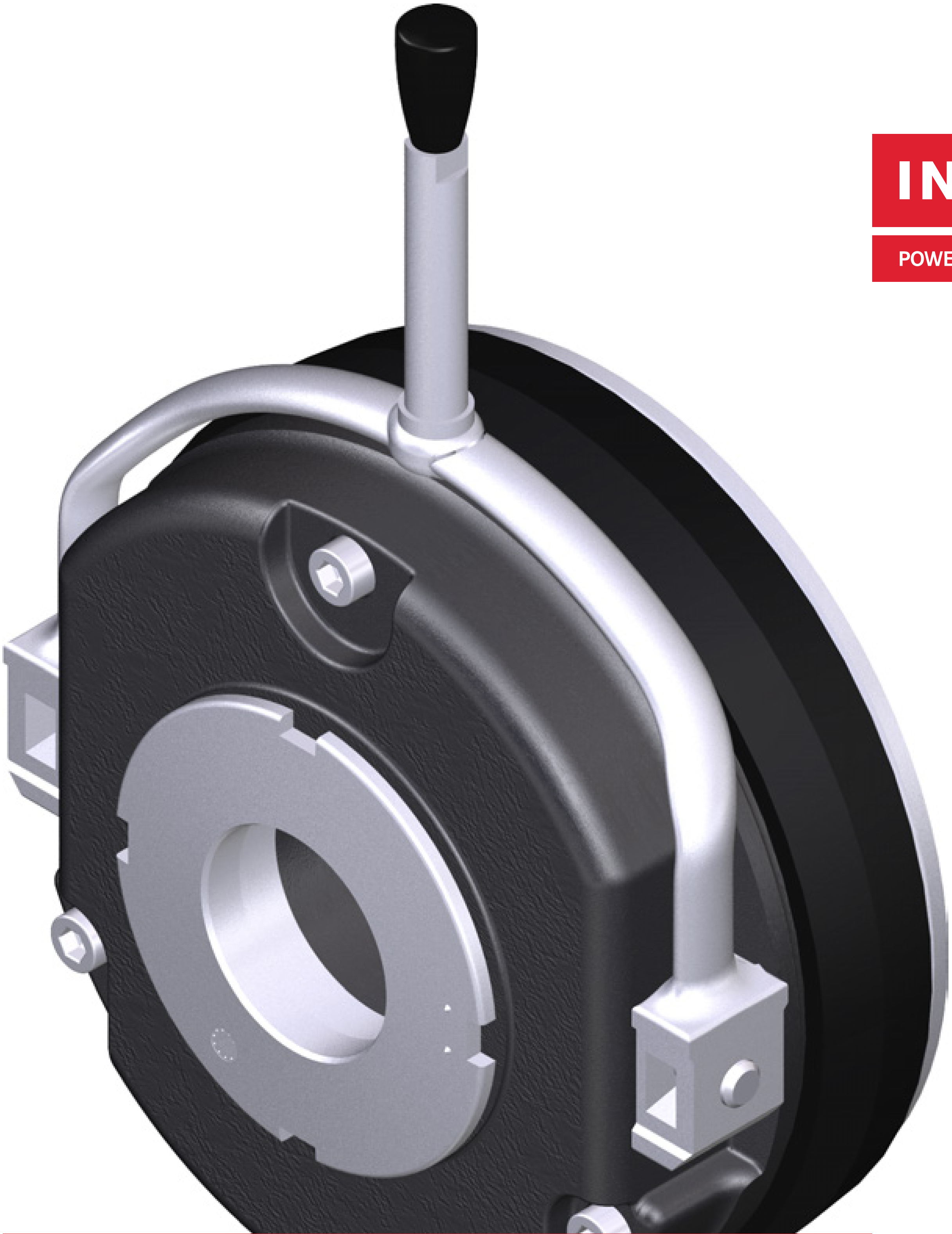


INTORQ

POWERED BY KENDRION

INTORQ BFK458-ATEX

Spring-applied brake with electromagnetic release

Translation of the Original Operating Instructions

www.kendrion.com

Document history

Material number	Version			Description
33007851	1.0	09/2019	SC	First edition
33007851	2.0	07/2021	SC	Change of name to Kendrion INTORQ Changes to Chapter 6.1, additions to Chapters 9.2 and 9.3

Legal regulations

Liability

- The information, data and notes in these Operating Instructions are up to date at the time of printing. Claims referring to drive systems which have already been supplied cannot be derived from this information, illustrations and descriptions.
- We do not accept any liability for damage and operating interference caused by:
  - inappropriate use
  - unauthorized modifications to the product
  - improper work on or with the product
  - operating errors
  - disregarding the documentation

Warranty

Notice

The warranty conditions can be found in the terms and conditions of Kendrion INTORQ GmbH.

- Warranty claims must be made to Kendrion INTORQ immediately after the defects or faults are detected.
- The warranty is void in all cases when liability claims cannot be made.

Spring-applied brakes of type BFK458-06...25

Design E	Design N
	
	Double spring-applied brake
	

Product key

INTORQ B FK □□□ □□ □

Product group: Brakes

Product family: Spring-applied brake

Type: 458

Size: 06, 08, 10, 12, 14, 16, 18, 20, 25

Design/type:
E - adjustable (brake torque can be reduced via torque adjustment ring)
N - not adjustable
L – not adjustable, long-life design

Not coded: Connection voltage, hub bore diameter, options

Checking the delivery

After receipt of the delivery, check immediately whether the items delivered match the accompanying papers.

Kendrion INTORQ does not accept any liability for deficiencies claimed subsequently.

- Claim visible transport damage immediately to the deliverer.
- Claim visible defects or incompleteness of the delivery immediately to Kendrion INTORQ.

Contents

1 General information

1.1 Using these Operating Instructions

- These Operating Instructions will help you to work safely with the spring-applied brake with electromagnetic release. They contain safety instructions that must be followed.
- All persons working on or with 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 Conventions in use

This document uses the following styles to distinguish between different types of information:

Spelling of numbers	Decimal separator	Point	The decimal point is always used. For example: 1234.56
Page reference	Underlined, red	———	Reference to another page with additional information For example: <u>Using these Operating Instructions, Page 8</u>
Symbols	Wildcard	□	Wildcard (placeholder) for options or selection details For example: BFK458-□□ = BFK458-10
	Notice	➡	Important notice about ensuring smooth operations or other key information.

1.3 Safety instructions and notices

The following icons and signal words are used in this document to indicate dangers and important safety information:

Structure of safety notices:

	⚠ CAUTION
⚠	**Icon** Indicates the type of danger **Signal word** Characterizes the type and severity of danger. **Notice text** Describes the danger. **Possible consequences** List of possible consequences if the safety notices are disregarded. **Protective measures** List of protective measures required to avoid the danger.

Danger level

	⚠ DANGER
⚠	DANGER indicates a hazardous situation which, if not avoided, *will* result in death or serious injury.

	⚠ WARNING
⚠	WARNING indicates a potentially hazardous situation which, if not avoided, *could* result in death or serious injury.

	⚠ CAUTION
⚠	CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

	NOTICE
!	Notice about a harmful situation with possible consequences: the product itself or surrounding objects could be damaged.

1.4 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

1.5 Abbreviations used

Letter symbol	Unit	Designation
F_R	N	Rated frictional force
F	N	Spring force
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_4	Nm	Torque that can be transmitted without slippage occurring (DIN VDE 0580)
M_A	Nm	Tightening torque of fastening screws
M_{dyn}	Nm	Average torque from initial speed to standstill
M_K	Nm	Rated torque of the brake, rated value at a relative speed of rotation of 100 rpm
n_{max}	rpm	Maximum occurring speed of rotation during the slipping time t_3
P_H	W	Coil power during holding, after voltage change-over and 20 °C
P_L	W	Coil power during release, before voltage change-over and 20 °C
P_N	W	Rated coil power, at rated voltage and 20 °C
Q	J	Quantity of heat/energy
Q_E	J	Max. permissible friction energy for one-time switching, thermal parameter of the brake
Q_R	J	Braking energy, friction energy
Q_{Smax}	J	Maximally permissible friction energy for cyclic switching, depending on the operating frequency
R_N	Ohms	Rated coil resistance at 20 °C
R_z	µm	Averaged surface roughness
S_h	1/h	Operating frequency: the number of switching operations evenly distributed over the time unit
S_{hue}	1/h	Transition operating frequency, thermal parameter of the brake
S_{hmax}	1/h	Maximum permissible operating frequency, depending on the friction energy per switching operation
s_L	mm	Air gap: the lift of the armature plate while the brake is switched
s_{LN}	mm	Rated air gap
s_{Lmin}	mm	Minimum air gap
s_{Lmax}	mm	Maximum air gap
t_1	ms	Engagement time, sum of the delay time and braking torque: rise time $t_1 = t_{11} + t_{12}$
t_2	ms	Disengagement time, time from switching the stator until reaching 0.1 M_{dyn}

Letter symbol	Unit	Designation
t_3	ms	Slipping time, operation time of the brake (according to t_{11}) until standstill
t_{11}	ms	Delay during engagement (time from switching off the supply voltage to the beginning of the torque rise)
t_{12}	ms	Rise time of the braking torque, time from the start of torque rise until reaching the braking torque
t_{ue}	s	Over-excitation period
U	V	Voltage
U_H	V DC	Holding voltage, after voltage change-over
U_L	V DC	Release voltage, before voltage change-over
U_N	V DC	Rated coil voltage; in the case of brakes requiring a voltage change-over, U_N equals U_L

2 Safety instructions

2.1 General safety instructions

- Never operate Kendrion INTORQ components when you notice they are damaged.
- Never make any technical changes to Kendrion INTORQ components.
- Never operate Kendrion INTORQ components when they are incompletely mounted or incompletely connected.
- Never operate Kendrion INTORQ components without their required covers.
- Only use accessories that have been approved by Kendrion INTORQ.
- Only use original spare parts from the manufacturer.

Keep the following in mind during the initial commissioning and during operation:

- Depending on the degree of protection, Kendrion INTORQ components may have both live (voltage carrying), moving and rotating parts. Such components require appropriate safety mechanisms.
- Surfaces can become hot during operation. Take appropriate safety measures (to ensure contact/ touch protection).
- Follow all specifications and information found in the Operating Instructions and the corresponding documentation. These must be followed to maintain safe, trouble-free operations and to achieve the specified product characteristics.
- The installation, maintenance and operation of Kendrion INTORQ components may only be carried out by qualified personnel. According to IEC 60364 and CENELEC HD 384, skilled personnel must be qualified in the following areas:
  - Familiarity and experience with the installation, assembly, commissioning and operation of the product.
  - Specialist qualifications for the specific field of activity.
  - Skilled personnel must know and apply all regulations for the prevention of accidents, directives, and laws relevant on site.

2.2 Safety notices for use in potentially explosive areas

⚠ DANGER

Danger of explosion

Increased temperatures on the surfaces and in the friction gap can result when the maximum friction work and operating frequencies specified by Kendrion INTORQ are exceeded. These can lead to ignition.

- Operation is only permitted within the specified specifications.

- The characteristic curve for the friction work (in the sections Dust explosive atmosphere (zone 22: non-conductive dusts), Page 30 and Gas explosive atmosphere (zone 2), Page 32) as a function of the operating frequency must not be exceeded when in an explosive atmosphere or even in emergency-stop mode.
- If the facility operator cannot ensure that the specified friction work and operating frequencies will be complied with, then the temperatures defined on the ATEX name plate for the dust zone must be monitored on the brake's magnet housing using a suitable temperature measurement mechanism. If there is no available knowledge of the occurring temperatures, then Kendrion INTORQ is no longer responsible for this ATEX certification.
- In an explosive gas atmosphere, the resulting frictional heat in the friction gap created during the braking process creates a potential source of ignition. It is not possible here to measure the temperature during braking operations. Thus, it is very important to comply with the specified values for the friction work and operating frequencies. If the values for the actual friction work and operating frequencies are not known, the brake must not be put into operation in this atmosphere.

2.3 Disposal

The Kendrion INTORQ components are made of various differing materials.

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

3 Product description

3.1 Proper and intended usage

3.1.1 Standard applications

Kendrion INTORQ components are intended for use in machinery and facilities. They may only be used for purposes as specified in the order and confirmed by Kendrion INTORQ. The Kendrion INTORQ components may only be operated under the conditions specified in these Operating Instructions. They may never be operated beyond their specified performance limits. The technical specifications (refer to Technical specifications) must be followed to comply with the proper and intended usage. Any other usage is consider improper and prohibited.

3.1.1.1 ATEX

The following is required for safely operating the Kendrion INTORQ spring-applied brakes BFK458 in hazardous areas, device category 3, zone 2/22:

The Kendrion INTORQ spring-applied brakes BFK458 described may only be used in normal operations within the following areas:

- Where an explosive atmosphere caused by gases, vapors, mists or swirled up dust is not expected,
- Or where, if these conditions nevertheless occur, then the use under these conditions may only take place rarely and for a short period of time in the sense of the ATEX guideline 2014/34/EU.

Kendrion INTORQ spring-applied brakes must never be operated outside the performance limits corresponding to ATEX brakes!

NOTICE

If the spring-applied brake shall be used as a holding/parking brake (refer to the name plate), all braking torques listed in the BFK458 spring-applied brake catalog are permissible.

DANGER

Danger of explosion

Increased temperatures on the surfaces and in the friction gap can result when the maximum friction work and operating frequencies specified by Kendrion INTORQ are exceeded. These can lead to ignition.

- Operation is only permitted within the specified specifications.

The following must always be observed when installing ATEX brakes:

- The proper functioning and correct dimensioning of the brake must be ensured before it is put into operation. The correct relation between the brake, motor, control and loads must be checked.
- If the switching times of the brake in conjunction with the control of the drive is not properly taken into consideration, the rotational speed could increase when the motor is switched off. As a result, the braking procedure would be carried out at a much higher speed and higher friction work than assumed in the preliminary design. This would result in higher temperatures, which would then pose a risk of ignition.

- Check if the rotor can be pushed when it is mounted on the hub. A sluggish heavy connection between the rotor and hub can lead to a continuous slip of the rotor. This would increase the temperature at the friction joint.
- Make sure that the air gap is properly and uniformly adjusted. An uneven air gap adjustment can lead to continuous slip of the rotor and thus to increased temperatures.
- When installing and dismantling the brake, make sure that no solids fall into the friction gap.
- Careless assembly, disassembly or operations can lead to sparking. Do not use spark-generating tools.
- Mount the brake so that it does not hit any rotating components. Ensure that there is sufficient clearance to the fan hood and fan blade.

3.2 Design

This chapter describes the variants, design and functionality of the INTORQ BFK458 spring-applied brake. The basic module E is adjustable (the braking torque can be reduced using the torque adjustment ring). The special feature for basic module L (with an identical design) is the more durable materials (torque support, guide pins, toothed intermediate ring, friction lining and gear teeth). The double spring-applied brake design is especially useful in redundant braking applications.

3.2.1 Spring-applied brake as holding/parking brake

If the spring-applied brake shall be used as a holding/parking brake, all braking torques listed in the BFK458 spring-applied brake catalog and in the BA14.0186 Operating Instructions are permissible.

The spring-applied brake is identified as a holding brake by the additional notice ("Holding brake") that is found on an additional name plate.

Example of this marking:

Haltebremse / holding brake
II 3G Ex ec IIC T4 Gc X
II 3D Ex tc IIIB 120°C Dc X

3.2.2 Spring-applied brake used as a holding brake with emergency-stop function and as a service brake

When using the spring-applied brake as a holding brake with emergency-stop functionality or as a service brake in an explosive atmosphere, it is absolutely necessary to increase the degree of protection of the brake. The following measures must be implemented:

- Use the brake with a cover ring (without a condensate drain hole) and consequently also with the Kendrion INTORQ flange/friction plate and the corresponding ring nut for attaching the cover ring (refer to the section Cover ring assembly, Page 52).
- Close the rear bore holes in the torque adjustment ring or in the magnet housing with a suitable radial shaft seal or a sealing cover (refer to the section Installing the shaft sealing ring, Page 53).
- Closing the hand vent holes using (for example) suitable plastic plugs and a suitable sealant.

