



INTORQ

setting the standard

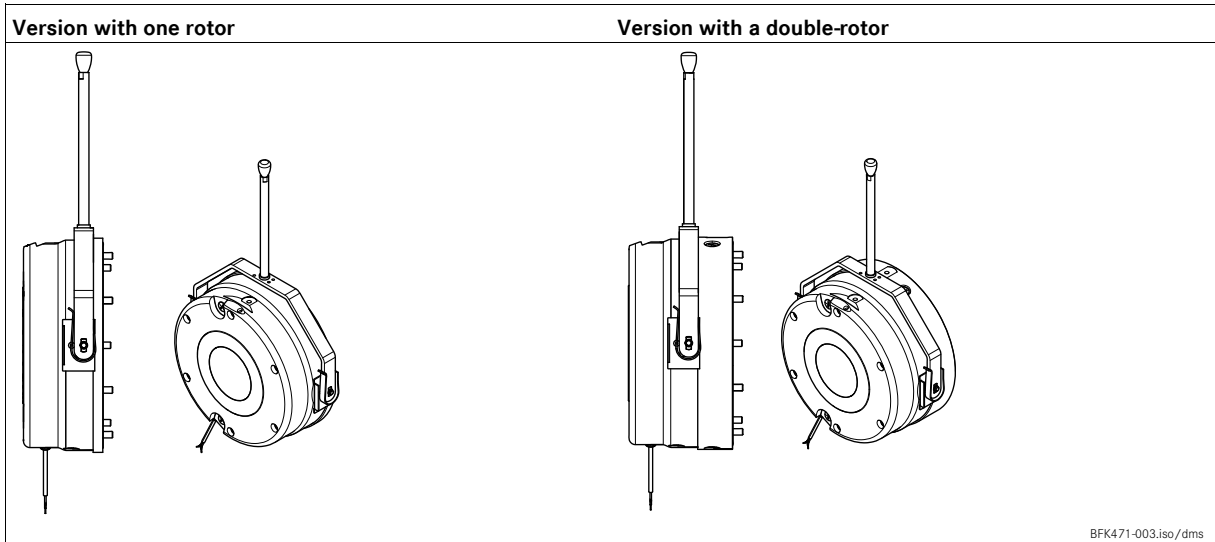
INTORQ BFK471-25

Electromagnetically spring-applied brake

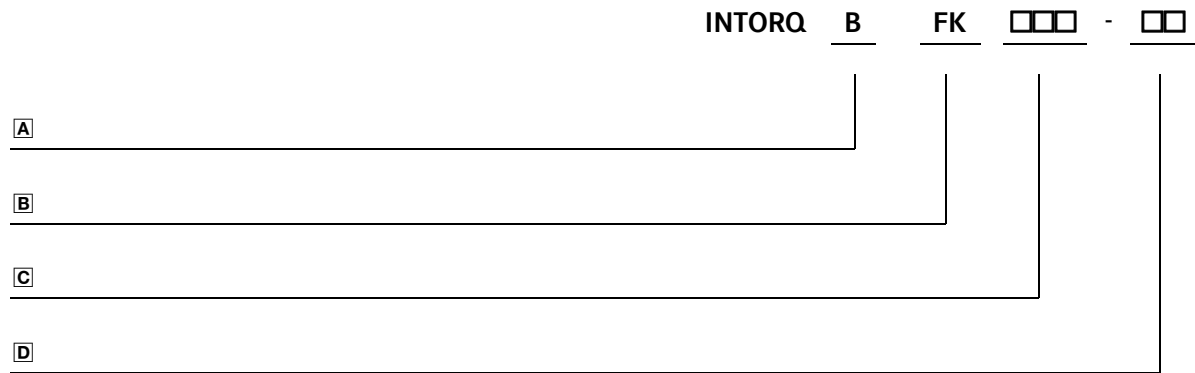
Operating Instructions

This documentation applies to ...

BFK471



Product key



Legend for the product key

INTORQ BFK471

A	Product group	Brakes
B	Product family	Spring-applied brake
C	Type	471
D	Size	25

Not coded: supply voltage, hub bore, options

Identification

Package label			Example
Manufacturer		Bar code	<p>INTORQ D-Aerzen Typ: BFK471-25N Nr.: 33001067 FEDERKRAFTBREMSE 205/103 V DC 1500 NM 1 St. 440/110 W 65 H7 18.10.12 Rostschutzverpackung-Reibfläche fettfrei halten! CE</p>
Type (see product key)		Type No.	
Name			
Release voltage/holding voltage	Rated torque	Quantity per box	
Release power/holding power	Hub diameter	Packing date	
Additional information		CE designation	

Nameplate			Example
Manufacturer		CE designation	<p>INTORQ D-Aerzen BFK471-25N CE 205/103 V DC 440/110 W 65 H7 Nr.:33001067 1500 NM 18.10.12</p>
Type (see product key)			
Release voltage/holding voltage	Release power/holding power	Hub diameter	
Type No.	Rated torque	Production date	
			<small>BFK471_001.iso/dms</small>

Document history

Material number	Version			Description
33002383	1.0	02/2013	TD09	First edition

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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 _H	A	Holding current at 20 °C and holding voltage
I _L	A	Release current at 20 °C and release voltage
I _N	A	Rated current at 20 °C and rated voltage
M _A	Nm	Tightening torque of the fixing screws
M _N	Nm	Rated torque of brake, rated value at a relative speed of 100 rpm
n _{max}	rpm	Maximum speed during the slipping time t ₃
P _H	W	Coil power during holding, through normal excitation and 20 °C
P _L	W	Coil power during release, through normal excitation and 20 °C
P _N	W	Rated coil power at rated voltage and 20 °C
Q	J	Heat/energy
Q _E	J	Max. permissible friction work per switching cycle, thermal rating of the brake
Q _R	J	Braking energy, friction work
Q _{Smax}	J	Max. permissible friction work during cyclic switching, depending on the operating frequency
R _N	Ohm	Rated coil resistance at 20 °C
S _h	1/h	Operating frequency, the number of repeated operations per unit time
S _{hue}	1/h	Transitional operating frequency, thermal rating of the brake
S _{hmax}	1/h	Maximum permissible operating frequency, depending on the friction work per operation
s _L	mm	Air gap, movement of armature plate by switching the brake
s _{LN}	mm	Rated air gap
s _{Lmin}	mm	Minimum air gap
s _{Lmax}	mm	Maximum air gap
t ₁	ms	Engagement time, the total of the reaction delay and torque rise time $t_1 = t_{11} + t_{12}$
t ₂	ms	Disengagement time, time from switching the stator until the torque has reduced to 0.1 M _K
t ₁₁	ms	Slipping time to standstill (after t ₁₁)
t ₁₁	ms	Delay time when connecting, time from disconnecting the voltage until the torque begins to rise
t ₁₂	ms	Rise time of braking torque, time from beginning of rise of torque until braking torque is reached
t _{ue}	S	Overexcitation time
U	V	Voltage
U _H	V DC	Holding voltage by change of voltage
U _L	V DC	Release voltage by change of voltage
U _N	V DC	Rated coil voltage for brakes which require automatic voltage changing, the rated coil voltage U _{rated} is the same as the release voltage U _L


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

- 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.

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

Warranty

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

2 Safety instructions

2.1 General safety information

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

In accordance with IEC 60364 or CENELEC HD 384, qualified, skilled personnel are persons ...

 - ... who are familiar with the installation, mounting, commissioning, and operation of the product.
 - ... who have the qualifications necessary for their occupation.
 - ... who know and apply all regulations for the prevention of accidents, directives, and laws relevant on site.
- Risk of burns!
 - Surfaces may be hot during operation! Provide for protection against accidental contact.
- Risk of injury due to a rotating shaft!
 - Wait until the motor is at standstill before you start working on the motor.
- The friction lining and the friction surfaces must by no means have contact to oil or grease since even small amounts reduce the brake torque considerably.
- The brake is designed for operation under the environmental conditions that apply to IP66. 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
- 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.
- No explosive or aggressive atmosphere.

Check bore hole



Note!

In the case of strongly fluctuating temperatures/increased water condensation, drain the condensed water from time to time via the check bore hole (metal screwed cap) provided for this purpose.

