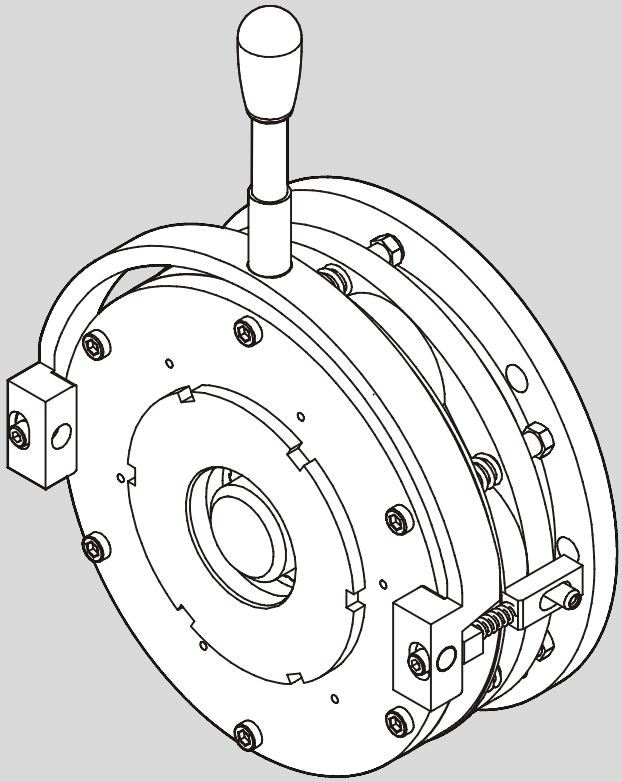
Operating Instructions INTORQ BFK468

Spring-applied brake with electromagnetic release



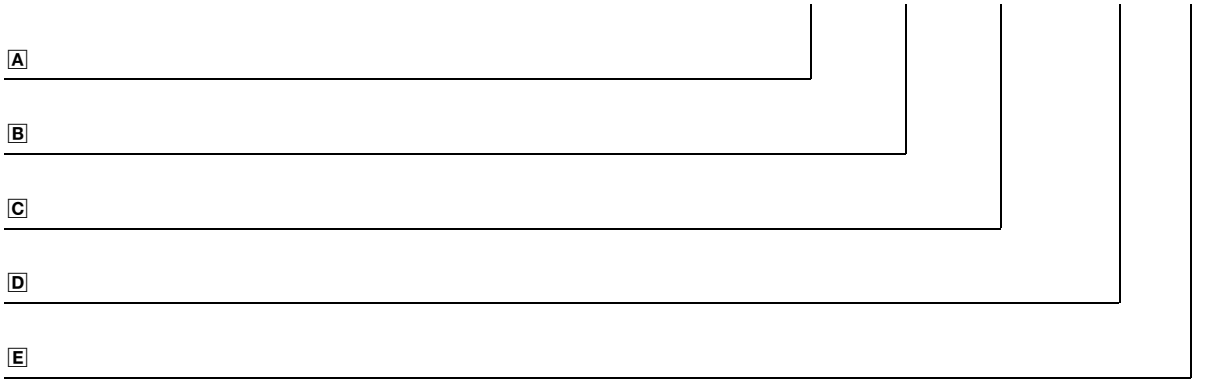
INTORQ

setting the standard

www.intorq.de

Product key

INTORQ B FK □□□ - □□ □



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

Nameplate

Field	Contents			Example
1	Manufacturer		CE mark	INTORQ D - Aerzen CE
2	Brake type			BFK468-25N
3	Rated voltage	Rated power	Hub diameter	205V DC 528/132W 65H7
4	Type no.	Rated torque	Date of manufacture	Nr.: 479714 800NM 01.03.05

Packaging sticker

Field	Contents			Example
1	Manufacturer		Barcode no.	INTORQ D - Aerzen
2	Name		Type no.	Typ: BFK468-25N Nr. 479714
3	Type see Product key	Rated torque	Qty. per box	FEDERKRAFTBREMSE 800NM 1 Stück
4	Rated voltage / rated power		Date of packaging	205V DC 528/132W 010305
5			Addition / CE mark	Rostschutzverpackung-Reibfläche fettfrei halten CE

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INTORQ

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1 Preface and general information

1.1 How to use 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 state.

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 Scope of supply

- The drive systems are combined individually according to a modular design. The scope of delivery is indicated in the accompanying papers.
- 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.
  - visible deficiencies / incompleteness immediately to INTORQ GmbH & Co.KG.

1 Preface and general information

1.4 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

- The INTORQ spring-applied brakes are also available as individual components. The user can built up the system as required. The following indications: packaging sticker, nameplate, and type code are valid for the spring-applied brake.
- If individual parts are supplied, there is no identification.

1.5 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

- These safety notes do not claim to be complete. If any questions or problems occur, please contact INTORQ GmbH & Co. KG.
- The spring-applied brake met the state of the art at the time of delivery and is generally safe to operate.
- The spring-applied brake is hazardous to persons, the spring-applied brake itself and other properties of the operator if
  - non-qualified personnel work on and with the spring-applied brake.
  - the spring-applied brake is used improperly.
- The spring-applied brakes must be planned in such a way that if they are correctly installed and used for their designed purpose in fault-free operation, they fulfil their function and do not put any persons at risk. This also applies to the interaction thereof with the overall system.
- Take appropriate measures to ensure that the failure of the spring-applied brake will not lead to damage to material.
- Do not operate the spring-applied brake unless it is in perfect condition.
- Retrofittings, modifications and changes of the drive system are generally forbidden. In any case, INTORQ GmbH & Co. KG must be contacted beforehand.
- The friction lining and the friction surfaces must be carefully protected from oil or grease since even small amounts of lubricants reduce the brake torque considerably.
- The braking torque will usually not be influenced if the brake is used 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

2.1.1 Personnel responsible for safety

Operator

- An operator is any natural or legal person who uses the spring-applied brake or on whose behalf the spring-applied brake is used.
- The operator or his safety personnel must ensure
  - that all relevant regulations, notes and laws will be complied with,
  - that only qualified personnel will work on and with the drive system,
  - that the Operating Instructions will be available to the personnel working on and with the brake at all times,
  - that unqualified personnel will not be allowed to work on and with the spring-applied brake.

Skilled personnel

Skilled personnel are persons who - because of their education, experience, instructions, and knowledge about corresponding standards and regulations, rules for the prevention of accidents, and operating conditions - are authorised by the person responsible for the safety of the plant to perform the required actions and who are able to recognise potential hazards. (See IEC 364, definition of skilled personnel)

2.1.2 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

- No explosive or aggressive atmosphere.
- Humidity, no restrictions.
- Ambient temperature -20°C to +40°C.
- With high humidity and low temperatures
  - Take measures to protect armature plate and rotor from freezing.
- Protect electrical connections against contact.

2 Safety instructions

2.2 Definition of 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

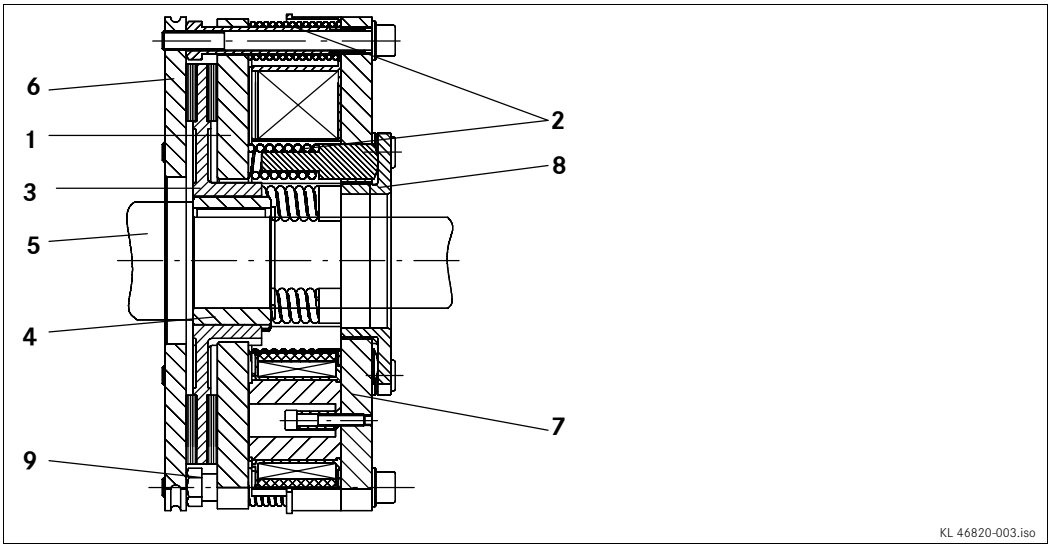

Fig. 1 Design of the spring-applied brake INTORQ BFK468: basic module E (complete stator) + rotor + hub + flange

