

**INTORQ**

POWERED BY KENDRION

## **INTORQ BFK458**

**Spring-applied brake with electromagnetic release**

**Translation of the Original Operating Instructions**

## Document history

Material number	Version			Description
402772	1.0	08/1998	TD09	First edition for the series
402772	1.1	05/2000	TD09	Address revision Changed values of brake torques, table 1 and table 3 Supplemented table 4, switching times
459885	2.0	11/2002	TD09	All chapters: Complete editorial revisions, renaming Changed values of brake torques Drawing changes to Figures 12, 13, 14, 15 and 16 New: Chapter 7.4 "Spare parts list for double spring-applied brake"
13040625	2.1	02/2005	TD09	Changed company name to INTORQ
13283719	3.0	12/2008	TD09	Changed the tightening torques Supplemented table 5 Revision of Chapter 3.5 Supplemented Chapters 7.1 and 7.2
13283719	3.1	01/2010	TD09	Changed the maintenance intervals for holding brakes with emergency stop
13343706	4.0	07/2010	TD09	Changed values for the braking torques and rotation speeds (table 3)
13343706	4.1	05/2012	TD09	Changed strength grade of the fastening screws
13343706	5.0	10/2013	TD09	Complete revision
13343706	6.0	09/2015	SC	Restructured FM, harmonized connection diagrams, revised graphics
13343706	6.1	11/2015	SC	Revision of Chapter 8.4 (Spare parts list)
13343706	7.0	02/2016	SC	Update
13343706	8.0	03/2017	SC	Update, extension to Project Planning Notes
13343706	8.1	07/2017	SC	Added to Safety Brake
13343706	9.0	04/2018	SC	Update, ST4 migration
13343706	10.0	05/2018	SC	Holding brake in the ATEX zone, added to HFC
13343706	11.0	11/2018	SC	Update
13343706	12.0	07/2019	SC	Update, mounting of hub
13343706	13.0	05/2021	SC	Change of company name to Kendrion INTORQ Changes to Chapters 3.1.2 and 5.1 Supplements to Chapters 6.7 and 8.2

## 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



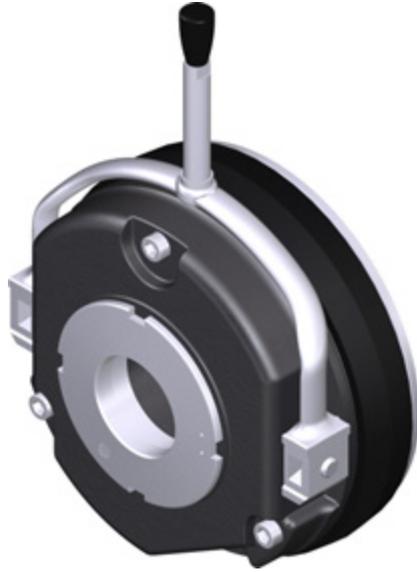
### Notice

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



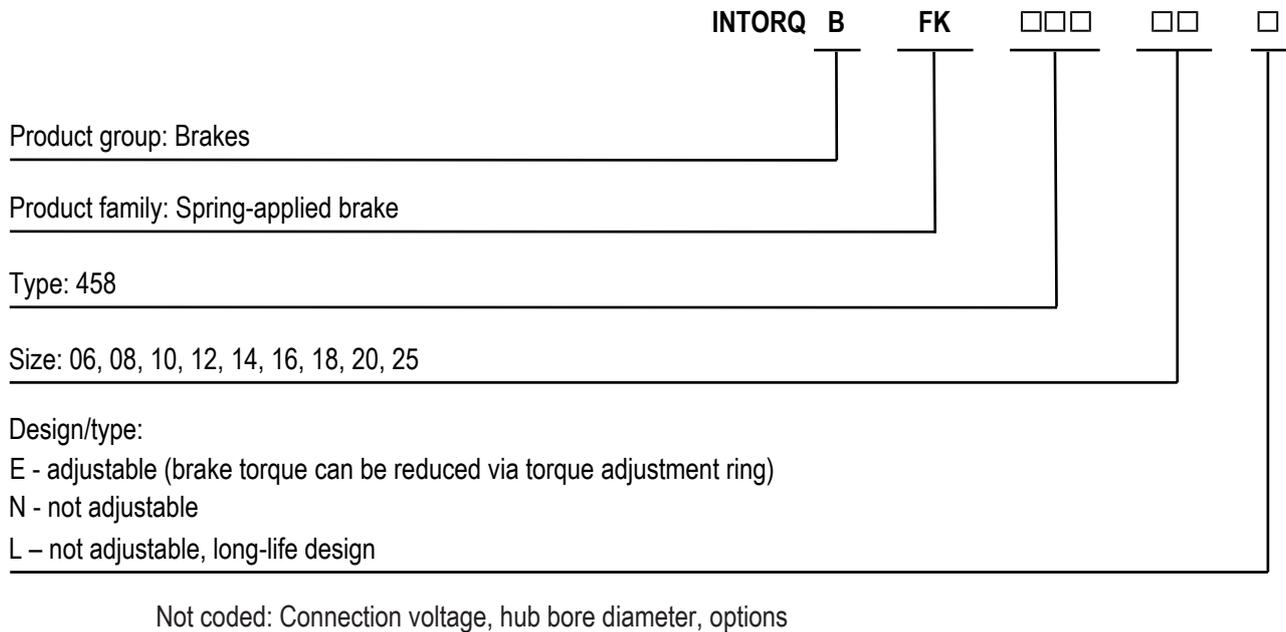
Design N



Double spring-applied brake



## Product key



## 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.

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# 1 General information

## 1.1 Using these Operating Instructions

- These Operating Instructions will help you to work safely with the spring-applied brake with electro-magnetic 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:

<b>Spelling of numbers</b>	Decimal separator	Point	The decimal point is always used. For example: 1234.56
<b>Page reference</b>	Underlined, red		Reference to another page with additional information For example: <u>Using these Operating Instructions, Page 9</u>
<b>Symbols</b>	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:

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

Danger level

	 <b>DANGER</b>
	<p>DANGER indicates a hazardous situation which, if not avoided, <i>will</i> result in death or serious injury.</p>

	 <b>WARNING</b>
	<p>WARNING indicates a potentially hazardous situation which, if not avoided, <i>could</i> result in death or serious injury.</p>

	 <b>CAUTION</b>
	<p>CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.</p>

	<b>NOTICE</b>
	<p>Notice about a harmful situation with possible consequences: the product itself or surrounding objects could be damaged.</p>

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
Cold Climate Version (CCV)	Version of the spring-applied brake suited for particularly low temperatures

## 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
$R_z$	$\mu\text{m}$	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 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, Page 21](#)) must be followed to comply with the proper and intended usage. Any other usage is consider improper and prohibited.

#### 3.1.2 Applications with special safety requirements ("Safety Brake")

A safety certificate for the system must be provided in accordance with DIN EN ISO 13849 whenever the Kendrion INTORQ spring-applied brakes are being used in applications that have special safety requirements. The BFK458-series brakes are suitable for use as service brakes, as holding brakes, and as holding brakes with emergency-stop functionality for safety applications. The safety characteristics of the safety brake apply to systems that are designed so that 80% of the characteristic torque of the brake is sufficient for the safety function. The selected characteristic torque of the brake must, at a minimum, comply with the standard braking torque in order to meet the high safety requirements.

Please note the following conditions:

- Proper and intended usage of the brake as described in [Standard applications, Page 14](#)
- Compliance with the installation specifications in these Operating Instructions
- The following points are important when mounting the brake with special safety requirements:
  - The material and the surface quality of the counter friction surface are listed in the table "End shield as counter friction surface", in the chapter [Design of end shield and shaft, Page 36](#).
  - To attach the brake to the motor end shield, use screws of strength class 8.8 which are capable of handling the tightening torque listed in the tables [Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 25](#) and [Characteristics: screw kit for brake assembly on motor, friction plate and flange with through hole, Page 25](#).
  - The fastening screws should be tightened evenly using a standard torque wrench, with a tightening torque tolerance of +/- 10%.
  - The following values apply for the minimum screw-in depths:  
Steel: 1.0 x thread diameter  
Cast aluminum: 1.5 x thread diameter
  - When determining the possible screw-in depths of the fastening screws into the motor flange, the max. adjustment (according to the table [Characteristics for air gap specifications, Page 24](#)) and the projection of the screws when the brake is new must be taken into account.
  - The recommended dimensions of the screws and the screw-in depth (including the adjustment reserve for rotor wear) into the mounting holes in the motor flange can be found in the table [Characteristics: screw kit for brake assembly on motor, friction plate and flange with through hole, Page 25](#).

- Version of the brake with:
  - A characteristic torque corresponding to the standard braking torque of that size or higher
  - An expected characteristic torque that covers the safety-relevant functionality, even with a drop to 80%
  - A noise-reduced rotor with toothed intermediate ring
- Compliance with the technical specifications listed in the Technical specifications, Page 21 chapter.
  - Ambient temperature during operation: -20° to +40° C
- The customer is responsible for ensuring that there is a secure connection between the shaft and the hub.
- Follow the information in chapter Installing the hub onto the shaft, Page 38 to ensure a safe shaft-to-hub connection.

Observe the following notices:

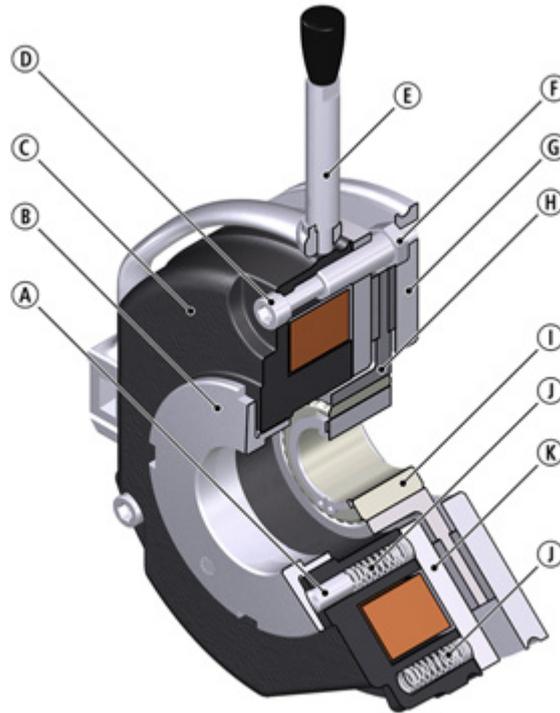
- The extended lower temperature range of the CCV version must not be reached when used as a safety brake.
- The micro-switch option is not covered by the safety certificate.
- The service life specification for the long-life version remains valid. When it is being used as a safety brake, however, the safety characteristic values for the non-long-life design must be used.
- The calculation for the safety application does not consider the wear of the friction lining or the load on the brake due to emergency stops. These points must be checked separately when configuring the brake.
- Furthermore, all specified restrictions apply to the standard and wear-resistant friction linings (e.g. permissible operating frequency, permissible friction work, reactivation during operation as a holding brake, breakaway torque after extended rest, temperature range, etc.).