3 Technical data

3.1 Product description

3.1.1 Important notes

STOP **Stop!**
 This brake is only to be actuated with a bridge half-wave rectifier (included in the scope of supply). The power input during the release is 440 W for 1.3 sec., then it is reduced to 110 W.

3.1.2 Structure and function

i **Note!**
 Due to the structural design of the stator, the air gap cannot be installed downstream.

- When the wear limit is reached:
 - in the case of the one-rotor design, the rotor must be replaced
 - in the case of the double-rotor design, the "Flange complete" unit and the rotor must be replaced.

One-rotor design

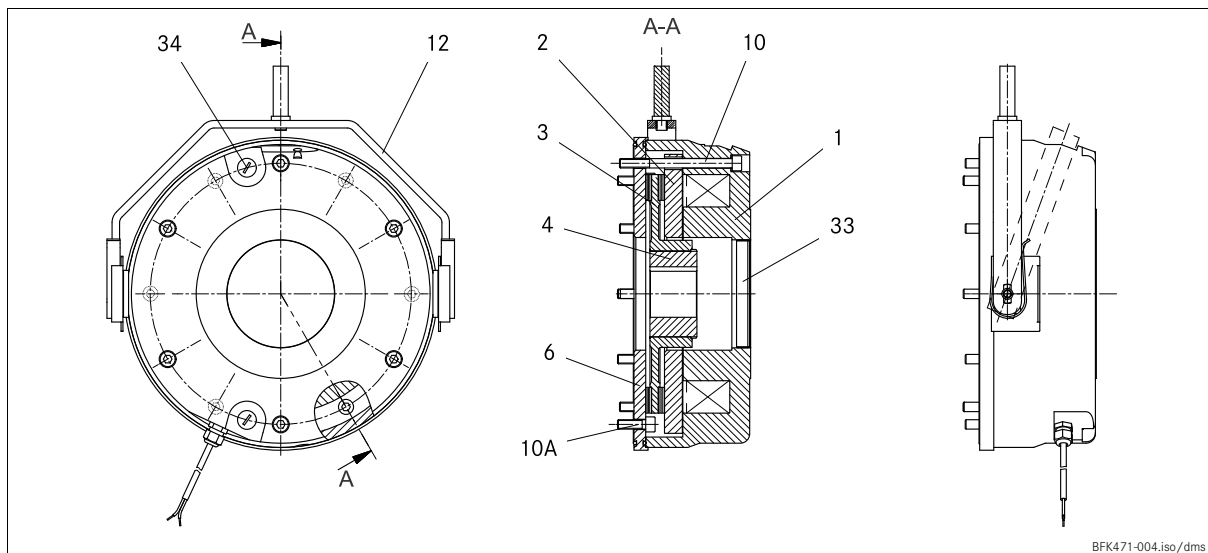
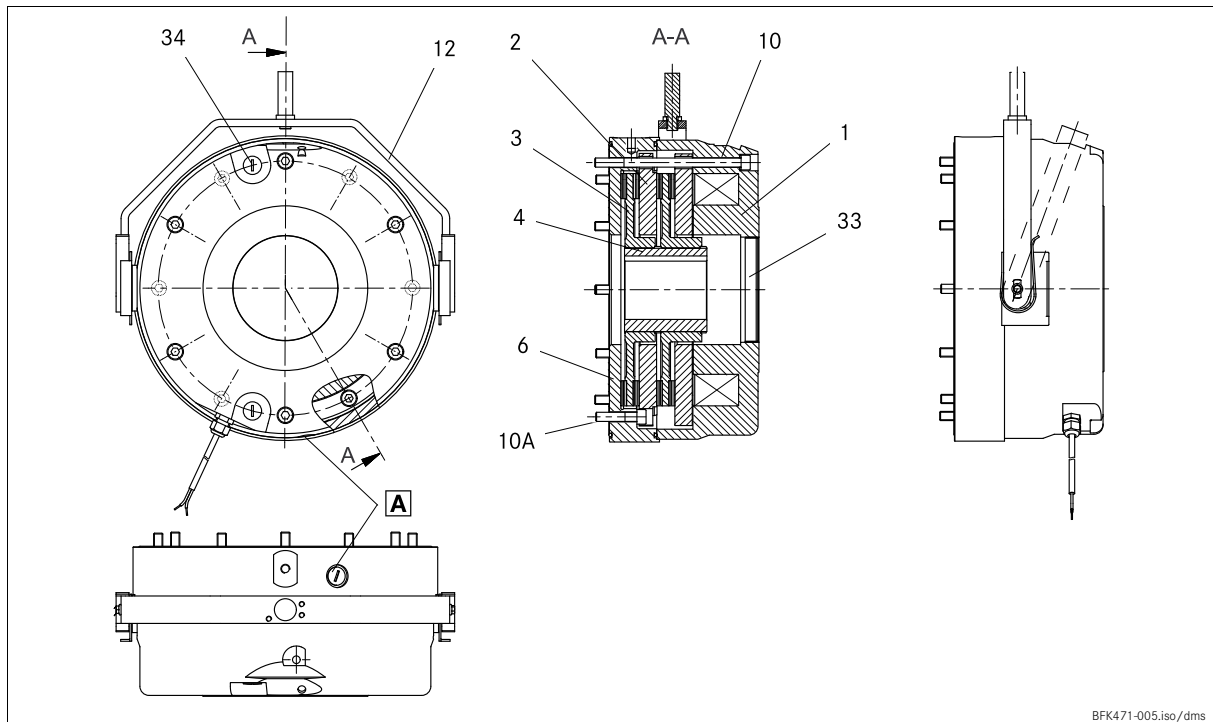


Fig. 1 Design of the BFK471-25 spring-applied brake, one-rotor design

1	Complete stator	4	Hub	12	Manual release
2	Armature plate	6	Flange	33	Cover plate
3	Complete rotor	10	Cheese head screw DIN 912	34	Locking screw
		10A	Cheese head screw DIN 912 (short)		

3 Technical data

Double-rotor design



A Check bore hole with cover plate

Fig. 2 Design of the BFK471-25 spring-applied brake, double-rotor design

1	Complete stator	4	Hub	12	Manual release
2	Armature plate	6	Flange	33	Cover plate
3	Complete rotor	10	Cheese head screw DIN 912	34	Locking screw
		10A	Cheese head screw DIN 912 (short)		

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 spring-applied brake is a disc brake which, depending on the version, has two or four friction surfaces. The braking torque is generated by several compression springs by friction locking. The brake is released electromagnetically.

3.1.3 Braking

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

3 Technical data


3.1.4 Brake release

In braked state, there is an air gap "s_L" between the stator (1) and the armature plate (2). To release the brake, the coil of the stator (1) is excited with the DC voltage provided. The magnetic force generated attracts the armature plate (2) towards the stator (1) against the spring force. The rotor (3) is then released and can rotate freely.

3.1.5 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.
- If the brake is used as a pure holding brake without dynamic load, the friction lining must be reactivated regularly.

3.2 Transport of the brake

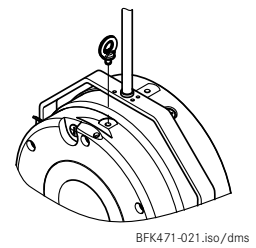
 **Danger!**

Completely screw in transport aids (such as eye bolts or bearing plates), they must be flat and applied over their entire surface!

If possible, the transport aids (such as eye bolts or bearing plates) must be stressed vertically in the direction of the screw axis! Angular tension or tension to the sides reduces the payload! Observe the information provided in the DIN 580!

Use additional appropriate lifting aids, if required, to achieve a direction of loading which is as vertical as possible (highest payload). Secure lifting aids against shifting!

By default, these brakes are provided with a transport thread for eye bolts complying with DIN 580. The position of the thread can be gathered from the following representation. The eye bolts are not included in the scope of supply.