1	Armature plate	4	Hub	7	Stator
2	Compression springs	5	Shaft	8	Adjuster nut
3	Rotor	6	Flange	9	Threaded sleeves

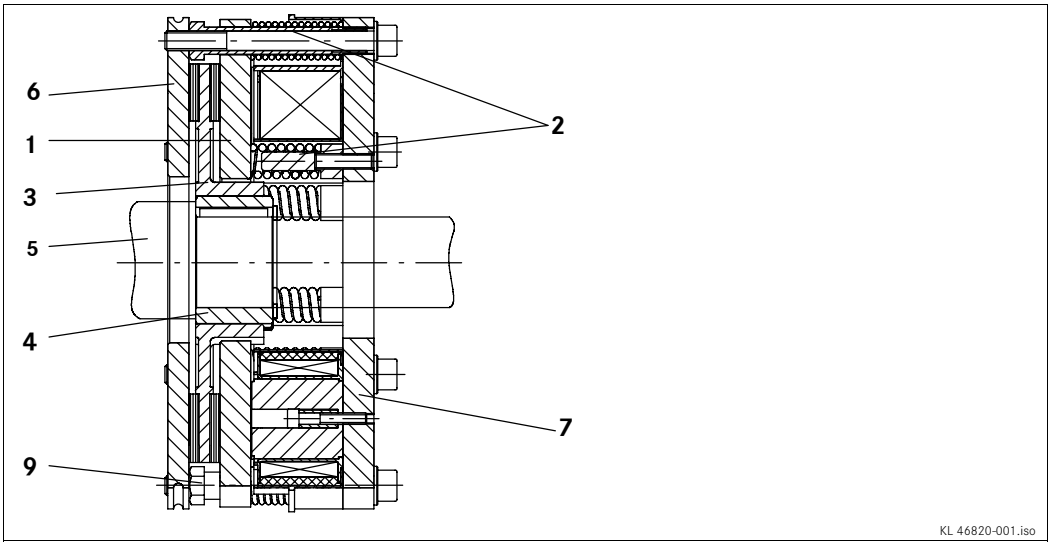

Fig. 2 Design of the spring-applied brake INTORQ BFK468: basic module N (complete stator) + rotor + hub + flange

1	Armature plate	4	Hub	7	Stator
2	Compression springs	5	Shaft	9	Threaded sleeves
3	Rotor	6	Flange		

3 Technical data

3.1.1 General information

The spring-applied brake INTORQ BFK468-□□□ is a single-disk brake with two friction surfaces. The brake torque is generated by several compression springs (2) by friction. The brake is released electromagnetically with holding current reduction via an INTORQ bridge/half-wave rectifier.

The spring-applied brake is designed for the conversion of mechanical work and kinetic energy into heat. For operating speed, see chapter 3.3 Rated data. Due to the static brake torque, the brake can hold loads without speed difference. Emergency braking is possible at high speed, see chapter 3.3 Rated data. The more friction work, the higher the wear.

The stator (7) is designed in thermal class F. The limit temperature of the coils is 155°C.

3.1.2 Braking

During braking, the rotor (3), which is axially movable on the hub (4), is pressed against the friction surface - via the armature plate (1) - by means of the inner and outer springs (2). The asbestos-free friction linings ensure a high brake torque with low wear. The brake torque is transmitted between hub (4) and rotor (3) via the splines.

3.1.3 Brake release

In braked state, there is an air gap "$s_{Lü}$" between stator (7) and armature plate (1). To release the brake, the stator coil (7) is excited with the DC voltage provided. The magnetic force generated attracts the armature plate (1) towards the stator (7) against the spring force. The rotor (3) is then released and can rotate freely.

3.1.4 Reducing the brake torque

For basic module E (adjustable), the spring force and thus the brake torque can be reduced by unscrewing the adjuster nut (8) (📖 35).

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.

3.1.6 Microswitch (optional)

The manufacturer offers the microswitch for air-gap or wear monitoring. The user must provide the corresponding electrical connection (📖 27 following).

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 Technical data

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).

3.2 Brake torques

Stop!

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

Rated torques [Nm], referring to the relative speed $\Delta n = 100\ min^{-1}$
Depending on the rated torque (spring assembly), the angle of rotation for the brake torque reduction can be 60°, 120° or 180° for basic module E.

Size	18		20		25		31
	Rated torque [NM]	Torque reduction E per detent position [NM]	Rated torque [NM]	Torque reduction E per detent position [NM]	Rated torque [NM]	Torque reduction E per detent position [NM]	Rated torque [NM]
					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 adjuster nut)
E.....Brake torque for module E (with adjuster nut)

Holding brake with emergency stop operation ($s_{Lümax.}$ approx. 2.0 x $s_{Lürated}$)
Service brake ($s_{Lümax.}$ approx. 4.0 x $s_{Lürated}$)
Standard brake torque

3.2.1 Basic module E, brake torque reduction

For basic module E, the brake torque can be reduced by means of the adjuster nut in the stator. The adjuster nut may only be screwed out up to the maximum projection "$h_{Emax.}$" (📖 12).

3 Technical data

3.2.2 Brake torques depending on the speed and permissible limit speeds

Type	Rated brake torque at Δn = 100 min-1	Brake torque at Δn_0 [min^{-1}] [%]			max. speed $\Delta n_{0max.}$ with horizontal mounting position
	[%]	1500	3000	maximum	[min^{-1}]
INTORQ BFK468-18	100	77	70	66	4400
INTORQ BFK468-20		75	68		3700
INTORQ BFK468-25		73	66		3000
INTORQ BFK468-31		69	—		2300

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

3.3 Rated data

Type	$s_{Lürated}$ +0.1 mm -0.05 mm	$s_{Lümax.}$ service brake	$s_{Lümax.}$ holding brake	max. adjustment, permissible wear	Rotor thickness		Excess of the adjuster nut $h_{Emax.}$
	[mm]	[mm]	[mm]	[mm]	min. [1] [mm]	max. [mm]	[mm]
INTORQ BFK468-18	0.4	1.0	0.6	3.0	10.0	13.0	15
INTORQ BFK468-20		1.25		4.0	12.0	16.0	17
INTORQ BFK468-25	0.5		0.75	4.5	15.5	20.0	19.5
INTORQ BFK468-31		1.5	1.0	3.0	15.0	18.0	—

Type	Pitch circle		Screws for flange installation DIN912 10.9	Minimum depth of the clearing holes (installation flange)	Tightening torque		Weight of complete stator
	[mm]	Thread	[2]	[mm]	Screws [Nm]	Complete lever [Nm]	[kg]
INTORQ BFK468-18	196	6 x M8	4 x M8 [3]	0.8	34	23	13.4
INTORQ BFK468-20	230	6 x M10	4 x M10 [3]	2.1	67	40	20.0
INTORQ BFK468-25	278		6 x M10	5			31.0
INTORQ BFK468-31	360	8 x M16	8 x M16		195	—	55.1

Tab. 3 Rated data - spring-applied brake INTORQ BFK468

1) The friction lining is designed such that the brake can be adjusted at least 5 times.
2) The screw length depends on the material and the thickness of the customer's mounting place.
3) The thread in the threading surface is offset by 30° in reference to the center axle of the manual release lever.

3 Technical data

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

Tab. 4 Coil voltage/coil resistance of INTORQ BFK468

1) Coil power at 20°C

3 Technical data

3.4 Operating times

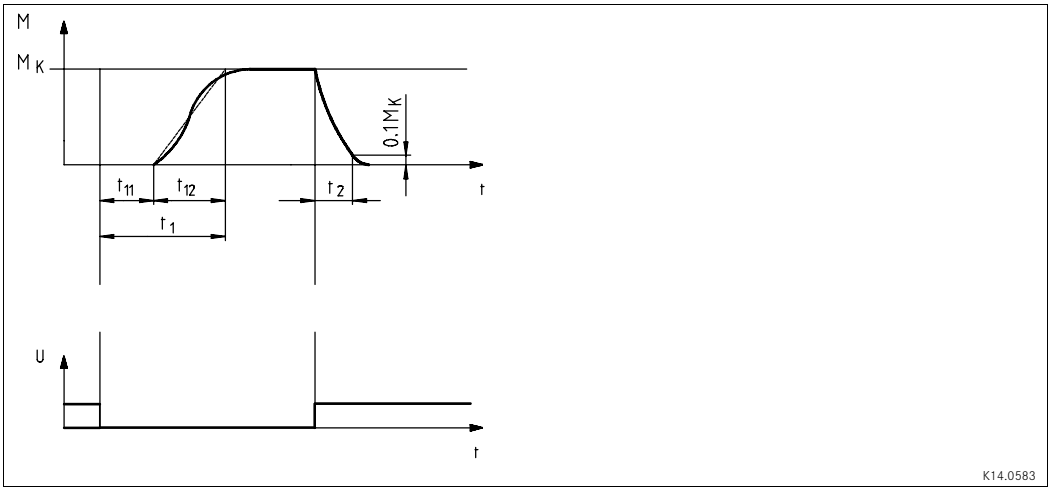

Fig. 3 Operating times of the INTORQ spring-applied brakes

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

Type	Rated brake torque at Δn = 100 min^{-1}	Max. permissible friction work per operation only	Transition operating frequency	Operating times [ms] for $s_{Lürated}$			
	M_r 1)	Q_E	$s_{hü}$	Engaging DC-switching			Disengaging
	[NM]	[J]	[h^{-1}]	t_{11}	t_{12}	t_1	t_2
INTORQ BFK468-18	150	60000	20	26	30	56	70
INTORQ BFK468-20	260	80000	19	102	112	168	106
INTORQ BFK468-25	400	120000	15	60	135	197	120
INTORQ BFK468-31	1200	300000	13	65	133	198	250

Tab. 5 Friction work - operating frequency - operating times

1) Minimum brake torque when all components are run in

The transition from the state without brake torque to the steady brake torque is not without delay. The engagement times are valid for switching on the DC side with an induction voltage of approx. 5 to 10 times nominal voltage. The chart shows the delay during engagement t_{11}, the rise time of the brake torque t_{12} and the engagement time $t_1 = t_{11} + t_{12}$, as well as the disengagement time t_2.