The following table shows the assignments for the ID numbers of the cover rings and the sealing covers for the different sizes and the basic models N and E:

Size	Kendrion INTORQ ID number				
		Sealing cover		Radial shaft sealing ring	Taper plug
	Cover ring	Basic Model N	Basic module E		
06	405194	398804	405719	Request the ID number corresponding to the shaft diameter from Kendrion INTORQ.	GPN 605/1648 (from the manufacturer Pöppelmann)
08	405197	398805	390665		
10	405198	379810	131444		
12	405199	398802	76767		
14	405201	398803	73355		
16	405202	398801	73355		
18	120591	381517	73356		
20	120592	364510	73357		
25	120593	379257	364510		

Tab. 1: **ID number: Assignment of the cover rings and sealing covers for the basic models N and E**

3.2.3 Basic module E

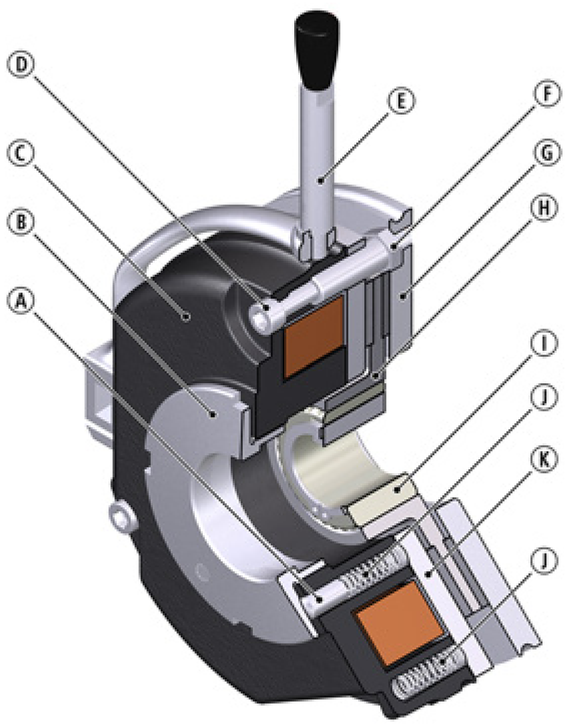


Fig. 1: **Design of a INTORQ BFK458 spring-applied brake Basic module E (complete stator) + rotor + hub + flange**

Ⓐ Tappet
Ⓑ Torque adjustment ring
Ⓒ Stator
Ⓓ Socket-head cap screw
Ⓔ Hand-release (optional)
Ⓕ Sleeve bolt
Ⓖ Flange
Ⓗ Rotor
Ⓘ Hub
Ⓙ Pressure spring
Ⓚ Armature plate

3.2.4 Basic module N

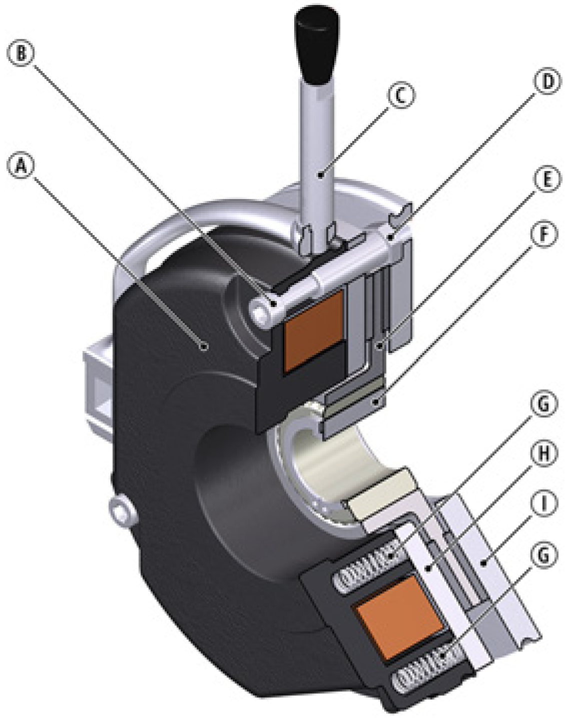


Fig. 2: **Design of a INTORQ BFK458 spring-applied brake Basic module N (complete stator) + rotor + hub + flange**

Ⓐ Stator	Ⓑ Socket-head cap screw	Ⓒ Hand-release (optional)
Ⓓ Sleeve bolt	Ⓔ Rotor	Ⓕ Hub
Ⓖ Pressure spring	Ⓗ Armature plate	Ⓘ Flange

3.2.5 Basic module L

Description of the long-life design:

- Armature plate with low backlash and reinforced torque support
- Pressure springs with guide pins for protection against shearing forces
- Aluminum rotor with toothed intermediate ring: Low-wear friction lining and low-wear gear teeth.

The long-life design can be configured modularly for size 6 to size 12 in combination with the specified rated torques. The specifications are as follows:

- The stator corresponds to the design N.
- Rear bores and extensions are not possible.

3.2.6 Double spring-applied brake

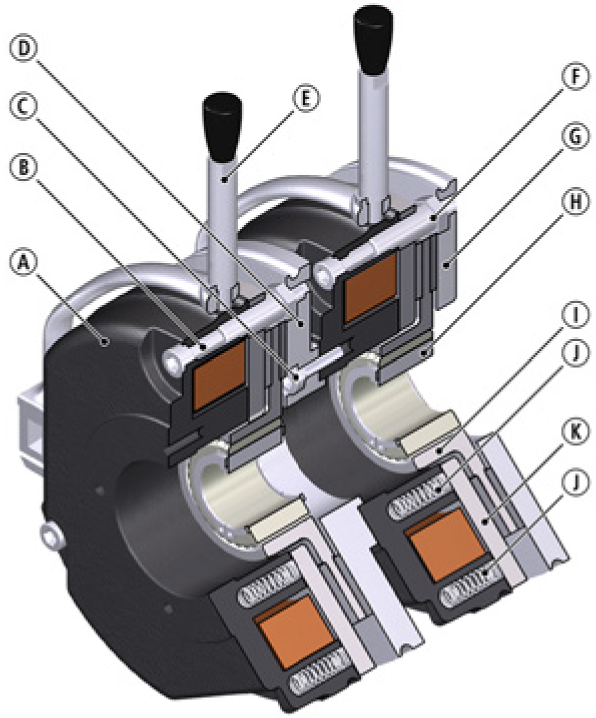


Fig. 3: **Design of a INTORQ BFK458 spring-applied brake Basic module N, doubled design with intermediate flange**

Ⓐ Stator	Ⓑ Socket-head cap screw	Ⓒ Screw for intermediate flange
Ⓓ Intermediate flange	Ⓔ Hand-release (optional)	Ⓕ Sleeve bolt
Ⓖ Flange	Ⓗ Hub	Ⓘ Rotor
Ⓙ Pressure spring	Ⓚ Armature plate	

Notice

A version of the double spring-applied brake using HFC (high-friction coefficient) linings is not permitted.

3.3 Function

This brake is an electrically releasable spring-applied brake with a rotating brake disk (rotor) that is equipped on both sides with friction linings. In its de-energized state, the rotor is clamped with braking force applied by pressure springs between the armature plate and a counter friction surface. This corresponds to a fail-safe functionality.

The brake torque applied to the rotor is transferred to the input shaft via a hub that has axial gear teeth.

The brake can be used as a holding brake, as a service brake, and as an emergency stop brake for high speeds.

The asbestos-free friction linings ensure a safe braking torque and low wear.

To release the brake, the armature plate is released electromagnetically from the rotor. The rotor, shifted axially and balanced by the spring force, can rotate freely.

3.4 Braking and release

During the braking procedure, the pressure springs use the armature plate to press the rotor (which can be shifted axially on the hub) against the friction surface. The braking torque is transmitted between the hub and the rotor via gear teeth.

When the brakes are applied, an air gap (s_L) is present between the stator and the armature plate. To release the brake, the coil of the stator is energized with the DC voltage provided. The resulting magnetic flux works against the spring force to draw the armature plate to the stator. This releases the rotor from the spring force and allows it to rotate freely.

3.5 Brake torque reduction

For the basic module E, the spring force and thus the brake torque can be reduced by unscrewing the central torque adjustment ring.

3.6 Optional configuration

3.6.1 Hand-release (optional)

To temporarily release the brake when there is no electricity available, a hand-release function is available as an option. The hand-release function can also be retrofitted.

4 Project planning notes

- When designing a brake for specific applications, torque tolerances, the limiting speeds of the rotors, the thermal resistance of the brake and the effects of environmental influences must all be taken into account.
- The brakes are dimensioned in such a way that the specified rated torques are reached safely after a short run-in process.
- Since the material properties of the friction linings are subject to fluctuations and as a result of different environmental conditions, deviations from the specified braking torque are possible. This has to be taken into account by appropriate dimensioning of the tolerances. Increased breakaway torque can occur in particular as an result of long standstill periods in humid environments with variing temperatures.
- If the brake is used as a pure holding brake without dynamic load, the friction lining must be reactivated regularly.
- You must comply with all technical specifications in order to ensure trouble-free operations of the ATEX brake. In particular, the user-specific dimensioning of the brake must be checked according to the specified limits of the friction performance charts (refer to Technical specifications, Page 21). If the limit values from the friction performance charts are not adhered to, the brake and the friction surface may overheat, which would lead to a risk of ignition. In such as case, the brake is no longer compliant with the ATEX standards.
- The permissible operating frequency (number of switching operations) corresponding to the required friction work is determined from the friction performance charts. The number of switching operations must be evenly distributed over the course of one hour.
- The correct relation between the brake, motor, control and loads must be taken into account when dimensioning the brake.
- If the operating times of the brake in conjunction with the control of the drive is not properly taken into consideration, the rotational speed could increase when the motor is switched off. As a result, the braking procedure would be carried out at a much higher speed and higher friction work than assumed in the preliminary design. This would result in higher temperatures, which would then pose a risk of ignition.
- Use only original Kendrion INTORQ friction parts (flange and armature plate) and standard friction linings (ST) for the ATEX brake.
- The brake is designed with one free cable end. This cable must be inserted into a suitable terminal box (through a cable gland) in accordance with the ATEX directives.
- Kendrion INTORQ half-wave and bridge rectifiers and spark suppressors have not been designed for use in potentially explosive atmospheres. If the use of these electrical components is necessary, they must be installed within a control cabinet that is outside the explosive atmosphere.
- To temporarily release the brake when there is no electricity available, a hand-release function is available as an option. The hand-release function can be retrofitted; for this, the hand-release holes in the magnetic housing of the brake must be closed.
- The use of a micro-switch for monitoring ventilation, wear and manual release is not permitted for brakes that are used in an explosive atmosphere.

5 Technical specifications

5.1 General information

	⚠ DANGER
EX	**Danger of explosion** Increased temperatures on the surfaces and in the friction gap can result when the maximum friction work and operating frequencies specified by Kendrion INTORQ are exceeded. These can lead to ignition. ▮ Operation is only permitted within the specified specifications.

- The characteristic curve for the friction work (in the sections Dust explosive atmosphere (zone 22: non-conductive dusts), Page 30 and Gas explosive atmosphere (zone 2), Page 32) as a function of the operating frequency must not be exceeded when in an explosive atmosphere or even in emergency-stop mode.
- If the facility operator cannot ensure that the specified friction work and operating frequencies will be complied with, then the temperatures defined on the ATEX name plate for the dust zone must be monitored on the brake's magnet housing using a suitable temperature measurement mechanism. If there is no available knowledge of the occurring temperatures, then Kendrion INTORQ is no longer responsible for this ATEX certification.
- In an explosive gas atmosphere, the resulting frictional heat in the friction gap created during the braking process creates a potential source of ignition. It is not possible here to measure the temperature during braking operations. Thus, it is very important to comply with the specified values for the friction work and operating frequencies. If the values for the actual friction work and operating frequencies are not known, the brake must not be put into operation in this atmosphere.

5.2 Possible applications of the Kendrion INTORQspring-applied brake

- Ambient temperature:
  - The ATEX spring-applied brake is designed for a duty cycle (DC) of 100% (with brake released, armature plate permanently tightened) at an ambient temperature of 40 °C as a holding/parking brake, as a holding brake with emergency-stop function, and as a service brake. At higher ambient temperatures, the duty cycle of the brake must be reduced (alternatively, the holding voltage of the brake may be reduced):
- Rated coil voltage:
  - Max. 110 % U_N
- Cooling conditions:
  - Motor with self-ventilation or forced ventilation, with thermal load according to thermal class B
- Temperature of the mounting flange for the spring-applied brake:
  - Holding brake: max. 100° C
  - Service brake in zone 2 (gas atmosphere): max. 80° C
  - Service brake in zone 22 (dust atmosphere): max. 80° C

5.3 Brake torques

NOTICE

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

Size	06	08	10	12	14	16	18	20	25
Rated torque M_K [Nm] of the brake, rated value at a relative speed of rotation of 100 rpm Standard lining (ST) and wear-resistant lining (WR)								80 E	
	1.5 E	3.5 N/E/L			25 N/E	35 N/E	65 N/E	115 N/E	175 N/E
	2 N/E/L	4 E	7 N/E/L	14 N/E/L	35 N	45 N/E	80 N/E	145 N/E	220 N
	2.5 N/E/L	5 N/E/L	9 N/E/L	18 N/E/L	40 N/E	55 N/E	100 N/E	170 N/E	265 N/E
	3 N/E/L	6 N/E/L	11 N/E/L	23 N/E/L	45 N/E	60 N/E	115 N/E	200 N/E	300 N/E
	3.5 N/E/L	7 N/E/L	14 N/E/L	27 N/E/L	55 N/E	70 N/E	130 N/E	230 N/E	350 N/E
	4 N/E/L	8 N/E/L	16 N/E/L	32 N/E/L	60 N/E	80 N/E	150 N/E	260 N/E	400 N/E
	4.5 N/E	9 N/E	18 N/E	36 N/E		90 N/E	165 N/E	290 N/E	
	5 E	10 E	20 E	40 E		100 N/E		315 N/E	
Torque reduction per detent [Nm], for design type E	0.2	0.35	0.8	1.3	1.7	1.6	3.6	5.6	6.2

Tab. 2: **Braking torques and possible brake torque reduction: Adjustable for the design types**

N Type without brake torque adjustment

E Type with brake torque adjustment

L Type in the long-life version

	Service brake (s_{Lmax} approx. 2.5 x s_{LN})
	Standard braking torque
	Holding brake with emergency stop ($s_{Lmax.}$ approx. 1.5 x s_{LN})

For basic module E, the brake torque can be reduced using the torque adjustment ring in the stator. The adjustment ring may only be unscrewed until the maximum protrusion (overhang) h_{Emax}; refer to the Characteristics for air gap specifications, Page 23 table and Brake torque reduction (for the optional adjustable braking torque), Page 68.

When using a standard friction lining, the maximum speeds and friction work Q_R per brake frame size, as specified in the sections Dust explosive atmosphere (zone 22: non-conductive dusts), Page 30 and Gas explosive atmosphere (zone 2), Page 32, shall be applicable.

Notice

A version of the double spring-applied brake using HFC (high-friction coefficient) linings is not permitted.

5.4 Characteristics

Size	Rated brake torque at Δn=100 rpm	Braking torque at Δn_0 [rpm]		
		1500	3000	maximum
	[%]	[%]	[%]	[%]
06	100	87	80	74
08		85	78	73
10		83	76	
12		81	74	
14		80	73	72
16		79	72	70
18		77	70	68
20		75	68	66
25		73	66	

Tab. 3: **Characteristics for braking torques, depending on the speed and permissible limiting speeds**

Size	s_{LN} +0.1 / -0.05	s_{Lmax} Service brake	s_{Lmax} Holding brake	Max. adjustment, permissible wear distance	Rotor thickness		Protrusion adjustment ring h_{Emax}
					min.[1]	Max.	
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
06	0.2	0.5	0.3	1.5	4.5	6.0	4.5
08					5.5	7.0	
10					7.5	9.0	7.5
12	0.3	0.75	0.45	2.0	8.0	10.0	9.5
14				2.5	7.5		11
16				3.5	8.0	11.5	10
18	0.4	1.0	0.6	3.0	10.0	13.0	15
20				4.0	12.0	16.0	17
25	0.5	1.25	0.75	4.5	15.5	20.0	19.5

Tab. 4: **Characteristics for air gap specifications**

[1] The friction lining is sized so that the brake can be adjusted at least five times.

<table>
<tr><th rowspan="3">Size</th><th rowspan="2">Screw hole circle</th><th rowspan="3">Screw set for flange attachment
DIN EN ISO 4762 (8.8)[1)]</th><th rowspan="3">Screw set for mounting to the flange</th><th rowspan="2">Minimum depth of the free bore holes (in the end shield)</th><th colspan="2">Tightening torque</th></tr>
<tr><th>Screws ± 10%</th><th>Complete lever ± 10%</th></tr>
<tr><th>Ø [mm]</th><th>[mm]</th><th>[Nm]</th><th>[Nm]</th></tr>
<tr><td>06</td><td>72</td><td>3 x M4</td><td>3 x M4x35</td><td>0.5</td><td>3.0</td><td rowspan="2">2.8</td></tr>
<tr><td>08</td><td>90</td><td>3 x M5</td><td>3 x M5x40</td><td>1</td><td>5.9</td></tr>
<tr><td>10</td><td>112</td><td>3 x M6</td><td>3 x M6x50</td><td>2</td><td rowspan="2">10.1</td><td rowspan="2">4.8</td></tr>
<tr><td>12</td><td>132</td><td>3 x M6</td><td>3 x M6x55</td><td>3</td></tr>
<tr><td>14</td><td>145</td><td rowspan="2">3 x M8</td><td>3 x M8x65</td><td>1.5</td><td rowspan="3">24.6</td><td rowspan="2">12</td></tr>
<tr><td>16</td><td>170</td><td>3 x M8x70</td><td>0.5</td></tr>
<tr><td>18</td><td>196</td><td>4 x M8[2)]</td><td>6 x M8x80</td><td>0.8</td><td rowspan="2">23</td></tr>
<tr><td>20</td><td>230</td><td>4 x M10[2)]</td><td>6 x M10x90</td><td>2.1</td><td rowspan="2">48</td></tr>
<tr><td>25</td><td>278</td><td>6 x M10[3)]</td><td>6 x M10x100</td><td>5</td><td>40</td></tr>
</table>

Tab. 5: **Characteristics: screw kit for brake assembly on separately screwed-on flange**

1) The screw length depends on the material and the thickness of the customer's mounting surface.

2) The thread in the mounting surface is offset by 30° in reference to the center axle of the hand-release lever.

3) Hex head screw according to DIN EN ISO 4017 - 8.8.

<table>
<tr><th rowspan="3">Size</th><th rowspan="2">Screw hole circle</th><th rowspan="3">Screw set for mounting onto the motor/friction plate</th><th rowspan="3">Screw set for flange with through hole</th><th rowspan="2">Possible screw-in depth[4)]</th><th colspan="2">Tightening torque</th></tr>
<tr><th>Screws ± 10%</th><th>Complete lever ± 10%</th></tr>
<tr><th>Ø [mm]</th><th>[mm]</th><th>[Nm]</th><th>[Nm]</th></tr>
<tr><td>06</td><td>72</td><td>3 x M4x40</td><td>3 x M4x45</td><td>12</td><td>3.0</td><td rowspan="2">2.8</td></tr>
<tr><td>08</td><td>90</td><td>3 x M5x45</td><td>3 x M5x50</td><td>13</td><td>5.9</td></tr>
<tr><td>10</td><td>112</td><td>3 x M6x55</td><td>3 x M6x65</td><td>18</td><td rowspan="2">10.1</td><td rowspan="2">4.8</td></tr>
<tr><td>12</td><td>132</td><td>3 x M6x60</td><td>3 x M6x70</td><td>18</td></tr>
<tr><td>14</td><td>145</td><td>3 x M8x70</td><td>3 x M8x80</td><td>18</td><td rowspan="3">24.6</td><td rowspan="2">12</td></tr>
<tr><td>16</td><td>170</td><td>3 x M8x80</td><td>3 x M8x90</td><td>22</td></tr>
<tr><td>18</td><td>196</td><td>6 x M8x90</td><td>-</td><td>22</td><td rowspan="2">23</td></tr>
<tr><td>20</td><td>230</td><td>6 x M10x100</td><td>-</td><td>24</td><td rowspan="2">48</td></tr>
<tr><td>25</td><td>278</td><td>6 x M10x110</td><td>-</td><td>28</td><td>40</td></tr>
</table>

Tab. 6: **Characteristics: screw kit for brake assembly on motor, friction plate and flange with through hole**

4) Possible screw-in depth = protruding screw plus adjustment reserve for the rotor

NOTICE

With the double spring-applied brake design, when working with braking torques which are greater than the standard braking torque, you need to check the screws connecting the first brake. Please consult with Kendrion INTORQ!

