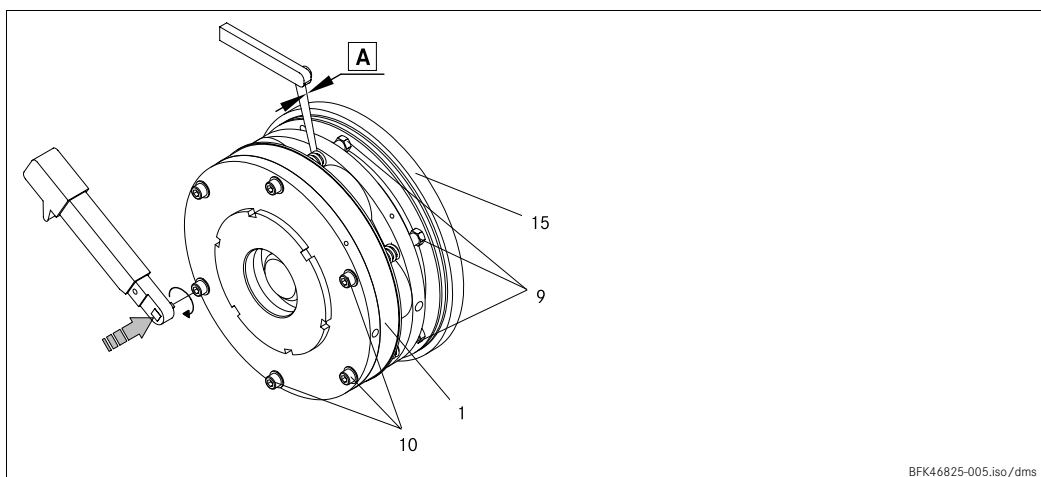


Fig. 9 Inspection of the air gap s_L

- | | | | | | |
|---|----------|----|--------------------|----|------------|
| A | s_{AR} | 9 | Sleeve bolts | 15 | End shield |
| 1 | Stator | 10 | Cheese head screws | | |

- Check the air gap " s_L " near the screws (10) using a feeler gauge and compare the values to the values for " s_{LN} " in the table (16).



Note!

Do not insert feeler gauge more than 10 mm between armature plate (2) and stator (1.1)!

4 Mechanical installation

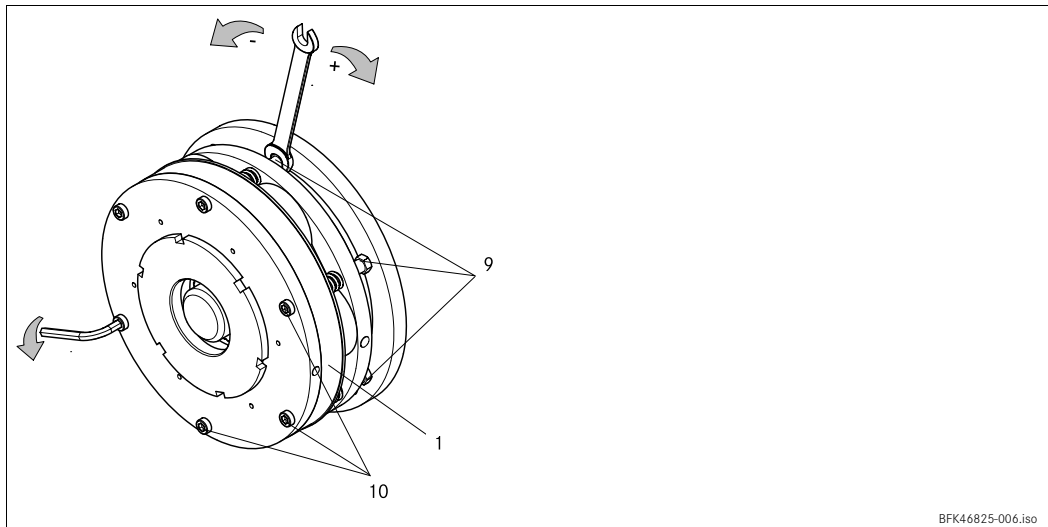


Fig. 10 Adjusting the air gap

1	Stator	10	Cheese head screw
9	Threaded sleeves		

Please adjust if the value for "s_L" is outside the tolerance of "s_{LN}":

4.3.3 Assembly of the cover seal

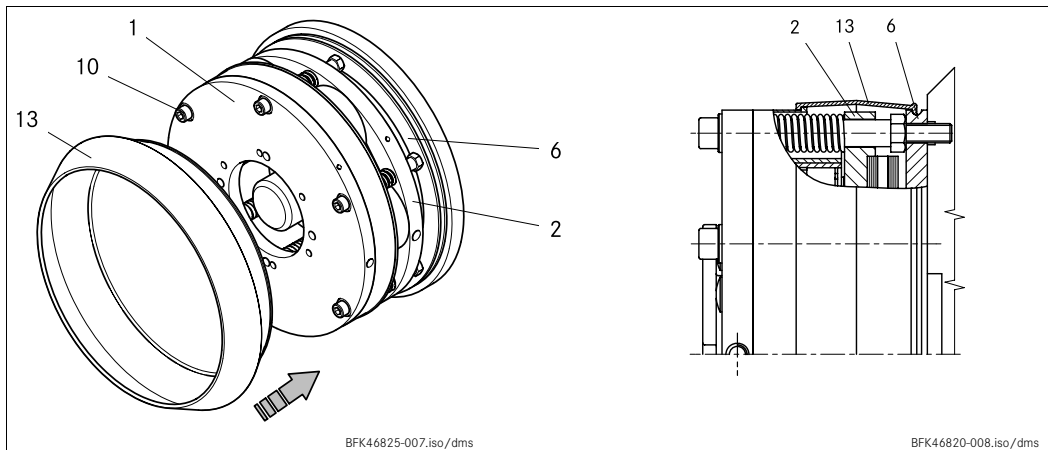


Fig. 11 Assembly of the cover ring

1	Stator	6	Flange	13	Cover ring
2	Armature plate	10	Cheese head screw		

1. Pull the cable through the seal (13).
2. Push the seal (13) over the complete stator (1).
3. Press the lips of the cover seal (13) into the groove of complete stator (1) and flange (6)/end shield.