Positioning	Thread, standard eye bolt
 <p style="font-size: small; text-align: center;">BFK471-021.iso/dms</p>	M10, DIN580

Tab. 1 Positioning of the eye bolt

3 Technical data

3.3 Characteristics

Type BFK471-25	Max. speed ¹⁾ n _{max}	Temperature class Stator	Operating time	Moment of inertia Rotor	Weight			
					Hub	Flange	Complete stator	Brake
Design	[rpm]		[%]	[kgcm ²]	[kg]	[kg]	[kg]	[kg]
with one rotor	1800	F	100	200	1.8	7.2	46.5	58
double rotor	1800	F	100	200+200	2.7	23.8	46.5	75

¹⁾ Maximum speed (for higher speeds, contact the manufacturer)

Tab. 2 General data of the brake

Type BFK471-25	Air gap		Rotor thickness	
	s _{LN} [mm]	s _{Lmax} [mm]	min. [mm]	max. [mm]
with one rotor	0.5	1.5	19.1	20.0
double rotor	0.8	1.5	19.7 + 19.7	20.0

Tab. 3 Air gap / rotor thickness

Type BFK471-25	Outer diameter	Pitch circle		Fixing screws DIN912/ISO4762 with flange	Minimum thread depth with flange	Tightening torque
		∅ [mm]	Thread			
Design	[mm]	[mm]		[mm]	[mm]	M _A [Nm]
with one rotor	333	278	12 x M10	6 x 120 *	19	48 ±10%
				6 x 30		
double rotor				6 x 160 *	19	
				6 x 45		

* Please note: with USIT discs (seal)

Tab. 4 Mounting data



Stop!

- The minimum thread depth must be observed, Tab. 4.
- If the required thread depth is not observed, the fixing screws may run into the thread root. As a result, the required preload force will no longer be built up and the brake will no longer be fixed securely!

3 Technical data

3.4 Rated data

Type	Voltage		Power		Coil resistance	Current	
	Release $\pm 10\%$ (1.3 sec.)	Holding $\pm 10\%$	Release	Holding		Release	Holding
	U_L [V] DC	U_H [V] DC	P_L [W]	P_H [W]	$R_N \pm 5\%$ [Ω]	I_L [A]	I_H [A]
BFK471-25	205	103	440	110	96.5	2.14	1.07
	360	180	440	110	294.6	1.22	0.61

Tab. 5 Coil powers of the BFK471-25

Type BFK471-25	Characteristic torque M_K at 100 rpm [Nm]	Reduction of characteristic torque M_K to X [%]	
		1500 rpm	1800 rpm
Design			
with one rotor	750	70 %	65 %
double rotor	1500		

3 Technical data

3.5 Operating times

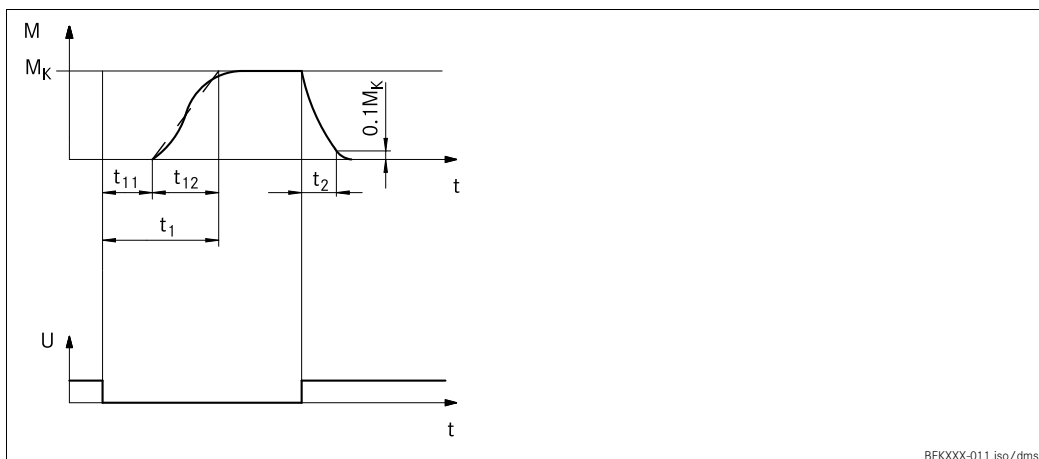


Fig. 3 Operating times of the spring-applied brakes

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

Engagement time

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

- 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: 29
- The engagement times are approx. 10 times longer with **AC switching**.
 - Connection: 28

Disengagement time

The disengagement time is identical for DC and AC switching. The disengagement times specified always refer to the control with overexcitation, i.e. current feed with $U_L = U_N$ (release voltage = rated coil voltage).

3 Technical data



Type BFK471-25	Characteristic torque M_N [Nm]	Max. perm. friction energy Q_E [J]	Transition operating frequency S_{hue} [1/h]	Operating times [ms] at s_{LN} and $0.7 I_N$				
				DC engagement ¹⁾			Disengage	
				t_{11}	t_{12}	t_1	$t_2 s_{LN}$	$t_2 s_{Lmax}$
with one rotor	750	90000	16	120	200	320	350	1050
double rotor	1500	180000	8				450	

1) Measured with induced voltage limitation -150 V DC

Tab. 6 Switching energy - operating frequency - operating times

3.6 Friction work / operating frequency

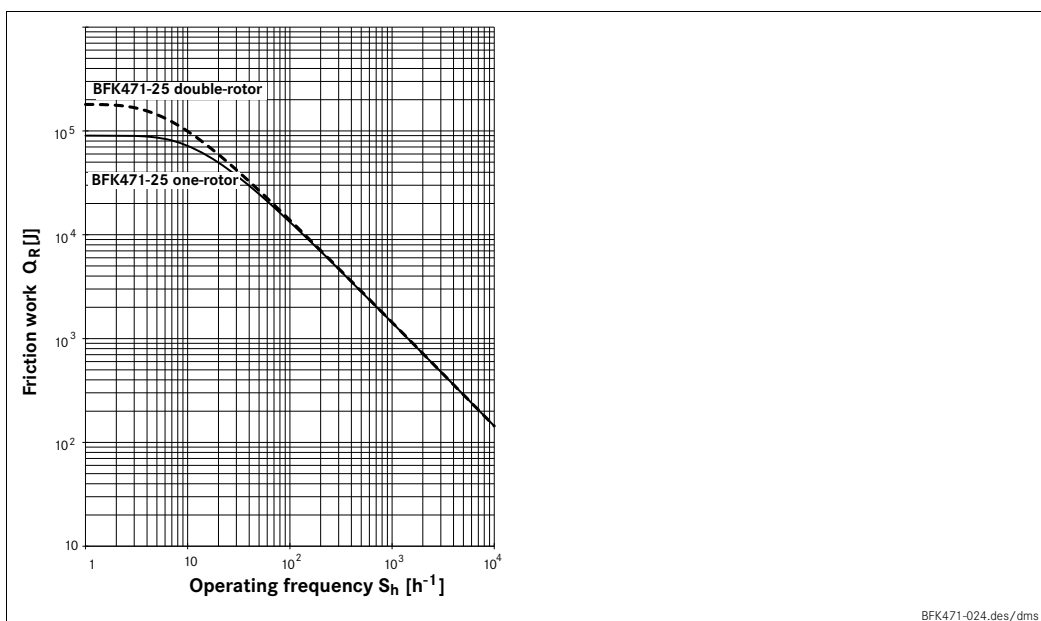


Fig. 4 Switching energy as a function of the operating frequency

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

The permissible operating frequency S_{hmax} depends on the quantity of heat Q_R (see Fig. 4). If the operating frequency S_h is specified, the permissible quantity of heat Q_{smax} will result.

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

3.7 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.

Noise

The switching noise during engagement and disengagement varies depending on the air gap "s_L" 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.

Others

The abrasion of the friction parts produces dust.

4 Mechanical installation

4.1 Important notes



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

4.1.1 Design of end shield and motor shaft



- Comply with the mentioned minimum requirements regarding the end shield and the motor shaft to ensure a correct function of the brake.
- The diameter of the shaft shoulder must not be greater than the tooth root diameter of the hub.
- The form and position tolerances exclusively apply to the materials mentioned. If other materials are used, please contact INTORQ.
- The brake flange must be supported by the end shield across the full surface.




Design of the end shield

Type	Minimum requirements				
	Material	Evenness [mm]	Axial runout [mm]	Roughness ¹⁾	Others
BFK471-25	Cast Steel	< 0.08	0.08	Rz max 16	<ul style="list-style-type: none"> ■ Threaded holes with minimum thread depth ≥ 16 ■ Free of grease and oil

1) In particular near the O-rings
Tab. 7 Minimum requirement for the leakproofness

4.1.2 Necessary tools

Type	Torque key	Insert for hexagon socket screws
BFK471-25	 Measuring range [Nm] 20 - 100	 Wrench size [mm] 8x1/2" square

Type	Feeler gauge	Caliper gauge	Multimeter
BFK471-25			

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

4.3.1 Brake assembly



Stop!