Disengagement time

The disengagement time is not influenced by DC or AC switching operations.

3 Technical data

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Engagement time

With switching on the AC side, the engagement times are prolonged approximately by the factor 5, for connection see page 28.

Spark suppressors for the rated voltages, which are to be connected in parallel to the contact are available for engagement on the DC side. 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 (for connection see page 28.

A reduction of the brake torque via the adjuster nut prolongs the engagement time and reduces the disengagement time. If the prolongation is too long, an anti-magnetic plate - to be assembled between stator and armature plate - is available. The plate reduces the engagement time and prolongs the disengagement time.

3.5 Operating frequency / friction work

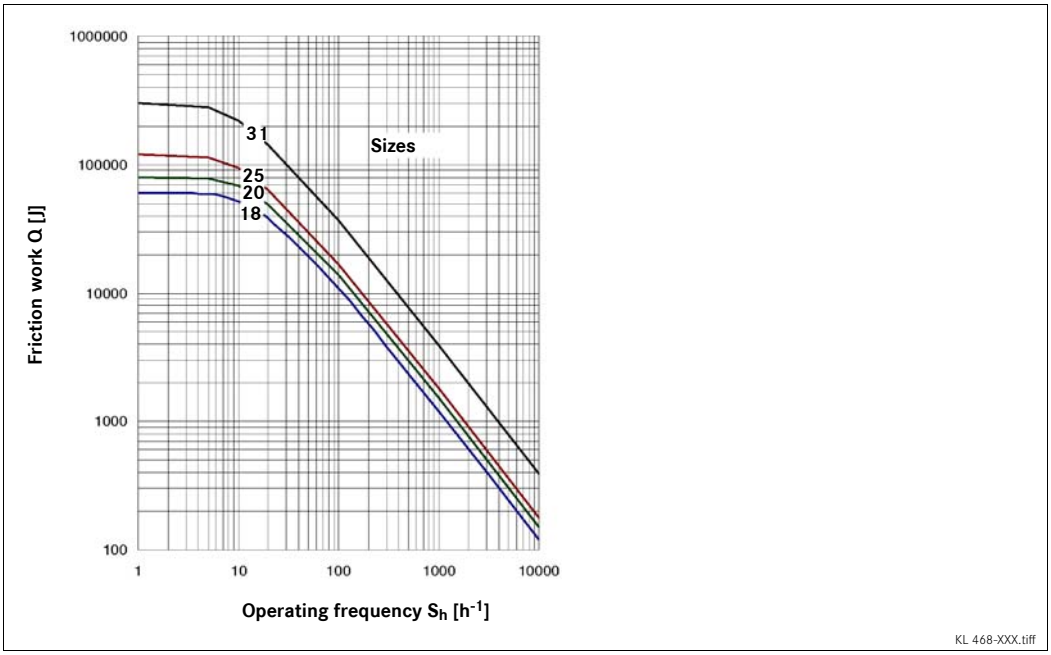


Fig. 4 Friction work as function of the operating frequency

$$S_{hperm} = \frac{-S_{hü}}{\ln\left(1 - \frac{Q}{Q_E}\right)} \qquad Q_{perm} = Q_E\left(1 - e^{\frac{-S_{hü}}{S_h}}\right)$$

The permissible operating frequency "S_{hperm}" depends on the friction work "Q" (see Fig. 4). An operating frequency of "S_h" results in the permissible friction work "Q_{perm}".

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

Under normal switching conditions with an unfiltered DC voltage via a bridge circuit, the INTORQ spring-applied brake complies with the EMC standard EN50081, part 1.

Please note that the entire circuit only complies with the EMC Directive, if it is configured according to one of the following possibilities:

Circuit		Rectifier		Spark suppressor in parallel to AC voltage	Mains filter
		complies with standard	does not comply with standard		
DC switching	< = 5 Switching operations/minute	●			
			●	●	
	> = 5 Switching operations/minute	●			●
			●		●
AC switching	< = 5 Switching operations/minute	●			
			●	●	
	> = 5 Switching operations/minute	●			
			●	●	

Spark suppressors according to coil voltage on request

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.

Noises

The switching noises during engagement and disengagement depend on the air gap "$s_{Lü}$" and the brake size.

Depending on the natural oscillation after installation, operating conditions and state of the friction faces, the brake may squeak during braking.

4 Mechanical installation

Stop!

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

4.1 Necessary tools

Type	Torque wrench Insertion for hexagon socket screws		Spanner wrench size [mm]			Hook wrench DIN 1810 design A	Box spanner for flange installation, outside
		 *		 Manual release			
	Measuring range [Nm]	Wrench size [mm]	Threaded sleeves	Nuts/bolts	2kt lever	Diameter [mm]	Wrench size [mm]
INTORQ BFK468-18	20 - 100	6 x 1/2" square	15	- / 10	10	110 - 115	13 x 1/2" square
INTORQ BFK468-20		8 x 1/2" square	17		12	135 - 145	17 x 1/2" square
INTORQ BFK468-25					14	155 - 165	
INTORQ 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
		

4.2 Mounting

4.2.1 Preparation

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

4 Mechanical installation

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

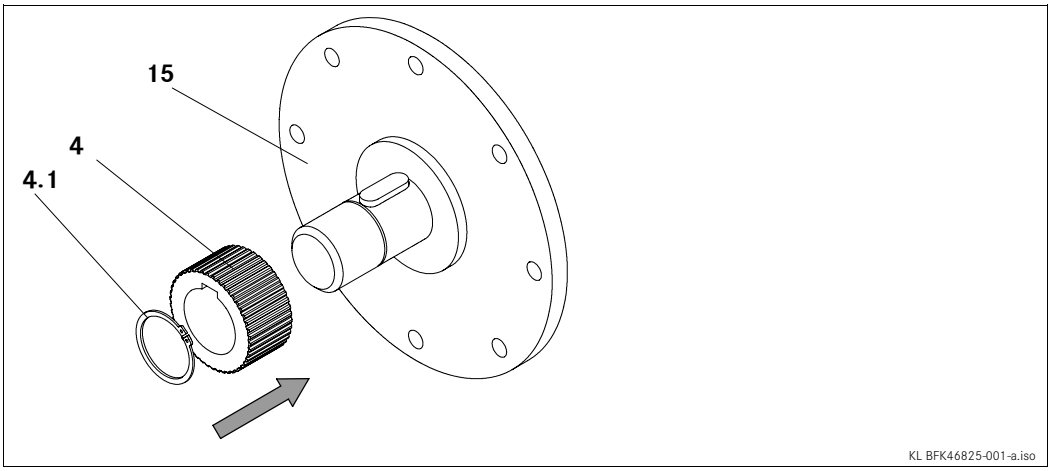


Fig. 5 Installation of the hub onto the shaft

4 Hub 4.1 Circlip 15 Endshield

1. Press hub (4) onto the shaft
2. Secure hub against axial displacement, e.g. using a circlip (4.1).

Stop!

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

4.3.2 Installation of the brake

Stop!

- When dimensioning the thread depth in the endshield, consider the permissible wear (chapter 3.3).
- Check the condition of the endshield (15). It must be free of oil and grease.

4 Mechanical installation

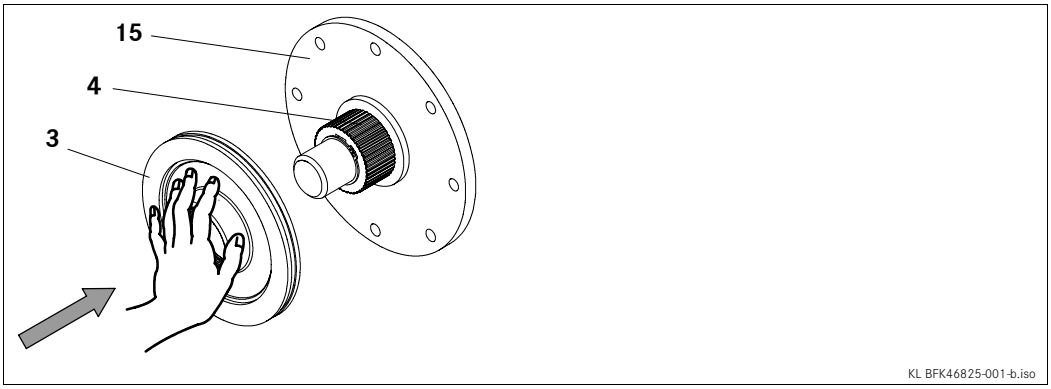


Fig. 6 Brake mounting

3	Rotor	4	Hub	15	Endshield

1. Push the rotor (3) onto the hub (4) and check whether it can be moved by hand (Fig. 6).

Stop!