The classification of the safety function of our brakes is based on the performance levels PL in accordance with DIN EN ISO 13849-1:2015. This can be used to support the verifications of the functional safety of drive systems. The safety characteristic data are available on request.

## 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.

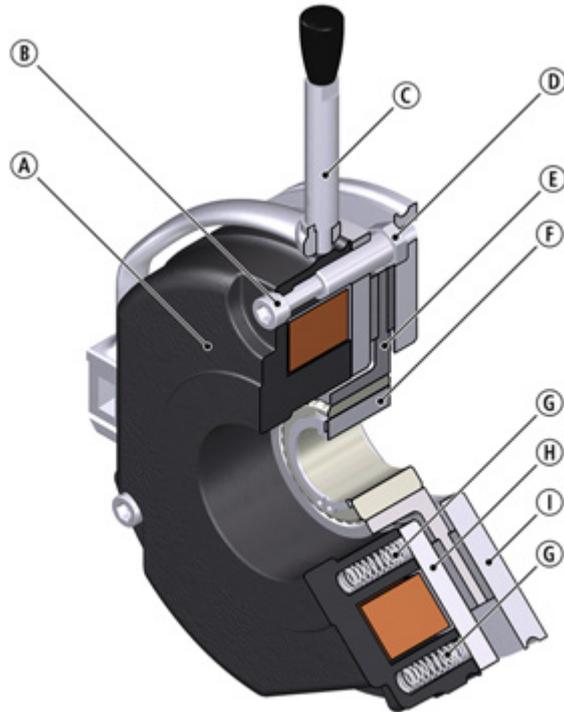
### 3.2.1 Basic module E



**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          |               |

### 3.2.2 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                  |

### 3.2.3 Basic module L

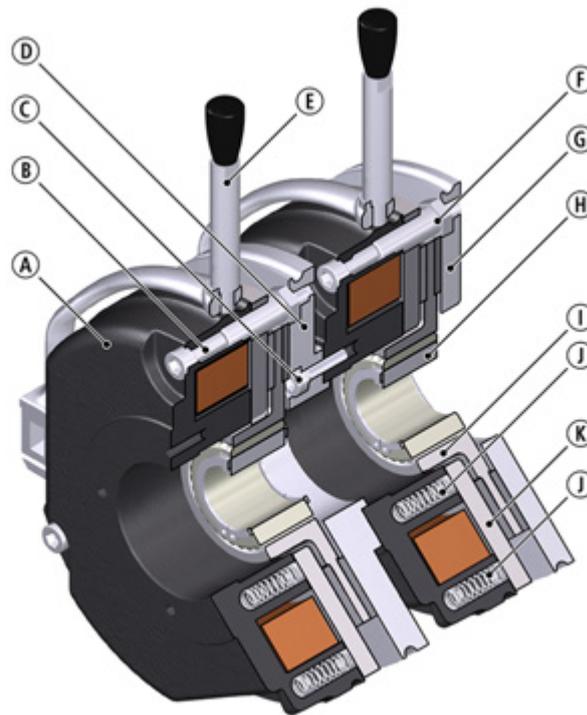
Description of the long-life design:

- 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.
- A micro-switch in the size 12 is not configurable.

### 3.2.4 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 ( $s_a$ ) 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 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 a result of long standstill periods in humid environments with varying temperatures.
- If the brake is used as a pure holding brake without dynamic load, the friction lining must be reactivated regularly.

### 3.6 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.

### 3.7 Optional configuration

#### 3.7.1 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.

The brake can be fitted with a micro-switch to monitor the hand-release function. The user is responsible for establishing the proper electrical connection.

### 3.7.2 Optional micro-switch

The micro-switch is used for the release monitoring or for wear monitoring. The user is responsible for arranging the electrical connection for this optional micro-switch.

- Usage for the (air) release monitoring: The motor will start only after the brake has been released. This enables the micro-switch to monitor for errors (e.g. when the motor does not start because of a defective rectifier, if there are broken connection cables, defective coils, or an excessive air gap).
- Usage for monitoring wear: The brake and motor are not supplied with power when the air gap is too large.

### 3.7.3 Optional CCV

The Cold Climate Version (CCV) allows the brake to be operated at lower ambient temperatures.

## 4 Technical specifications

### 4.1 Possible applications of the Kendrion INTORQ spring-applied brake

- Degree of protection:
  - The brake is designed for operation under the operating conditions that apply to IP54 protection. Because of the numerous possibilities of using the brake, it is still necessary to check the functionality of all mechanical components under the corresponding operating conditions.
- Ambient temperature:
  - -20 °C to +40 °C (Standard)
  - -40 °C to +40 °C (Cold Climate Version: CCV)

	<b>NOTICE</b>
When using the spring-applied brake as safety brake, the temperature range specified for the Cold Climate Version (CCV) is not permitted.	



#### Notice

The Kendrion INTORQ BFK458 size 06 to 25 spring-applied brakes described in these operating instructions may be used in normal operation in areas where there is **not expected to be any** explosive atmosphere due to gases, vapors, mist or swirling dust – **but if they nevertheless did occur, then only rarely and for a short period of time within the meaning of the ATEX Directive 2014/34/EU** – as holding brakes, as holding brakes with emergency stop functionality, and as service brakes.

Special conditions and instructions for safe operations within the ATEX zone are detailed in the Kendrion INTORQ Operating Instructions BFK458-ATEX BA14.0217. You can also contact the Kendrion INTORQ sales department for this information.

## 4.2 Brake torques

	<b>NOTICE</b>
	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	65 N/E	90 N/E	165 N/E	290 N/E	445 N/E	
	5 E	10 E	20 E	40 E	75 N/E	100 N/E	185 N/E	315 N/E	490 N/E	
	5.5 E	11 E	23 N/E	46 N/E	80 N/E	105 N/E	200 N/E	345 N/E	530 N/E	
	6 N/E	12 N/E				125 N/E	235 N/E	400 N/E	600 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	
Rated torque $M_k$ [Nm] with HFC (high-friction coefficient) lining	7.5 N/E	15 N/E	28 N/E	55 N/E	100 N/E	150 N/E	290 N/E	490 N/E	720 N/E	
Torque reduction per detent [Nm], for design type E with HFC lining	0.25	0.4	1.0	1.6	2.1	1.9	4.4	6.9	7.5	

**Tab. 1: Braking torques and possible brake torque reduction: Adjustable for the design types with HFC**

**N Type without brake torque adjustment**

**E Type with brake torque adjustment**

**L Type in the long-life version**

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

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)  $h_{E_{max}}$ ; refer to the **Rated data for air gap specifications** table and Brake torque reduction (for the optional adjustable braking torque), Page 64.

	<b>NOTICE</b>
	When using the spring-applied brake as a safety brake: Observe the information concerning the shaft-hub connection in section <u>Applications with special safety requirements ("Safety Brake")</u> , Page 14.

When using a standard friction lining, the maximum speeds and friction work ( $Q_E$ ) values specified in the catalog apply for each brake size. For wear-resistant (WR) friction linings and friction linings with a high-friction coefficient (HFC), the following restrictions apply regarding friction work and speed.

Size / speed [rpm]	06	08	10	12	14	16	18	20	25
100	3000	7500	12000	24000	30000	36000	60000	80000	120000
1000	3000	7500	12000	24000	30000	36000	60000	80000	120000
1200	3000	7500	12000	24000	30000	36000	60000	80000	120000
1500	3000	7500	12000	24000	30000	36000	60000	24000	36000
1800	3000	7500	12000	24000	30000	36000	36000	*	*
3000	3000	7500	12000	24000	18000	11000	*	*	*
3600	3000	7500	12000	7000	*	*	*	*	*

**Tab. 2: WR versions: Maximum permissible friction work, in joules**

\* On request

Size / speed [rpm]	06	08	10	12	14	16	18	20	25
100	3000	7500	12000	24000	30000	36000	60000	80000	120000
1000	3000	7500	12000	24000	30000	36000	60000	80000	120000
1200	3000	7500	12000	24000	30000	36000	60000	48000	36000
1500	3000	7500	12000	24000	18000	18000	18000	18000	10000
1800	3000	7500	12000	24000	10000	10000	*	*	*
3000	3000	7500	12000	7000	*	*	*	*	*
3600	3000	7500	3500	*	*	*	*	*	*

**Tab. 3: HFC version: Maximum permissible friction work, in joules**

\* On request

### 4.3 Characteristics

Size	Rated brake torque at $\Delta n=100$ rpm	Braking torque at $\Delta n_0$ [rpm]			Max. speed $\Delta n_{0max}$ . when mounted horizontally
		1500	3000	maximum	
	[%]	[%]	[%]	[%]	[rpm]
06	100	87	80	74	6000
08		85	78	73	5000
10		83	76		4000
12		81	74	3600	
14		80	73		72
16		79	72		70
18		77	70		68
20		75	68	66	
25		73	66		3000

Tab. 4: 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 $h_{Emax}$
	[mm]	[mm]	[mm]		min. <sup>1)</sup>	Max.	
				[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	
12	0.3	0.75	0.45	2.0	8.0	10.0	9.5
14					7.5		11
16					3.5	8.0	11.5
18	0.4	1.0	0.6	3.0	10.0	13.0	15
20					12.0	16.0	17
25					15.5	20.0	19.5

Tab. 5: Characteristics for air gap specifications

<sup>1)</sup> The friction lining is sized so that the brake can be adjusted at least five times.

	<b>NOTICE</b>
	To attach the brake to the motor end shield, use screws of strength class 8.8 which are capable of handling the tightening torque.

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

**Tab. 6:** Characteristics: screw kit for brake assembly on separately screwed-on flange

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

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

<sup>3)</sup> Hex head screw according to DIN EN ISO 4017 - 8.8.