Size	Screw hole circle		Screw set for mounting an adapter flange to complete stator, DIN EN ISO 4762 strength grade 8.8 (10.9)	Thread depth in the magnet housing	Tightening torque
	Ø [mm]	Thread	(4 pieces)	[mm]	[Nm]
06	37.7	4 x M4	M4x16	10	3.0
08	49	4 x M5	M5x16	12	5.9
10	54				
12	64		M5x20		
14	75	4 x M6	M6x20		10.1
16	85		M6x25	15	
18	95	4 x M8	M8x25	17	24.6
20	110	4 x M10	M10x25	20	48
25	140		M10x30 – **10.9**		71

Tab. 7: Characteristics: screw set, intermediate flange installation for double spring-applied brake

Size	Electrical power P_{20} 1)	Coil voltage U	Coil resistance R_{20} ±8%	Rated current I_N
	[W]	[V]	[Ω]	[A]
06	20	24	28.8	0.83
		96	460.8	0.21
		103	530.5	0.194
		170	1445	0.114
		180	1620	0.111
		190	1805	0.105
		205	2101	0.098
08	25	24	23	1.04
		96	268	0.26
		103	424.4	0.242
		170	1156	0.147
		180	1296	0.138
		190	1444	0.131
		205	1681	0.121

Size	Electrical power P_{20} [1)]	Coil voltage U	Coil resistance R_{20} ±8%	Rated current I_N
	[W]	[V]	[Ω]	[A]
10	30	24	19.2	1.25
	31	96	297.3	0.322
	32	103	331.5	0.31
	30	170	963.3	0.176
	32	180	1013	0.177
	30	190	1203	0.157
	33	205	1273	0.160
12	40	24	14.4	1.66
		96	230.4	0.41
		103	265.2	0.388
		170	722.5	0.235
		180	810	0.222
		190	902.5	0.210
		205	1051	0.195
14	50	24	11.5	2.08
		96	184.3	0.52
	53	103	200.2	0.514
	50	170	578	0.294
	53	180	611.3	0.294
	50	190	722	0.263
	53	205	792.9	0.258
16	55	24	10.5	2.29
		96	167.6	0.573
	56	103	189.5	0.543
	55	170	525.5	0.323
		180	589.1	0.305
	60	190	601.7	0.315
	56	205	750.5	0.292

Size	Electrical power P_{20} [1)	Coil voltage U	Coil resistance R_{20} ±8%	Rated current I_N
	[W]	[V]	[Ω]	[A]
18	85	24	6.8	3.54
		96	108.4	0.885
		103	124.8	0.825
		170	340	0.5
		180	387.2	0.472
		190	424.7	0.447
		205	494.4	0.414
20	100	24	5.76	4.16
		96	92.2	1.04
		103	106.1	0.970
		170	289	0.588
		180	324	0.55
		190	328.2	0.578
		205	420.3	0.487
25	110	24	5.24	4.58
		96	83.8	1.14
		103	96.5	1.06
		170	262.7	0.647
		180	294.6	0.611
		190	328.2	0.578
		205	382.1	0.536

Tab. 8: **Rated data for coil power**

[1) Coil power at 20 °C in W, deviation up to +10% is possible depending on the selected connection voltage.

5.5 Operating times

The operating times listed here are guide values which apply to DC switching with rated air gap s_{LN}, warm coil and standard characteristic torque. The given operating times are average values and subject to variations. The engagement time t_1 is approximately 8 to 10 times longer for AC switching. ...

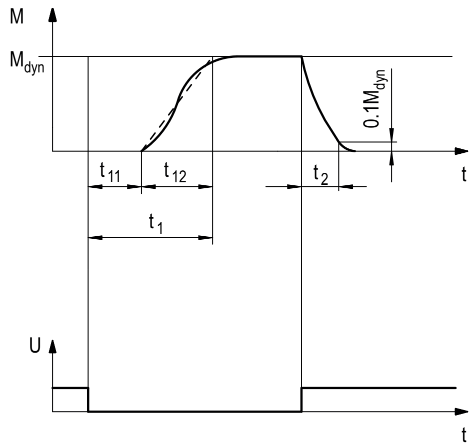


Fig. 4: **Operating/switching times of the spring-applied brakes**

t_1	Engagement time	t_{11}	Delay time during engagement
t_2	Disengagement time (up to M = 0.1 M_{dyn})	t_{12}	Rise time of the braking torque
M_{dyn}	Braking torque at a constant speed of rotation	U	Voltage

Size	Rated torque M_K	Operating times [1]			
		DC-side engagement			Disengaging
		t_{11}	t_{12}	t_1	t_2
	[Nm]	[ms]	[ms]	[ms]	[ms]
06	4	15	13	28	45
08	8	15	16	31	57
10	16	28	19	47	76
12	32	28	25	53	115
14	60	17	25	42	210
16	80	27	30	57	220
18	150	33	45	78	270
20	260	65	100	165	340
25	400	110	120	230	390

Tab. 9: **Switching energy - operating frequency - operating times**

[1] These operating times are specified for usage of Kendrion INTORQ bridge/half-wave rectifiers and coils with a connection voltage of 205 V DC at s_{LN} and 0.7 I_N.

Engagement time

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

For emergency braking, short engagement times for the brake are absolutely essential. The DC-side switching in connection with a suitable spark suppressor must therefore be provided.

Engagement time: A braking torque reduction via the torque adjustment ring prolongs the engagement time and reduces the disengagement time. An anti-magnetic pole shim is available when there is excessive prolongation. This plate is installed between the stator and the armature plate. The plate reduces the engagement time and prolongs the disengagement time.

Engagement time for AC-side switching: The engagement time is significantly prolonged (approx. 10 times longer).

	NOTICE
!	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.

- If the drive system is operated with a frequency inverter so that the brake will not be de-energized before the motor is at standstill, AC switching is also possible (not applicable to emergency braking).
- The specified engagement times are valid for DC switching with a spark suppressor.
  - Circuit proposals: refer to DC switching at mains – fast engagement, Page 59.

Notice

Spark suppressors are available for the rated voltages.

Notice

Kendrion INTORQ half-wave and bridge rectifiers and spark suppressors have not been designed for use in potentially explosive atmospheres. If the use of these electrical components is necessary, they must be installed within a control cabinet that is outside the explosive atmosphere.

Disengagement time

The disengagement time is the same for DC-side and AC-side switching. The specified disengagement times always refer to control using Kendrion INTORQ rectifiers and rated voltage.

5.6 Friction work / operating frequency

Based on the specified operating conditions of the ATEX brakes, the friction performance chart as a function of friction work and operating frequency is depicted. If friction work is to be performed by the brake, the charts can be used to determine the maximum number of switching operations that must be maintained in order to be able to operate the brake within the corresponding ATEX zones. The friction work and the operating frequency are independent of the rated torque of the brake.

For dust and gas explosive atmospheres, the permissible brake torques of the BFK458 spring-applied brake must be observed from the tables "Maximum permissible rated torques", as specified in the following chapters.

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

The permissible operating frequency S_{hmax} depends on the amount of heat Q_R (refer to Figure Friction work / operating frequency, Page 30). At a pre-set operating frequency S_h, the permissible amount of heat is Q_{Smax}.

Notice

With high speeds of rotation and switching energy, the wear increases, because very high temperatures occur at the friction surfaces for a short time.

5.7 Dust explosive atmosphere (zone 22: non-conductive dusts)

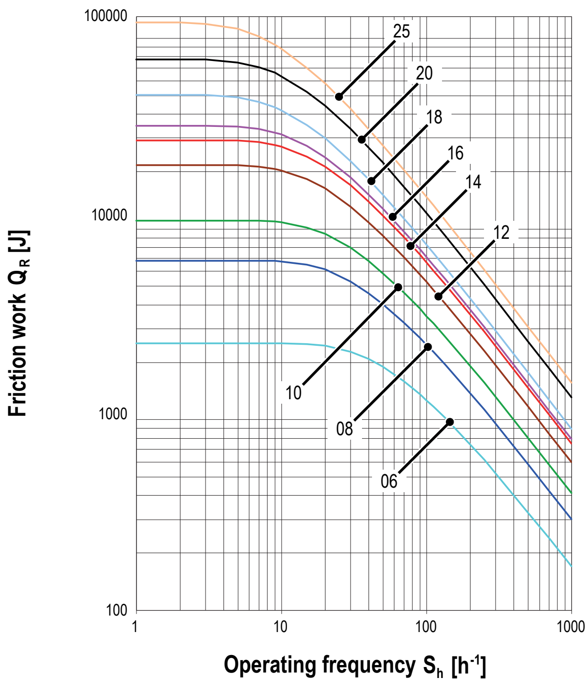


Fig. 5: **Friction work as a function of the operating frequency BFK-458-ATEX for dust atmospheres**

The following table specifies the permissible friction work [J], depending on the number of switching operations, that is typical for facility acceptance tests (This information differs from the values given in the operating instructions for the standard spring-applied brake BFK458!)

Notice

The number of switching operations must be evenly distributed over the course of one hour.

Size	Number of switching operations per hour	Permissible friction work [J]
06	6	2500
	10	2498
08	6	6798
	10	6754
10	6	10986
	10	10799
12	6	21329
	10	20317
14	6	28727
	10	27237
16	6	34117
	10	32181
18	6	48216
	10	43233
20	6	73755
	10	65483
25	6	110150
	10	93224

Tab. 10: **Permissible friction work [J], depending on the number of switching operations that is typical for facility acceptance tests**

5.8 Gas explosive atmosphere (zone 2)

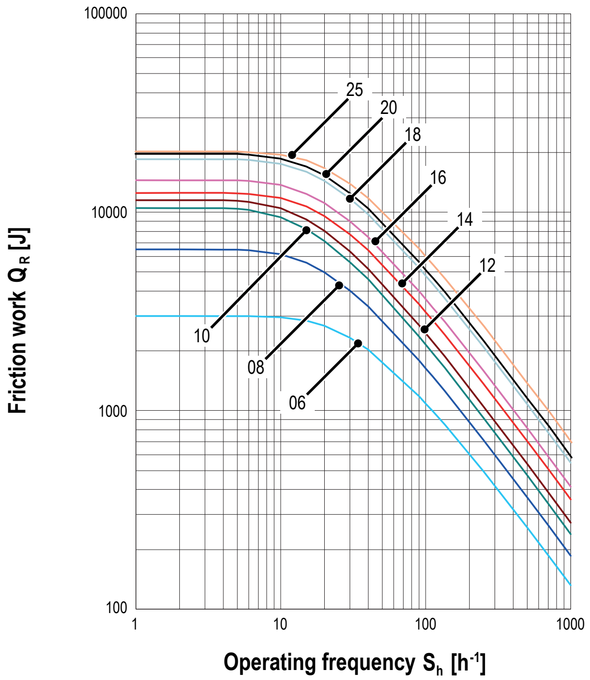


Fig. 6: **Friction work as a function of the operating frequency for the BFK-458-ATEX, for gas atmospheres, for the speed 800 rpm**

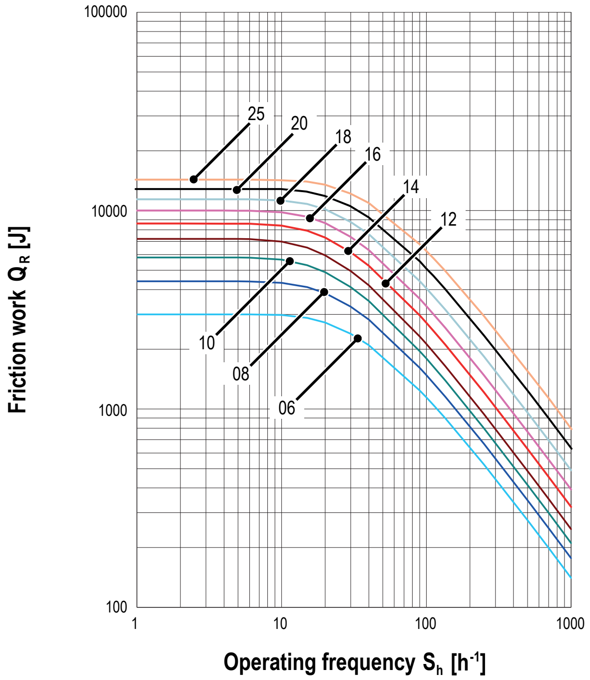


Fig. 7: **Friction work as a function of the operating frequency for the BFK-458-ATEX, for gas atmospheres, for the speed 1500 rpm**

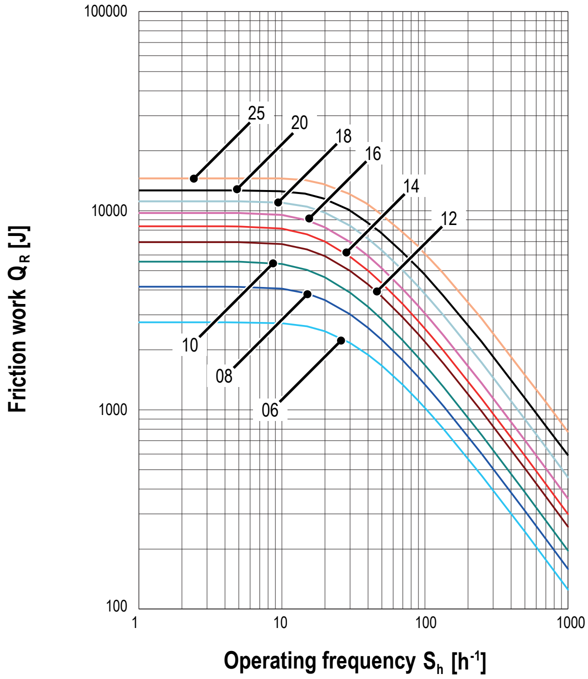


Fig. 8: Friction work as a function of the operating frequency for the BFK-458-ATEX, for gas atmospheres, for the speed 1800 rpm

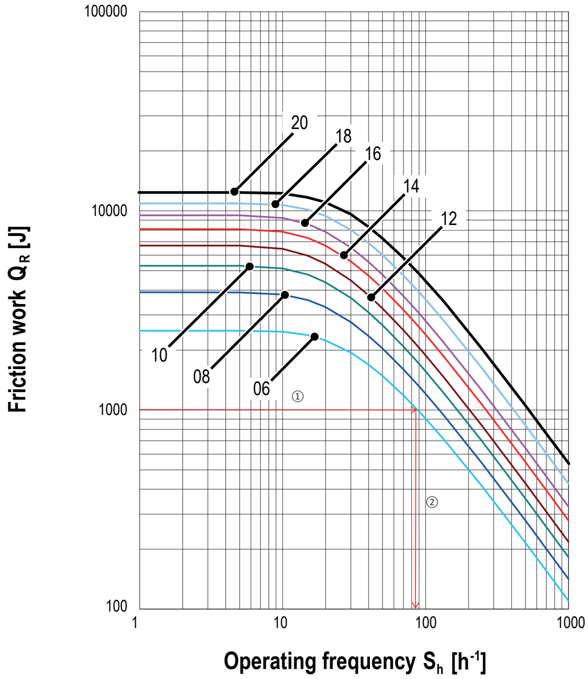


Fig. 9: Friction work as a function of the operating frequency for the BFK-458-ATEX, for gas atmospheres, for the speed 2500 rpm

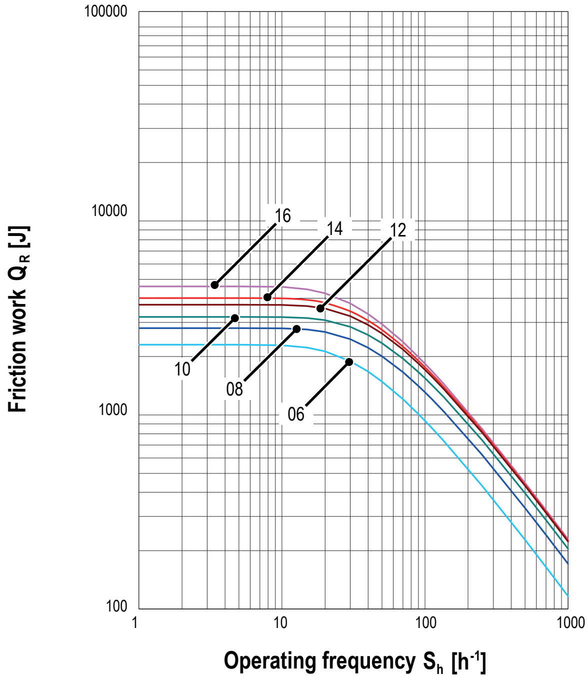


Fig. 10: **Friction work as a function of the operating frequency for the BFK-458-ATEX, for gas atmospheres, for the speed 3000 rpm**

The following table specifies the permissible speed [rpm], depending on the number of switching operations, that is typical for facility acceptance tests. (This information differs from the values given in the operating instructions for the standard spring-applied brake BFK458!)

Notice

The number of switching operations must be evenly distributed over the course of one hour.