Please note the following for versions with shaft seal in the adjuster nut:

2. Lightly lubricate the lip of the shaft seal with grease.
3. When assembling the stator (7) push the shaft seal carefully over the shaft.
   – The shaft should be located concentrically to the shaft seal.

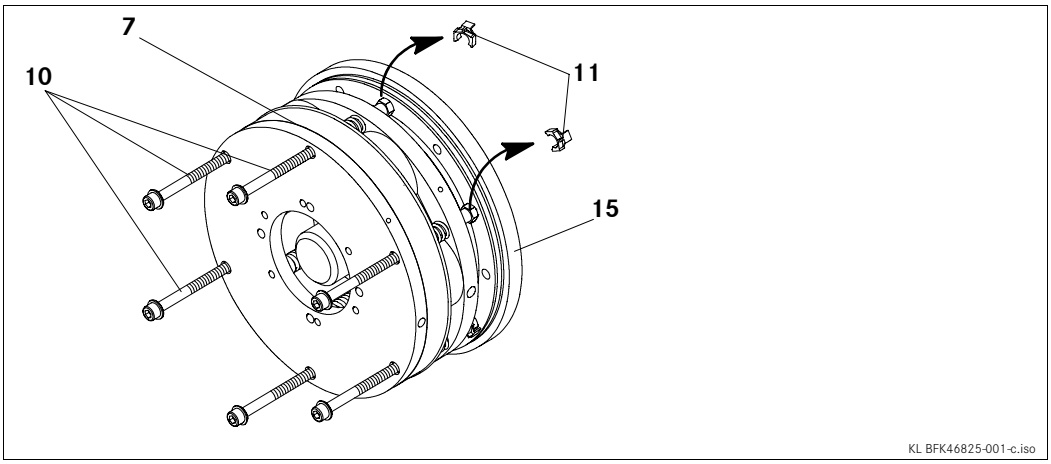


Fig. 7 Assembly of the complete stator

7	Complete stator	11	Clip
10	Allen screw	15	Endshield

4. Screw the complete stator (7) onto the endshield (15) using the screws (10). (Fig. 7).
5. Remove the clips (11) (throw away; Fig. 7).

4 Mechanical installation

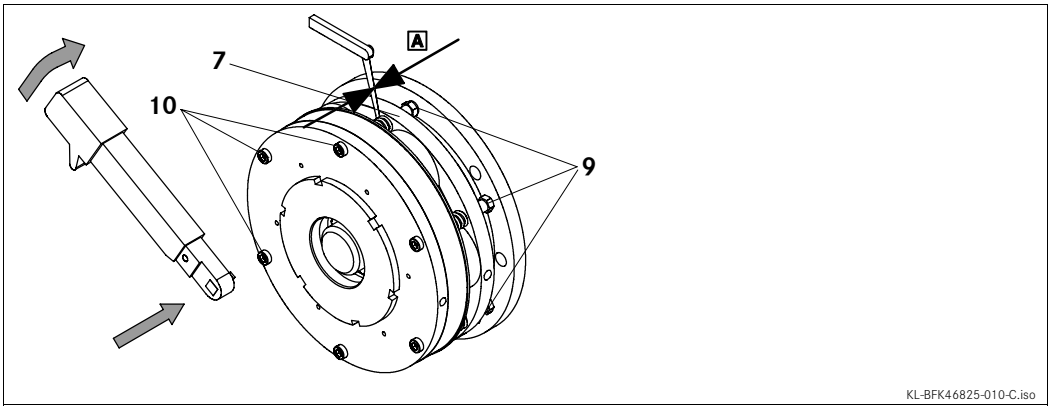


Fig. 8 Checking the air gap $s_{Lü}$

A	$s_{Lürated}$	9	Threaded sleeves
7	Stator	10	Allen screws

6. Tighten the screws (10) evenly (for torques see table chapter 3.3 and Fig. 8).
7. Check the air gap "$s_{Lürated}$" near the bolts (10) by means of the thickness gauge ("$s_{Lürated}$" see table chapter 3.3 and Fig. 8).

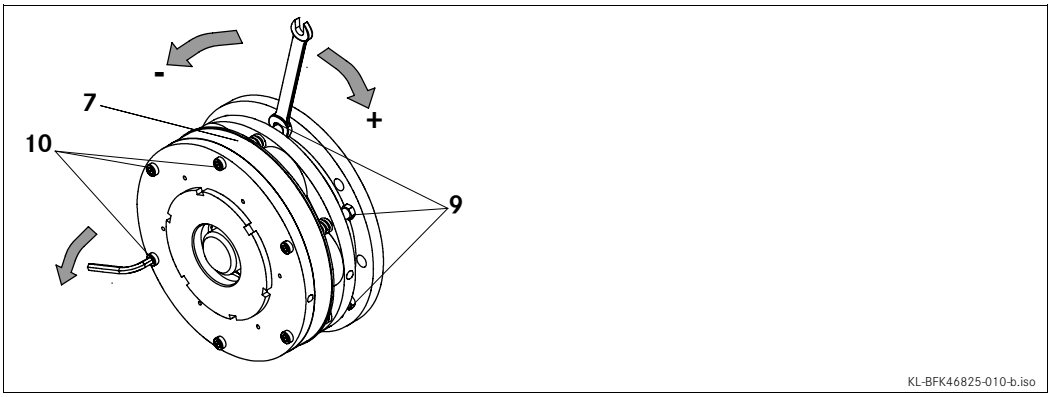


Fig. 9 Air gap adjustment

7	Stator	10	Allen screw
9	Threaded sleeves		

If the air gap is too large or small, readjust "$s_{Lürated}$" as follows:

8. Unbolt screws (10).
9. Slightly turn threaded sleeves (9) using a spanner.
   - If the air gap is too large, screw them into the stator (7).
   - If the air gap is too small, screw them out of the stator (7).
   - $^1/_6$ turn changes the width of the air gap by approx. 0.15mm.
10. Tighten the screws (10) (for torques see chapter 3.3).
11. Check air gap again and, if necessary, repeat the adjustment.

4 Mechanical installation

4.3.3 Assembly of the flange

- The flange (4) can be screwed onto the endshield (15) with the outer pitch circle (for screw dimensions see chapter 3.3).

Flange assembly with additional screws

Stop!

- Behind the threaded holes for the screws in the flange there must be clearing holes in the endshield (see chapter 3.3). Without clearing holes the minimum rotor thickness cannot be used. Under no circumstances may the screws be pressed against the endshield.
- For sizes 18 and 20 the threads at the fastening surface are shifted by 30° with respect to the center axis of the manual release lever.

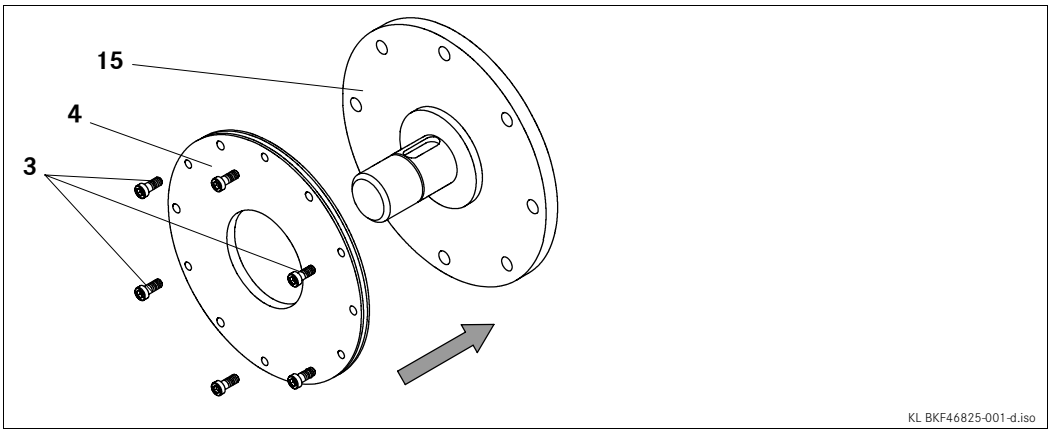


Fig. 10 Flange assembly BFK468

4	Flange	15	Endshield
3	Set of fastening screws		

1. Hold the flange (4) to the endshield (15) and check the pitch circle and the thread of the fastening bore holes.
2. Screw the flange (4) onto the endshield (15) using the screws (3).
3. Tighten the screws evenly (for torques see chapter 3.3).
4. Check the height of the screw heads. On the outer pitch circle the screw head must not be higher than the minimum rotor thickness. We recommend to use screws according to DIN 912, property class 10.9 (for dimensions see chapter 3.3).

Flange assembly without additional screws

Stop!

Consider the permissible wear when dimensioning the depth of the thread in the endshield (see chapter 3.3).

1. Hold the flange (4) to the endshield (15) and check the pitch circle and the thread of the fastening bore holes.
2. Assemble the brake with the corresponding screw set (see chapter 4.3.2).