4 Mechanical installation

4.3.4 Assembly of the manual release sizes 18 to 25

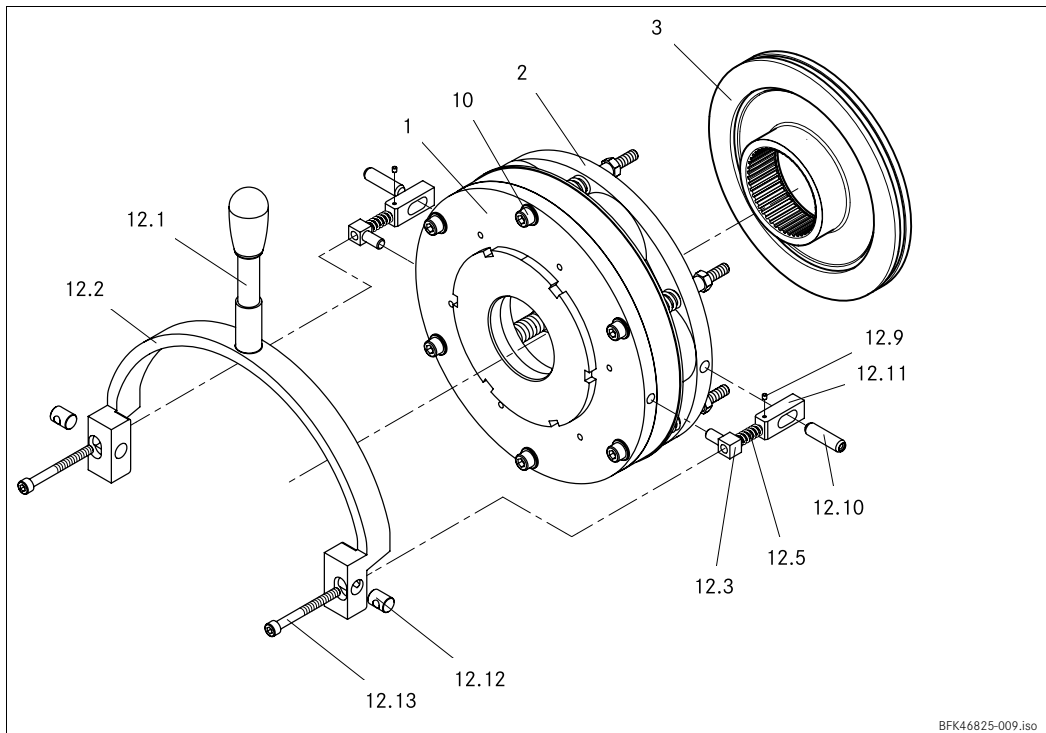


Fig. 12 Assembly of the manual release for brake sizes 18-25

1	Stator (here: design E)	12.1	Manual release lever with control button	12.10	Pin
2	Armature plate	12.2	Manual release shackle	12.11	Clip
3	Complete rotor	12.3	Eyebolts	12.12	Trunnion
10	Cheese head screw	12.5	Compression spring		




Stop!

Before assembly of the manual release, the brake must be mounted onto the motor end shield and the air gap must be adjusted correctly, (further documentation for BKF468).

1. Hammer the pins (12.10) into the bore holes of the armature plate (2). (When the brake has already been installed, cushion the impact energy by pressing against the opposite side of the armature plate).
2. Screw the eyebolts (12.3) into the stator (1) and align them according to the hole spacing of the manual release shackle (12.2).
3. Put clips (12.11) with elongated hole onto the pins (12.10), align thread towards the eyebolts (12.3).
4. Insert the compression springs (12.5) between clips (12.11) and eyebolts (12.3).
5. Push the trunnions (12.12) into the bore holes of the shackle (12.2), cross hole to the outside.

4 Mechanical installation

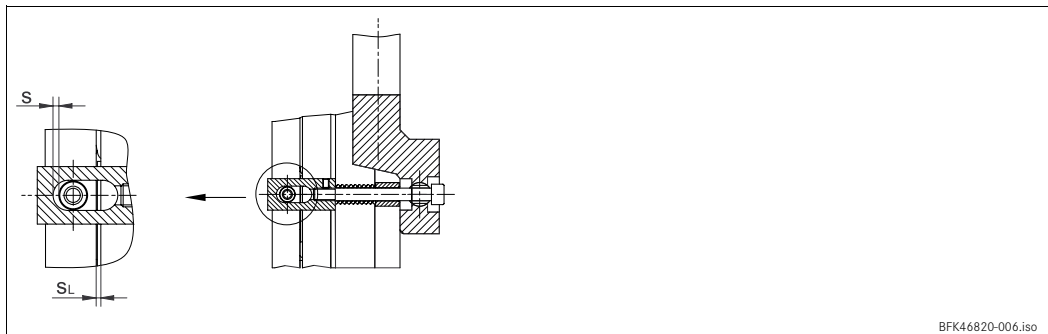
6. Push the cheese head screws (12.13) through the cross holes of the trunnions (12.12).
7. Locate the shackle (12.2) with trunnions (12.12) and cheese head screws (12.13) such onto the back of the stator (1) that the cheese head screws (12.13) are led through the eyebolts (12.3) and the compression springs (12.5).
8. Screw the cheese head screws (12.13) into the clip threads (12.11).
9. Adjust gap "s" using the cheese head screws (12.13), (values for "s"  28).
10. Secure the adjustment of the cheese head screws (12.13) using the threaded pin (12.9) in the clip (12.11).