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

**Tab. 7:** Characteristics: screw kit for brake assembly on motor, friction plate and flange with through hole

<sup>4)</sup> Possible screw-in depth = protruding screw plus adjustment reserve for the rotor

	<b>NOTICE</b>
	<p>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!</p>

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

Tab. 8: Characteristics: screw set, intermediate flange installation for double spring-applied brake

Size	Electrical power $P_{20}^{1)}$	Coil voltage U	Coil resistance $R_{20} \pm 8\%$	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 $R_{20} \pm 8\%$	Rated current $I_N$
	[W]	[V]	[ $\Omega$ ]	[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

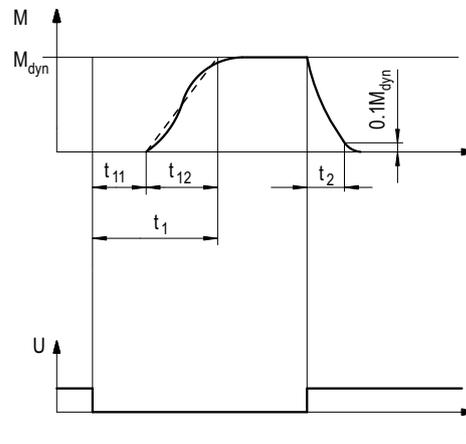
Size	Electrical power $P_{20}^{1)}$	Coil voltage U	Coil resistance $R_{20} \pm 8\%$	Rated current $I_N$
	[W]	[V]	[ $\Omega$ ]	[A]
18	85	24	6.8	3.54
		96	108.4	0.885
		103	124.8	0.825
		170	340	0.5
		180	387.2	0.472
		190	424.7	0.447
		205	494.4	0.414
20	100	24	5.76	4.16
		96	92.2	1.04
		103	106.1	0.970
		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. 9: Rated data for coil power**

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

## 4.4 Switching 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 $M_K$	$Q_E$ <sup>1)</sup>	$S_{hue}$	Operating times <sup>2)</sup>			
				DC-side engagement			Disengag- ing $t_2$
				$t_{11}$	$t_{12}$	$t_1$	
	[Nm]	[J]	[1/h]	[ms]	[ms]	[ms]	[ms]
06	4	3000	79	15	13	28	45
08	8	7500	50	15	16	31	57
10	16	12000	40	28	19	47	76
12	32	24000	30	28	25	53	115
14	60	30000	28	17	25	42	210
16	80	36000	27	27	30	57	220
18	150	60000	20	33	45	78	270
20	260	80000	19	65	100	165	340
25	400	120000	15	110	120	230	390

**Tab. 10:** Switching energy - operating frequency - operating times

<sup>1)</sup> The maximum permissible friction energy  $Q_E$  relates to the standard friction lining.

<sup>2)</sup> 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 longer (approx. 10 times longer).

	<b>NOTICE</b>
	<p>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.</p>

- 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 54](#).



**Notice**

Spark suppressors are available for the rated voltages.

**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.

## 4.5 Friction work / operating frequency

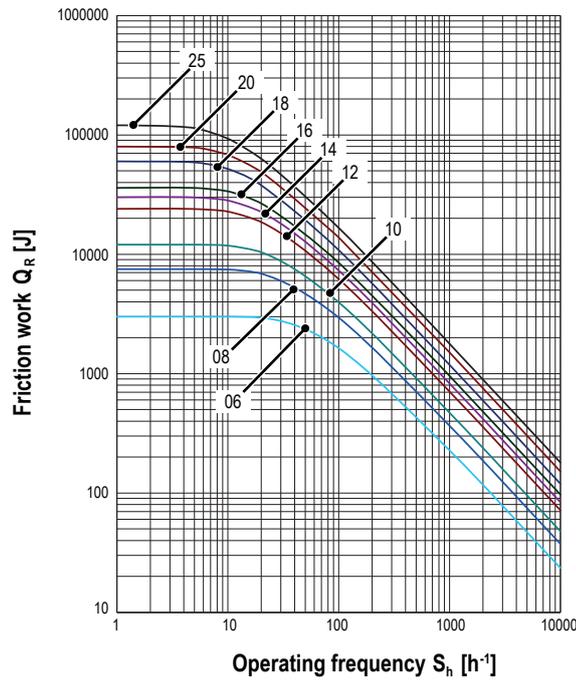


Fig. 5: Friction work as a function of the operating frequency

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

The permissible operating frequency  $S_{hmax}$  depends on the friction work  $Q_R$  (refer to [Figure Friction work / operating frequency](#), Page 31). At a pre-set operating frequency  $S_h$ , the permissible friction work 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.

## 4.6 Electromagnetic compatibility



### Notice

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

<b>NOTICE</b>	
	<p>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.</p> <p>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.</p>

## 4.7 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<sub>L</sub>" 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.

## 4.8 Hand-release

The hand-release mechanism is used to release the brake by hand and can be retrofitted (refer to [Mounting the hand-release \(retrofitting\)](#), Page 49).

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.

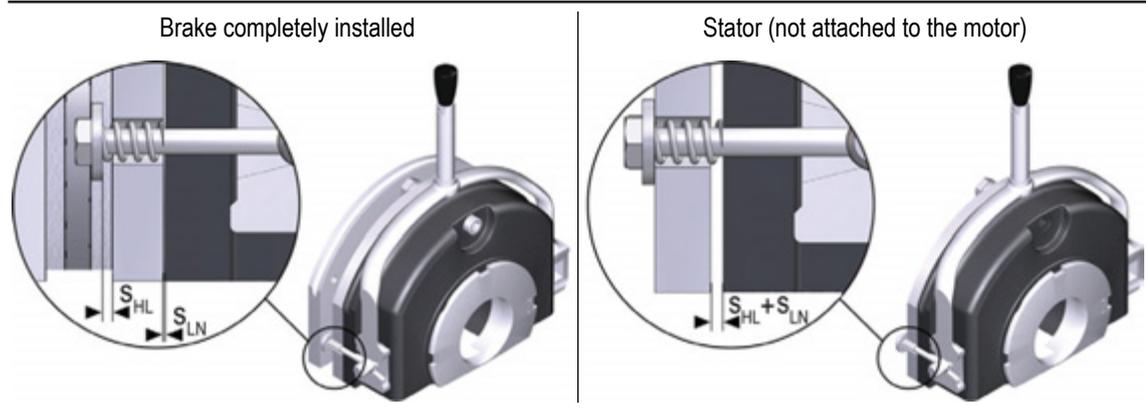


Fig. 6: Positions of the adjustment dimensions that must be checked

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

Tab. 11: Adjustment setting for hand-release

## 4.9 Labels on product

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



Fig. 7: Packaging label

Kendrion INTORQ	Manufacturer
13227500	ID number
BFK458-12E	Type (refer to <a href="#">Product key, Page 5</a> )
	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 mark

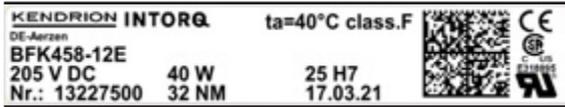


Fig. 8: Name plate (example)

Kendrion INTORQ	Manufacturer
ta = 40°C	Permissible ambient temperature
Class. F	Insulation class F
BFK458-12E	Type (refer to <a href="#">Product key, Page 5</a> )
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
	CSA/CUS acceptance
	UL mark

## 5 Mechanical installation

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

### Important notices and information

	<b>NOTICE</b>
	The toothed hub and screws must not be lubricated with grease or oil.

### 5.1 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 25](#)
- Keep the end shield free from grease or oil.

#### Minimum requirements of the end shield

Size	Material <sup>1) 2)</sup>	Roughness <sup>2)</sup>	Run-out	Levelness	Tensile strength $R_m$
			[mm]	[mm]	[N/mm <sup>2</sup> ]
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. 12: End shield as counter friction surface

<sup>1)</sup> Consult with Kendrion INTORQ before using other materials.

<sup>2)</sup> When **no** brake flange or friction plate is used.

## 5.2 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		4	9	10 / 7	52 - 55	-
10		5	12		68 - 75	-
12		20 to 100	6	15	12 / 8	80 - 90
14	95 - 100					-
16	110 - 115					13
18	- / 10				135 - 145	17
20					155 - 165	
25	8	17				

	<b>NOTICE</b>
	Tightening torques: refer to the table <u>Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 25.</u>

Multimeter	Caliper gauge	Feeler gage
		

## 5.3 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)!



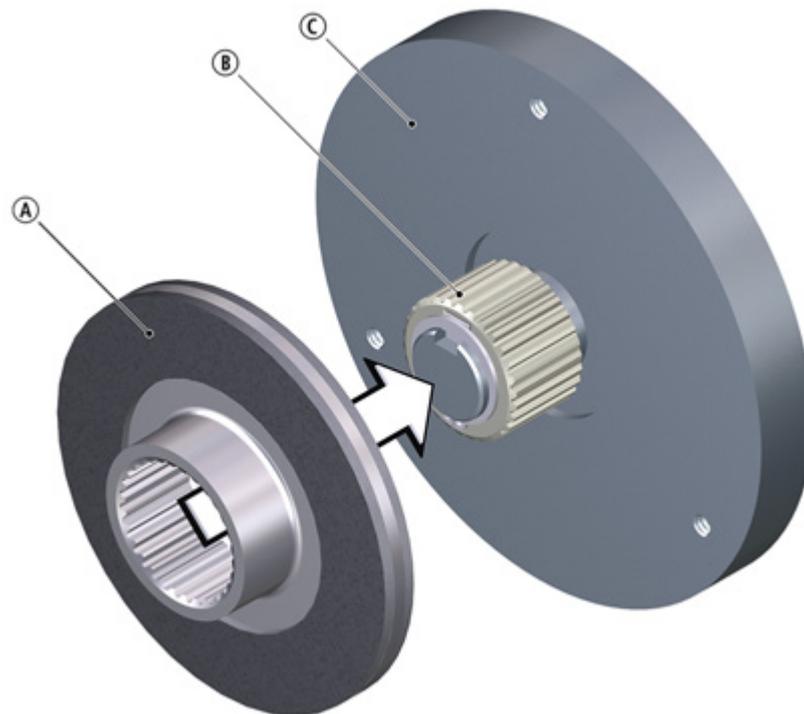
- If you have deviating operating conditions (e.g. additional load spectra with engaged brake), please contact Kendrion INTORQ for the proper dimensioning of the hub-side key connection.
- Secure the hub against axial displacement after you install it (e.g. with a circlip).

	<b>NOTICE</b>
	If you are using the spring-applied brake for reverse operations, glue the hub to the shaft.