4 Mechanical installation

4.3.4 Assembly of the cover seal

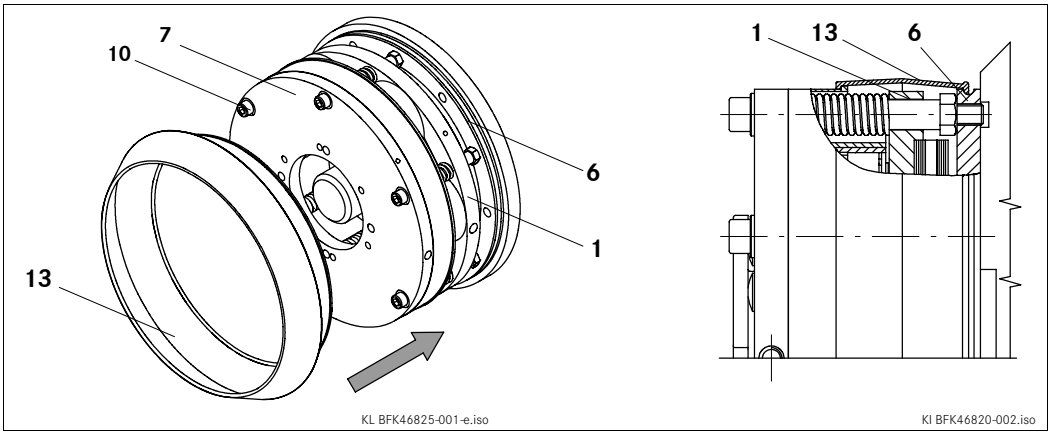


Fig. 11 Assembly of the cover seal

1	Armature plate	7	Stator	13	Cover seal
6	Flange	10	Allen screw		

1. Pull the cable through the seal (13).
2. Push the seal (13) over the stator (7).
3. Press the lips of the cover seal (13) into the groove of stator (7) and flange (6).

4.3.5 Assembly of the manual release sizes 18 to 25

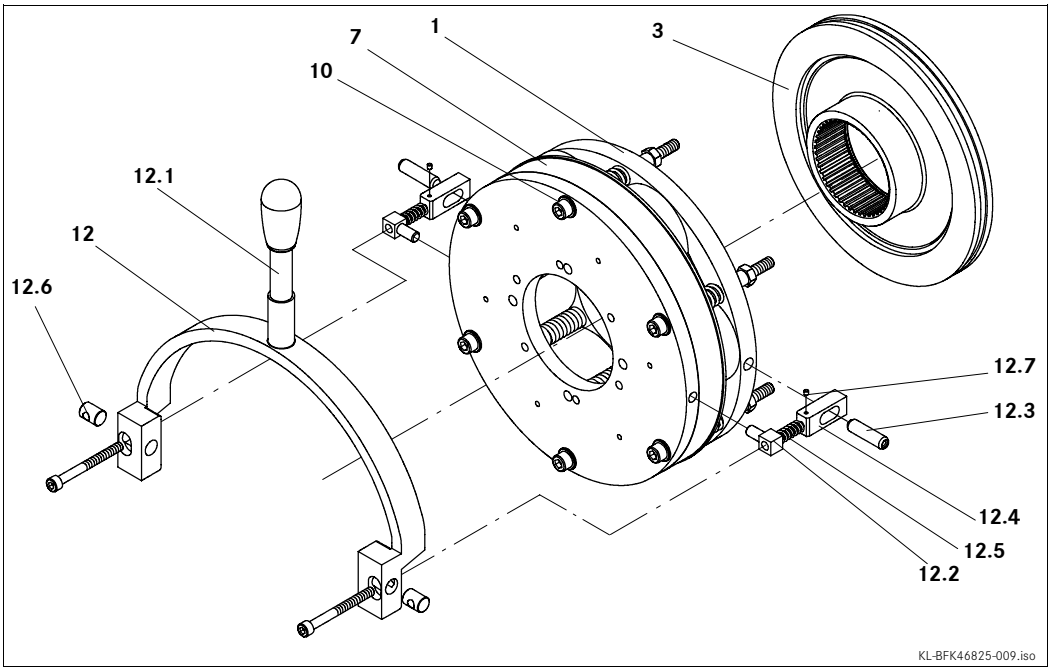


Fig. 12 Assembly of the manual release for brake sizes 18-25

1	Armature plate	12	Manual release shackle	12.4	Clip
3	Complete rotor	12.1	Manual release lever with control button	12.5	Compression spring
7	Stator (here: design E)	12.2	Eyebolts	12.6	Trunnion
10	Allen screw	12.3	Pin	12.7	Threaded pin

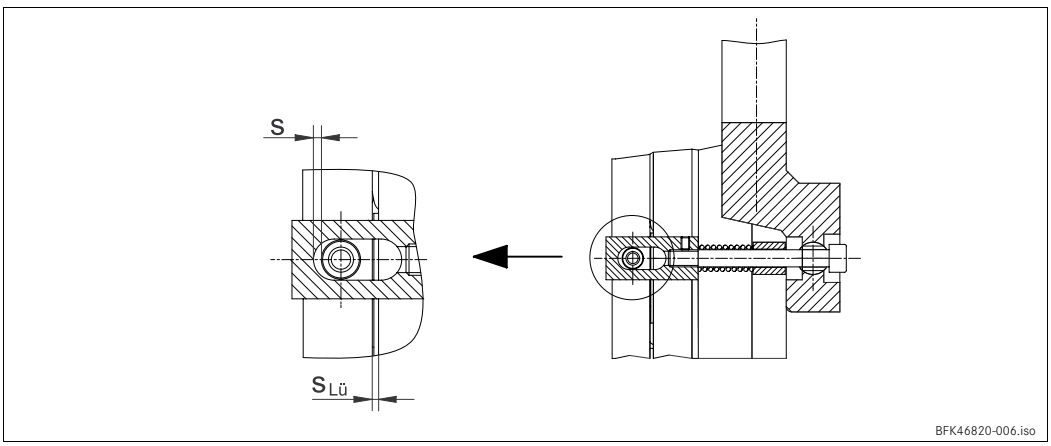
4 Mechanical installation

1. Hammer the pins (12.3) into the bore holes of the armature plate (1). (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 (12.2) into the mounting plate (16) and align them according to the hole spacing of the manual release shackle (12).
3. Put clips (12.4) with elongated hole onto the pins (12.3), align thread towards the eyebolts (12.2).
4. Insert the compression springs (12.5) between clips (12.4) and eyebolts (12.2).
5. Push the trunnions (12.6) into the bore holes of the shackle (12), cross hole to the outside.
6. Push the Allen screws (10) through the cross holes of the trunnions (12.6).
7. Locate the shackle (12) with trunnions (12.6) and Allen screws (10) such onto the back of the stator (7) that the Allen screws (10) are led through the eyebolts (12.2) and the compression springs (12.5).
8. Screw the Allen screws (10) into the clip threads (12.4).
9. When the brake has not been installed yet, tighten the Allen screws (10) until the armature plate (1) moves towards the stator (7) and remove (throw away) the clips (11).
10. Adjust gap "s" and "$s_{Lü}$" using the Allen screws (10) (values for "s " and "$s_{Lü}$" see Tab. 6).
11. Secure the adjustment of the Allen screws (10) using the threaded pin (12.7) in the clip.

Note!

Dimension "s + $s_{Lü}$" 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.

12. If necessary, screw the lever into the shackle.



4 Mechanical installation

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

Tab. 6 Adjustment setting for manual release

Stop!

Dimension ”s” must be observed! Check air gap ”$s_{Lü}$”.

5 Electrical installation

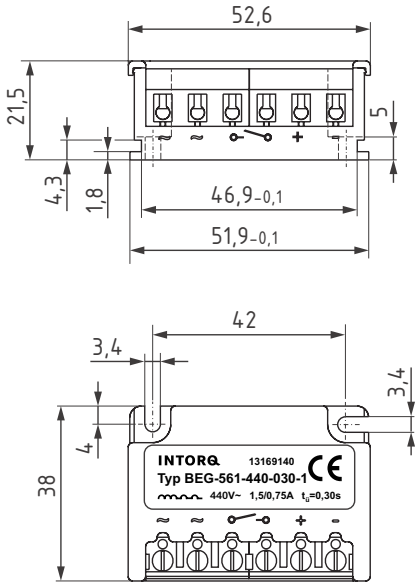
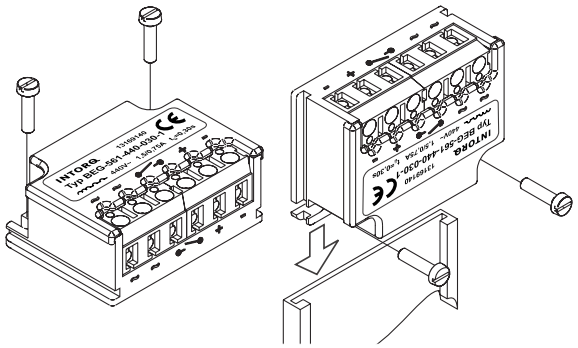
5.1 Bridge/half-wave rectifiers

BEG-561-□□□ -□□□

Bridge/half-wave rectifiers are used for the supply of electromagnetic spring-applied DC brakes which have been released for operation with such rectifiers. Any other use is only permitted with the explicit written approval of INTORQ.