Note!

Dimension "s + s_L" can be checked through the difference of the fitting length of the compression springs when the armature plate is attracted towards the stator and the manual release has been adjusted.

11. If necessary, screw the lever (12.1) into the shackle (12.2).



Type	s _L (mm)	s + ^{0.1} (mm)	s + s _L (mm)
BFK468-18	0.4	2.0	2.4
BFK468-20	0.4	2.0	2.4
BFK468-25	0.5	2.5	3.0

Tab. 6 Adjustment setting for manual release



Stop!

Dimension "s" must be observed! Check air gap "s_L".

5 Electrical installation

5.1 Bridge/half-wave rectifiers (option)

BEG-561

After a defined overexcitation time, the bridge/half-wave rectifiers change from bridge rectification to half-wave rectification. Depending on the dimensioning of the load, the switching performance can thus be improved or the power can be derated.

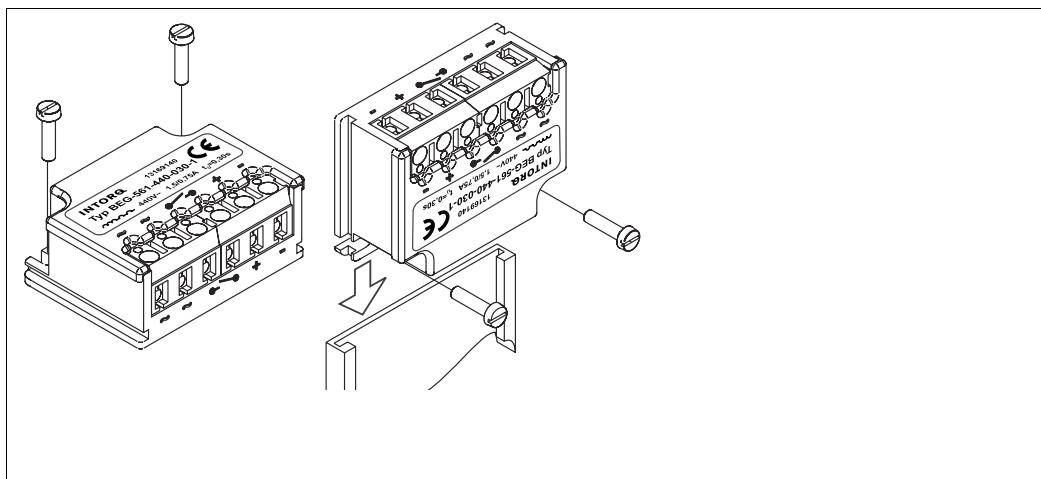


Fig. 13 BEG-561 attachment features

5.1.1 Technical data

	Rectifier type	Bridge/half-wave rectifier
	Output voltage for bridge rectification	$0.9 \times U_1$
	Output voltage for half-wave rectification	$0.45 \times U_1$
	Ambient temperature (storage/operation) [°C]	-25 ... +70

Type	Input voltage U_1 (40 Hz ... 60 Hz)			Max. current I_{max} .		Overexcitation time t_{ue} ($\pm 20\%$)		
	min. [V ~]	rated [V ~]	max. [V ~]	bridge [A]	half-wave [A]	with U_1 min [s]	with U_1 rated [s]	with U_1 max [s]
BEG-561-255-030	160	230	255	3.0	1.5	0.430	0.300	0.270
BEG-561-255-130						1.870	1.300	1.170
BEG-561-440-030-1	230	400	440	1.5	0.75	0.500	0.300	0.270
BEG-561-440-130				3.0	1.5	2.300	1.300	1.200

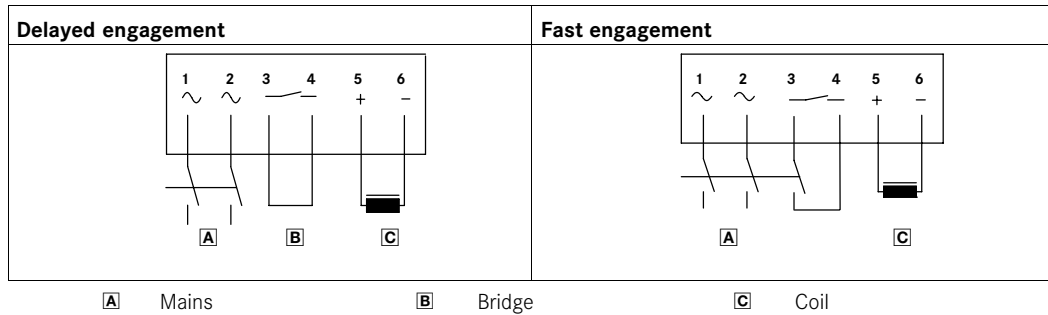
Input voltage U_1 (40 ... 60 Hz)