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

Installation of the hub onto the shaft

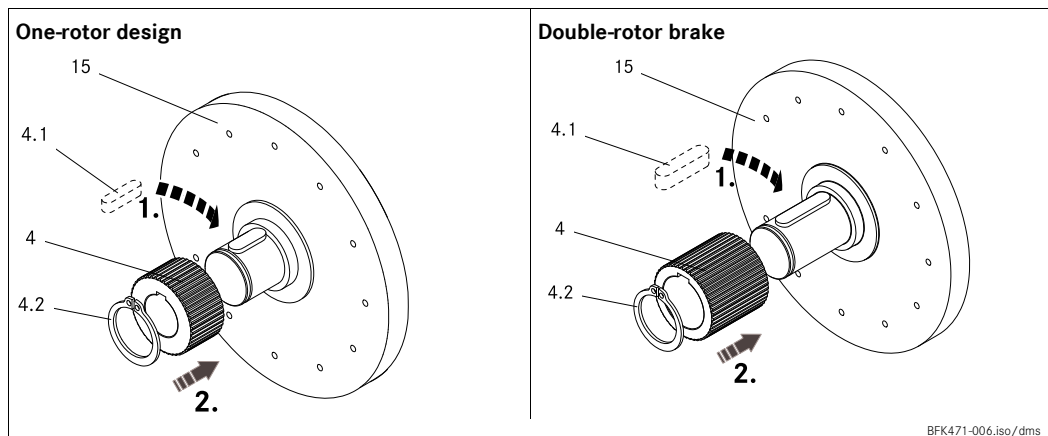


Fig. 5 Mounting the hub onto the shaft

4	Hub	4.1	Keyway	4.2	Circlip
15	End shield				

1. Insert keyway (4.1) into the shaft.
2. Press hub (4) onto the shaft.
3. Secure hub against axial displacement, e.g. by using a circlip (4.2).



Stop!

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

4 Mechanical installation

4.3.1.1 One-rotor design

Mount the flange

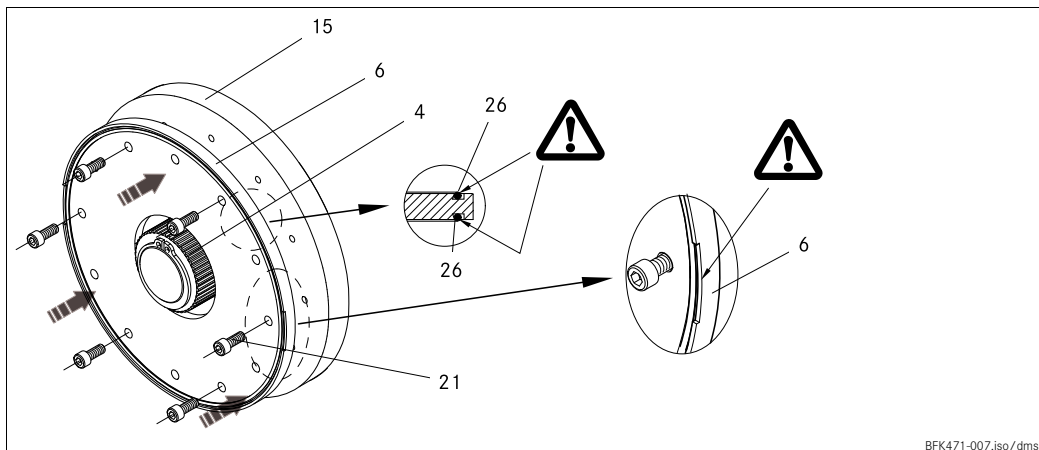


Fig. 6 Assembly of the flange

4 Hub	15 End shield	26 O-rings
6 Flange	21 Fixing screws	

1. Check fit of the two O-rings (26) in the flange (6).
2. Push flange (6) onto the shaft.
 - Observe flange position relating to the recesses for the manual release!
 - The chamfer at the flange must be directed towards the motor end shield!
 - Align through holes of the flange (6) with the fixing holes in the end shield (15) and tighten to the flange using the fixing screws (21). Tightening torque \square 16 - use torque key!

Assembly of the rotor

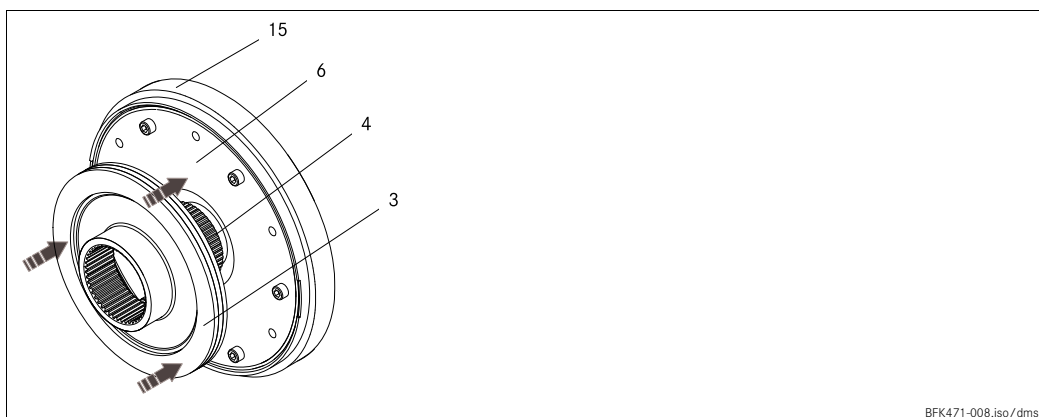


Fig. 7 Mounting of one-rotor design

3 Rotor	6 Flange	15 End shield
4 Hub		

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

4 Mechanical installation

Assembly of the stator

1. Push the complete stator (1) onto the shaft.

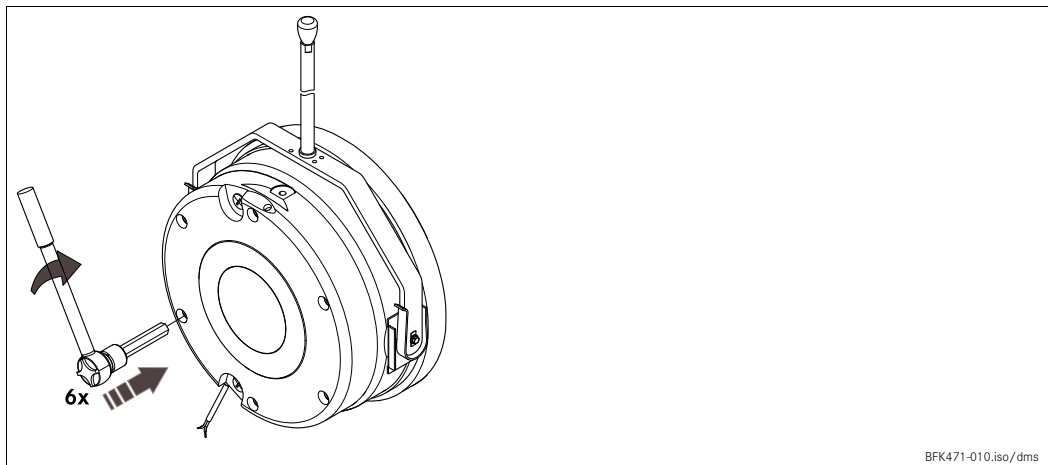
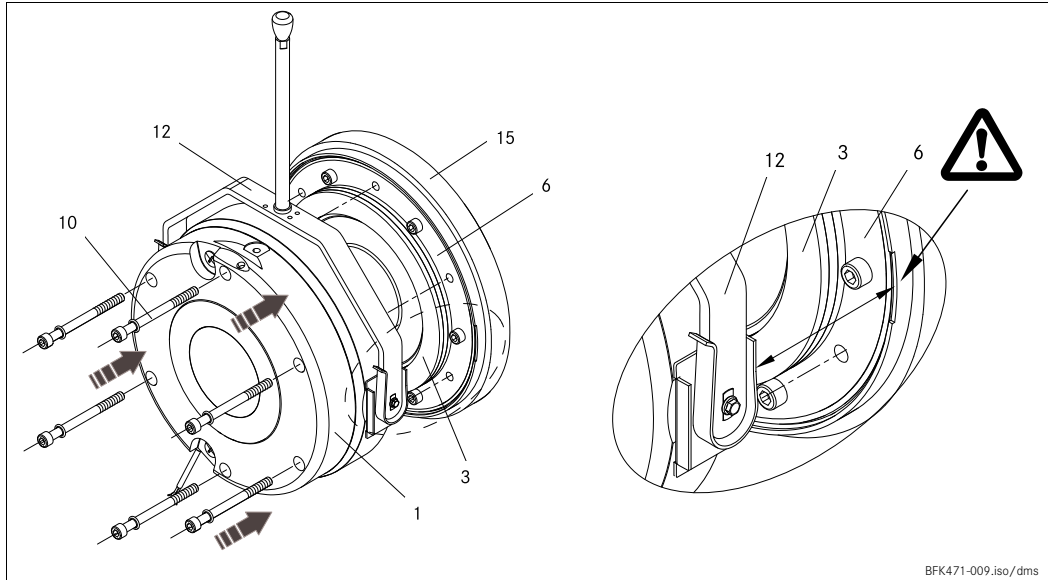