	<b>NOTICE</b>
	When using the spring-applied brake as a safety brake: Observe the information concerning the shaft-hub connection in section <u>Applications with special safety requirements ("Safety Brake")</u> , Page 14.

## 5.5 Mounting the brake

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



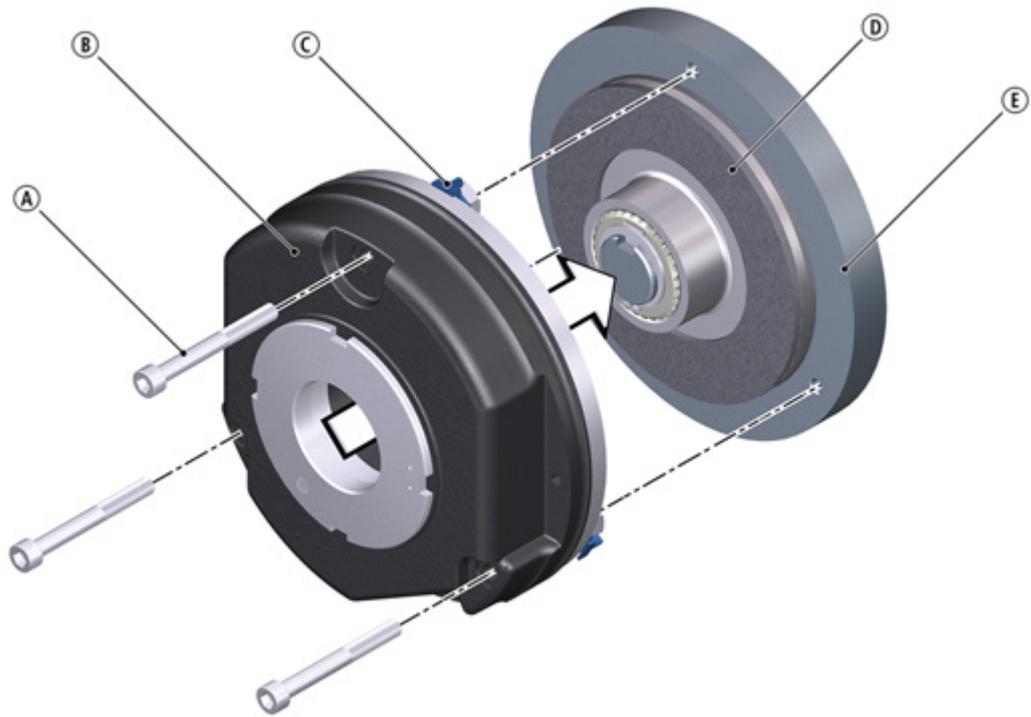
**Fig. 10: Assembly of the rotor**

Ⓐ Rotor

Ⓑ Hub

Ⓒ End shield

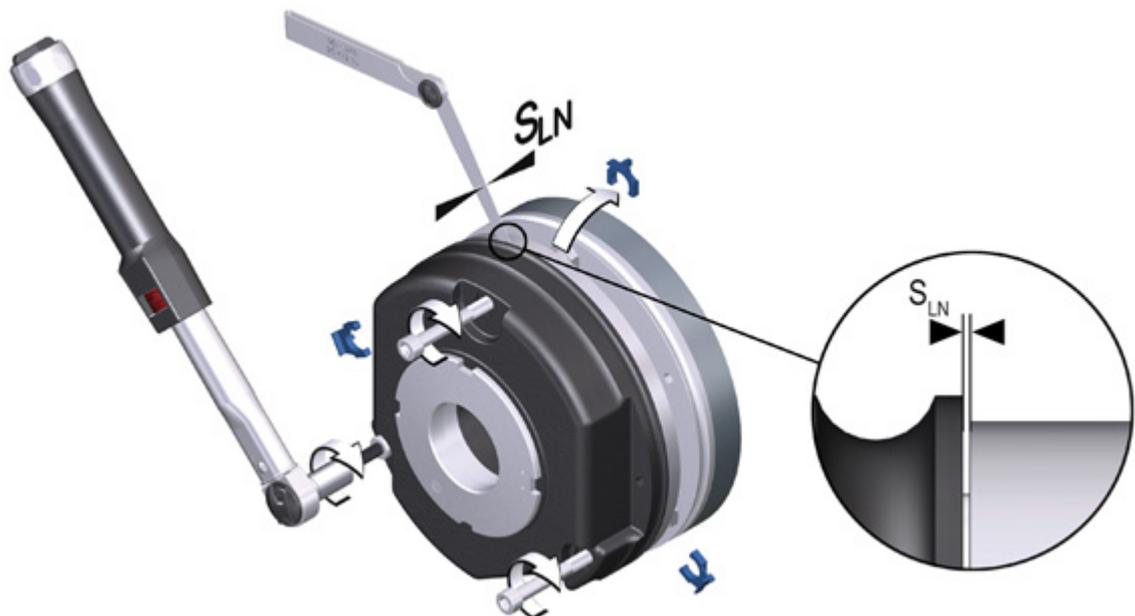
1. Push the rotor on the hub.
2. Check if the rotor can be moved manually.



**Fig. 11: Mounting the complete stator**

- (A) Socket-head cap screw
- (B) Complete stator
- (C) Terminal clip
- (D) Rotor
- (E) 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 25](#) ).
4. Remove the terminal clips and dispose of properly.

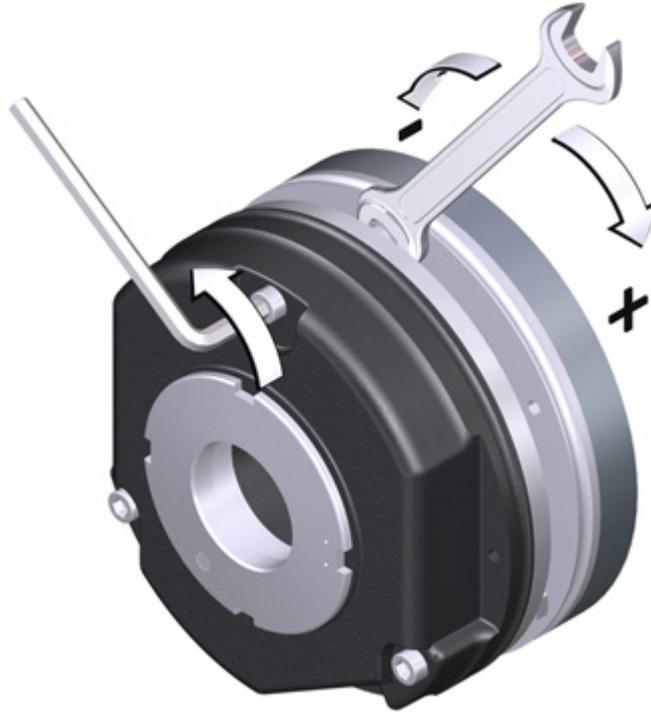


**Fig. 12: Tightening the screws with a torque wrench**

**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 24](#).



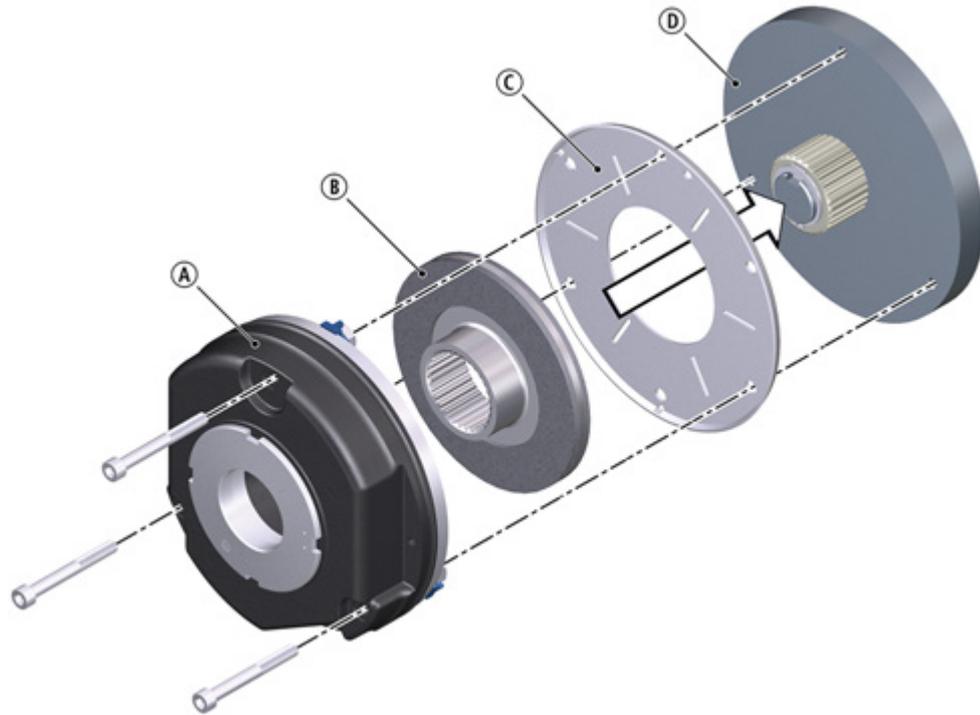
**Fig. 13:** Adjusting the air gap

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 40](#)).

**NOTICE**

Tightening torques: refer to the table [Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 25](#).

## 5.6 Installing the friction plate (optional)



**Fig. 14:** Mounting the friction plate

- (A) Stator
- (B) Rotor
- (C) Friction plate
- (D) 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.