Size	Number of switching operations per hour	Speed [rpm]				
		800	1500	1800	2500	3000
06	6	2998	2999	2749	2499	2300
	10	2967	2975	2724	2472	2287
08	6	6448	4395	4144	3892	2800
	10	6142	4327	4066	3804	2795
10	6	10273	5788	5536	5284	3200
	10	9447	5657	5398	5140	3196
12	6	11289	7179	6938	6673	3700
	10	10457	6983	6795	7855	3692
14	6	12401	8585	8331	8076	4000
	10	11812	8408	7855	7855	3988
16	6	14385	9987	9731	9472	4599
	10	13702	9817	9521	9213	4572

Size	Number of switching operations per hour	Speed [rpm]				
		800	1500	1800	2500	3000
18	6	18375	11393	11140	10889	
	10	17579	11260	10983	10700	
20	6	19865	12797	12546	10700	
	10	19004	12722	12447	12193	
25	6	20440	14199	14447	12163	
	10	19881	14157	14391		

Tab. 11: **Permissible speed, depending on the number of switching operations, that is typical for facility acceptance tests.**

5.9 Example calculation for the charts

Notice

The number of switching operations must be evenly distributed over the course of one hour.

If, at a speed of 2500 rpm, a size 06 brake should be used for gas zone applications, the calculation must be made as follows: If the brake will be performing friction work of 1000 J ①, then 85 switching operations per hour ② are allowed. In order not to overload the brake thermally, these 85 switching operations should be distributed evenly over the time interval:

60 minutes x 60 seconds / 85 switching operations = 42.3 seconds

In this example, in each interval of 42.3 seconds, the ATEX brake is permitted to carry out 1000 J of friction work.

5.10 Electromagnetic compatibility

Notice

The user must ensure compliance with EMC Directive 2014/30/EC using appropriate controls and switching devices.

NOTICE

If a Kendrion INTORQ rectifier is used for the DC switching of the spring-applied brake and if the switching 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.

5.11 Emissions

Heat

Since the brake converts kinetic energy and electrical energy into heat, the surface temperature varies considerably, depending on the operating conditions and possible heat dissipation. A surface temperature of 130 °C may be reached under unfavorable conditions.

Noise

The loudness of the switching noise during engaging and disengaging depends on the air gap "s_L" and the brake size.

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

5.12 Hand-release

The hand-release mechanism is used to release the brake by hand and can be retrofitted (refer to Mounting the hand-release (retrofitting)).

The hand-release springs back to its original position automatically after operation. The hand-release requires an additional air gap s_{HL} in order to function; this is factory-set prior to delivery. Verify the dimension s_{HL} after the installation.

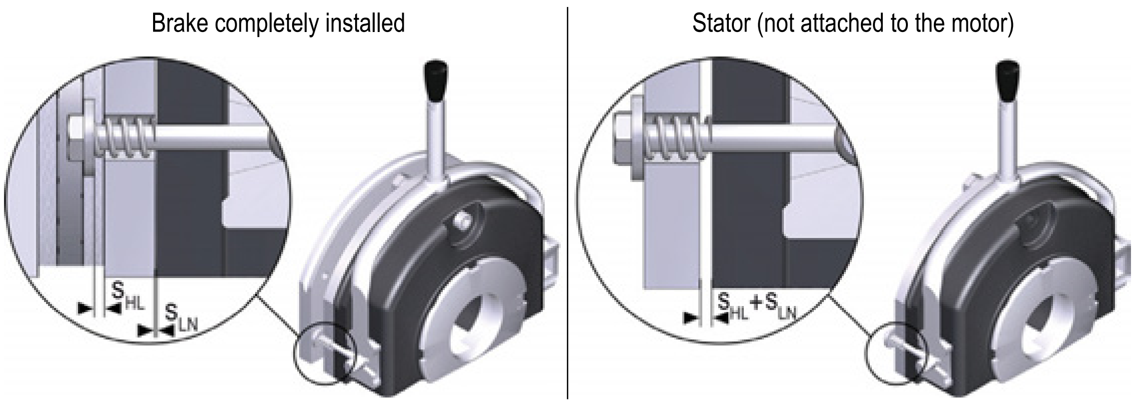


Fig. 11: **Positions of the adjustment dimensions that must be checked**

Size	S_{LN} $^{+0.1\,/\,-0.05}$	S_{HL} $^{+0.1}$
	[mm]	**[mm]**
06		
08	0.2	1
10		
12		
14	0.3	1.5
16		
18	0.4	2
20		
25	0.5	2.5

Tab. 12: **Adjustment setting for hand-release**

5.13 Labels on product

There is a packaging label on the package. The name plate is glued to the lateral surface of the brake.

Fig. 12: **Packaging label**

Kendrion INTORQ	Manufacturer
13227500	ID number
BFK458-12E	Type (refer to Product key)
	Bar code
SPRING-APPLIED BRAKE	Designation of the product family
205 V DC	Rated voltage
32 NM	Rated torque
1 pc.	Qty. per box
40 W	Rated power
25 H7	Hub diameter
17.03.21	Packaging date
Anti-rust packaging: keep friction surface free of grease!	Addition
CE	CE mark

Fig. 13: Name plate (example)

Kendrion INTORQ	Manufacturer
ta = 40°C	Permissible ambient temperature
Class. F	Insulation class F
BFK458-12E	Type (refer to Product key)
205 V DC	Rated voltage
40 W	Rated power
20 H7	Hub diameter
No. 15049627	ID number
32 NM	Rated torque
17.03.21	Date of manufacture
	Data matrix code
	CE mark
C US	CSA/CUS acceptance
	UL mark

5.14 ATEX marking

An additional name plate is used to label the BFK458 spring-applied brake for the ATEX zone. The name plate contains the following information:

Haltebremse / holding brake
II 3G Ex ec IIC T4 Gc X
II 3D Ex tc IIIB 120°C Dc X

II 3G Ex ec IIC T3 Gc X
II 3D Ex tc IIIB 120°C Dc X

Fig. 14: **Name plate ATEX holding brake (an example)**

Labeling	Meaning
II 3G II 3D	Designation label according to ATEX directive 2014/34/EU
Ex nA IIC T4 Gc X Ex tc IIIC 120°C Dc X	Designation label according to DIN EN 60079-0

6 Mechanical installation

This chapter provides step-by-step instructions for the installation.

Important notices and information

	⚠ DANGER
	Danger of explosion Increased temperatures on the surfaces and in the friction gap can result when the maximum friction work and operating frequencies specified by Kendrion INTORQ are exceeded. These can lead to ignition. ▮ Operation is only permitted within the specified specifications.

The following must always be observed when installing ATEX brakes:

- The proper functioning and correct dimensioning of the brake must be ensured before it is put into operation. The correct relation between the brake, motor, control and loads must be checked.
- If the switching times of the brake in conjunction with the control of the drive is not properly taken into consideration, the rotational speed could increase when the motor is switched off. As a result, the braking procedure would be carried out at a much higher speed and higher friction work than assumed in the preliminary design. This would result in higher temperatures, which would then pose a risk of ignition.
- Check if the rotor can be pushed when it is mounted on the hub. A sluggish heavy connection between the rotor and hub can lead to a continuous slip of the rotor. This would increase the temperature at the friction joint.
- Make sure that the air gap is properly and uniformly adjusted. An uneven air gap adjustment can lead to continuous slip of the rotor and thus to increased temperatures.
- When installing and dismantling the brake, make sure that no solids fall into the friction gap.
- Careless assembly, disassembly or operations can lead to sparking. Do not use spark-generating tools.
- Mount the brake so that it does not hit any rotating components. Ensure that there is sufficient clearance to the fan hood and fan blade.

	NOTICE
	The toothed hub and screws must not be lubricated with grease or oil.

6.1 Design of end shield and shaft

- Comply with the specified minimum requirements regarding the end shield and the 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 apply only to the materials mentioned. Consult with Kendrion INTORQ before using other materials; written confirmation is required for such usage.
- If a friction plate is used as a counter friction surface, the customer must ensure that it is fully supported by the motor end shield.
- Depending on the type of installation, additional clearing bore holes may be required.
- Threaded holes with minimum thread depth: refer to Characteristics: screw kit for brake assembly on motor, friction plate and flange with through hole, Page 24
- Keep the end shield free from grease or oil.

Minimum requirements of the end shield

Size	Material [1) 2)]	Roughness [2)]	Run-out	Levelness	Tensile strength R_m
			[mm]	[mm]	[N/mm²]
06	S235JR; C15; EN-GJL-250	Rz6	0.03	< 0.06	250
08			0.03		
10			0.03		
12			0.05		
14		Rz10	0.05	< 0.10	
16			0.08		
18			0.08		
20			0.08		
25			0.10		

Tab. 13: **End shield as counter friction surface**

1) Consult with Kendrion INTORQ before using other materials.

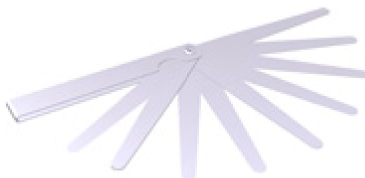
2) When **no** brake flange or friction plate is used.

6.2 Tools

Size	Torque wrench Insert for hexagonal socket (Allen) screws		Open-end wrench Width across flats		Hook wrench DIN 1810 Type A	Socket wrench for external flange mount
						
	Measuring range	Wrench width	Sleeve bolts	Hand-release screws	Diameter	Width across flats
	[Nm]	[mm]	[mm]	[mm]	[mm]	[mm]
06	1 to 12	3	8	7 / 5.5	45 - 55	-
08	1 to 12	4	9	10 / 7	52 - 55	-
10	1 to 12	5	12	10 / 7	68 - 75	-
12	1 to 12	5	12	10 / 7	80 - 90	-
14	20 to 100	6	15	12 / 8	80 - 90	-
16	20 to 100	6	15	12 / 8	95 - 100	-
18	20 to 100	6	15	- / 10	110 - 115	13
20	20 to 100	6	15	- / 10	135 - 145	17
25	20 to 100	8	17	- / 10	155 - 165	17

NOTICE

Tightening torques: refer to the table Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 24.

Multimeter	Caliper gauge	Feeler gage
		

6.3 Preparing the installation

1. Remove the packaging from the spring-applied brake and dispose of it properly.
2. Check the delivery for completeness.
3. Check the name plate specifications (especially the rated voltage)!

6.4 Installing the hub onto the shaft

Notice

The customer is responsible for dimensioning the shaft-hub connection. Make sure that the length of the key (shape A) is identical to the length of the hub.

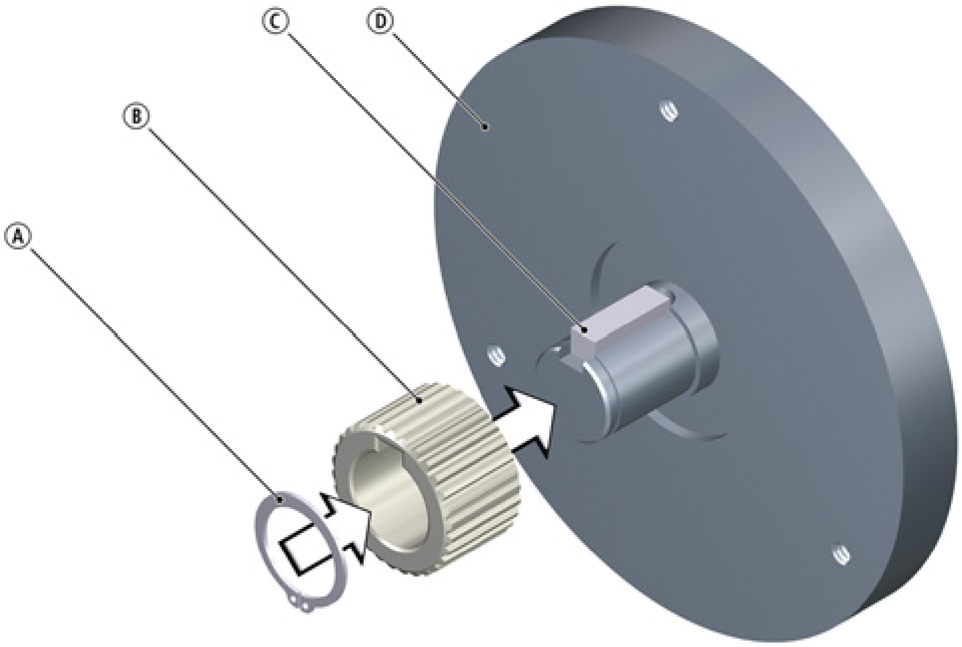


Fig. 15: **Installing the hub onto the shaft**

Ⓐ Circlip Ⓑ Hub Ⓒ Key
Ⓓ End shield

1. Insert the key into the shaft.
2. Press the hub with a moderate amount of force to the shaft.
3. Secure the hub against axial displacement (for example, by using a circlip).

Note the following when mounting the hub on the brake:

- The supporting length of the key should be equal to the hub length chosen.
- The hub-side dimensioning of the key connection takes into account one million braking operations in reversing mode without additional operational loads (e.g. additional load spectra with engaged brake).
- We would be happy to advise you on the selection of suitable adhesives.
- If you have deviating operating conditions (e.g. additional load spectra with engaged brake), please contact Kendrion INTORQ for the proper dimensioning of the hub-side key connection.
- Secure the hub against axial displacement after you install it (e.g. with a circlip).

NOTICE

If you are using the spring-applied brake for reverse operations, glue the hub to the shaft.

6.5 Mounting the brake

Mounting the rotor (without friction plate / without brake flange)

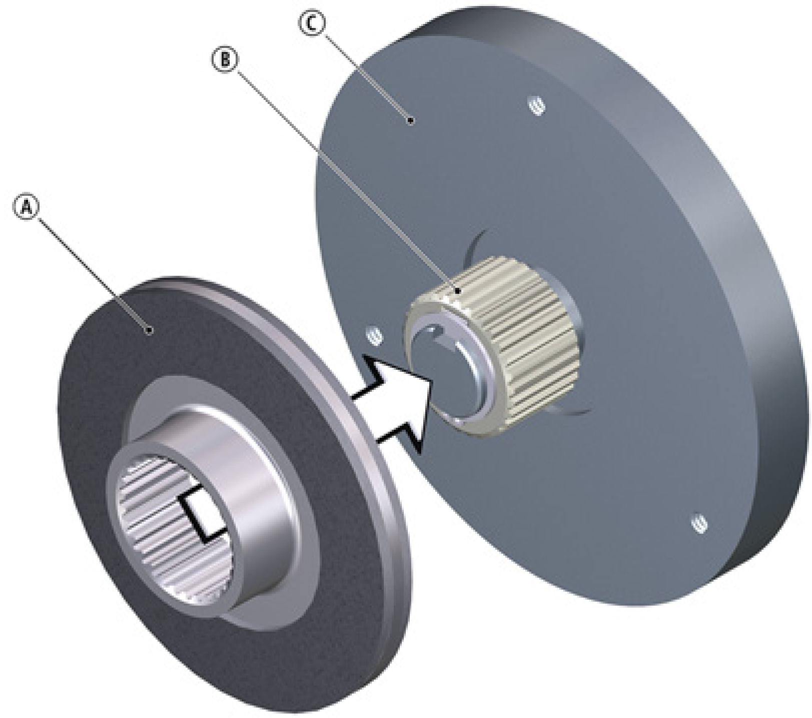


Fig. 16: **Assembly of the rotor**

Ⓐ Rotor Ⓑ Hub Ⓒ End shield

1. Push the rotor on the hub.
2. Check if the rotor can be moved manually.

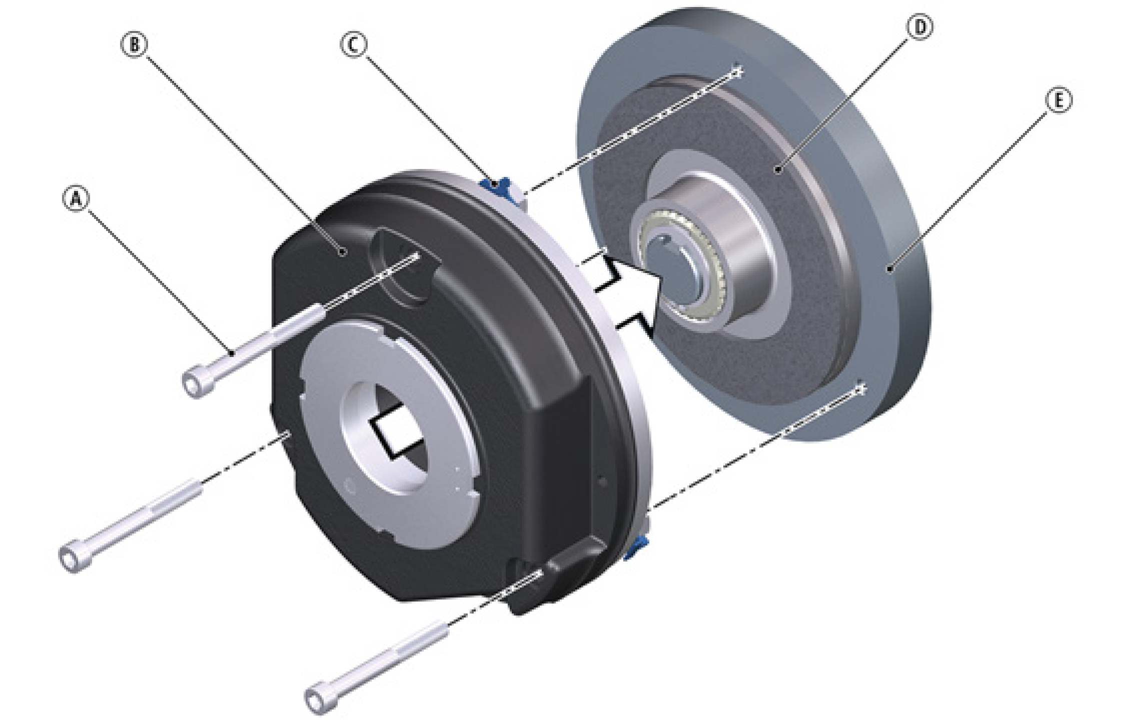


Fig. 17: **Mounting the complete stator**

Ⓐ Socket-head cap screw	Ⓑ Complete stator	Ⓒ Terminal clip
Ⓓ Rotor	Ⓔ End shield	

3. Screw the complete stator to the end shield Use the supplied screw set and a torque wrench (for tightening torque, refer to the table Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 24).
4. Remove the terminal clips and dispose of properly.