Fig. 8 Assembly of the stator

- | | | |
|-------------------|-------------------------------------|----------------------------|
| 1 Complete stator | 6 Flange | 12 Complete manual release |
| 3 Complete rotor | 10 Cheese head screw with USIT ring | 15 End shield |

2. Screw the complete stator (1) onto the end shield (15) using the screw set supplied (10). Tightening torque \square 16 - use torque key!



Stop!

In order to ensure leakproofness, the screw set with USIT rings (included in the scope of supply) must be used!

4 Mechanical installation

4.3.1.2 Double-rotor design

Mount the flange

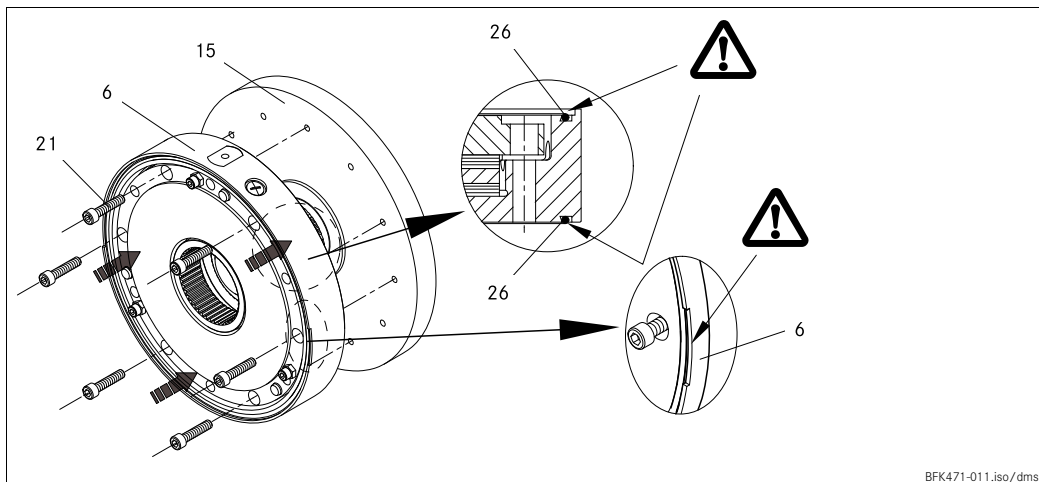


Fig. 9 Assembly of the flange

4	Hub	15	End shield	26	O-ring
6	Flange complete	21	Fixing screws		

1. Check fit of the two O-rings (26) in the flange (6).
2. Push flange (6) onto the shaft.
 - Observe flange position relating to the recesses for the manual release!
 - The chamfer at the flange must be directed towards the motor end shield!
 - Align through holes of the flange (6) with the fixing holes in the end shield (15) and tighten to the flange using the fixing screws (21). Tightening torque \square 16 - use torque key!

Assembly of the rotor

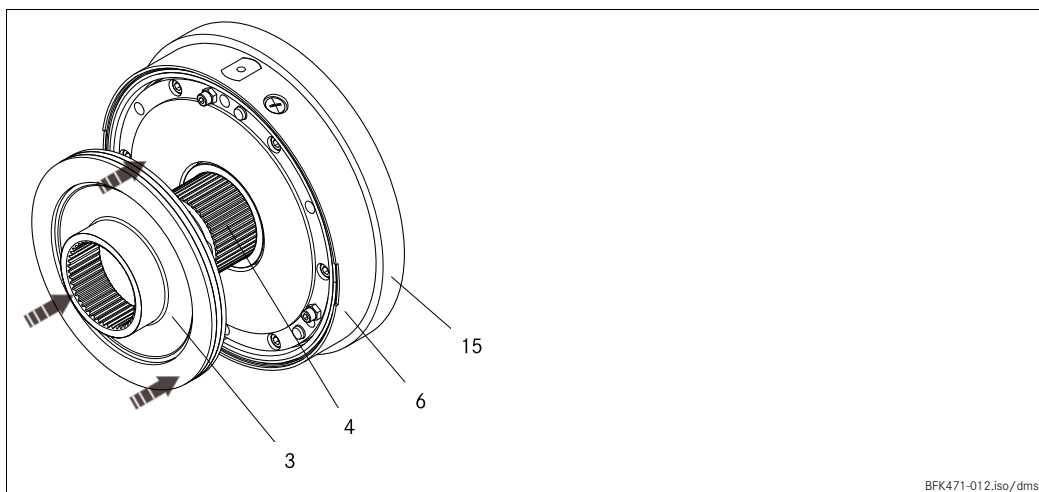


Fig. 10 Mounting of double-rotor design

3	Complete rotor	6	Flange complete	15	End shield
4	Hub				

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

4 Mechanical installation

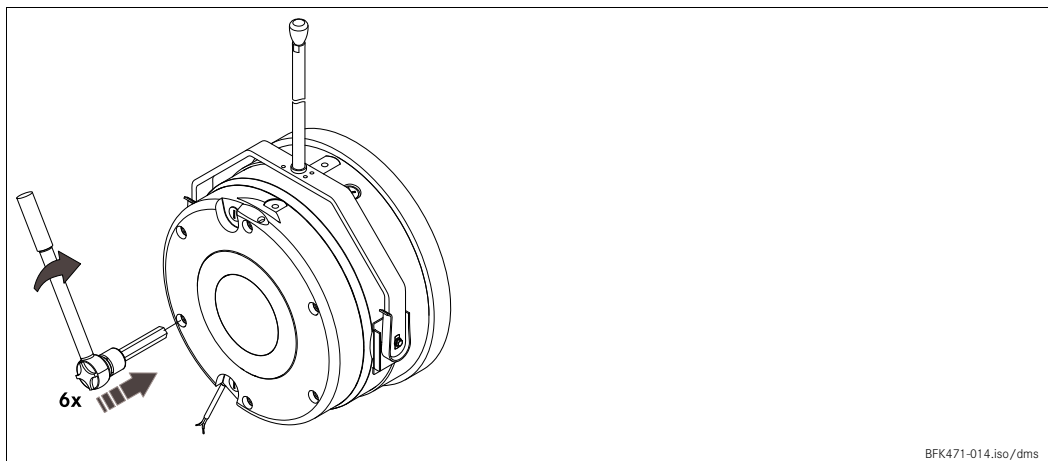
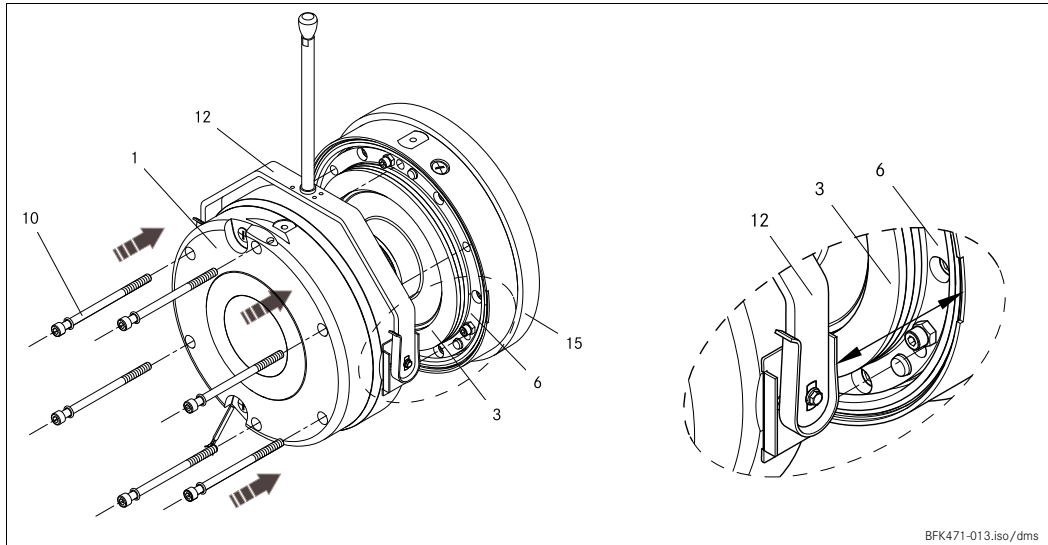