## 5.7 Mounting the flange

### 5.7.1 Mounting the flange without additional screws



**NOTICE**

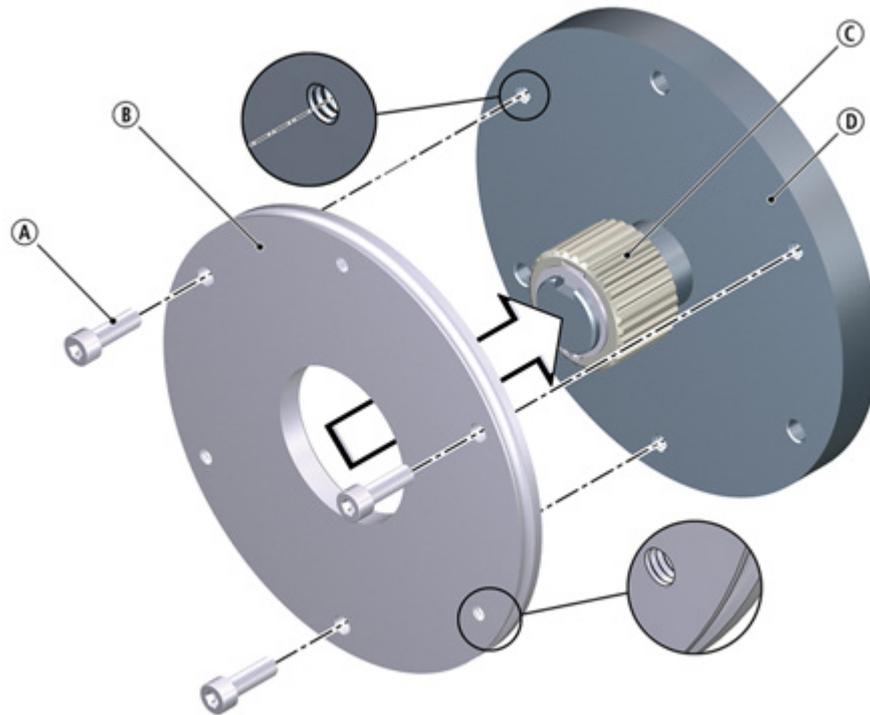
When dimensioning the thread depth in the end shield, be sure to take into account the permissible wear distance (refer to Table [Characteristics for air gap specifications, Page 24](#)).

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 39](#) and [Spare parts list, Page 71](#)).

### 5.7.2 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 25](#)).

<b>NOTICE</b>	
	<p>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.</p>



**Fig. 15: Flange mounting for sizes 06 - 16**

- (A) Screw <sup>1)</sup>
- (B) Flange
- (C) Hub
- (D) End shield

<sup>1)</sup> According to the table [Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 25](#)

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 25](#)).
2. Place the flange against the end shield.

<b>NOTICE</b>	
	<p>Tighten the screws evenly (for tightening torques, refer to the table <a href="#">Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 25</a> ).</p>

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 25](#).



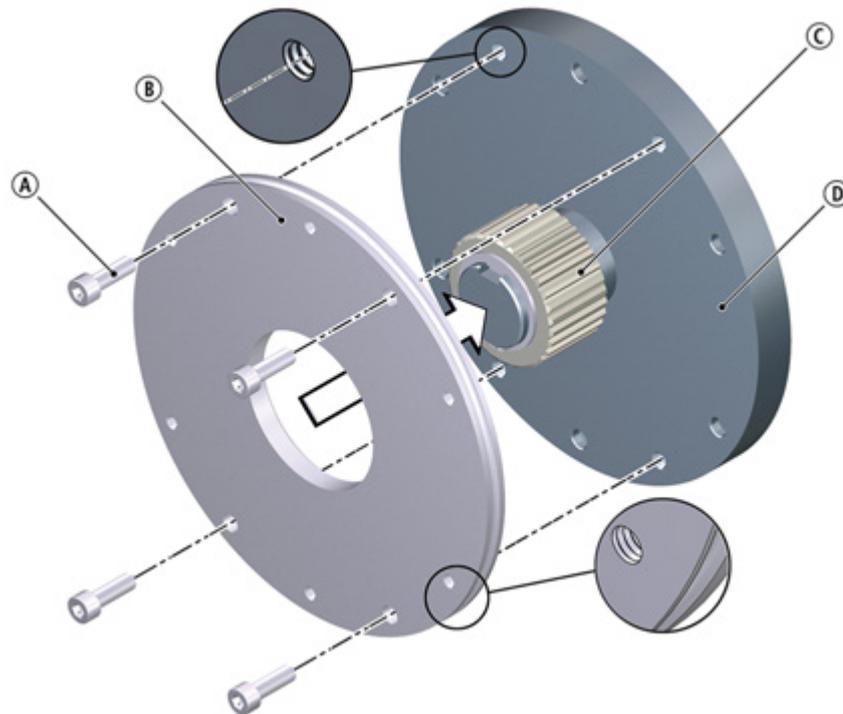
**Notice**

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

**5.7.3 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 25](#)).

<b>NOTICE</b>	
	<ul style="list-style-type: none"> <li>■ 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.</li> <li>■ For sizes 18 and 20, the mounting surface threading must be angled at 30° to the center axis to the hand-release lever.</li> </ul>



**Fig. 16:** Flange mounting for sizes 18 – 20

<sup>1)</sup> According to the table [Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 25](#)

1. Place the flange against the end shield.

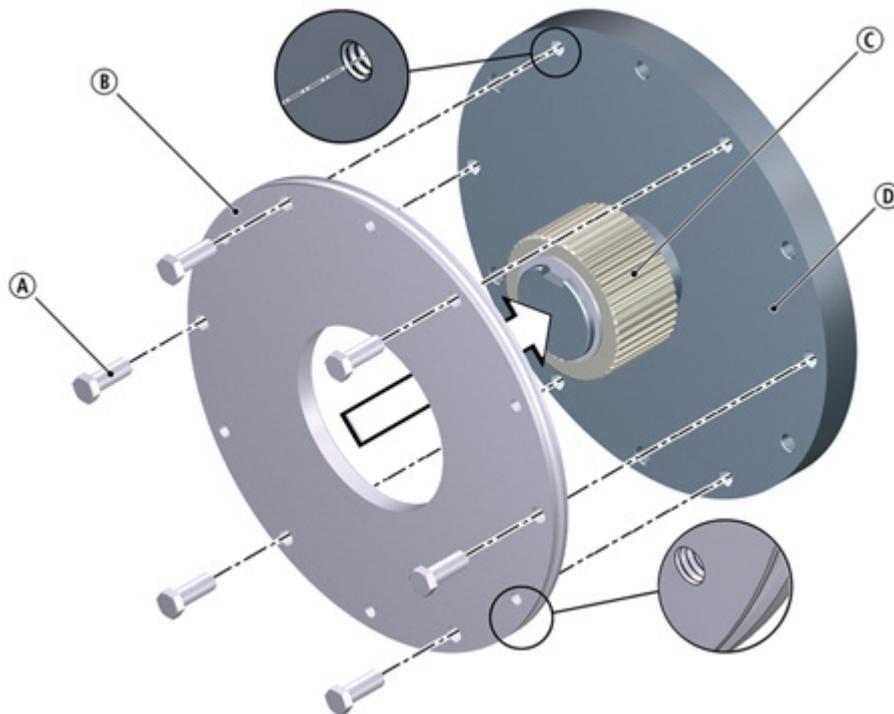
	<b>NOTICE</b>
<p>Tighten the screws evenly (for tightening torques, refer to the table <a href="#">Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 25</a> ).</p>	

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 25](#).

### 5.7.4 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 25](#)).

	<b>NOTICE</b>
<p>■ Clearing holes for the screws in the end shield must be behind the threaded screw holes in the flange (refer to the table <a href="#">Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 25</a>). Without the clearing holes, the minimal rotor thickness cannot be used. The screws must not press against the end shield.</p>	



**Fig. 17: Flange mounting for size 25**

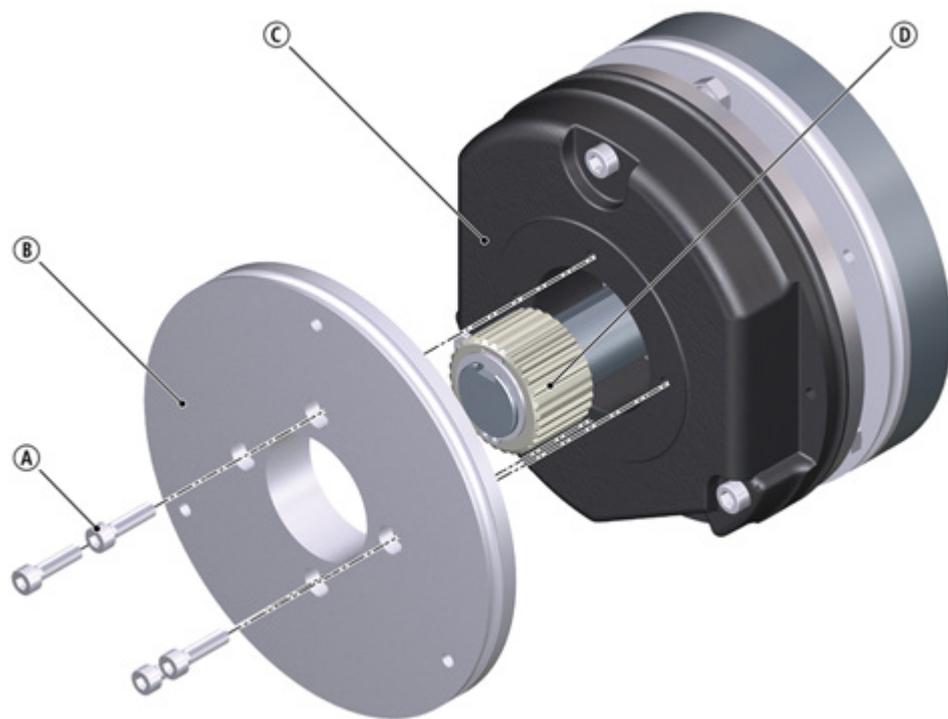
- |                             |            |         |
|-----------------------------|------------|---------|
| (A) Hex screw <sup>1)</sup> | (B) Flange | (C) Hub |
| (D) End shield              |            |         |

<sup>1)</sup> According to the table [Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 25](#)

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.