Tab. 7 Data for bridge/half-wave rectifier type BEG-561

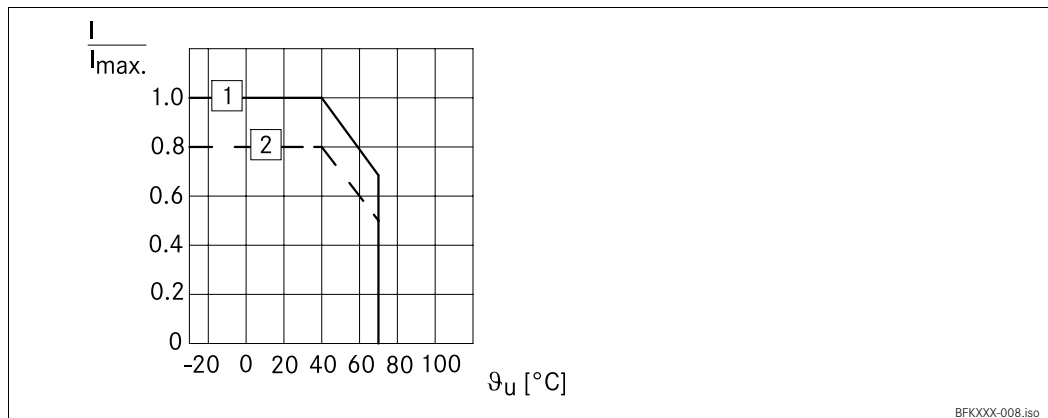
5 Electrical installation

5.1.2 Reduced switch-off times

When switching on the DC side (fast engagement), switching on the AC side is also required! Otherwise, there will be no overexcitation during power-on.



5.1.3 Permissible current load - ambient temperature



- 1 For screw assembly with metal surface (good heat dissipation)
- 2 For other assembly (e.g. glue)

BFKXXX-008.iso

5.1.4 Assignment: Bridge/half-wave rectifier - brake size

Rectifier type	AC voltage	Coil voltage release/holding	Assigned brake
	[V AC]	[V DC]	
BEG-561-255-030	230 ±10%	205 / 103	BFK468-18
BEG-561-255-130			BFK468-20
BEG-561-440-030-1	400 ±10%	360 / 180	BFK468-18
BEG-561-440-130			BFK468-20
			BFK468-25

5 Electrical installation

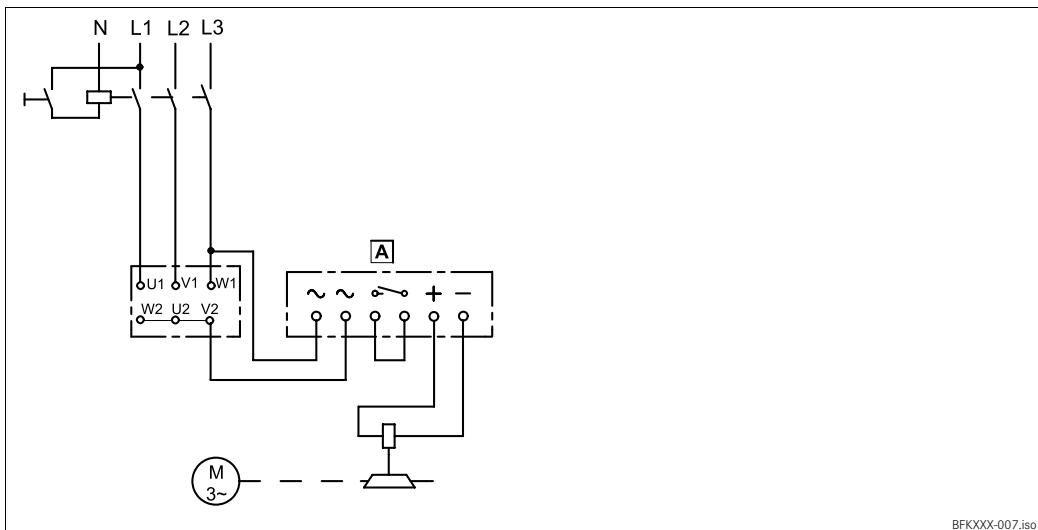
5.2 Electrical connection



Danger!

The brake must only be electrically connected when no voltage is applied!

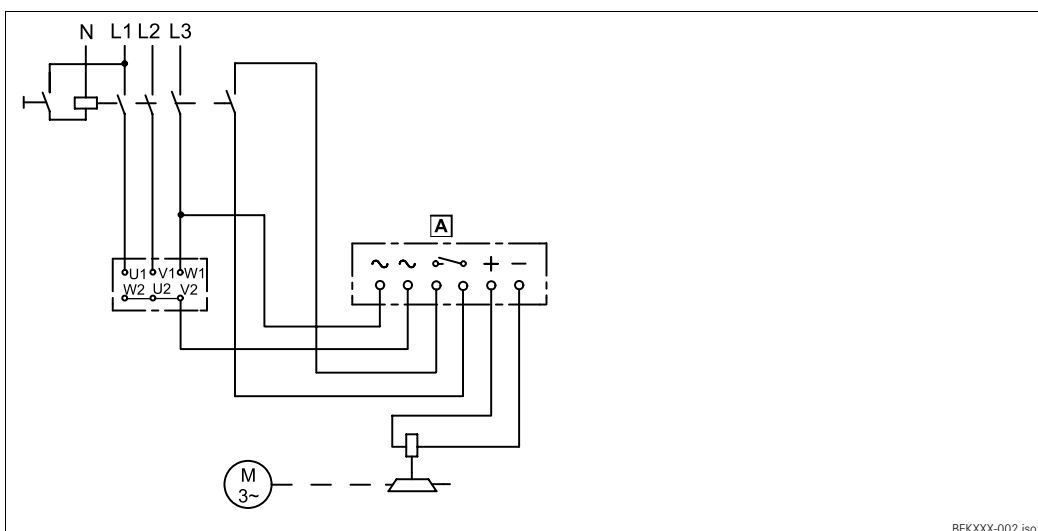
5.2.1 Circuit proposals



BFKXXX-007.iso

Fig. 14 AC switching, delayed engagement

Bridge rectifier/half-wave rectifier



BFKXXX-002.iso

Fig. 15 DC switching, normal engagement

Bridge rectifier/half-wave rectifier



Stop!

For switching on the DC side the brake must be operated with a spark suppressor to avoid impermissible overvoltages.