Fig. 11 Assembly of the stator

- | | | |
|-------------------|-------------------------------------|----------------------------|
| 1 Complete stator | 6 Flange complete | 12 Complete manual release |
| 3 Complete rotor | 10 Cheese head screw with USIT ring | 15 End shield |

4. Screw the complete stator (1) onto the end shield (15) using the screw set supplied (10). Tightening torque \square 16 - use torque key!



Stop!

In order to ensure leakproofness, the screw set with USIT rings (included in the scope of supply) must be used!

5 Electrical installation

5.1 Important notes



Danger!

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



Stop!

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



Stop!

This brake is only to be actuated with a bridge half-wave rectifier (included in the scope of supply). The power input during the release is 440 W for 1.3 sec., then it is reduced to 110 W.

5.2 Bridge/half-wave rectifiers

BEG-56 1-□□□-□□□

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.

Once a set overexcitation time has elapsed, the bridge/half-wave rectifiers switch over from bridge rectification to half-wave rectification.

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



For more information see the documentation for the bridge half-wave rectifier (included in the scope of supply).

5 Electrical installation

Rectifier types	AC voltage	Coil voltage U_L release/ U_H holding
	[V AC]	[V DC]
BEG-561-255-130	230 $\pm 10\%$	205 / 103
BEG-561-440-130	400 $\pm 10\%$	360 / 180

The brake requires a voltage switch-over. The rated voltage of the brake corresponds to the release voltage $U_N = U_L$.

5.3 Electrical connection

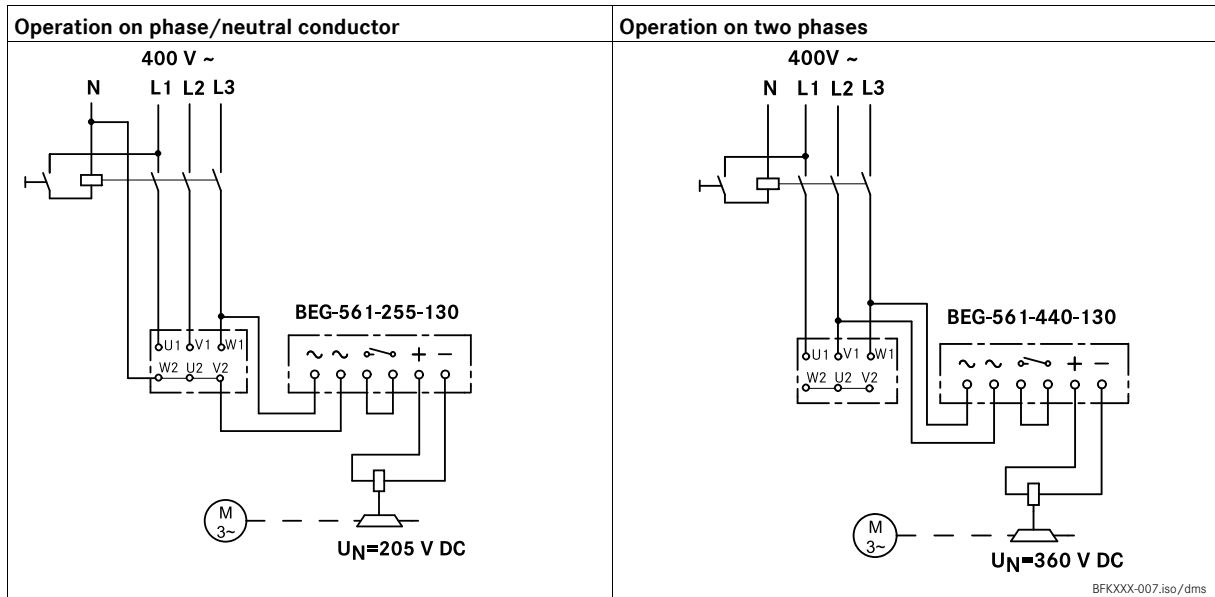
5.3.1 Circuit proposals



Stop!

If the rectifier is connected to the neutral point of the motor, the neutral conductor must **additionally** be connected to this point. Otherwise the rectifier and the brake may be damaged if a mains phase fails.

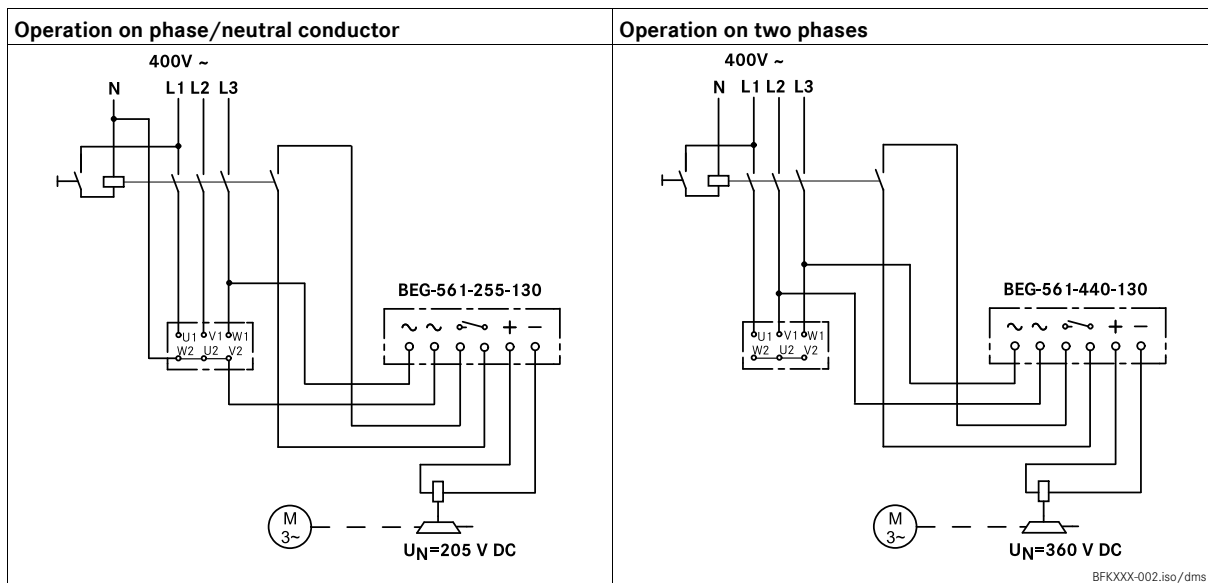
AC switching - delayed engagement



5 Electrical installation



DC switching - fast engagement



6 Commissioning and operation

6.1 Important 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. They 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.
- If the brake is used as a pure holding brake without dynamic load, the friction lining must be reactivated regularly.

**Danger!**

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

**Danger!**

Live connections must not be touched.

6 Commissioning and operation

6.2 Commissioning


1. Switch on drive system.
2. Carry out several test brake checks.

6.3 During operation




Danger!

Live connections must not be touched.