	<b>NOTICE</b>
<p>Tighten the screws evenly (for tightening torques, refer to the table <a href="#">Characteristics: screw kit for brake assembly on separately screwed-on flange, Page 25</a> ).</p>	

## 5.8 Installing the double spring-applied brake



**Fig. 18:** Installing the intermediate flange

- |                              |                         |                 |
|------------------------------|-------------------------|-----------------|
| (A) Screw from the screw set | (B) Intermediate flange | (C) Rear stator |
| (D) Front hub                |                         |                 |

	<b>NOTICE</b>
<p>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 <a href="#">Characteristics: screw set, intermediate flange installation for double spring-applied brake</a> , <a href="#">Page 26</a> (in the column "Screw kit for mounting an adapter flange on a stator").</p>	



**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 39.

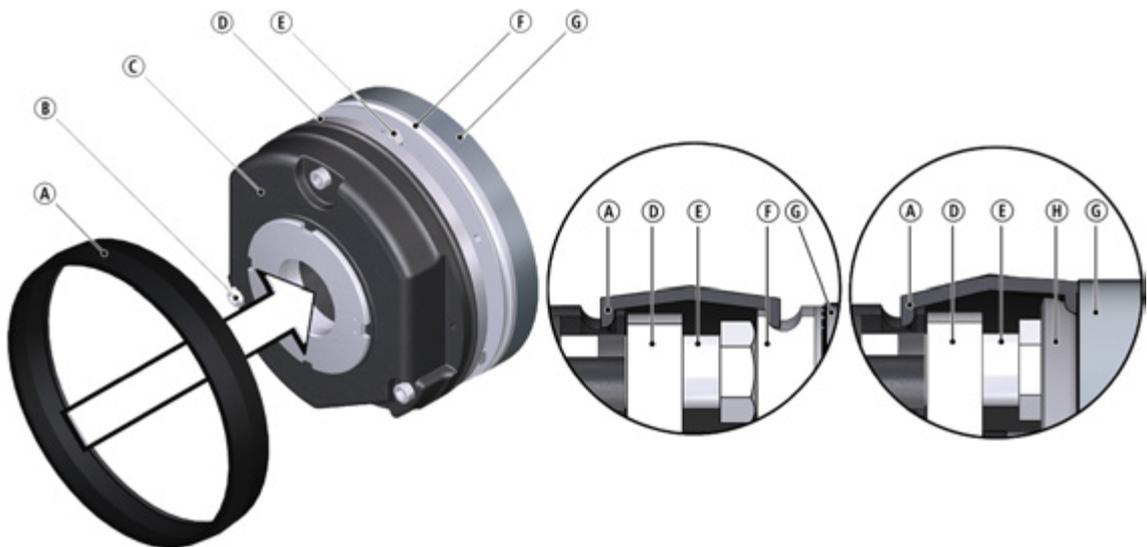


**NOTICE**

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!

**5.9**

**Cover ring assembly**



**Fig. 19: Cover ring assembly**

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



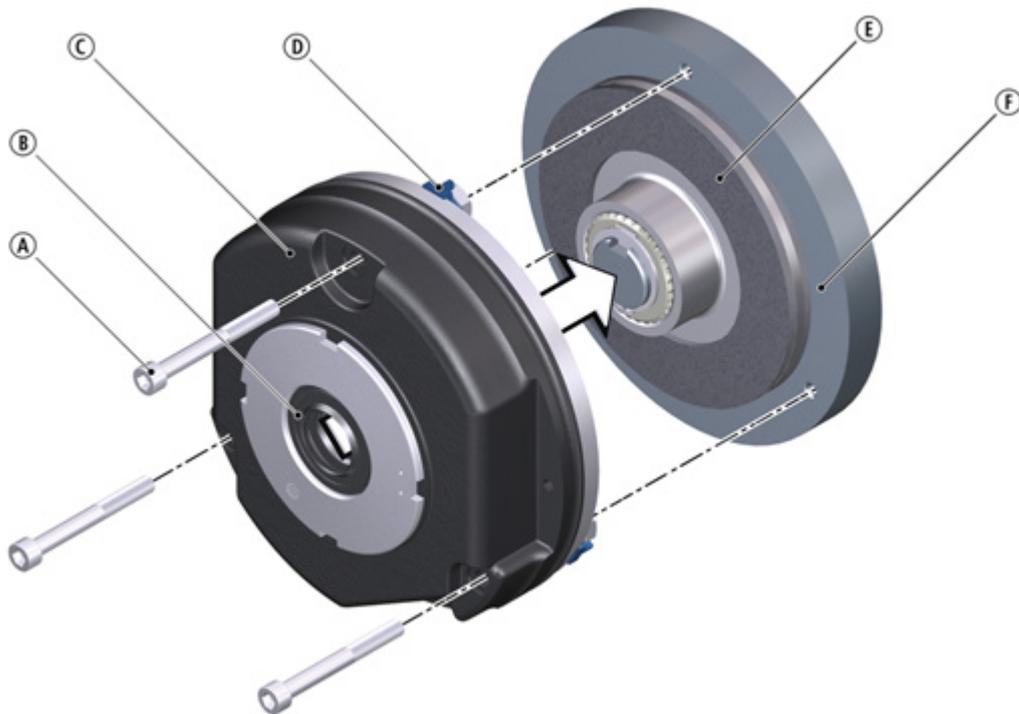
**NOTICE**

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.

## 5.10 Installing the shaft sealing ring

<b>NOTICE</b>	
	<p>When using a shaft sealing ring, the brake has to be mounted so that it is centered properly!</p> <p>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 <math>R_z \leq 3.2 \mu\text{m}</math> in the sealing area.</p>



**Fig. 20:** Installing the shaft sealing ring

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

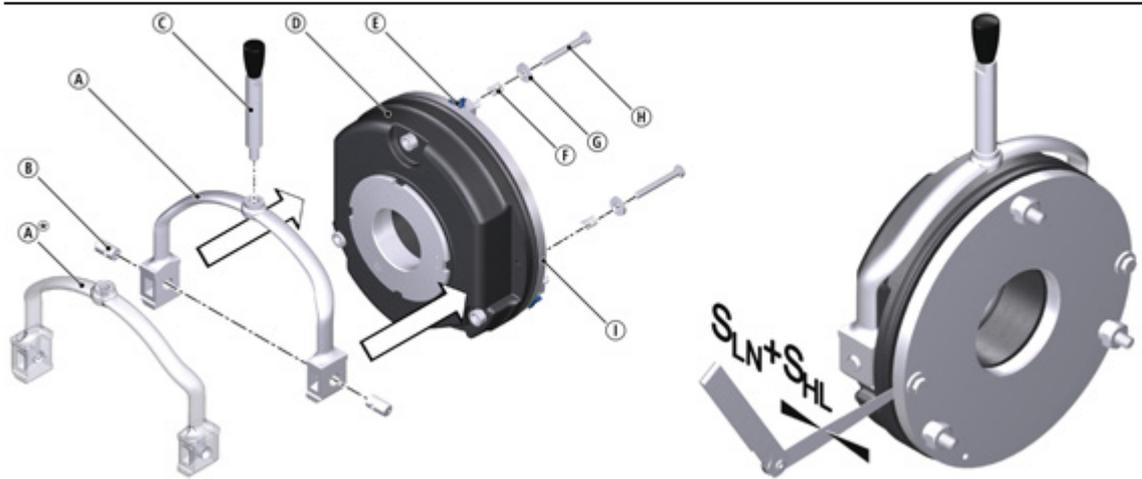


### Notice

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

### 5.11 Mounting the hand-release (retrofitting)



**Fig. 21: 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.

<b>NOTICE</b>	
	<p>Note that the gap <math>s_{LN}</math> 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!</p>

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 33](#) for the values for the dimension  $s_{LN} + s_{HL}$ .

## 6 Electrical installation

### Important notes

	 <b>DANGER</b>
	<p><b>There is a risk of injury by electrical shock!</b></p> <ul style="list-style-type: none"> <li>■ The electrical connections may only be made by trained electricians!</li> <li>■ Make sure that you switch off the electricity before working on the connections! There is a risk of unintended start-ups or electric shock.</li> </ul>

	<b>NOTICE</b>
	<p>Make sure that the supply voltage matches the voltage specification on the name plate.</p>

### 6.1 Electrical connection

#### Switching suggestions

	<b>NOTICE</b>
	<p>The terminal pin sequence shown here does not match the actual order.</p>

## 6.2 AC switching at the motor – extremely delayed engagement

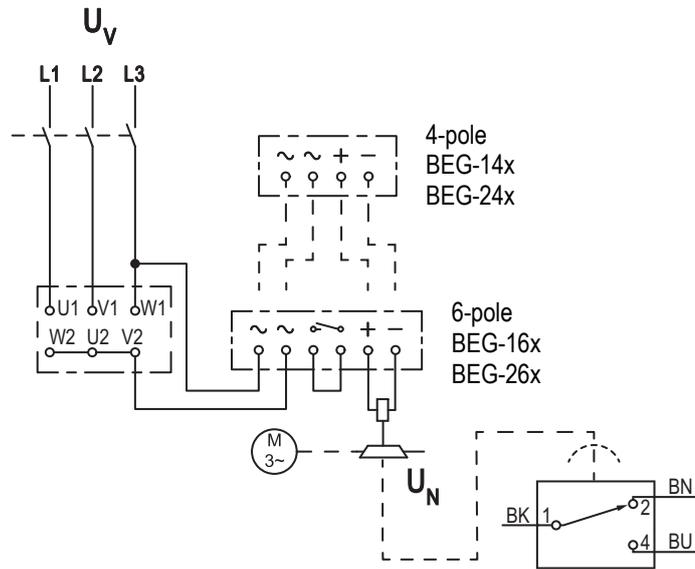


Fig. 22: Supply: Phase-neutral

Bridge rectifiers

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

Half-wave rectifiers

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

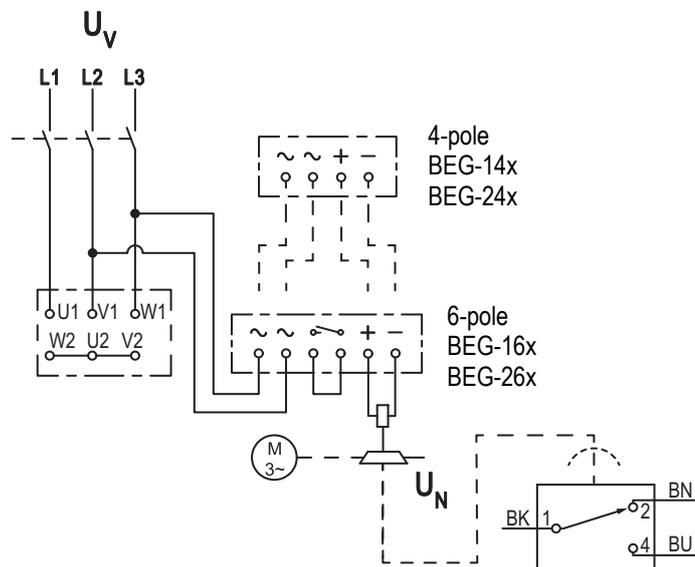


Fig. 23: Supply: Phase-phase

Bridge rectifier <sup>1)</sup>

$$\text{BEG-1xx: } U_N \text{ [V DC]} = 0.9 \cdot U_V \text{ [V AC]}$$

Half-wave rectifier

$$\text{BEG-2xx: } U_N \text{ [V DC]} = 0.45 \cdot U_V \text{ [V AC]}$$

<sup>1)</sup> Not recommended for most regional/national high-voltage mains voltages.