5 Electrical installation

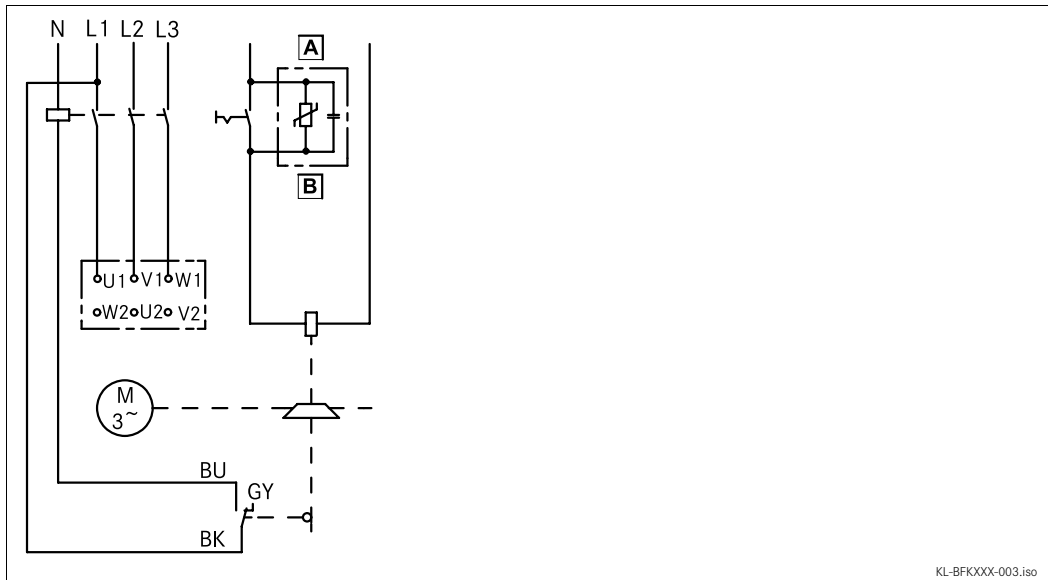


Fig. 16 With microswitch (release check); connection diagram also valid for star connection

▣ DC voltage depending on coil voltage

▣ Spark suppressor

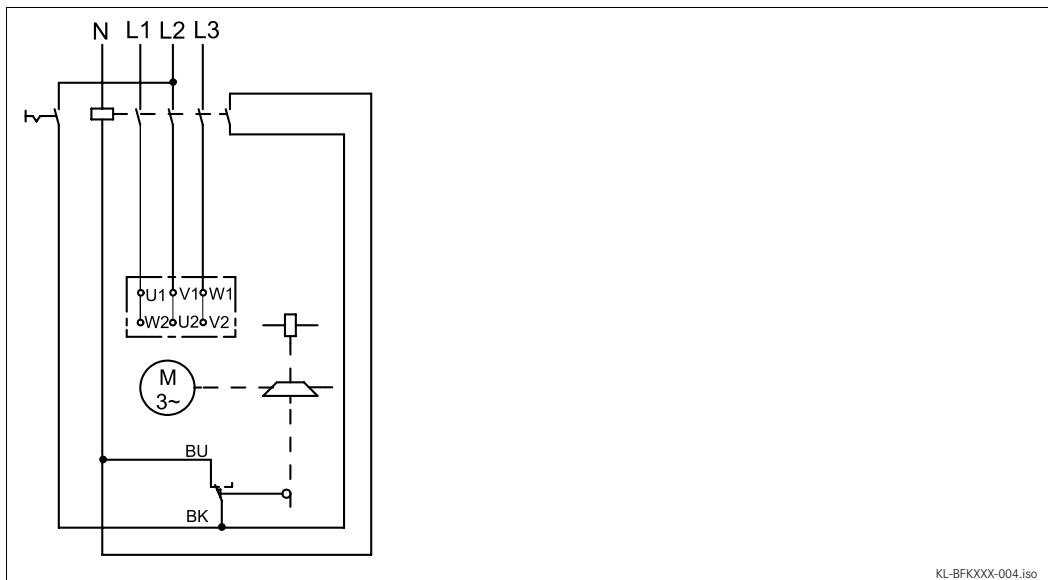


Fig. 17 With microswitch / wear check addition for all circuits; connection diagram also valid for star connection


5 Electrical installation



Tip!


During operation according to Fig. 17 the air gap is only monitored when no voltage is applied to the brake. This makes sense because it is possible that when the current flows only one side of the armature plate is attracted at first. This misalignment may cause a simulation of the maximum air gap and the actuation of the microswitch. If there is no closed contact in parallel to the microswitch contact, motor and brake will be switched off. The microswitch contact is closed again when the armature plate is completely released - the release is repeated again - because of the small difference-contact travel of the microswitch.

To avoid this misinterpretation of the microswitch signal, the signal should only be processed when no voltage is applied to the brake.

1. Mount the rectifier in the terminal box. With motors of the insulation class "H", mount the rectifier in the control cabinet. Permissible ambient temperature for the rectifier -25 °C to +70 °C.
2. Compare the coil voltage of the stator to the DC voltage of the rectifier installed.
Conversion of supply voltage to DC voltage:
 - Bridge rectifier: $U_{DC} = U_{AC} \cdot 0.9$
 - Half-wave rectifier: $U_{DC} = U_{AC} \cdot 0.45$
 - Permissible deviation of U_{coil} and U_{DC} up to $\pm 10\%$.
3. Select suitable circuit diagram ( 31).



Note!

Selection of the rectifier at voltages ≥ 460 V AC  catalogue "Electronic switchgear and accessories" Chapter spark suppressors and rectifiers.

4. Motor and brake must be wired according to the requirements of the engagement time.


6 Commissioning and operation



Danger!

The live connections and the rotating rotor must not be touched.
The drive must not be running when checking the brake.

6.1 Functional test

In the event of failures, refer to the troubleshooting table,  46. If the fault cannot be eliminated, please contact the aftersales service.