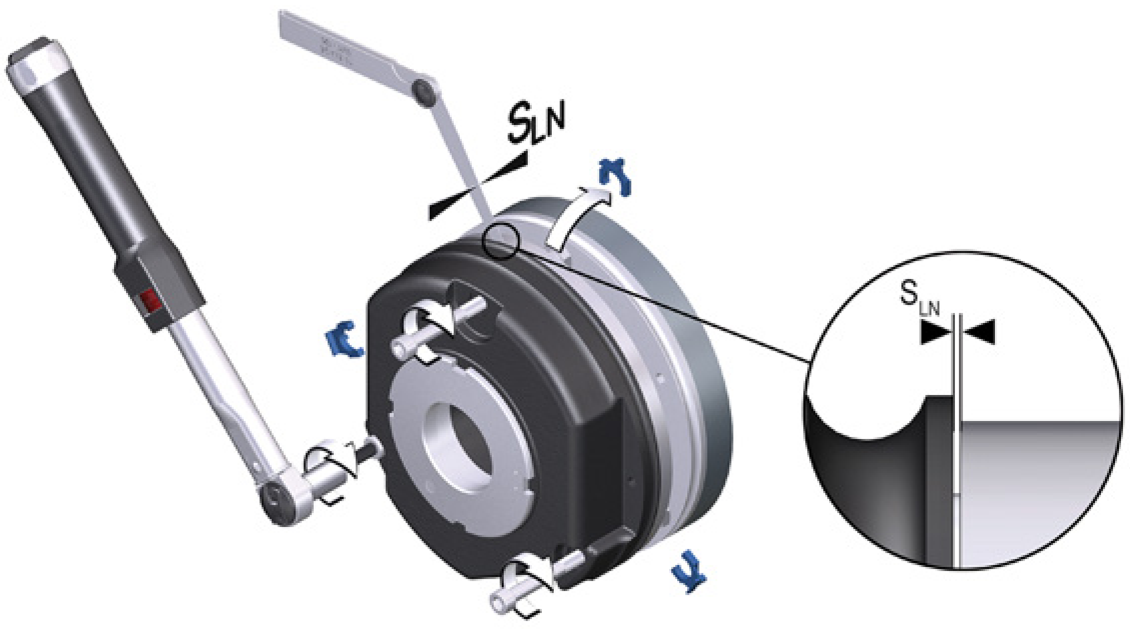


Fig. 18: **Tightening the screws with a torque wrench**

Notice

Do not push the feeler gauge in more than 10 mm between the armature plate and the stator!

5. Check the air gap near the screws using a feeler gauge. These values must match the specifications for s_{LN} found in the table Characteristics for air gap specifications, Page 23.

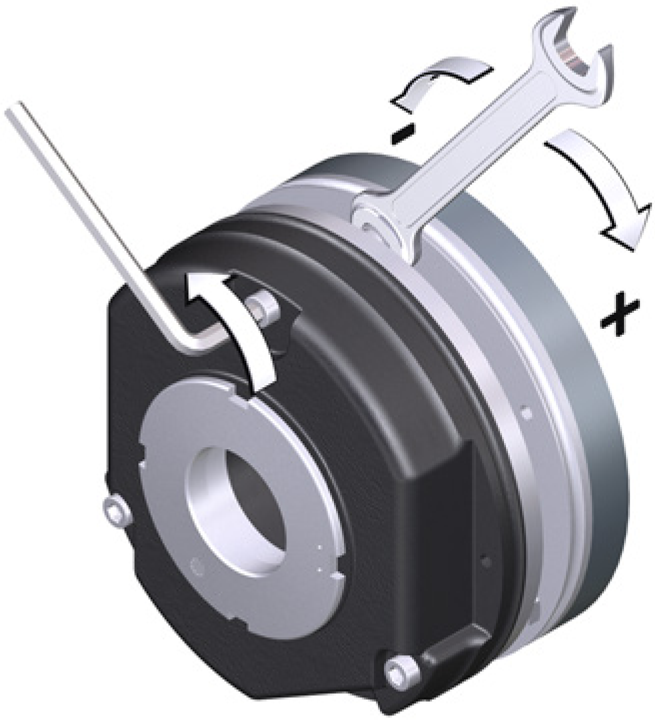


Fig. 19: **Adjusting the air gap**

6. If the measured value s_L is outside of the tolerance s_{LN}, readjust this dimension. Loosen the socket head cap screws slightly and adjust the air gap (turn the sleeve bolts using a wrench).
7. Use a torque wrench to tighten the socket head cap screws (refer to the Figure Tightening the screws with a torque wrench, Page 45).

NOTICE

Tightening torques: refer to the table Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 24.

6.6 Installing the friction plate (optional)

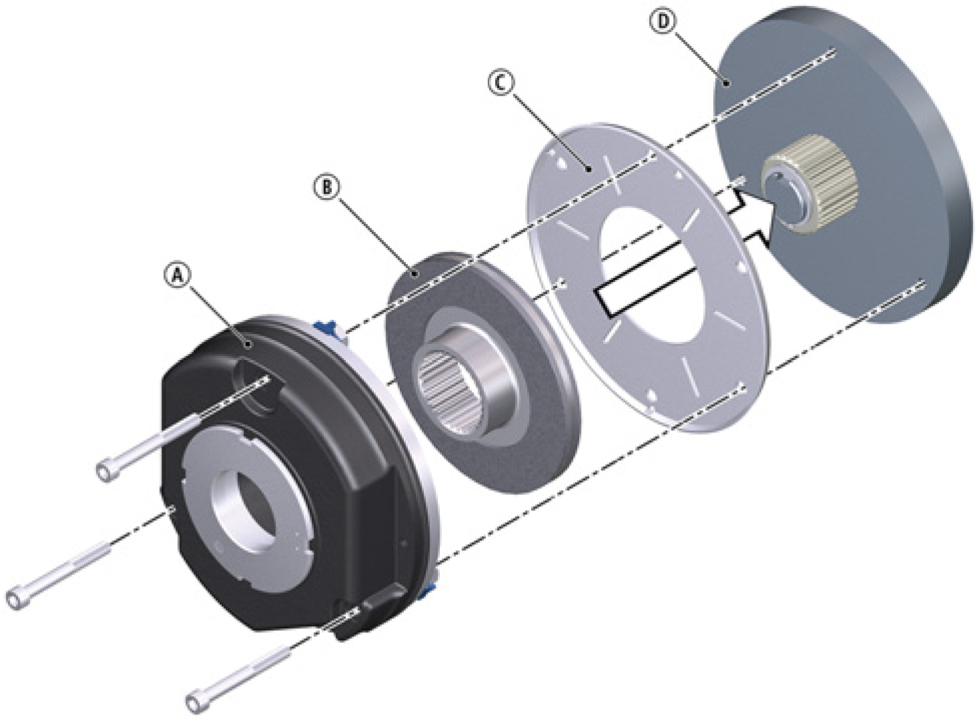


Fig. 20: **Mounting the friction plate**

Ⓐ Stator
Ⓑ Rotor
Ⓒ Friction plate
Ⓓ End shield

1. Place the friction plate against the end shield. The lip edging of the friction plate must remain visible!
2. Align the hole circle along the screw-in holes.

6.7 Mounting the flange

6.7.1 Mounting the flange without additional screws

NOTICE

When dimensioning the thread depth in the end shield, be sure to take into account the permissible wear distance (refer to Table Characteristics for air gap specifications, Page 23).

1. Place the flange against the end shield.
2. Align the hole circle along the screw-in holes.
3. Mount the brake using the appropriate set of screws (refer to the figures in the chapters Mounting the brake, Page 44 and Spare parts list, Page 76).

6.7.2 Installing the flange (variants: size 06 - 16)

The flange can be screwed to the end shield on the outer hole circle (for screw dimensioning, refer to the table Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 24).

NOTICE

Clearing holes for the screws in the end shield must be behind the threaded screw holes in the flange. Without the clearing holes, the minimal rotor thickness cannot be used. The screws must not press against the end shield.

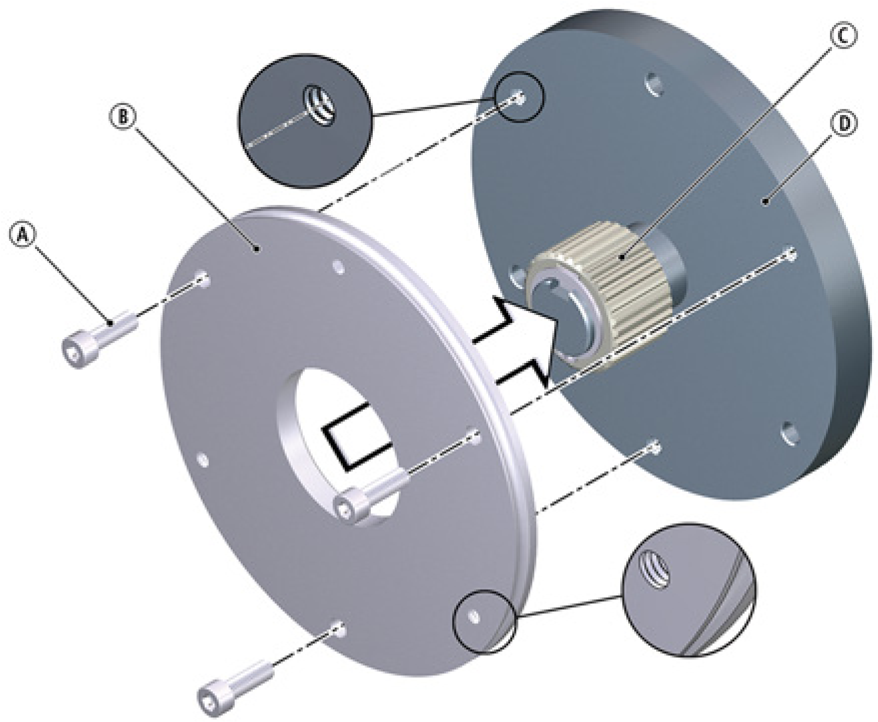


Fig. 21: **Flange mounting for sizes 06 - 16**

Ⓐ Screw [1]
Ⓑ Flange
Ⓒ Hub
Ⓓ End shield

[1] According to the table Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 24

1. Make sure that there are clearing holes in the end shield at the positions of the screws in the stator (for these free hole depths, refer to the table Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 24).
2. Place the flange against the end shield.

NOTICE

Tighten the screws evenly (for tightening torques, refer to the table Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 24).

3. Use the three screws to screw the flange to the end shield.

4. Check the height of the screw heads. The screw heads must not be higher than the minimum rotor thickness. Use screws that comply with the information in the table Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 24.

Notice

When mounting the flange, the various size classes must be distinguished: sizes 06 – 16, 18 – 20 and 25 are mounted differently.

6.7.3 Installing the flange (variants: size 18 - 20)

The flange can be screwed to the end shield onto the outer hole circle (refer to the table Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 24).

NOTICE

- Clearing holes for the screws in the end shield must be behind the threaded screw holes in the flange. Without the clearing holes, the minimal rotor thickness cannot be used. The screws must not press against the end shield.
- For sizes 18 and 20, the mounting surface threading must be angled at 30° to the center axis to the hand-release lever.

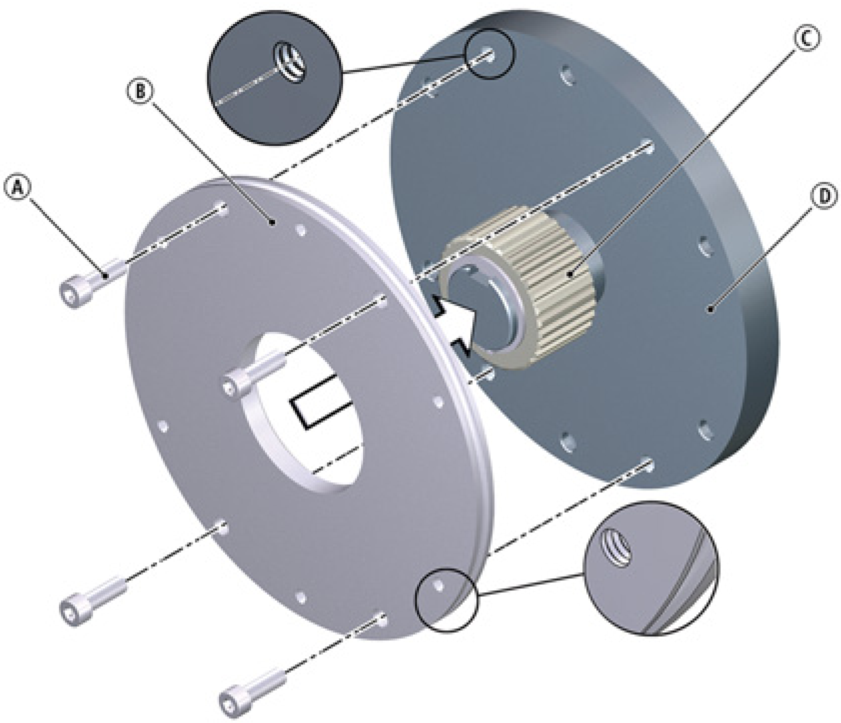


Fig. 22: **Flange mounting for sizes 18 – 20**

[1)] According to the table Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 24

1. Place the flange against the end shield.

> **NOTICE**
>
> Tighten the screws evenly (for tightening torques, refer to the table Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 24).

2. Use the four screws to screw the flange to the end shield.
3. Check the height of the screw heads. The screw heads must not be higher than the minimum rotor thickness. Use screws that comply with the information in the table Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 24.

6.7.4 Installing the flange (variants: size 25)

The flange can be screwed to the end shield onto the outer hole circle (refer to the table Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 24).

> **NOTICE**
>
> - Clearing holes for the screws in the end shield must be behind the threaded screw holes in the flange (refer to the table Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 24). Without the clearing holes, the minimal rotor thickness cannot be used. The screws must not press against the end shield.

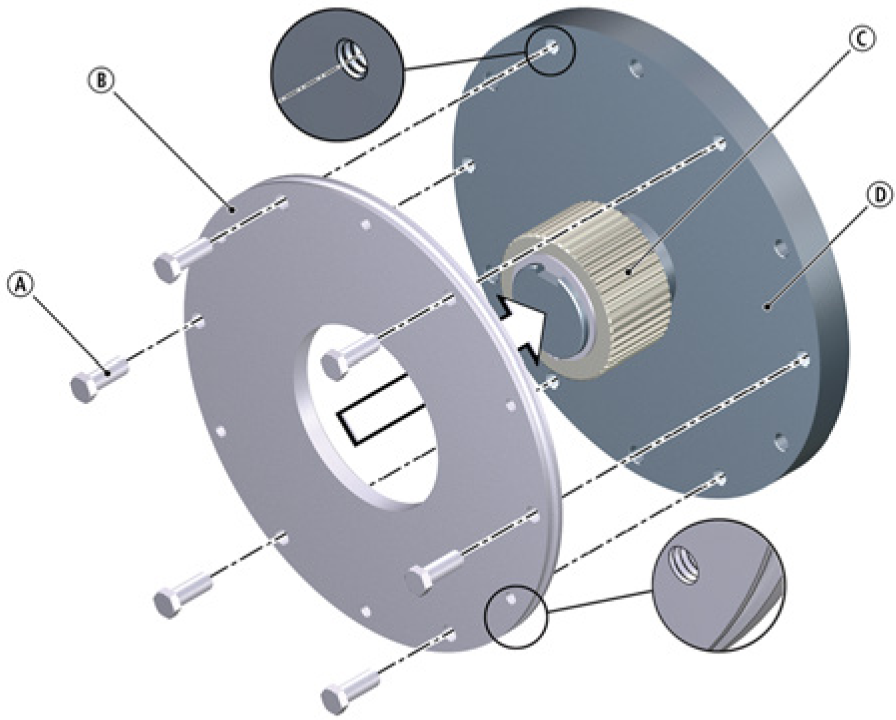


Fig. 23: **Flange mounting for size 25**

Ⓐ Hex screw [1] Ⓑ Flange Ⓒ Hub

Ⓓ End shield

[1] According to the table Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 24

1. Place the flange against the end shield.
2. Use the six screws to screw the flange to the end shield.
3. Check the height of the screw heads. The screw heads must not be higher than the minimum rotor thickness.

NOTICE

Tighten the screws evenly (for tightening torques, refer to the table Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 24).

6.8 Installing the double spring-applied brake

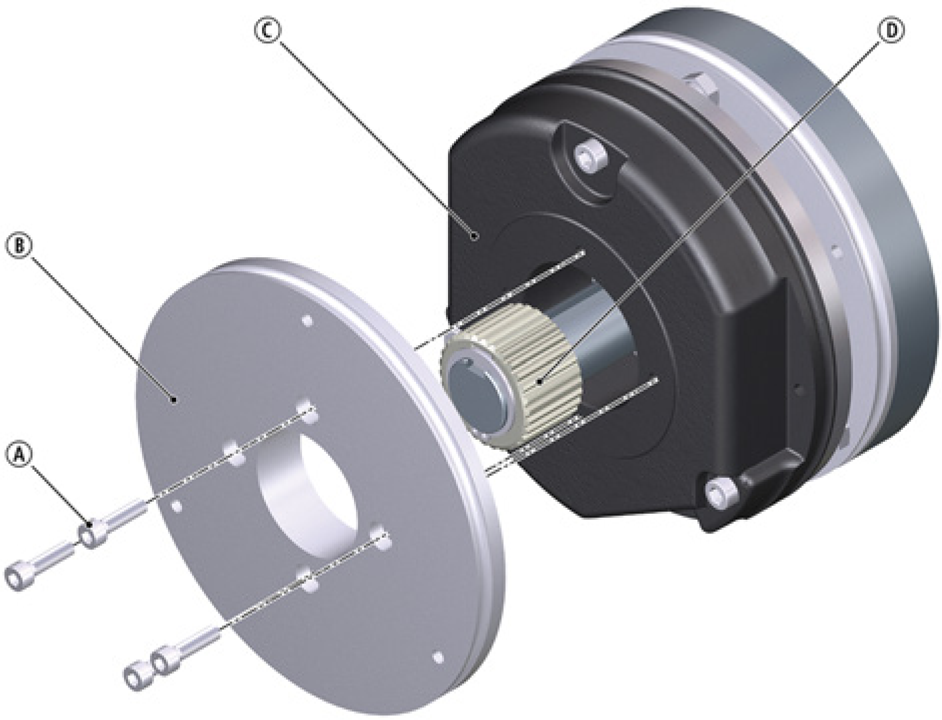


Fig. 24: **Installing the intermediate flange**

Ⓐ Screw from the screw set
Ⓑ Intermediate flange
Ⓒ Rear stator
Ⓓ Front hub

NOTICE

When installing the double spring-applied brake, use screws of the required strength class. Install them using the tightening torque specified in the table for the screw kit for intermediate flange mounting for double spring-applied brakes as well as the table Characteristics: screw set, intermediate flange installation for double spring-applied brake , Page 25 (in the column "Screw kit for mounting an adapter flange on a stator").