- Check the brake regularly during operation. Take special care of:
 - unusual noises or temperatures
 - loose fixing elements
 - the condition of the electrical cables
 - The armature plate must be attracted and the rotor must move without residual torque.
- 3. Measure the DC voltage at the brake.
 - For approx. 1.3 sec., the high release voltage is applied. Then the system is dropped to holding voltage (see nameplate).
- If faults occur, go through the error search table,  41. If the fault cannot be eliminated, please contact your customer service.

7 Maintenance/repair

7.1 Wear of spring-applied brakes

INTORQ spring-applied brakes are wear-resistant and designed for long maintenance intervals. The friction lining and the mechanical brake components are subject to function-related wear. For safe and trouble-free operation, the brake must be checked at regular intervals or, if necessary, be replaced,  33.

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 flange	Rubbing of brake lining	Armature plate and flange are run in	Friction work
Splining of brake rotor	Relative movements and shocks between brake rotor and brake shaft	Wear of splining (primarily on the rotor side)	Number of start/stop cycles
Brake support	Load alternations and shocks in reversal error between the armature plate, guide pins	Play of armature plate and guide pins	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, (☞ 32). 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.

7.2.2 Maintenance intervals

Time interval	for service brakes:	for holding brakes with emergency stop:
	<ul style="list-style-type: none"> ■ according to service life calculation ■ otherwise every six months ■ after 4000 operating hours at the latest 	<ul style="list-style-type: none"> ■ at least every 2 years ■ after 1 million cycles at the latest
Inspections with assembled brake	<ul style="list-style-type: none"> ■ Check release function and control once a year ■ Check air gap s_L; check screw plug; check O-rings <div style="text-align: right;">☞ 38</div>	
Inspections after removing the brake	<ul style="list-style-type: none"> ■ Check rotor 	
	<ul style="list-style-type: none"> ■ Check hub ■ Check armature plate and counter friction face <div style="text-align: right;">☞ 37</div>	

7 Maintenance/repair

7.3 Maintenance



Note!

Generally observe the following for inspections and maintenance works:

- Brakes with defective armature plates, cheese head screws, springs or counter friction faces must always be replaced completely.
- Remove impurities through oil and grease using brake cleaning agents.
 - Identify and remove the cause of impurity
 - If required, replace the brake.
- After replacing the rotor, the original braking torque will not be reached until the run-in operation of the friction surfaces has been completed. After replacing the rotor, run-in armature plates and counter friction faces have an increased initial rate of wear.



Note!

For maintenance work, the brake must be detached.

7 Maintenance/repair

7.3.1 Disassembling the one-rotor brake

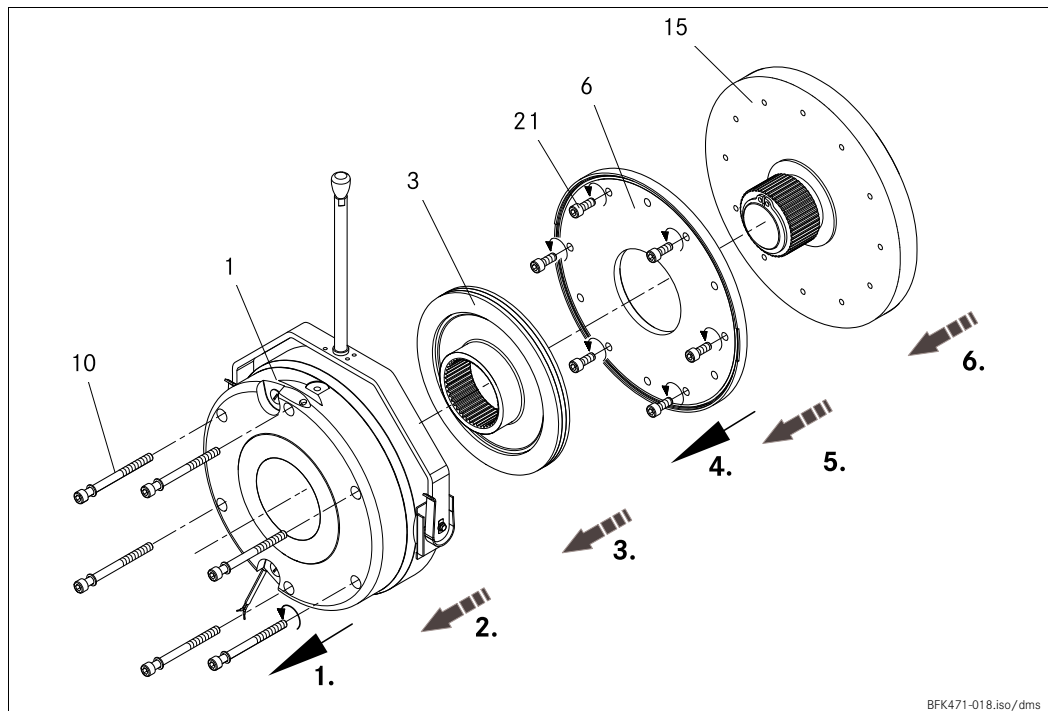


Fig. 12 Brake disassembly

1 Stator	3 Rotor	21 Fixing screws
6 Flange	10 Cheese head screws	15 End shield

1. Disconnect the connection cable.
2. Loosen cheese head screws (10) and remove them.
3. Detach stator (1) from the shaft.
4. Detach rotor (3) from the hub.
5. Loosen fixing screws (21) and remove them.
6. Remove flange (6) from the end shield (15).

7 Maintenance/repair

7.3.2 Disassembling the double-rotor brake

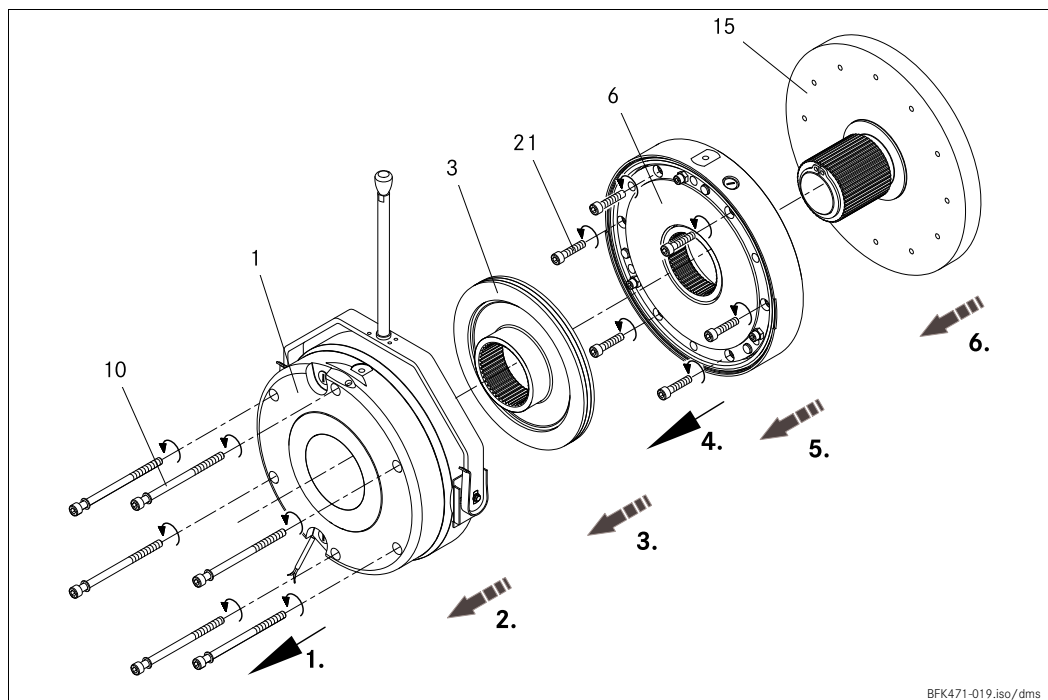


Fig. 13 Brake disassembly

1 Stator	3 Rotor 2	21 Fixing screws
6 "Flange incl. rotor" unit	10 Cheese head screws	15 End shield

1. Disconnect the connection cable.
2. Loosen cheese head screws (10) and remove them.
3. Detach stator (1) from the shaft.
4. Detach rotor (3) from the hub.
5. Loosen fixing screws (21) and remove them.
6. Detach "Flange complete" unit (6) from the hub.