### 6.3 DC switching at the motor – fast engagement

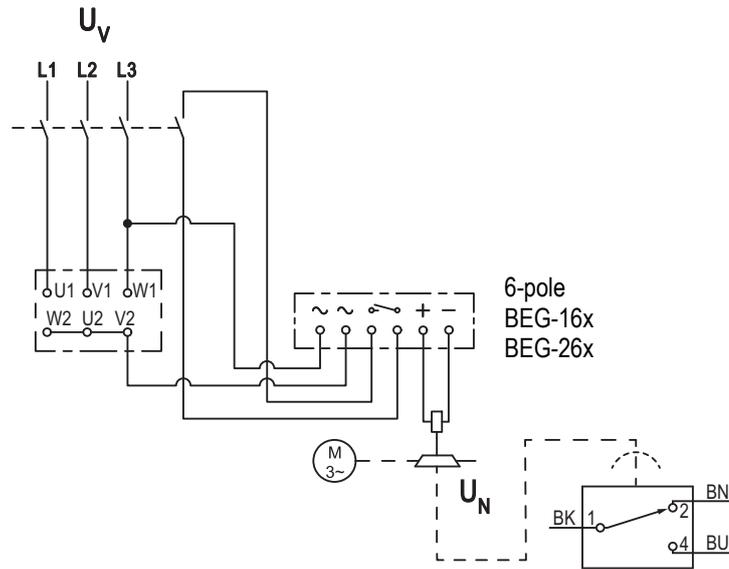


Fig. 24: Supply: Phase-neutral

Bridge rectifiers

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

Half-wave rectifiers

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

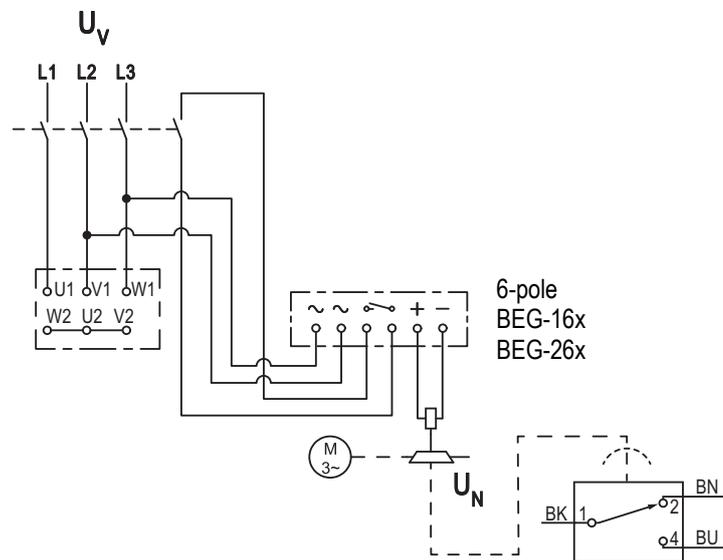


Fig. 25: Supply: Phase-phase

Bridge rectifier <sup>1)</sup>

$$\text{BEG-1xx: } U_N \text{ [V DC]} = 0.9 \cdot U_V \text{ [V AC]}$$

Half-wave rectifiers

$$\text{BEG-2xx: } U_N \text{ [V DC]} = 0.45 \cdot U_V \text{ [V AC]}$$

<sup>1)</sup> Not recommended for most regional/national high-voltage mains voltages.

### 6.4 AC switching at mains – delayed engagement

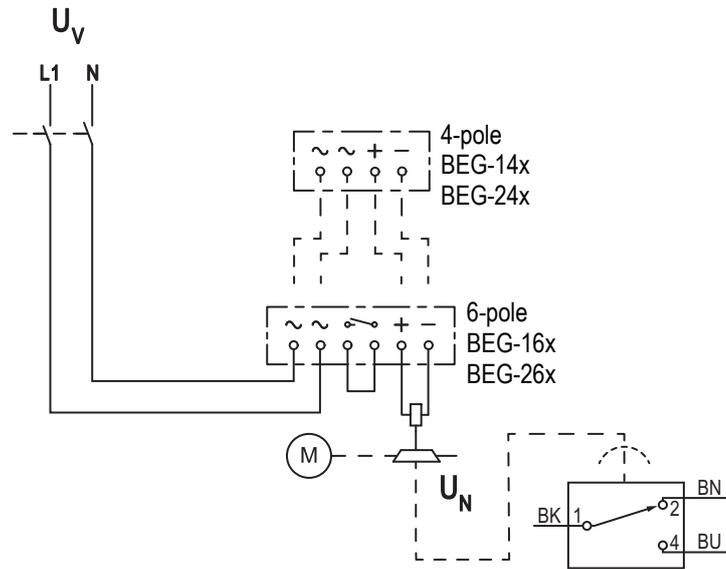


Fig. 26: Supply: Phase-N

Bridge rectifiers

$$\text{BEG-1xx: } U_N [\text{V DC}] = 0.9 \cdot U_V [\text{V AC}]$$

Half-wave rectifiers

$$\text{BEG-2xx: } U_N [\text{V DC}] = 0.45 \cdot U_V [\text{V AC}]$$

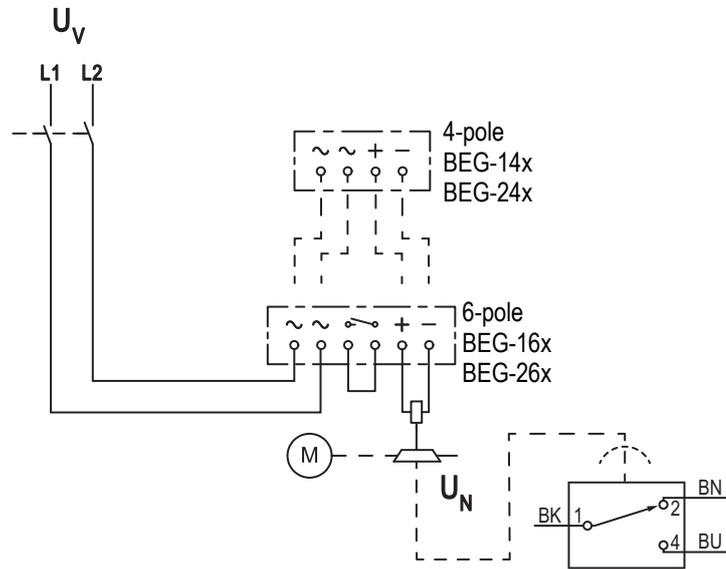


Fig. 27: Supply: Phase-phase

Bridge rectifier <sup>1)</sup>

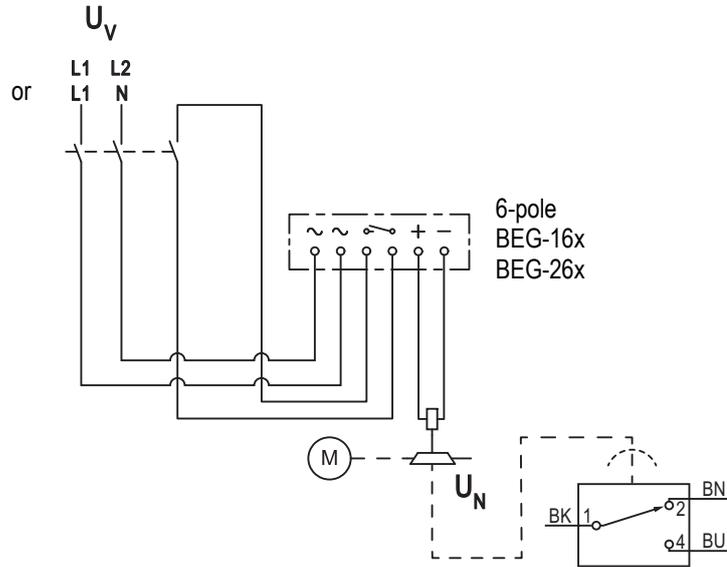
$$\text{BEG-1xx: } U_N [\text{V DC}] = 0.9 \cdot U_V [\text{V AC}]$$

Half-wave rectifiers

$$\text{BEG-2xx: } U_N [\text{V DC}] = 0.45 \cdot U_V [\text{V AC}]$$

<sup>1)</sup> Not recommended for most regional/national high-voltage mains voltages.

## 6.5 DC switching at mains – fast engagement



**Fig. 28:** Supply: Phase-phase or phase-N via 6-pole rectifier

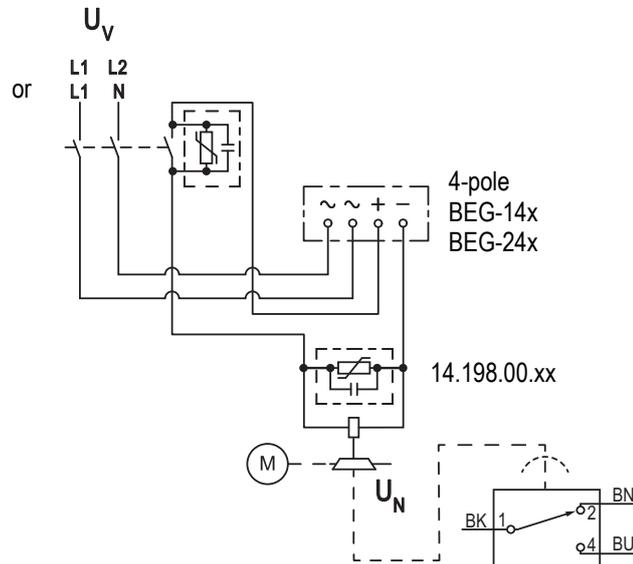
Bridge rectifier <sup>1)</sup>

$$\text{BEG-16x: } U_N [\text{V DC}] = 0.9 \cdot U_V [\text{V AC}]$$

Half-wave rectifiers

$$\text{BEG-26x: } U_N [\text{V DC}] = 0.45 \cdot U_V [\text{V AC}]$$

<sup>1)</sup> For most regional/national high-voltage mains voltages, this only makes sense for supplies on L1 and N.



**Fig. 29:** Supply: Phase-phase or phase-N via 4-pole rectifier

Bridge rectifier <sup>1)</sup>

$$\text{BEG-14x: } U_N [\text{V DC}] = 0.9 \cdot U_V [\text{V AC}]$$

Half-wave rectifiers

$$\text{BEG-24x: } U_N [\text{V DC}] = 0.45 \cdot U_V [\text{V AC}]$$

Spark suppressor:

14.198.00.xx (required once, select position)

<sup>1)</sup> For most regional/national high-voltage mains voltages, this only makes sense for supplies on L1 and N.