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.

Terminals 3 and 4 are in the DC circuit of the brake. The induction voltage peak for DC switching (see circuit diagram "Reduced switch-off times") is limited by an integrated overvoltage protection at terminals 5 and 6.

Dimensions	Possible installations
	

5.1.1 Technical data

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

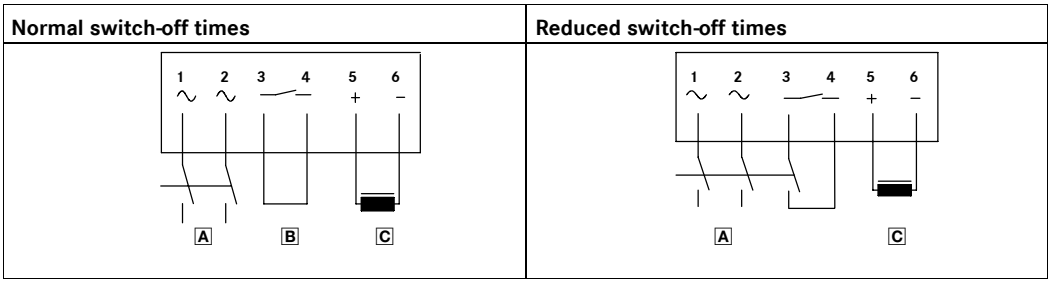
U_1 Input voltage (40 ... 60 Hz)

5 Electrical installation

Type	Input voltage U_1 (40 Hz ... 60 Hz)			Max. current $I_{max.}$		Overexcitation time t_o (±20%)		
	min. [V ~]	rated [V ~]	max. [V ~]	bridge [A]	half-wave [A]	with U_{1min} [s]	with U_{1rated} [s]	with U_{1max} [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

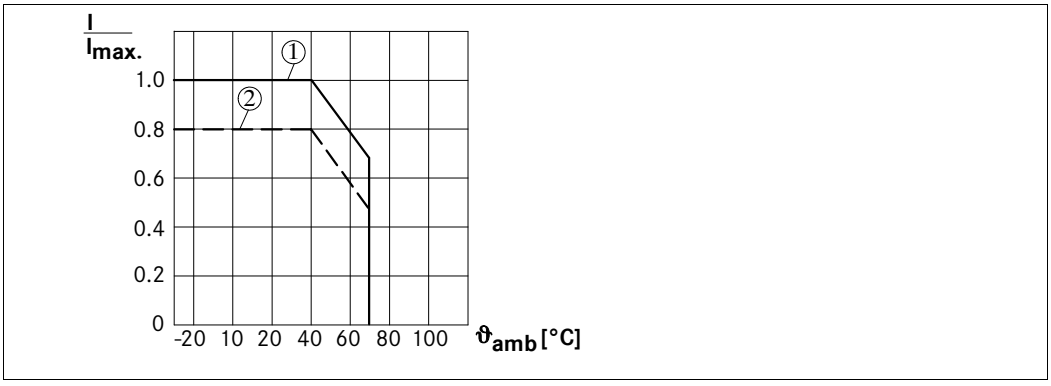
5.1.2 Reduced switch-off times

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



A Mains B Bridge C Coil

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)

5 Electrical installation

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

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

5.2 Electrical connection

Danger!

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

5 Electrical installation

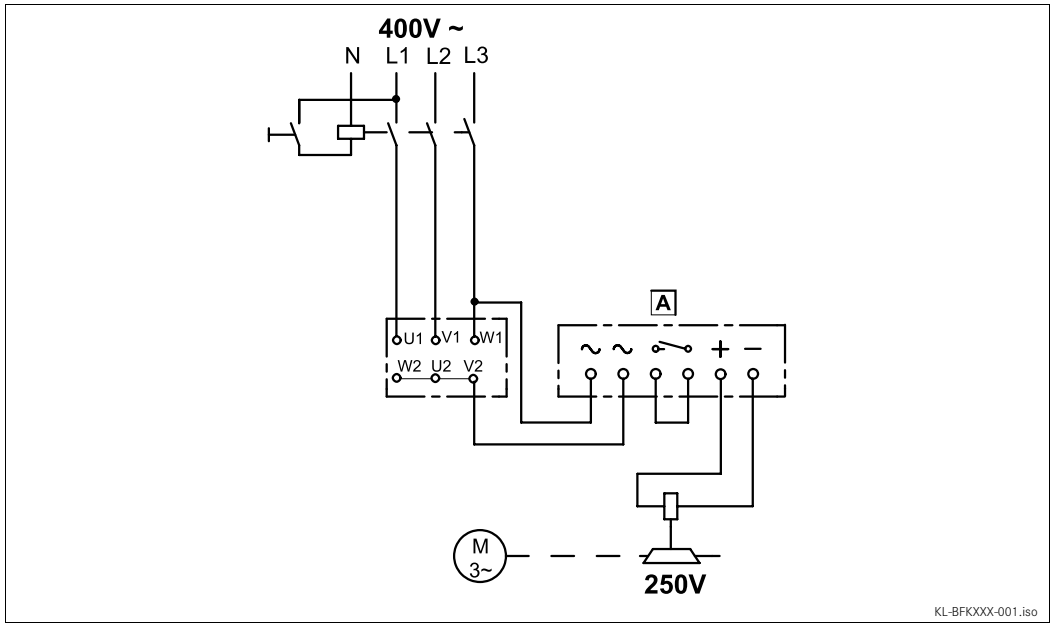


Fig. 13 AC switching, delayed engagement

A Bridge / half-wave rectifier

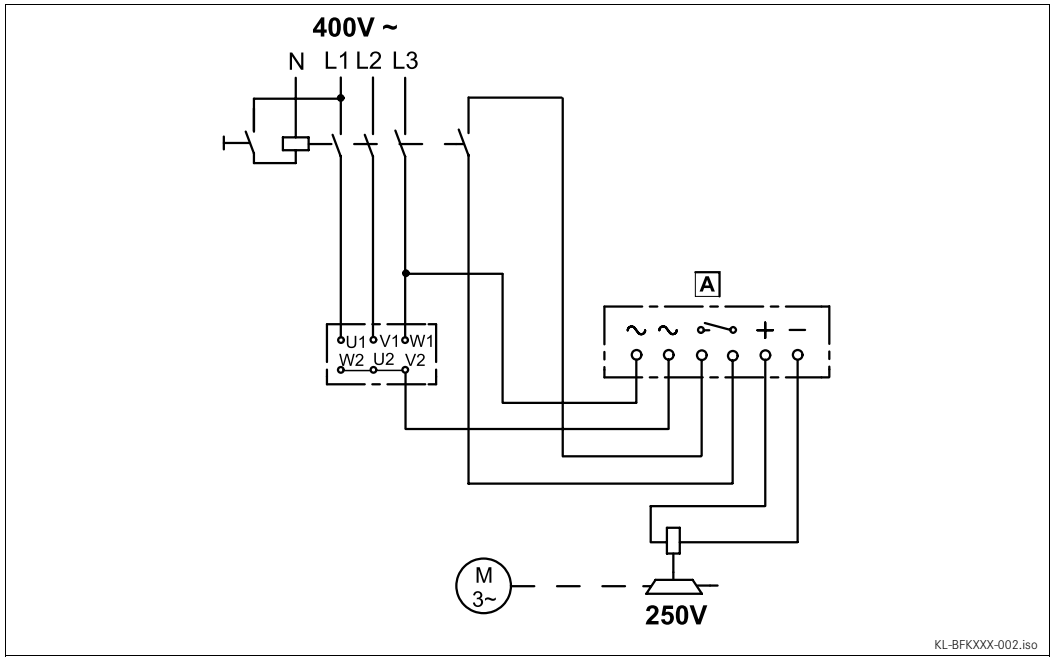


Fig. 14 DC switching, normal engagement

A Bridge / half-wave rectifier

STOP

Stop!