7 Maintenance/repair

7.3.3 Check brake



Danger!

Disconnect voltage. The brake must be free of residual load torque.

1. Disassemble brake, 35 and 36.
2. Check rotor:
 - Rotor thickness
 - Measure the rotor thickness using a caliper gauge.
 - Compare the measured rotor thickness with the minimally permissible rotor thickness, 16.
 - If necessary, exchange the rotor.
 - Toothing
 - Check toothing of the rotor.
 - If the toothing is damaged, replace the rotor.
3. Check hub:
 - Toothing
 - Check toothing of the hub.
 - If the toothing is damaged, dismount and replace the hub.
4. Check armature plate:
 - Thermal damage
 - In the case of thermal damage (dark blue tarnishing), replace the stator.
 - Levelness < 0.15 mm
5. Check counter friction face:
 - A Flange
 - Maximum insertion depth < 0.1 mm.
 - In the case of strong scoring, replace the flange.
 - In the case of thermal damage (dark blue tarnishing), replace the flange.



Stop!

If the brake is mounted again, use new INTORQ screw sets!

6. Assembly brake, 22.
7. Connect supply cable.
8. Recommission the brake, 30.



Stop!

In the case of the double rotor brake, the second rotor is part of the "Flange complete" unit. If required, this unit must be replaced completely and must not be disassembled!

7 Maintenance/repair



Note!

After replacing the rotor, the original braking torque will not be reached until the run-in operation of the friction surfaces has been completed. After replacing the rotor, run-in armature plates and flanges have an increased initial rate of wear.

7.3.4 Release / voltage



Danger!

Live connections must not be touched.

1. Observe the brake function during operation of the drive. The armature plate must be attracted and the rotor must move without residual torque.
2. Measure the DC voltage at the brake.
 - Compare the DC voltage measured with the voltage specified on the nameplate. A 10 % deviation is permissible.

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

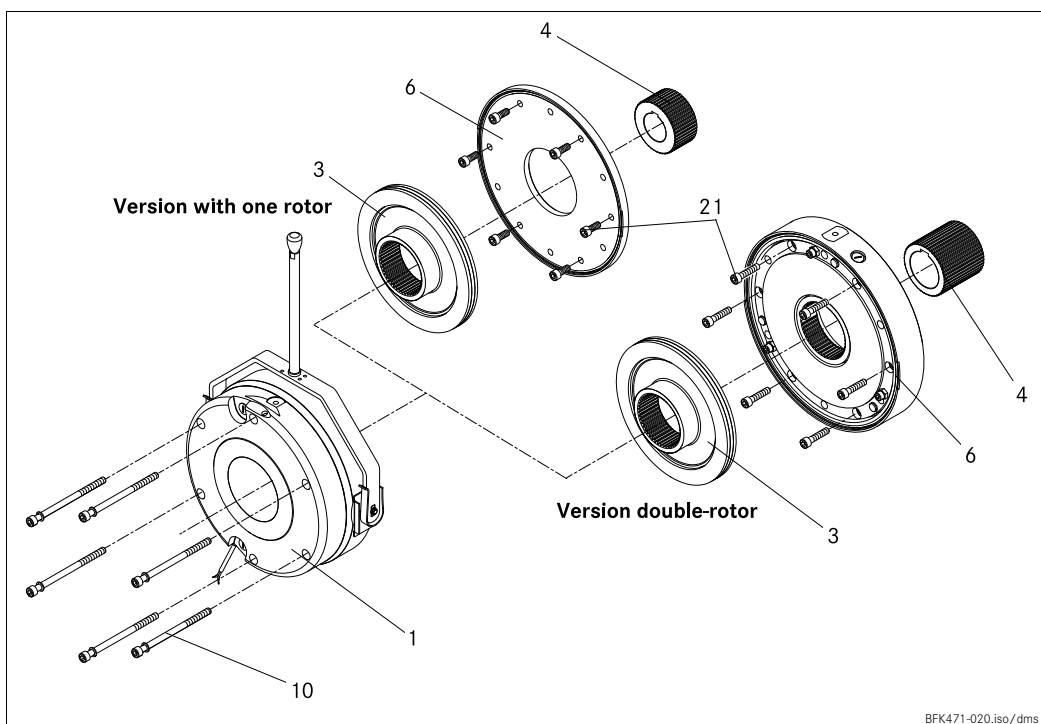


Fig. 14 BFK471 spring-applied brake

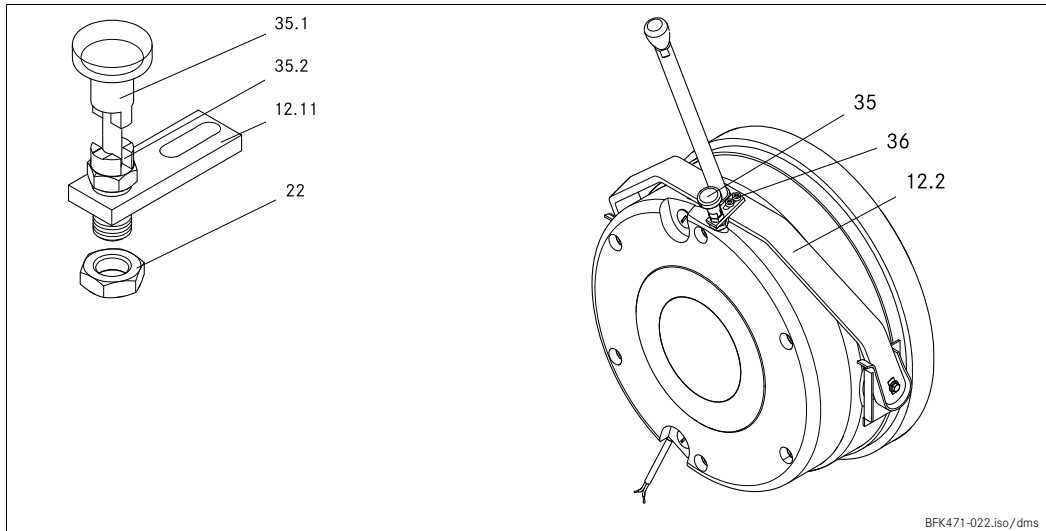
Pos.	Name	Variant
1	Complete stator	Voltage, characteristic torque
3	Complete rotor	
4	Hub	Bore diameter
6	Flange "Flange incl. rotor" unit	One-rotor design Double-rotor design
10	Fixing screws with USIT rings Cheese head screw set DIN912	One-rotor design Double-rotor design
21	Fixing screw set	For flange mounting (one-rotor design) For "Flange complete" unit (double-rotor design)
35	Manual release locking element (☐ 40)	Optional

7 Maintenance/repair

7.5 Accessories

Locking element of the manual release

The locking element (35) of the manual release can be procured optionally as retrofit kit.





1. Pre-assemble clip (12.11) loosely on manual release shackle (12.2) with screws (36).
2. Screw locking pin (35.2) into clip (12.11) and secure it by means of the lock nut (22).
3. Setting approx. 1-2 mm above magnet housing.
4. Operate manual release, engage locking pin (35.2) into the bore hole in the magnet housing provided for this purpose, secure twisting the bolt head (35.1), and tighten screws (36, M6) with a tightening force of 9 Nm. The rotor must be able to rotate freely; i.e. this position is set by correspondingly moving the clip (12.11).
5. Check function of the manual release or locking element; if required, repeat the adjustment process.

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.

Maloperation of the brake

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 with multimeter: <ul style="list-style-type: none"> - Compare measured value with rated resistance. - Values:  17 - If 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 defective or wrong	<ul style="list-style-type: none"> ■ Check and correct wiring. ■ Check cable for continuity using a multimeter: <ul style="list-style-type: none"> - Replace the complete stator if a cable is defective.
	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 If DC voltage is too low: <ul style="list-style-type: none"> - Check rectifier - If diode is defective, use suitable new rectifier ■ Check 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.
	Air gap too big	Replace rotor  35 and read note
Rotor not thick enough		



Stop!

In the case of the double rotor brake, the second rotor is part of the "Flange complete" unit. If required, this unit must be replaced completely and must not be disassembled!

Deviating measured values

Measured value	Cause	Remedy
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 is missing or defective	Install fuse. Exchange fuse.