Notice

Requirements:

- The first hub has to be mounted on the shaft!
- The first brake must be completely mounted!
- The air gap must be set!

1. Mount the intermediate flange with the four screws in the threads of the first magnet housing.

All other steps for mounting the second brake are carried out as described in the section Mounting the brake, Page 44.

NOTICE

With the double spring-applied brake design, when working with braking torques which are greater than the standard braking torque, you need to check the screws connecting the first brake. Please consult with Kendrion INTORQ!

6.9 Cover ring assembly

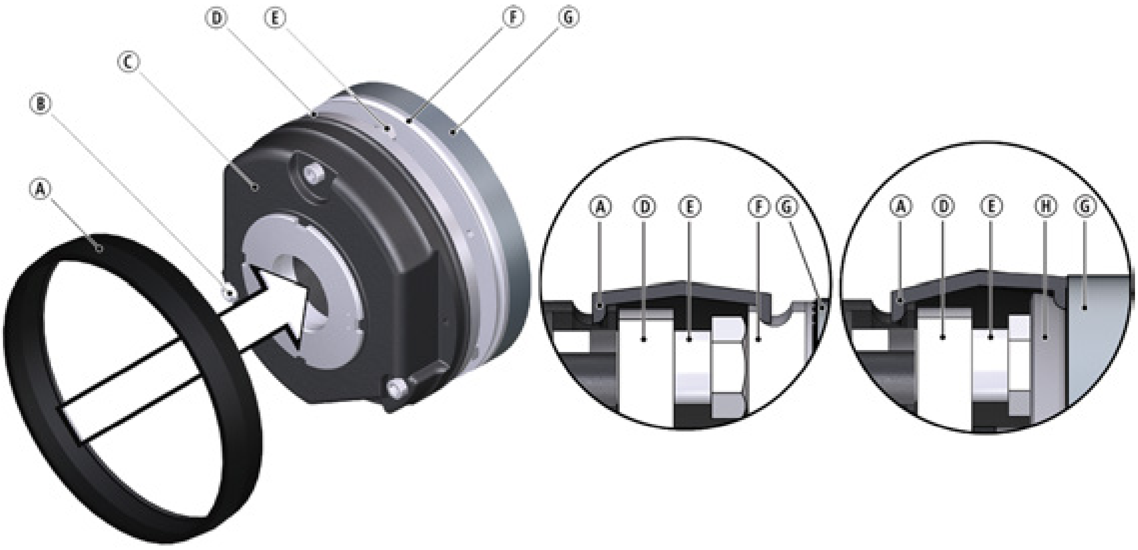


Fig. 25: **Cover ring assembly**

Ⓐ Cover ring	Ⓑ Socket-head cap screw	Ⓒ Stator
Ⓓ Armature plate	Ⓔ Sleeve bolt	Ⓕ Flange
Ⓖ End shield	Ⓗ Friction plate	

NOTICE

The cover ring may only be used in conjunction with a flange or friction plate!

1. Pull the cables through the cover ring.
2. Slide the cover ring over the stator.
3. Press the corresponding lips of the cover ring in the groove of the stator and in the groove of the flange. If a friction plate is used, the lip must be pulled over the edging.

6.10 Installing the shaft sealing ring

NOTICE

When using a shaft sealing ring, the brake has to be mounted so that it is centerd properly!
The shaft diameter must be implemented in accordance with ISO tolerance h11, with a radial eccentricity tolerance according to IT8 and an averaged surface roughness of $R_z \leq 3.2$ µm in the sealing area.

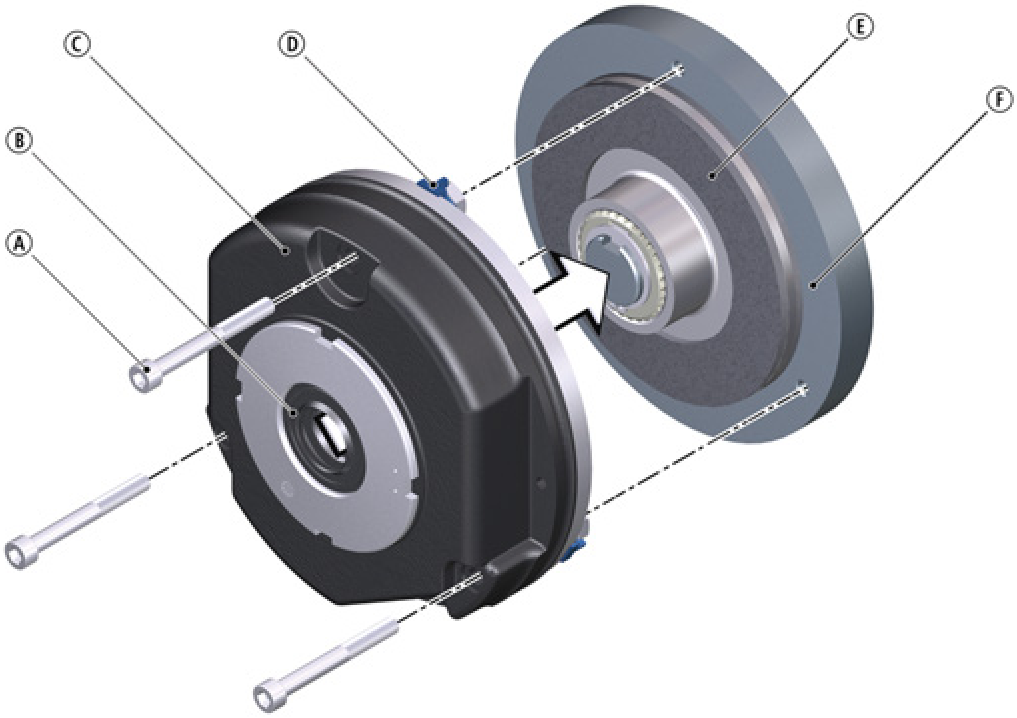


Fig. 26: **Installing the shaft sealing ring**

Ⓐ Socket-head cap screw
Ⓑ Shaft sealing ring
Ⓒ Complete stator
Ⓓ Terminal clip
Ⓔ Rotor
Ⓕ End shield

Notice

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

- Lightly lubricate the lip of the shaft sealing ring with grease.
- No grease should be allowed to contact the friction surfaces.
- When assembling the stator, push the shaft sealing ring carefully over the shaft. The shaft should be located concentrically to the shaft sealing ring

6.11 Mounting the hand-release (retrofitting)

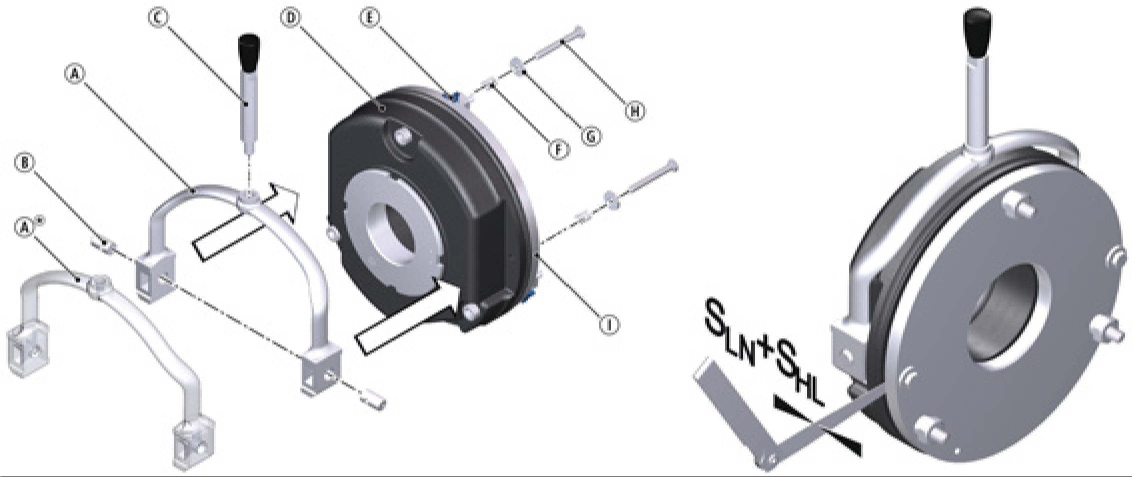


Fig. 27: **Assembly of the hand-release BFK458**

Ⓐ Yoke (standard mount)	Ⓐ * Yoke (rotated mount - optional)	Ⓑ Pin
Ⓒ Lever	Ⓓ Stator	Ⓔ Terminal clip
Ⓕ Pressure spring	Ⓖ Washer	Ⓗ Hex head screw
Ⓘ Armature plate		

1. Insert pin into the bores of the yoke.
2. Insert the pressure springs in the bores of the armature plate.
3. Push the hex head screws through the pressure springs in the armature plate and through the bore hole in the stator.
4. Screw the hex head screws into the yoke pins.
5. Tighten the hex head screws to fasten the armature plate against the stator.
6. Remove the terminal clips and dispose of properly.

NOTICE

Note that the gap s_{LN} can only be set after the brake is mounted.

Measure the air gap in the immediate vicinity of the hexagon screws; otherwise measurement errors can occur because the armature plate is not plane-parallel to the pole face!

7. Set the gap s_{LN} + s_{HL} evenly using the hex head screws and the feeler gauge. Refer to the table Adjustment setting for hand-release, Page 36 for the values for the dimension s_{LN} + s_{HL}.

7 Electrical installation

Important notes

⚠ DANGER

There is a risk of injury by electrical shock!

- The electrical connections may only be made by trained electricians!
- Make sure that you switch off the electricity before working on the connections! There is a risk of unintended start-ups or electric shock.

NOTICE

Make sure that the supply voltage matches the voltage specification on the name plate.

7.1 Electrical connection

Switching suggestions

NOTICE

The terminal pin sequence shown here does not match the actual order.

Notice

Kendrion INTORQ half-wave and bridge rectifiers and spark suppressors have not been designed for use in potentially explosive atmospheres. If the use of these electrical components is necessary, they must be installed within a control cabinet that is outside the explosive atmosphere.

7.2 AC switching at the motor – extremely delayed engagement

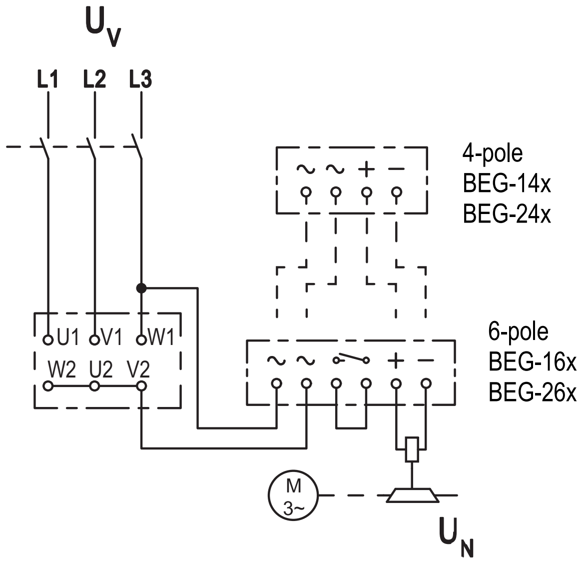


Fig. 28: **Supply: Phase-neutral**

Bridge rectifiers

BEG-1xx: U_N [V DC] = 0.9 • $\frac{U_V}{\sqrt{3}}$ [V AC]

Half-wave rectifiers

BEG-2xx: U_N [V DC] = 0.45 • $\frac{U_V}{\sqrt{3}}$ [V AC]

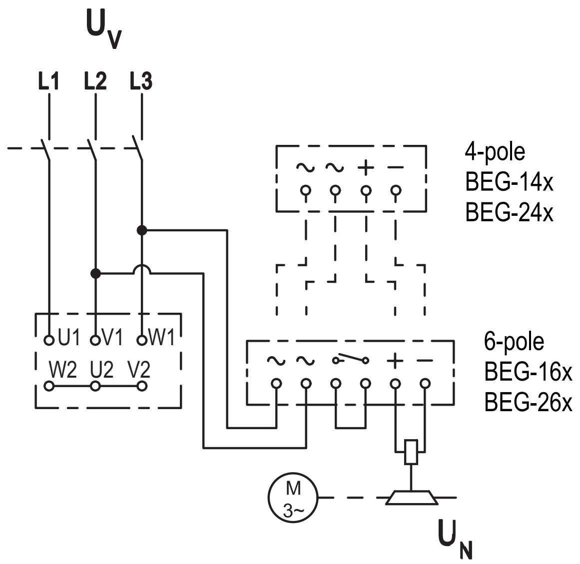


Fig. 29: **Supply: Phase-phase**

Bridge rectifier [1)]

BEG-1xx: U_N [V DC] = 0.9 • U_V [V AC]

Half-wave rectifier

BEG-2xx: U_N [V DC] = 0.45 • U_V [V AC]

[1)] Not recommended for most regional/national high-voltage mains voltages.

7.3 DC switching at the motor – fast engagement

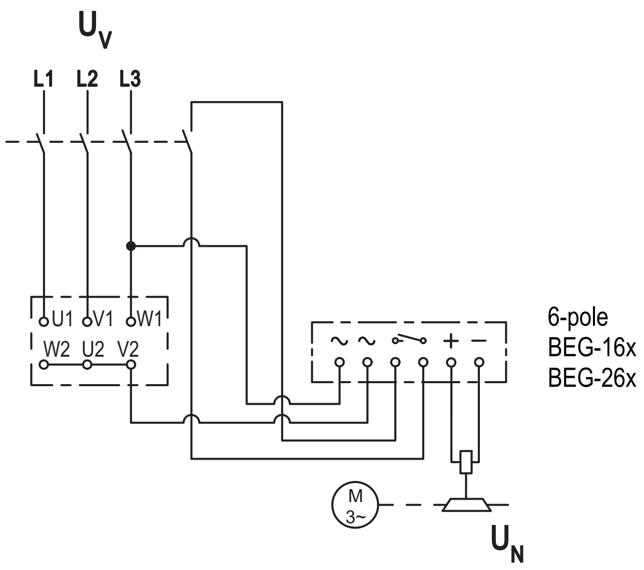


Fig. 30: **Supply: Phase-neutral**

Bridge rectifiers

BEG-1xx: U_N [V DC] = 0.9 • $\frac{U_V}{\sqrt{3}}$ [V AC]

Half-wave rectifiers

BEG-2xx: U_N [V DC] = 0.45 • $\frac{U_V}{\sqrt{3}}$ [V AC]

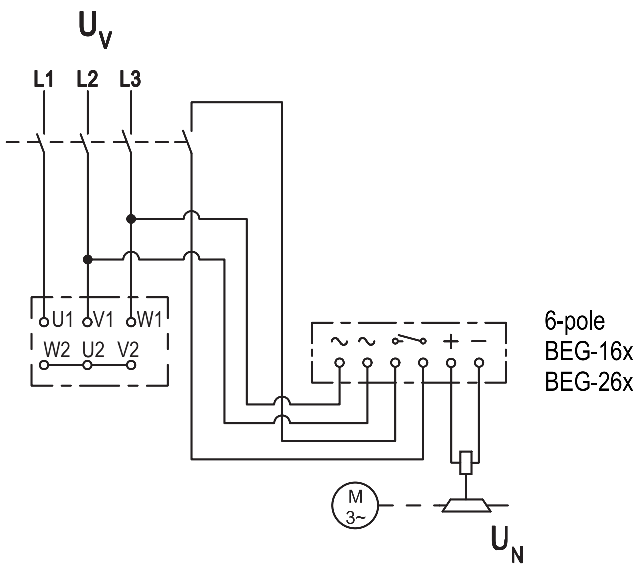


Fig. 31: **Supply: Phase-phase**

Bridge rectifier [1)]

BEG-1xx: U_N [V DC] = 0.9 • U_V [V AC]

Half-wave rectifiers

BEG-2xx: U_N [V DC] = 0.45 • U_V [V AC]

[1)] Not recommended for most regional/national high-voltage mains voltages.

7.4 AC switching at mains – delayed engagement

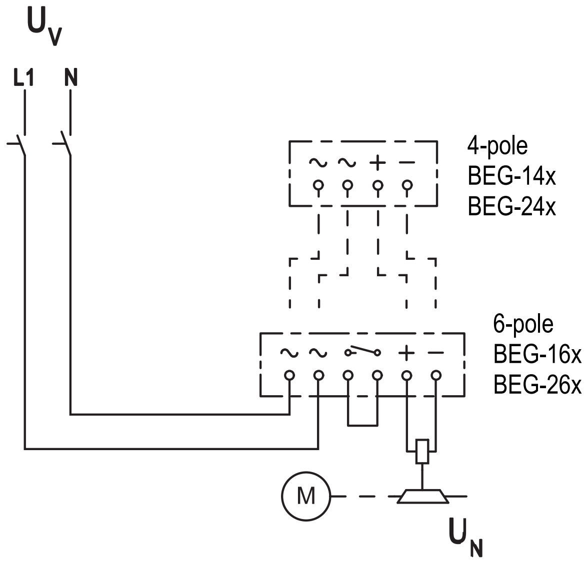


Fig. 32: **Supply: Phase-N**

Bridge rectifiers

BEG-1xx: U_N [V DC] = 0.9 • U_V [V AC]

Half-wave rectifiers

BEG-2xx: U_N [V DC] = 0.45 • U_V [V AC]

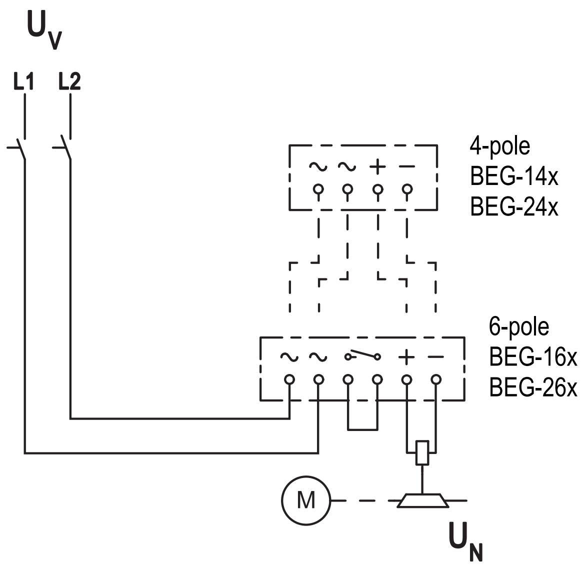


Fig. 33: **Supply: Phase-phase**

Bridge rectifier [1)]

BEG-1xx: U_N [V DC] = 0.9 • U_V [V AC]

Half-wave rectifiers

BEG-2xx: U_N [V DC] = 0.45 • U_V [V AC]

[1)] Not recommended for most regional/national high-voltage mains voltages.