6.1.1 Release / voltage check

For brakes without microswitch only



Danger!

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



Danger!

Live connections must not be touched.

1. Remove two bridges from the motor terminals. Do **not** switch off the DC brake supply. When connecting the rectifier to the neutral point of the motor, the PE conductor must **also** be connected to this point.
2. Connect the mains supply.
3. Measure the DC voltage at the brake.
 - Compare the DC voltage measured with the voltage specified on the nameplate. A 10 % deviation is permissible.
4. Check air gap "s_L". It must be zero and the rotor must rotate freely.
5. Switch off the current.
6. Bolt bridges to the motor terminals. Remove additional PEN conductor.

6 Commissioning and operation

6.1.2 Microswitch - release check

**Danger!**

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

**Danger!**

Live connections must not be touched.

1. The switching contact for the brake must be open.
2. Remove two bridges from the motor terminals to deenergise the motor.
 - Do not switch off the DC brake supply.
 - When connecting the rectifier to the neutral point of the motor, the PE conductor must also be connected to this point.
3. Apply DC voltage to the brake.
4. Measure the AC voltage at the motor terminals. It must be zero.
5. Close the switching contact for the brake.
 - The brake is released.
6. Measure the DC voltage at the brake:
 - Compare the DC voltage measured with the voltage specified on the nameplate. A $\pm 10\%$ deviation is permissible.
7. Check air gap "s_L".
 - It must be zero and the rotor must rotate freely.

6 Commissioning and operation

6.1.3 Microswitch - wear check





Danger!

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



Danger!

Live connections must not be touched.

1. Remove two bridges from the motor terminals. Do not switch off the DC voltage for the brake. When connecting the rectifier to the neutral point of the motor, the PE conductor must also be connected to this point.
2. Set air gap to " s_{Lmax} ". Description  23 worksteps 8-11.
3. Connect the mains supply.
4. Measure the AC voltage at the motor terminals and the DC voltage at the brake. Both must be zero.
5. Switch off the current.
6. Set air gap to " s_{LN} ". Description  23 worksteps 8-11.
7. Connect the mains supply.
8. Measure the AC voltage at the motor terminals. It must be the same as the mains voltage.
9. Measure the DC voltage at the brake.
 - The DC voltage measured after the overexcitation time (see bridge/half-wave rectifier) must be half the voltage indicated on the nameplate. A 10 % deviation is permissible.
10. Check air gap " s_L ". It must be zero and the rotor must rotate freely.
11. Switch off the current for the brake.
12. Bolt bridges to the motor terminals. Remove additional PEN conductor.

6 Commissioning and operation

6.1.4 Manual release



Stop!

This operational test is to be carried out additionally!



Danger!

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

1. Pull the lever (Fig. 18) with approx. 250 N until the resistance increases strongly.



Stop!

Additional tools to facilitate brake release are not allowed! (e.g. extension piece)

2. The rotor must rotate freely. Small residual torques are permissible.
3. Release the lever.

6 Commissioning and operation

6.2 Reducing the brake torque

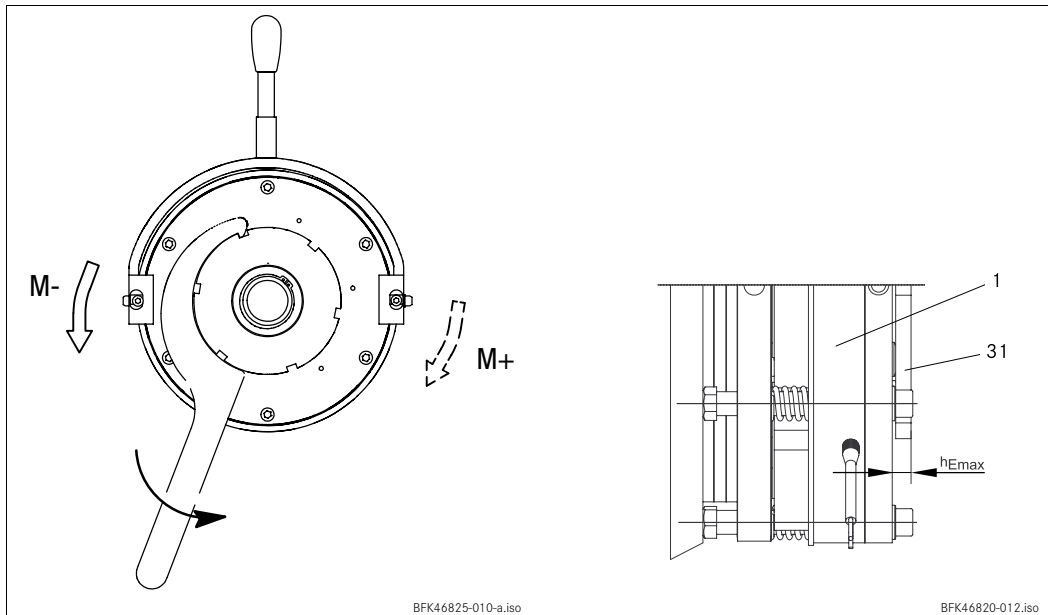


Fig. 18 Braking torque adjustment

- | | |
|----|------------------------|
| 1 | Stator |
| 31 | Torque adjustment ring |

1. Turn the adjuster nut (8) counterclockwise using the hook wrench.
 - Observe the notches. Positions between notches are impermissible. (Values for the brake torque reduction see chapter 3.2.1).
 - The maximum permissible projection " $h_{E_{max}}$ " of the adjuster nut (8) to the stator (7) is to be observed (values for " $h_{E_{max}}$ " see chapter 3.3).



Danger!

The reduction of the brake torque does not increase the maximum permissible air gap " $s_{L_{max}}$ ".