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

5 Electrical installation

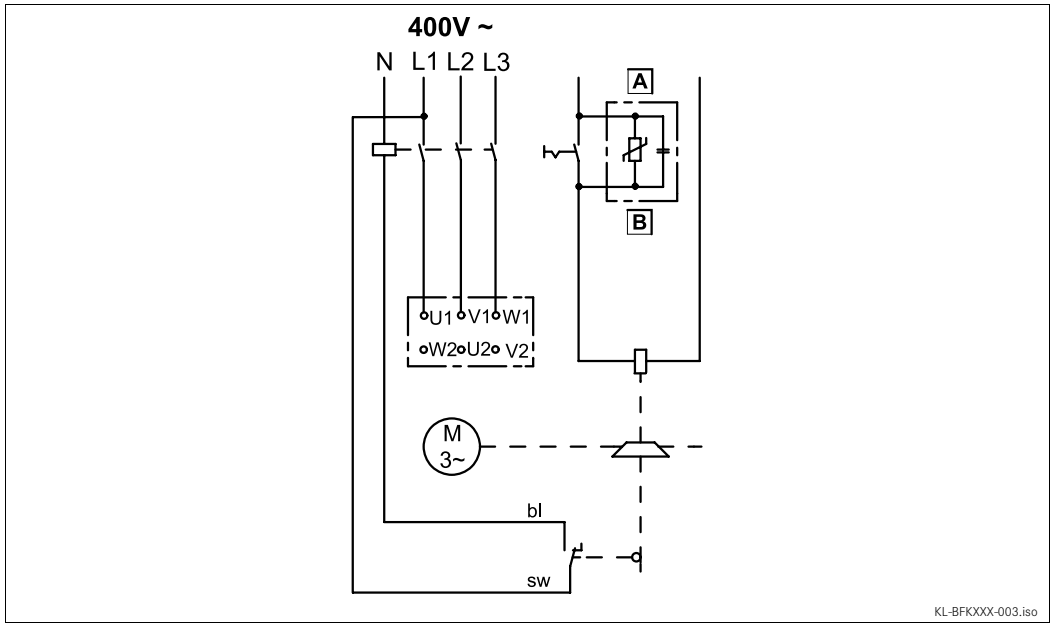


Fig. 15 With microswitch / release check; connection diagram also valid for star connection

A DC voltage depending on coil voltage
B Spark suppressor

bl blue sw black

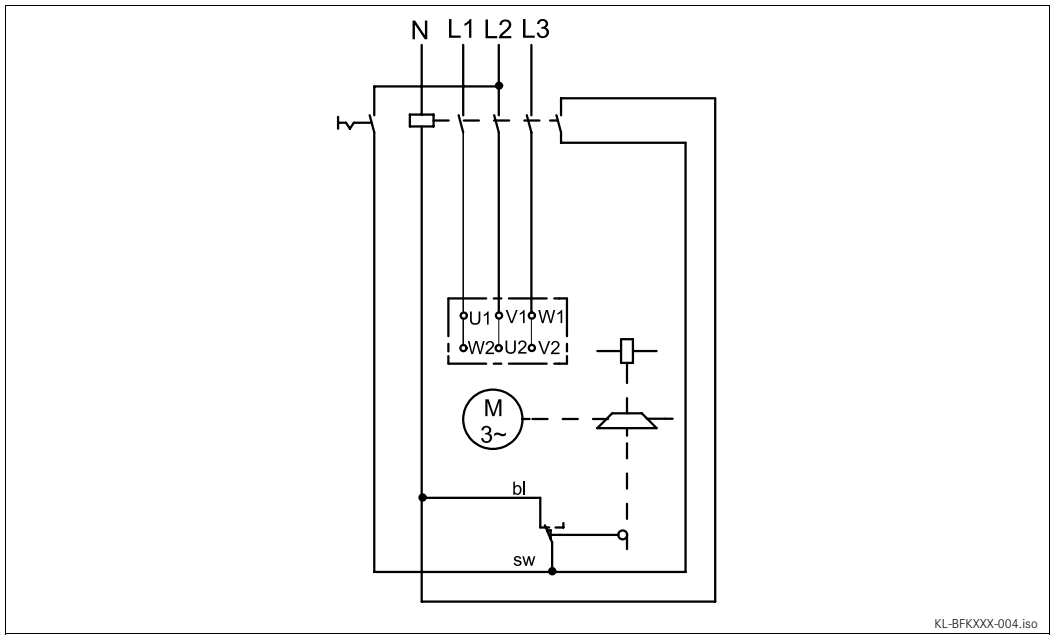


Fig. 16 With microswitch / wear check addition for all circuits; connection diagram also valid for star connection

bl blue sw black

5 Electrical installation

Tip!

During operation according to Fig. 16 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. Install the rectifier in the terminal box. For motors with insulation class ”H”, the rectifier must be installed in the control cabinet. The permissible ambient temperature for the rectifier is -25°C to +70°C.
2. Compare the coil voltage of the stator to the DC voltage of the installed rectifier.
3. Select the suitable circuit diagram. Convert the values to deviating AC voltage, e.g. with a 380V bridge rectifier,
   - 380/400x205 = 195V
   - Deviations up to 3% are permissible.
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 motor must not be running when checking the brake.

6.1 Functional test

In the event of failures, refer to the troubleshooting table in chapter 8. 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.
   - 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.
4. Check air gap "$s_{Lü}$". 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.

Connection diagram: (📖 29)

1. Remove two bridges from the motor terminals.
   - Do not switch off the DC brake supply.
2. The switching contact for the brake must be open.
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.
6. Measure the AC voltage at the motor terminals.
   - It must be the same as the mains voltage.
7. 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.
8. Check air gap "$s_{Lü}$".
   - It must be zero and the rotor must rotate freely.
9. Open the switching contact for the brake.
10. Bolt bridges to the motor terminals.

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 "$s_{Lümax.}$". See chapter 4.3.2 Step 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. Disconnect the mains supply.
6. Set air gap to "$s_{Lürated}$". See chapter 4.3.2 Step 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 "$s_{Lü}$". 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. 17) 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

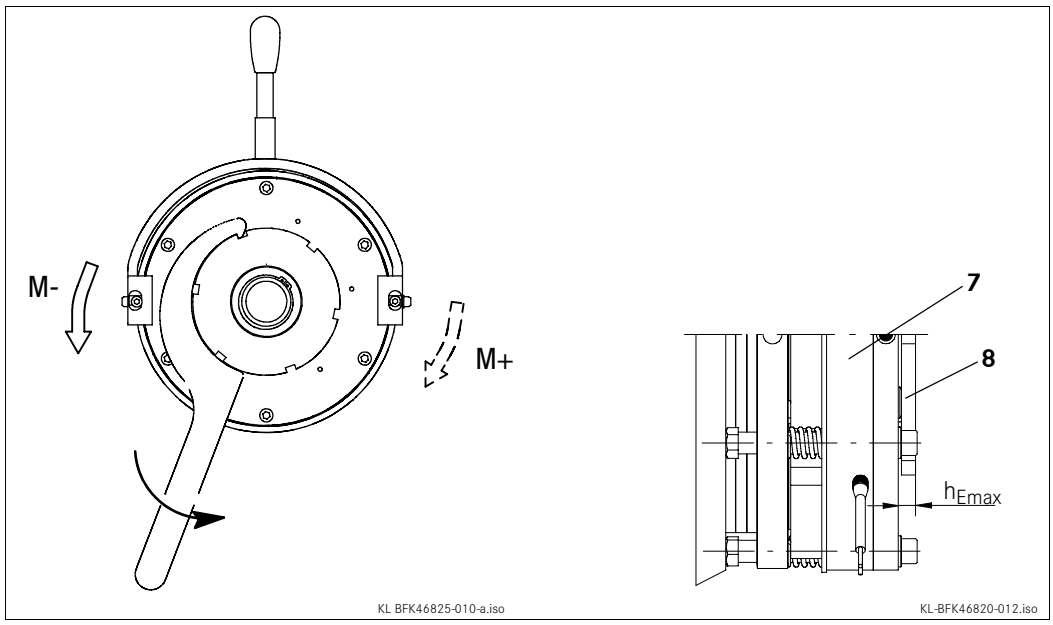


Fig. 17 Brake torque adjustment

7 Stator
8 Adjuster nut

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 "$h_{Emax.}$" of the adjuster nut (8) to the stator (7) is to be observed (values for "$h_{Emax.}$" see chapter 3.3).

Danger!

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

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

6.3 During operation

- Check the brake regularly during operation. Take special care of:
  - unusual noises and temperatures
  - loose fixing elements
  - the state of the cables.
- In the event of failures, refer to the troubleshooting table in chapter 8. If the fault cannot be eliminated, please contact the aftersales service.

7 Maintenance/repair

7.1 Inspection intervals

The wear of the friction lining of the rotor depends on the operating conditions. The time until readjustment does not only depend on the friction work. The friction work per operation decreases steadily until readjustment takes place. High speed differences additionally reduce the friction work until readjustment. The inspection intervals must be adapted to the operating conditions and can be prolonged if the wear is small.

7.2 Inspections

7.2.1 Rotor thickness

Danger!
The motor must be at standstill when checking the rotor thickness.

1. Remove motor cover and - if mounted - remove seal.
2. Measure the rotor thickness using a caliper gauge.
3. Compare the measured rotor thickness with the minimum permissible rotor thickness (see chapter 3.3).
4. If necessary, replace the rotor. See chapter 7.3.2.

7.2.2 Air gap

Danger!
The motor must be at standstill when checking the air gap.

1. Measure the air gap "$s_{Lü}$" between armature plate and rotor using a feeler gauge (3.3).
2. Compare the measured air gap to the maximum permissible air gap "$s_{Lümax.}$" (see table chapter 3.3).
3. If necessary, adjust air gap to "$s_{Lürated}$". See chapter 7.3.1.

7 Maintenance/repair

7.2.3 Release / voltage

Danger!
The running rotor must not be touched.

Danger!
Live connections must not be touched.

1. Observe air gap "$s_{Lü}$" during operation of the drive.
2. 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.

7.3 Maintenance operations

7.3.1 Readjustment of air gap

Danger!
Disconnect voltage. The brake must be free of residual torque.