7.5 DC switching at mains – fast engagement

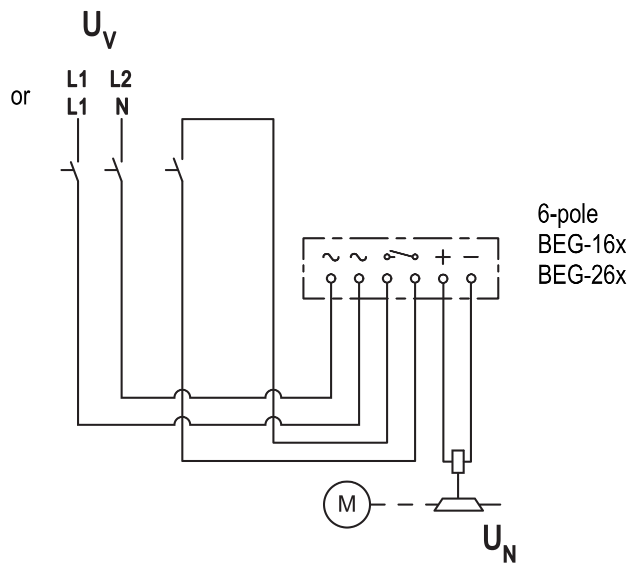


Fig. 34: **Supply: Phase-phase or phase-N via 6-pole rectifier**

Bridge rectifier [1]	Half-wave rectifiers
BEG-16x: U_N [V DC] = 0.9 • U_V [V AC]	BEG-26x: U_N [V DC] = 0.45 • U_V [V AC]

[1] For most regional/national high-voltage mains voltages, this only makes sense for supplies on L1 and N.

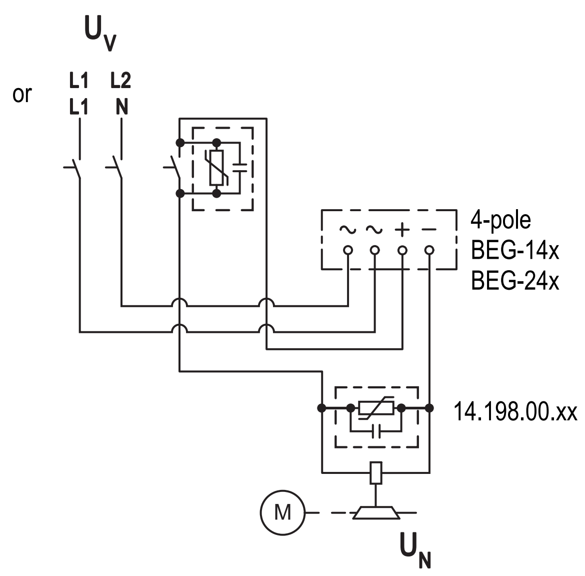


Fig. 35: **Supply: Phase-phase or phase-N via 4-pole rectifier**

Bridge rectifier [1]	Half-wave rectifiers
BEG-14x: U_N [V DC] = 0.9 • U_V [V AC]	BEG-24x: U_N [V DC] = 0.45 • U_V [V AC]

Spark suppressor:

14.198.00.xx (required once, select position)

[1] For most regional/national high-voltage mains voltages, this only makes sense for supplies on L1 and N.

7.6 Minimum bending radius for the brake connection cable

Size	Wire cross-section	Minimum bending radius
06	AWG 20	27.5 mm
08		
10		
12		
14		
16		
18		45.6 mm
20		
25		

Tab. 14: **Minimum bending radius for the brake connection cable**

7.7 Bridge/half-wave rectifier (optional)

BEG-561-□□□-□□□

The bridge-half-wave rectifiers are used to supply electromagnetic DC spring-applied brakes which are approved for use with such rectifiers. Other use is only permitted with the approval of Kendrion INTORQ.

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

Terminals 3 and 4 are in the DC circuit of the brake. The induction voltage peak for DC switching (refer to the circuit diagram DC switching at the motor – fast engagement, Page 57) is limited by an integrated overvoltage protection at terminals 5 and 6.

7.7.1 Assignment: Bridge/half-wave rectifier – brake size

Rectifier type	Supply voltage	Over-excitation		Holding current reduction	
		Coil voltage	Size	Coil voltage	Size
	[V AC]	[V DC]		[V DC]	
BEG-561-255-030	230	103	06 – 25	205	06 – 14
BEG-561-255-130			-		16 – 25
BEG-561-440-030-1	400	180	06 – 25	-	-

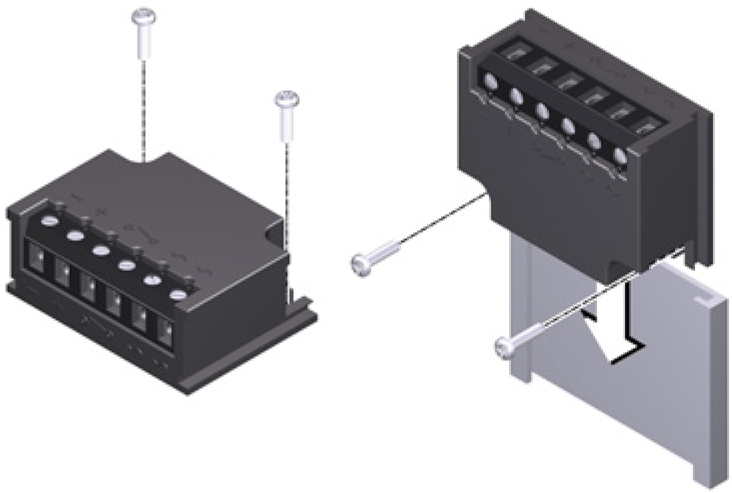


Fig. 36: BEG-561 fastening options

7.7.2 Technical specifications

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

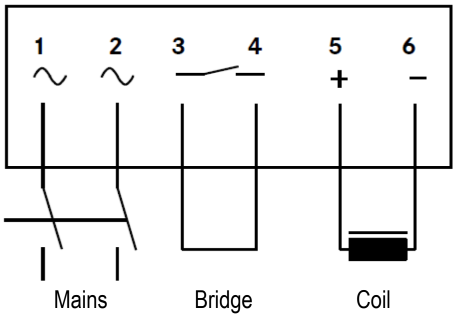
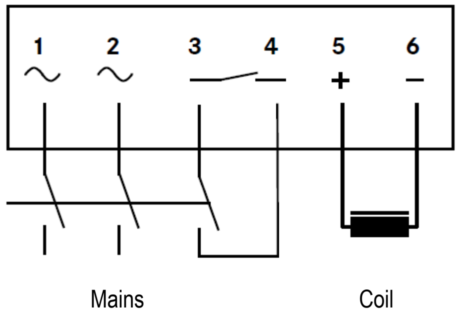
U_1 input voltage (40 – 60 Hz)

Type	Input voltage U_1 (40 Hz – 60 Hz)			Max. current I_{max}		Over-excitation period t_{ue} (± 20 %)		
	Min.	Rated	Max.	Bridge	Half-wave	at $U_{1\ min}$	at $U_{1\ Nom}$	at $U_{1\ max}$
	[V~]	[V~]	[V~]	[A]	[A]	[s]	[s]	[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

Tab. 15: Data for bridge/half-wave rectifier type BEG-561

7.7.3 Reduced switch-off times

AC switching must also be carried out for the mains supply side switching (fast engagement)! Otherwise, there will be no overexcitation when it is switched back on.

Delayed engagement	Fast engagement
	

7.7.4 Permissible current load at ambient temperature

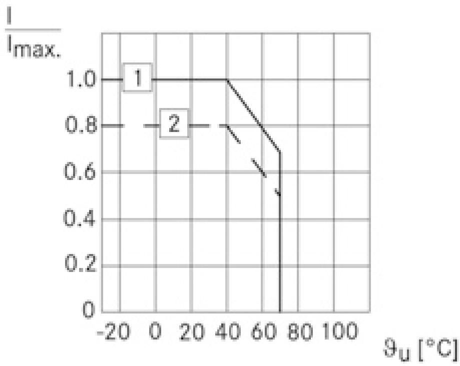


Fig. 37: **Permissible current load**

① If screwed to metal surface (good heat dissipation)

② For other installations (e.g. with adhesive)

8 Commissioning and operation

8.1 Possible applications of the Kendrion INTORQ spring-applied brake

NOTICE

In case of high humidity: If condensed water and moisture are present, provide for an appropriate ventilation for the brake to ensure that all friction components dry quickly.
At high humidity and low temperatures: Take measures to ensure that the armature plate and rotor do not freeze.

Important notes

DANGER

Danger: rotating parts!

- The brake must be free of residual torque.
- The drive must not be running when checking the brake.

DANGER

There is a risk of injury by electrical shock!

The live connections must not be touched.

- The brake is designed for operation under the environmental conditions that apply to IP54 protection. Because of the many ways the brake can be used, it is necessary to check the functionality of all mechanical components under the corresponding operating conditions.

Notice

Functionality for different operating conditions

- The brakes are dimensioned in such a way that the specified rated torques are reached safely after a short run-in process.
- Since the material properties of the friction linings are subject to fluctuations and as a result of different environmental conditions, deviations from the specified braking torque are possible. This has to be taken into account by appropriate dimensioning of the tolerances. Increased breakaway torque can occur in particular as an result of long standstill periods in humid environments with varying temperatures.

Notice

Operation without dynamic loads (functioning as a pure holding brake)

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

8.2 Function checks before initial commissioning

	⚠ DANGER
⚠	**Danger: rotating parts!** ▮ The brake must be free of residual torque. ▮ The drive must not be running when checking the brake.

	⚠ DANGER
⚡	**There is a risk of injury by electrical shock!** The live connections must not be touched.

8.2.1 Function check of the brake

If a fault or malfunction arises during the function check, you can find important information for troubleshooting in the chapter Troubleshooting and fault elimination, Page 79. If the fault cannot be fixed or eliminated, please contact the customer service department.

8.2.2 Release / voltage control

1. Switch off the supply to the motor and brake securely.
2. When switching on the brake supply, make sure that the motor DOES NOT start up (e.g. remove the two bridges on the motor terminals).
   - **Do not** disconnect the supply connections to the brake.
   - If the rectifier for the brake supply is connected to the neutral point of the motor, **also** connect the neutral conductor to this connection.

	⚠ DANGER
⚠	**Danger: rotating parts!** Your system should be mechanically immobilized in the event that it could start moving when the brake is released.

3. Switch the power on.
4. Measure the DC voltage at the brake.
   - Compare the measured voltage to the voltage specified on the name plate. A deviation of up to 10% is permitted.
   - When using bridge/half-wave rectifiers: After switching to one-way voltage, the measured DC voltage may drop to 45% of the voltage specified on the name plate.
5. Check the air gap s_L. The air gap must be zero and the rotor must rotate freely.
6. Switch off the supply to the motor and brake securely.
7. Connect the bridges to the motor terminals. Remove any extra neutral conductor.

8.2.3 Testing the hand-release functionality

NOTICE

This operational test must also be carried out!

Fig. 38: **Turning direction of the lever**

Size	Hand force [N] Standard braking torque	Hand force [N] Maximum braking torque
06	20	30
08	35	50
10	55	75
12	90	120
14	130	170
16	150	230
18	220	250*
20	260	330*
25	270	350*

Tab. 16: **Actuating forces**

* When used with a long lever

1. Make sure that the motor and brake are de-energized.
2. Pull (with some force) on the lever until the force increases sharply.
   – The rotor must now rotate freely. A small residual torque is permissible.

NOTICE

- Make sure that the brake it not subject to excessive force.
- Do not use auxiliary tools (e.g. extension pipes) to facilitate the air release. Auxiliary tools are not permitted and are not considered as proper and intended usage.

3. Release the lever.
   – A sufficient torque must build up immediately!

Notice

If faults occur, refer to the error search table (Troubleshooting and fault elimination, Page 79). If the fault cannot be fixed or eliminated, please contact the customer service department.

8.3 Commissioning

DANGER

Danger: rotating parts!

- The brake must be free of residual torque.
- The drive must not be running when checking the brake.

DANGER

There is a risk of injury by electrical shock!

The live connections must not be touched.

1. Switch on your drive system.
2. Perform a test braking procedure; if necessary, reduce the braking torque (depending on your specifications and requirements)

8.4 Operation

	⚠ DANGER
	Danger: rotating parts! ▮ The running rotor must not be touched. ▮ Take structural design measures on your final product and implement organizational safety rules to ensure that nobody can touch a rotor.

	⚠ DANGER
	There is a risk of injury by electrical shock! ▮ Live connections must not be touched. ▮ Take structural design measures on your final product and implement organizational safety rules to ensure that nobody can touch a connection.

- Checks must be carried out regularly. Pay special attention to:
  - unusual noises or temperatures
  - loose fixing/attachment elements
  - the condition of the electrical cables.
- While current is being applied to the brake, make sure that the armature plate is completely tightened and the drive moves without residual torque.
- Measure the DC voltage at the brake. Compare the measured DC voltage with the voltage indicated on the name plate. The deviation must be less than ± 10%!
- When using bridge/half-wave rectifiers: After switching to one-way voltage, the measured DC voltage may drop to 45% of the voltage specified on the name plate.

8.4.1 Brake torque reduction (for the optional adjustable braking torque)

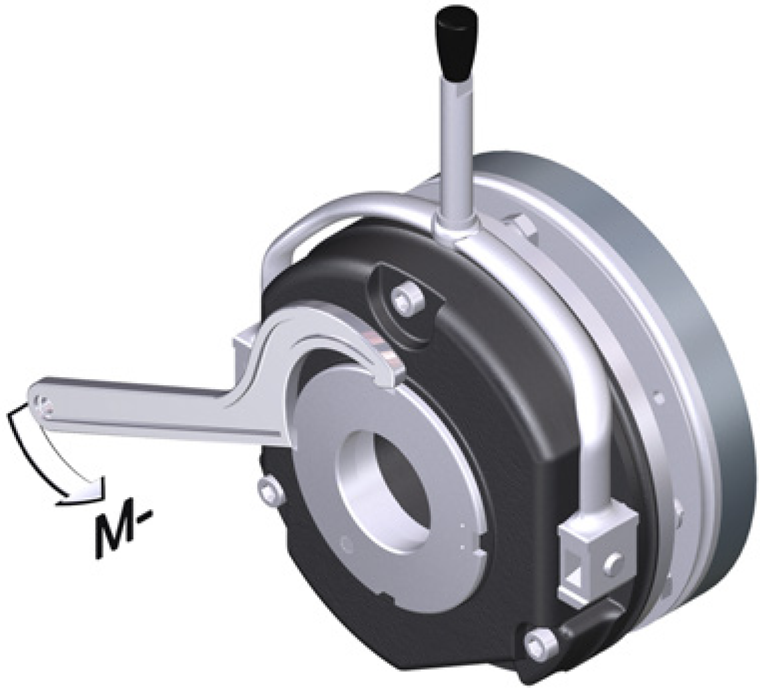


Fig. 39: **Reducing the braking torque**

1. Use a hook wrench to turn the torque adjustment ring counter-clockwise. This reduces the braking torque.
   - Note the correct position of the tappet notches on the torque adjustment ring: Only the latched-in positions are permitted. It is forbidden to operate the brake when the notches are adjusted between these latched-in positions! (Refer to chapter Brake torques, Page 22 for the values for the braking torque reduction for each latched-in position.)
   - Observe the max. permissible protrusion (h_{Emax}) of the torque adjustment ring over the stator. (Refer to the table Rated data for braking torques, depending on the speed and permissible limiting speeds for values of h_{Emax}.)

⚠ DANGER

The reduction of the braking torque does not increase the maximum permissible air gap s_{Lmax} .
Do not change the hand-release setting for designs with hand-release.
Increasing the braking torque by screwing in the torque adjustment ring is only permitted up to the default (as delivered) torque value .

8.4.2 Operating procedures

Operating procedures

⚠ DANGER

The friction lining and the friction surfaces must never contact oil or grease since even small amounts reduce the braking torque considerably.

9 Maintenance and repair

	DANGER
EX	**Danger of explosion** Increased temperatures on the surfaces and in the friction gap can result when the maximum friction work and operating frequencies specified by Kendrion INTORQ are exceeded. These can lead to ignition. ▮ Operation is only permitted within the specified specifications.

The following must always be observed when installing or repairing ATEX brakes:

- All work related to the dismantling of the brake must be carried out with non-sparking tools.
- If spark-generating tools are used for further work, then such work on the brake must always be performed outside the explosive atmosphere.
- For every servicing or repair that is carried out, the brake must be cleaned in accordance with the instructions in the Maintenance, Page 71 section, and the entire brake must be cleared of impurities caused by the explosive dust atmosphere.
- In order to eliminate the risk of ignition and injury, the spring-applied brakes may only be dismantled after they cool down.