Do not change the manual release setting for models with manual release.

6 Commissioning and operation

6.3 During operation

- 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 $\pm 10\%$ deviation is permissible.

7 Maintenance/repair

7.1 Wear of spring-applied brakes

The following table describes the different causes of wear and their effects on the components of the spring-applied brake. The important influencing factors must be quantified so that the service life of the rotor and brake can be calculated and that the maintenance intervals to be prescribed can be specified precisely. The most important factors in this context are the applied friction energy, the initial speed of braking and the operating frequency. If several of the causes of friction lining wear occur in an application at the same time, the influencing factors are to be added together when the amount of wear is calculated.

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		Number of start/stop cycles
	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			
Armature plate and counter friction face	Rubbing of brake lining	Run-in of armature plate and counter friction face	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. 8 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, (📖 40). 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.

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.



Danger!

The live connections and the rotating rotor must not be touched.
The drive must not be running when checking the brake.

7.2.2 Checking the rotor thickness

1. Remove the motor cover and seal ring, if mounted.
2. Measure the rotor thickness using a caliper gauge.
3. Compare the measured rotor thickness with the minimally permissible rotor thickness, (📖 16).
4. If required, replace rotor completely, (📖 43).

7.2.3 Checking the air gap



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. Check the air gap "s_L" near the fixing screws between the armature plate and stator using a feeler gauge (📖 16).
2. Compare air gap measured to maximally permissible air gap "s_{L max.}" (📖 16).
3. If required, set air gap to "s_{LN}" (📖 42).

7 Maintenance/repair

7.2.4 Release / voltage



Danger!

The running rotor must not be touched.



Danger!

Live connections must not be touched.

7.3 Maintenance operations

7.3.1 Adjusting the air gap



Danger!

The brake must be free of residual torque.



Stop!

Please observe when mounting the flange with additional screws:

Behind the threaded holes for the screws in the flange there must be clearing holes in the endshield. Without clearing holes the minimum rotor thickness cannot be used. Under no circumstances may the screws be pressed against the endshield.

1. Unbolt screws (Fig. 10).
2. Screw the threaded sleeves into the stator by using a spanner. $\frac{1}{6}$ revolution reduces the air gap by approx. 0.15 mm.
3. Tighten screws, torques 16.
4. Check air gap "s_L" near the screws using a feeler gauge, "s_{LN}" 16.
5. If the difference between the measured air gap and "s_{LN}" is too large, repeat the readjustment.

7 Maintenance/repair

7.3.2 Rotor replacement





Danger!

The brake must be free of residual torque.

1. Switch off voltage!
2. Disconnect the supply cable.
3. Loosen the screws evenly and remove them completely.
4. Remove the complete stator from the end shield. Observe the supply cable.
5. Pull the complete rotor off the hub.
6. Check hub teeth.
7. Replace the hub as well if worn.
8. Check the friction surface at the end shield. In case of strong scoring at the flange, replace the flange. If scoring occurs at the end shield, re-finish end shield.
9. Measure rotor thickness (new rotor) and sleeve bolt head with a caliper gauge.
10. Calculate the gap between the stator and the armature plate as follows:

$$\text{Gap} = \text{rotor thickness} + s_{LN} - \text{head height}$$

("s_{LN}"  16)

11. Unscrew the sleeve bolts evenly until the calculated gap between stator and armature plate is reached.
12. Install and adjust new rotor and stator,  23.
13. Reconnect the supply cable.

7 Maintenance/repair

7.4 Spare-parts list

- Only parts with item numbers are available.
 - The item numbers are only valid for the standard design.
- Please include the following information with the order:
 - Order number of the brake
 - Position number of the spare part