Stop!
Observe for the flange version when it is fixed 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. 9).
2. Screw the threaded sleeves into the stator by using a spanner. $^1/_6$ revolution reduces the air gap by approx. 0.15 mm.
3. Tighten screws (for torques see table chapter 3.3).
4. Check the air gap "$s_{Lü}$" near the screws using a feeler gauge ("$s_{Lürated}$" see table chapter 3.3).
5. If the difference between the measured air gap and "$s_{Lürated}$" is too large, repeat the readjustment.

7 Maintenance/repair

7.3.2 Rotor replacement

Danger!
Disconnect voltage. The brake must be free of residual torque.

1. Loosen connection cable.
2. Loosen the screws evenly and remove them.
3. Completely remove the stator from the endshield. Observe the supply cable.
4. Pull rotor from hub.
5. Check hub toothing.
6. In case of wear, the hub must also be replaced.
7. Check the friction surface at the endshield. In case of strong scoring at the flange, replace the flange. If scoring occurs at the endshield, re-finish endshield.
8. Measure the rotor thickness (new rotor) and head height of the threaded sleeves using a caliper gauge.
9. Calculate the distance between stator and armature plate as follows:

   Distance = Rotor thickness + $s_{Lürated}$ - head height

   ("$s_{Lürated}$" see table chapter 3.3)
10. Evenly loosen the threaded sleeves until the calculated distance between stator and armature plate is reached.
11. Install and adjust new rotor and stator (see chapter 4.3.2).
12. Reconnect the supply cable.

7 Maintenance/repair

7.4 Spare-parts list

Only parts with position numbers are available.

The position numbers are only valid for the standard design.

7.4.1 Brakes BFK468-18 to 31

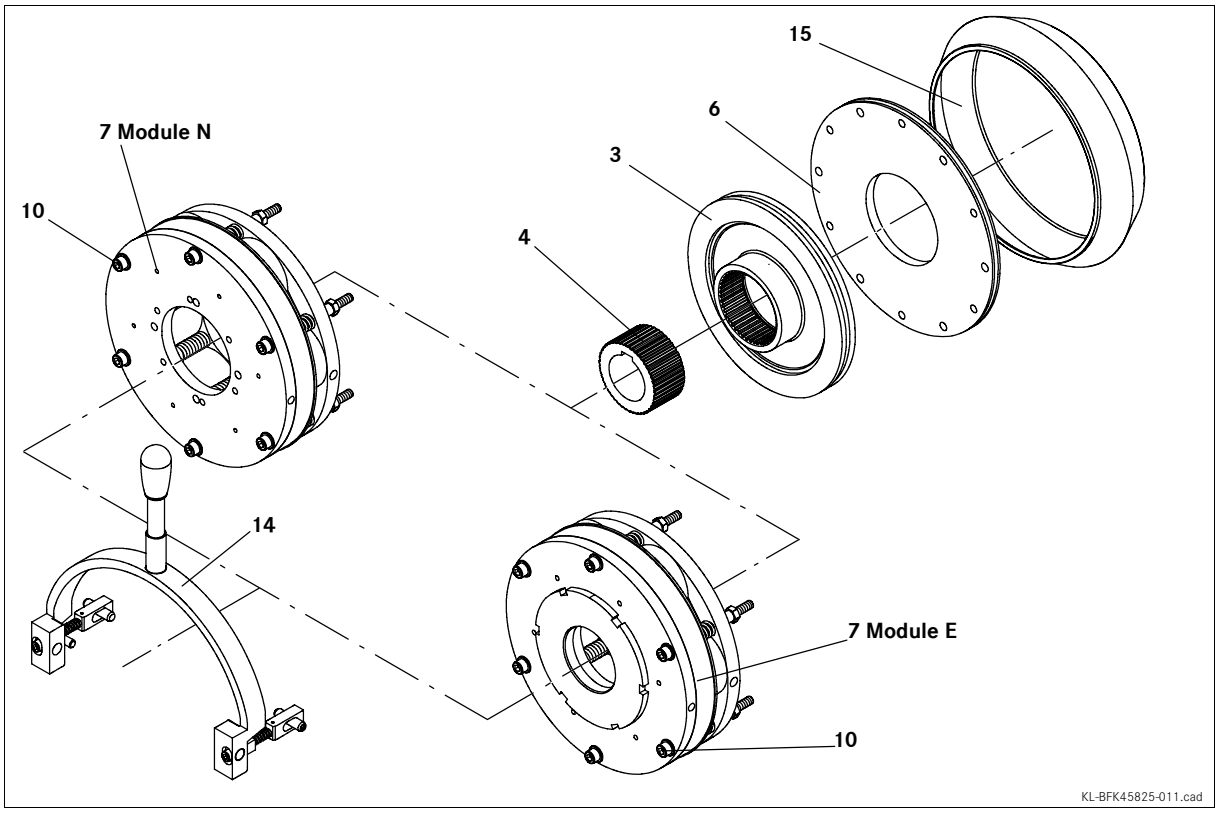


Fig. 18 Spring-applied brake INTORQ BFK468-18 to 31

Pos.	Name	Variant
3	Complete rotor Complete rotor, low-noise version	
4	Hub	Bore
6	Flange Hardchromed flange	
7	Complete stator, module E Complete stator, module N	Voltage / brake torque
10	Set of fastening screws Allen screw DIN912 10.9	for mounting to the motor / flange for flange with through hole
14	Manual release	
15	Seal	

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)
Cable length	☐ Standard _____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 ☐ Low-noise version (rotor with sleeve)
Hub	_____ mm (for bore diameter, see dimensions)
Flange	☐
Set of fixing screws	☐ for mounting to the motor / flange ☐ for mounting to the flange with through holes
Sealing	☐ Seal ☐ Shaft seal (shaft diameter on request) ☐ Sealing 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 BFK468-20
BEG-561-255-130			BFK468-25
BEG-561-440-030-1	400 ±10%	360 / 180	BFK468-18 BFK468-20
BEG-561-440-130			BFK468-25 BFK468-31

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 not zero	Coil is interrupted	▮ Measure coil resistance using multimeter: – If the resistance is too high replace the stator.
	Coil has interturn fault or short circuit to ground	▮ Measure coil resistance using multimeter: – Compare measured resistance to rated resistance. For values, see chapter 3.3. If the resistance is too low, replace the entire stator. ▮ Test the coil for short circuit to ground using a multimeter: – If a short circuit to ground occurs, replace the stator. ▮ Check the brake voltage (see defective rectifier, voltage too low).
	Defective or wrong wiring	▮ Check and correct wiring. ▮ Check the cable using a multimeter: – Replace defective cable
	Defective or wrong rectifier	▮ Measure the DC voltage at the rectifier using a multimeter. When the DC voltage is zero: ▮ Measure the AC voltage at the rectifier. When the AC voltage is zero: – Apply voltage – Check fuse – Check wiring When the AC voltage is ok: – Check rectifier – Replace defective rectifier When the DC voltage is too low: – Check rectifier – If diode is defective, use suitable new rectifier ▮ Check the coil for fault between turns and short circuit to ground. ▮ If the rectifier defect occurs again, replace the entire stator, even if you cannot find any fault between turns or short circuit to ground. The fault may occur later during heating-up.
	Incorrect wiring of microswitch	Check the wiring of the microswitch and correct it.
	Incorrect setting of microswitch	Replace the stator and complain about the micro switch quality at the manufacturer
	Air gap too big	Readjust the air gap (chapter 7.3.1)
Rotor cannot rotate freely	Wrong setting of manual release	Check dimension $s+s_{Lü}$ with energised brake. The dimension must be identical at both sides. Correct if necessary.
	Air gap $s_{Lü}$ too small	Check air gap $s_{Lü}$ and readjust it, if necessary (chapter 7.3.1).

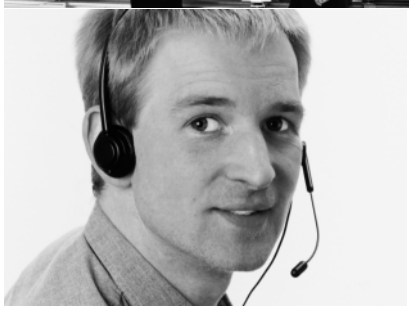
8 Troubleshooting and fault elimination

Fault	Cause	Remedy
Rotor not thick enough	Rotor has not been replaced in time	Replace rotor (chapter 7.3.2)
Voltage is not zero when checking the operation (6.2.2 or 6.2.3)	Incorrect wiring of microswitch	Check the wiring of the microswitch and correct it.
	Defective microswitch or incorrect setting	Replace the 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.
	Defective rectifier diode	Replace rectifier by a suitable new one.
AC voltage is not mains voltage	Fuse missing or defective	Select a connection with proper fusing.
	Incorrect wiring of microswitch	Check the wiring of the microswitch and correct it.
	Defective microswitch or incorrect setting	Replace the entire stator and return it to the manufacturer.

9 Disposal

Protect the environment! Packing material can be recycled.

What?	Where?		
Transport material	Pallets		Return to the manufacturer or forwarder
	Packing material		Cardboard boxes to waste paper Plastics to plastics recycling or waste material Reuse or dispose of wood wool
Components	Hub	Steel	Separate material and dispose
	Seals, friction lining	Hazardous waste	



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