9.1 Wear of spring-applied brakes

	WARNING
!	**Braking torque reduction** The system must **not** be allowed to continue operations after the maximum air gap s_{Lmax} has been exceeded. Exceeding the maximum air gap can cause a major reduction in the braking torque!

The table below shows the different causes of wear and their impact on the components of the spring-applied brake. The influencing factors must be quantified in order to calculate the service life and prescribed maintenance intervals of the rotor and brake accurately. The most important factors in this context are the applied friction work, the initial speed of rotation before braking and the operating frequency. If several of the causes of friction lining wear occur in an application at the same time, the effects should be added together when the amount of wear is calculated.

Component	Cause	Effect	Influencing factors
Rotor	Service braking	Wear of the friction lining	Friction work
	Emergency stops		
	Overlapping wear during start and stop of drive		
	Active braking via the drive motor with support of brake (quick stop)		
	Start-up wear in case of motor mounting position with vertical shaft, even when the brake is not applied		Number of start/stop cycles
Armature plate and counter friction surface	Rubbing and friction of the brake lining	Run-in of armature plate and counter friction surface	Friction work
Gear teeth of brake rotor	Relative movements and shocks between brake rotor and brake shaft	Wear of gear teeth (primarily on the rotor side)	Number of start/stop cycles
Armature plate support	Load reversals and jerks in the backlash between armature plate, adjustment tubes and guide/cylinder pins	Breaking of armature plate, sleeve bolts and bolts or cylinder 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. 17: **Causes for wear**

9.2 Inspections

To ensure safe and trouble-free operations, the spring-applied brakes must be checked at regular intervals and, if necessary, replaced. Servicing at the facility will be easier if the brakes are made accessible. This must be considered when installing the drives in the plant.

Primarily, the required maintenance intervals for industrial brakes result from their load during operation. When calculating the maintenance interval, all causes of wear must be taken into account. Refer to the table Causes for wear, Page 70 in the chapter Verschleiß von Federkraftbremsen, Page 69. For brakes with low loads (such as holding brakes with emergency stop function), we recommend a regular inspection at a fixed time interval. To reduce costs, the inspection can be carried out along with other regular maintenance work in the facility.

When there is low friction work for each switching operation, the brake's mechanical components may also limit the service life. The rotor-hub connection, the springs, the armature plate and the sleeves are particularly subject to operational wear.

If there is a requirement for a longer service life, service life-optimized solutions are available (consult with the manufacturer).

Failures, production losses or damage to the system may occur when the brakes are not serviced. Therefore, a maintenance strategy that is 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 table below must be followed. The maintenance operations must be carried out as described in the detailed descriptions.

9.2.1 Maintenance intervals

⚠ WARNING

In safety-relevant applications that have periodic torque surges (e.g. due to dynamic braking processes), the rotors must always be replaced after 2 million cycles or 10 years at the latest.

Versions	Service brakes	Holding brakes with emergency stop
BFK458-□□ E / N BFK458-□□ L	according to the service life calculation	at least every 2 years
	or else every six months	after 1 million cycles at the latest*
	after 4000 operating hours at the latest	Plan shorter intervals for frequent emergency stops.

* NOTICE: 10 million cycles for the L design type

9.3 Maintenance

Notice

Brakes with defective armature plates, springs or flanges must be completely replaced.
Observe the following for inspections and maintenance works:

- Contamination by oils and greases should be removed using brake cleaner, or the brake should be replaced after determining the cause. Dirt and particles in the air gap between the stator and the armature plate endanger the function and should be removed.
- After replacing the rotor, the original braking torque will not be reached until the run-in operation for the friction surfaces has been completed. After replacing the rotor, the run-in armature plates and the flanges have an increased initial rate of wear.

9.3.1 Brake testing

Notice

A simplified inspection/maintenance is permitted with the mounted brake under the following conditions:

- Usage as a holding brake (brake engaged only at standstill)
- Air gap within permissible range
- < 10000 emergency stops
- Rotor in noise-reduced version (gear teeth with plastic sleeve)

The extended inspection/maintenance required after the brake removal can then be omitted.

Simplified inspection/ maintenance with the mounted brake	▮ Check the air gap (CAUTION: If the air gap needs to be readjusted, the extended inspection is required after the brake is removed.)	Refer to Checking the air gap, Page 73
	▮ Check release function and control	Refer to Release / voltage, Page 73
Extended inspection/ maintenance after removal of brake	▮ Adjusting the air gap	Refer to Adjusting the air gap, Page 74
	▮ Checking the rotor thickness	Refer to Checking the rotor thickness, Page 74
	▮ Check the play of the rotor gear teeth (replace worn-out rotors)	Refer to Replacing the rotor, Page 74
	▮ Check for breaking out of the torque support at the guide parts and the armature plate	
	▮ Check the springs for damage	
	▮ Check the armature plate and flange or counter friction surface	
	– Thermal damage (dark blue tarnish)	
	– Flatness depending on the size	Refer to the Design of end shield and shaft, Page 41 table.
	– Max. run-in depth = rated air gap for the size	Refer to the Characteristics for air gap specifications, Page 23 table.

9.3.2 Checking the air gap

	DANGER
	Danger: rotating parts! The motor must **not** run while the air gap is being checked.

1. Measure the air gap s_L between the armature plate and the stator near the fastening screws using a feeler gauge. (Refer to table Characteristics for air gap specifications, Page 23 for the values.)
2. Compare the measured air gap with the value for the max. permissible air gap s_{Lmax} . (Refer to the Characteristics for air gap specifications, Page 23 table for the values.)
3. Adjust the air gap to s_{LN}. (Refer to Adjusting the air gap, Page 74).

9.3.3 Release / voltage

	DANGER
	Danger: rotating parts! The running rotor must not be touched.

	DANGER
	There is a risk of injury by electrical shock! The live connections must not be touched.

1. Check the brake functionality when the drive is running: The armature plate must be tightened and the rotor must move without residual torque.
2. Measure the DC voltage at the brake.
   – Compare the measured voltage to the voltage specified on the name plate. A deviation of up to 10% is permitted.
   – When using bridge/half-wave rectifiers: After switching to one-way voltage, the measured DC voltage may drop to 45% of the voltage specified on the name plate.

9.3.4 Adjusting the air gap

⚠ DANGER

Danger: rotating parts!

The brake must be free of residual torque.

NOTICE

Please observe when mounting the flange design with additional screws:
Clearing holes for the screws in the end shield must be behind the threaded screw holes in the flange. Without the clearing holes, the minimal rotor thickness cannot be used. The screws must not press against the end shield.

1. Loosen the screws (refer to the figure Adjusting the air gap, Page 46).
2. Screw the sleeve bolts (using an open-end wrench) further into the stator. A 1/6 turn will decrease the air gap by approximately 0.15 mm.
3. Tighten the screws. (Refer to table Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 24 for the torque values.)
4. Check the value of s_L near the screws using a feeler gauge. (Refer to table Characteristics for air gap specifications, Page 23.)

9.3.5 Checking the rotor thickness

1. Pull the rotor off the hub.
2. Check for possible damage (e.g. chipping in the friction lining or worn gear teeth).
3. Measure the rotor thickness using a caliper gauge at three different points on the rotor's circumference.
4. Compare the measured rotor thickness with the minimum permissible rotor thickness. (Refer to the values in the table Characteristics for air gap specifications, Page 23.) If the measured rotor thickness is insufficient, the rotor must be replaced completely. (Refer to Replacing the rotor, Page 74 for the description.)

9.3.6 Replacing the rotor

⚠ DANGER

Danger: rotating parts!

Switch off the voltage. The brake must be free of residual torque.
Your system should be mechanically immobilized in the event that it could start moving when the brake is released.

1. Remove the connection cables.
2. Loosen the screws evenly and then remove them.
3. Pay attention to the connection cable during this step! Remove the complete stator from the end shield.

4. Pull the rotor off the hub.
5. Check the hub's gear teeth.
6. Replace the hub if wear is visible.
7. Check the end shield's friction surface. Replace the friction surface on the end shield when there is clearly visible scoring at the running surface. In case of strong scoring on the end shield, rework the friction surface.
8. Measure the rotor thickness of the new rotor and the head thickness of the sleeve bolts (use a caliper gauge).
9. Calculate the distance between the stator and the armature plate as follows:
   – **Distance = rotor thickness + s_{LN} - head height**
     (For values of s_{LN} , refer to the table Characteristics for air gap specifications, Page 23.)
10. Unscrew the sleeve bolts evenly until the calculated distance between the stator and armature plate is reached.
11. You can now install and adjust the new rotor and the complete stator. (Refer to Mounting the brake, Page 44.)
12. Re-connect the connection cables.
13. If necessary, deactivate the mechanical shutdown of the system.

9.4 Spare parts list

INTORQ spring-applied brake BFK458-06 to 25

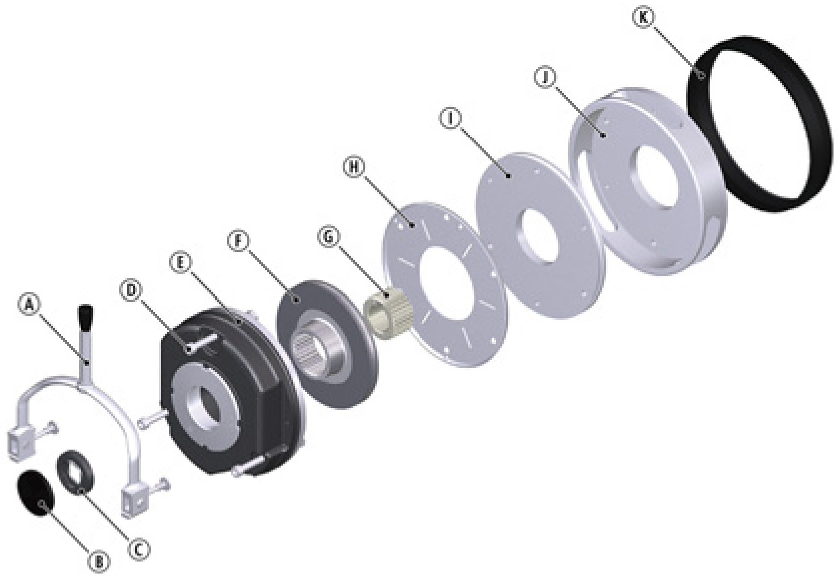


Fig. 40: INTORQ spring-applied brake BFK458-06 to 25

	Designation	Variant
Ⓐ	Hand-release with standard lever	Mounting kit
Ⓑ	Cap	Basic module N
Ⓒ	Shaft sealing ring	Shaft diameter on request
Ⓓ	Screw set DIN EN ISO 4762 - 8.8 in various designs and lengths	▮ for mounting to the flange ▮ for mounting to the motor / friction plate ▮ for flange with through hole
Ⓔ	Complete stator, module E Complete stator, module N	Voltage / braking torque Module E: Optionally with rear threads
Ⓕ	Complete rotor	Aluminum rotor
		Aluminum rotor with sleeve - Noise-reduced design
Ⓖ	Hub	Bore diameter [mm] keyway according to DIN 6885/1
Ⓗ	Friction plate	
Ⓘ	Flange Hard chrome-plated flange	
Ⓙ	Centering flange (tacho flange)	
Ⓚ	Cover ring	
	Brake cover (degree of protection corresponds to IP65)	
	Terminal box as mounting kit	

INTORQ double spring-applied brake BFK458-06 to 25

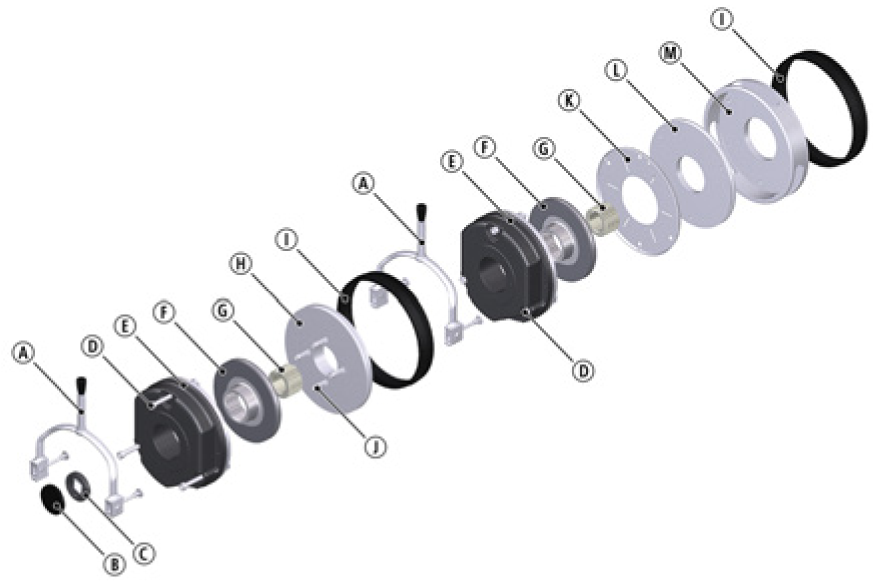


Fig. 41: **INTORQ double spring-applied brake BFK458-06 to 25**

	Designation	Variant
Ⓐ	Hand-release with standard lever	Mounting kit
Ⓑ	Cap	Basic module N
Ⓒ	Shaft sealing ring	Shaft diameter on request
Ⓓ	Screw set DIN EN ISO 4762 - 8.8 in various designs and lengths	▮ for mounting to the flange ▮ for mounting to the motor / friction plate ▮ for flange with through hole
Ⓔ	Complete stator, module N	Voltage / braking torque - Optionally with rear threads
Ⓕ	Complete rotor	Aluminum rotor
		Aluminum rotor with sleeve - Noise-reduced design
Ⓖ	Hub with standard bore	Bore diameter [mm] keyway according to DIN 6885/1
Ⓗ	Intermediate flange, double spring-applied brake	
Ⓘ	Cover ring	
Ⓙ	Screw set; socket head cap screw DIN EN ISO 4762 8.8 / size 25 10.9	for intermediate flange, double spring-applied brake
Ⓚ	Friction plate	
Ⓛ	Flange Hard chrome-plated flange	
Ⓜ	Centering flange (tacho flange)	

Electrical accessories

Bridge/half-wave rectifier	Supply voltage	Over-excitation		Holding current reduction	
		Coil voltage	Size	Coil voltage	Size
	[V AC]	[V DC]		[V DC]	
BEG-561-255-030	230	103	06 – 25	205	06 – 14
BEG-561-255-130			-		16 – 25
BEG-561-440-030-1	400	180	06 – 25	-	-

10 Troubleshooting and fault elimination

If any malfunctions should occur during operations, please check for possible causes based on the following table. If the fault cannot be fixed or eliminated by one of the listed steps, please contact customer service.

Fault	Cause	Remedy
Brake cannot be released, air gap is not zero	Coil interruption	▮ Measure coil resistance using a multimeter: – Compare the measured resistance with the nominal resistance. Refer to Rated data for coil power, Page 25 for the values. – If resistance is too high, replace the complete spring-applied brake.
	Coil has contact to earth or between windings	▮ Measure coil resistance using a multimeter: – Compare the measured resistance with the nominal resistance. Refer to Rated data for coil power, Page 25 for the values. If resistance is too low, replace the complete stator. ▮ Check the coil for short to ground using a multimeter: – If there is a short to ground, replace the complete spring-applied brake. ▮ Check the brake voltage (refer to section on defective rectifier, voltage too low).
	Wiring defective or wrong	Check the wiring and correct. ▮ Check the cable for continuity using a multimeter – Replace a defective cable.
	Rectifier defective or incorrect	▮ Measure rectifier DC voltage using a multimeter. ▮ If DC voltage is zero: ▮ Check AC rectifier voltage. ▮ If AC voltage is zero: – Switch on power supply – Check fuse – Check wiring. ▮ If AC voltage is okay: – Check rectifier, – Replace defective rectifier ▮ Check coil for inter-turn fault or short circuit to ground. ▮ If the rectifier defect occurs again, replace the entire spring-applied brake, even if you cannot find any fault between turns or short circuit to ground. The error may only occur on warming up.

Fault	Cause	Remedy
Brake cannot be re-leased, air gap is not zero	Air gap "s_L" is too large	Adjust the air gap (Adjusting the air gap, Page 74).
Rotor cannot rotate freely	Wrong setting of hand-release	Check the dimensions s_{LN} + s_{HL} with the brake energized. The dimen-sions must be the same on both sides. Correct if required. (Refer to Mounting the hand-release (retrofitting), Page 54.)
Rotor is too thin	Air gap "s_L" too small	Check the air gap "s_L" and adjust if necessary (Adjusting the air gap, Page 74).
Rotor is too thin Voltage too high	Rotor has not been replaced in time	Replace the rotor (Replacing the rotor, Page 74).
	Brake voltage does not match the rectifier	Adjust rectifier and brake voltage to each other.
Voltage too low	Brake voltage does not match the rectifier	Adjust rectifier and brake voltage to each other.
Voltage too low AC voltage is not mains voltage	Defective rectifier diode	Replace the defective rectifier with a suitable undamaged one.
	Fuse is missing or defective	Select a connection with a proper fuse.

Kendrion INTORQ GmbH
Germany
PO Box 1103
D-31849 Aerzen, Germany
Wülmser Weg 5
D-31855 Aerzen, Germany
☎ +49 5154 70534-0 (Headquarters)
☎ +49 5154 70534-222 (Sales)
+49 5154 70534-200
info@intorq.com

应拓柯制动器（上海）有限责任公司
INTORQ (Shanghai) Co., Ltd.
上海市浦东新区泥城镇新元南路600
号6 号楼一楼B 座
No. 600, Xin Yuan Nan Road,
Building No. 6 / Zone B
Nicheng town, Pudong
201306 Shanghai
☎ +86 21 20363-810
+86 21 20363-805
info@cn.intorq.com

INTORQ US Inc.
USA
300 Lake Ridge Drive SE
Smyrna, GA 30082, USA
☎ +1 678 236-0555
+1 678 309-1157
info@us.intorq.com

INTORQ India Private Limited
India
Plot No E-2/7
Chakan Industrial Area, Phase 3
Kharabwadi, Taluka – Khed
Pune, 410501, Maharashtra
☎ +91 2135625500
info@intorq.in

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www.kendrion.com