7.4.1 Brakes BFK468-18 to 31

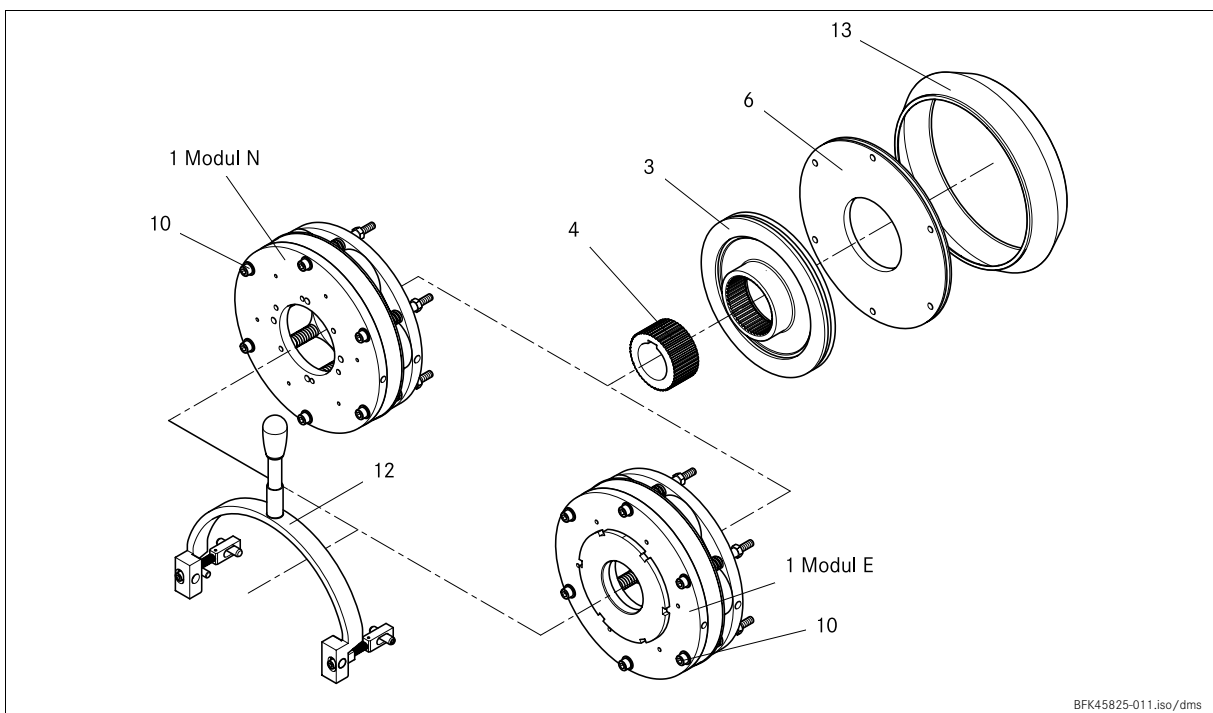


Fig. 19 BFK468-18 spring-applied brake to 31

Pos.	Name	Variant
1	Complete stator, module E Complete stator, module N	Voltage / braking torque
3	Complete rotor Complete rotor, noise-reduced	
4	Hub	Bore
6	Flange Hartchromed flange	
10	Set of fastening screws Cheese head screw DIN 912 10.9	for mounting to the motor for flange with through hole
12	Manual release	
13	Cover ring	

7 Maintenance/repair



7.5 Spare parts order

INTORQ BFK468-□□□ / complete stator

- Size** 18 20 25 31
- Design:** E (with adjuster nut, sizes 18, 20,25)
 N (without adjuster nut)
- Voltage** 205 V / 103 V (not available for size 31)
 360 V / 180 V
- Brake torque** _____ Nm (see torque ranges)
 Standard
- Cable length** _____ mm (from 100 mm to 1000 mm in 100 mm steps,
from 1000 mm to 2500 mm in 250 mm steps)
- Manual release mounted** (not available for size 31)
- Armature plate** Standard Hardchromed
- Microswitch** Monitoring of the operation
 Wear monitoring
- Switching noises** Low-noise

Accessories

- Rotor** Aluminium Noise-reduced (rotor with sleeve)
- Hub** _____ mm (for hole diameter see dimensions)
- Flange**
- Fixing screw set** For mounting to the motor
 For mounting to the flange with through holes
- Sealing** Cover ring
 Shaft seal (shaft diameter on request)
 Cap
- Brake cover** 18 20 25

Electrical accessories

Rectifier type	AC voltage [V AC]	Coil voltage release/holding [V DC]	Assigned brake
BEG-561-255-030	230 ±10%	205 / 103	BFK468-18
BEG-561-255-130			BFK468-20
BEG-561-440-030-1	400 ±10%	360 / 180	BFK468-18
BEG-561-440-130			BFK468-20
			BFK468-25
			BFK468-31

8 Troubleshooting and fault elimination

If any malfunctions should occur during operation, 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 does not release	Coil interruption	<ul style="list-style-type: none"> ■ Measure coil resistance using multimeter: <ul style="list-style-type: none"> - If resistance is too high, replace the complete stator.
	Coil has interturn fault or short circuit to ground	<ul style="list-style-type: none"> ■ Measure coil resistance using multimeter: <ul style="list-style-type: none"> - Compare measured resistance to rated resistance. For values, see Fig. 16. If the resistance is too low, replace the complete stator. ■ Check coil for short circuit to ground using a multimeter: <ul style="list-style-type: none"> - Replace the complete stator if short circuit to ground is detected. ■ Check brake voltage (see "defective rectifier, voltage too low").
	Wiring incorrect or defective	<ul style="list-style-type: none"> ■ Check and correct wiring. ■ Check cable continuity using a multimeter: <ul style="list-style-type: none"> - Replace defective cable.
	Rectifier defective or wrong	<ul style="list-style-type: none"> ■ Measure rectifier DC voltage using a multimeter. If DC voltage is zero: <ul style="list-style-type: none"> ■ Check AC rectifier voltage. If AC voltage is zero: <ul style="list-style-type: none"> - Apply voltage, - check fuse, - check wiring If AC voltage is ok: <ul style="list-style-type: none"> - Check rectifier - replace defective rectifier ■ Check coil for fault between turns and short circuit to ground. ■ If the rectifier defect occurs again, replace the complete stator, even if no fault between turns or short circuit to ground can be detected. The fault may only occur when warm.
	Incorrect microswitch wiring	Check microswitch wiring and correct it.
	Incorrect microswitch setting	Replace the complete stator and complain about the incorrect microswitch setting to the manufacturer.
	Air gap too big	Adjust air gap (Fig. 42) Measure rotor thickness and compare with minimum rotor thickness (Fig. 16). If necessary, replace rotor.
Rotor cannot rotate freely	Wrong setting of manual release	Check dimension "s+s _L " with energised brake. The dimension must be identical on both sides. Correct if necessary.
	Air gap "s _L " too small	Check air gap "s _L " and, if required, readjust it (Fig. 42).

8 Troubleshooting and fault elimination

Fault	Cause	Remedy
Rotor not thick enough	Rotor has not been replaced in time	Replace rotor (📖 43)
Voltage is not zero during functional test (chapter 6.1)	Incorrect wiring of microswitch	Check and correct the microswitch wiring.
	Defective microswitch or incorrect setting	Replace the entire stator and send the defective stator to the manufacturer.
Voltage too high	Brake voltage does not match the rectifier	Adapt rectifier and brake voltage to each other.
Voltage too low	Brake voltage does not match the rectifier	Adapt rectifier and brake voltage to each other.
AC voltage is not mains voltage	Fuse missing or defective	Select a connection with proper fusing.
	Incorrect wiring of microswitch	Check the microswitch wiring and correct it.
	Defective microswitch or incorrect setting	Replace the entire stator and send the defective stator to the manufacturer.

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