## 6.6 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		
20	45.6 mm	
25		

Tab. 13: Minimum bending radius for the brake connection cable

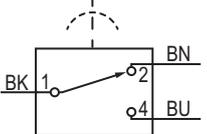
## 6.7 Micro-switch (optional)

### 6.7.1 Monitoring the release and wear

The brake can be equipped with a micro-switch for monitoring the release or wear. The micro-switch can be integrated into the circuit as an NO or NC contact.

Design	Micro-switch
3-wire connecting cable	3 x 0.34 mm <sup>2</sup> (AWG22) black / brown / blue D = 4.8 mm, black, CSA Style 2517/105° Length: 1100 mm
Contacts	Silver
Current carrying capacity 250 V AC	Max. 3 A
Current carrying capacity 30 V DC	Max. 3 A
Minimum load at 24 V DC	10 mA
Temperature range:	-40 °C to +85 °C
Protection class	IP67

Tab. 14: Technical data for the micro-switch for monitoring the release and wear

	Switching states	$s_L = 0$	$s_{LN}$	$s_{Lmax} (-0.1)$
	Checking the air gap	1 - 4	1 - 2	1 - 2
	Monitoring wear	1 - 4	1 - 4	1 - 2

Tab. 15: Switching states of the micro-switch for monitoring the release and wear

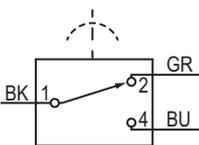
### 6.7.2 Hand-release monitoring

The brake can be fitted with a micro-switch for monitoring the hand-release function.

The micro-switch should be integrated into the customer's electrical circuit as a normally closed contact, normally open contact or as a changeover contact.

Design	Micro-switch
3-pole connecting cable	3 x AWG 18 black / grey / blue
	Style 2517 Length 800 mm, 45 mm stripped
Contacts	Silver
Therm. Continuous current according to EN60947 and UL508	10A at T=85°C
Utilization category according to EN60947 and UL508	AC-15, 230V AC/1.5A AC 240V/1.5A DC-13, 60V DC/0.5A DC 60V/0.5A
Temperature range:	-20 °C to +85 °C
Protection class	IP67
Mechanical service life	Minimum of 5 million switching cycles

**Tab. 16:** Technical data for the micro-switch for monitoring the hand-release function

	Function	Pin assignment
	CO contact	1 – 2 – 4
	N/C contact	1 - 2
	NO contact	1 - 4

**Tab. 17:** Pin assignment of the micro-switch for monitoring the hand-release function

### 6.8 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 52) is limited by an integrated overvoltage protection at terminals 5 and 6.

6.8.1 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	-	-

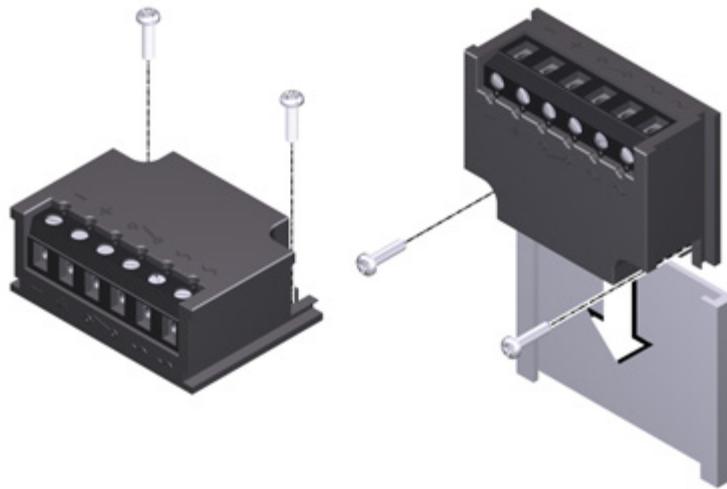


Fig. 30: BEG-561 fastening options

6.8.2 Technical specifications

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

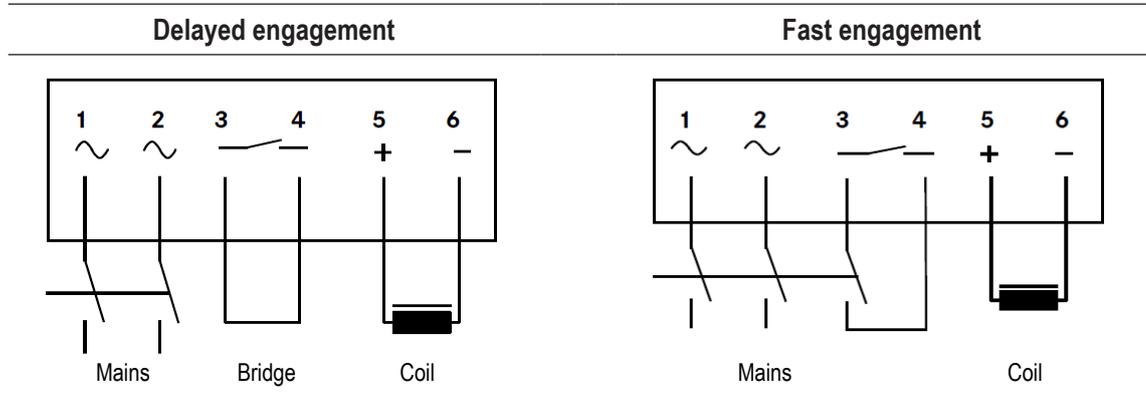
$U_1$  input voltage (40 – 60 Hz)

Type	Input voltage $U_1$ (40 Hz – 60 Hz)			Max. current $I_{max}$		Over-excitation period $t_{ue}$ ( $\pm 20\%$ )		
	Min.	Rated	Max.	Bridge	Half-wave	at $U_{1min}$	at $U_{1Nom}$	at $U_{1max}$
	[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. 18: Data for bridge/half-wave rectifier type BEG-561

### 6.8.3 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.



### 6.8.4 Permissible current load at ambient temperature

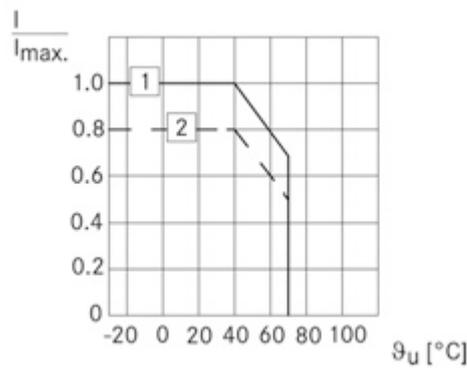


Fig. 31: Permissible current load

- ① If screwed to metal surface (good heat dissipation)
- ② For other installations (e.g. with adhesive)

## 7 Commissioning and operation

### 7.1 Possible applications of the Kendrion INTORQ spring-applied brake

	<b>NOTICE</b>
	<p>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.</p> <p>At high humidity and low temperatures: Take measures to ensure that the armature plate and rotor do not freeze.</p>

#### Important notes

	<b>⚠ DANGER</b>
	<p><b>Danger: rotating parts!</b></p> <ul style="list-style-type: none"> <li>■ The brake must be free of residual torque.</li> <li>■ The drive must not be running when checking the brake.</li> </ul>

	<b>⚠ DANGER</b>
	<p><b>There is a risk of injury by electrical shock!</b></p> <p>The live connections must not be touched.</p>

- 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.

## 7.2 Function checks before initial commissioning

	 <b>DANGER</b>
	<p><b>Danger: rotating parts!</b></p> <ul style="list-style-type: none"> <li>■ The brake must be free of residual torque.</li> <li>■ The drive must not be running when checking the brake.</li> </ul>

	 <b>DANGER</b>
	<p><b>There is a risk of injury by electrical shock!</b></p> <p>The live connections must not be touched.</p>

### 7.2.1 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 74](#). If the fault cannot be fixed or eliminated, please contact the customer service department.

### 7.2.2 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.

	 <b>DANGER</b>
	<p><b>Danger: rotating parts!</b></p> <p>Your system should be mechanically immobilized in the event that it could start moving when the brake is released.</p>

3. Micro-switch option - release monitoring: Check that the switching state is correct on the micro-switch: the brake is applied.
4. Micro-switch option - wear monitoring: Check that the switching state is correct on the micro-switch: the brake is NOT worn.
5. Switch the power on.
6. 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.
7. Micro-switch option - release monitoring: Check that the switching state is correct on the micro-switch: the brake is released.

8. Check the air gap  $s_L$ . The air gap must be zero and the rotor must rotate freely.
9. Switch off the supply to the motor and brake securely.
10. Connect the bridges to the motor terminals. Remove any extra neutral conductor.
11. Micro-switch option for wear monitoring: Adjust the air gap to  $s_{Lmax}$  (refer to the figure [Adjusting the air gap](#), Page 41).
12. Micro-switch option for wear monitoring: Check that the switching state is correct on the micro-switch: the brake is worn.
13. Adjust the air gap to  $s_{LN}$ .
14. If necessary, deactivate the mechanical shutdown of the system.

### 7.2.3 Testing the hand-release functionality



#### NOTICE

This operational test must also be carried out!



Fig. 32: 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. 19: 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.

	<b>NOTICE</b>
	<ul style="list-style-type: none"> <li>■ Make sure that the brake is not subject to excessive force.</li> <li>■ 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.</li> </ul>

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 74](#)). If the fault cannot be fixed or eliminated, please contact the customer service department.

### 7.3 Commissioning

	 <b>DANGER</b>
	<p><b>Danger: rotating parts!</b></p> <ul style="list-style-type: none"> <li>■ The brake must be free of residual torque.</li> <li>■ The drive must not be running when checking the brake.</li> </ul>

	 <b>DANGER</b>
	<p><b>There is a risk of injury by electrical shock!</b></p> <p>The live connections must not be touched.</p>

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

### 7.4 Operation

	 <b>DANGER</b>
	<p><b>Danger: rotating parts!</b></p> <ul style="list-style-type: none"> <li>■ The running rotor must not be touched.</li> <li>■ Take structural design measures on your final product and implement organizational safety rules to ensure that nobody can touch a rotor.</li> </ul>

	 <b>DANGER</b>
	<p><b>There is a risk of injury by electrical shock!</b></p> <ul style="list-style-type: none"> <li>■ Live connections must not be touched.</li> <li>■ Take structural design measures on your final product and implement organizational safety rules to ensure that nobody can touch a connection.</li> </ul>

- 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  $\pm 10\%$ !
- 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.

### 7.4.1 Brake torque reduction (for the optional adjustable braking torque)

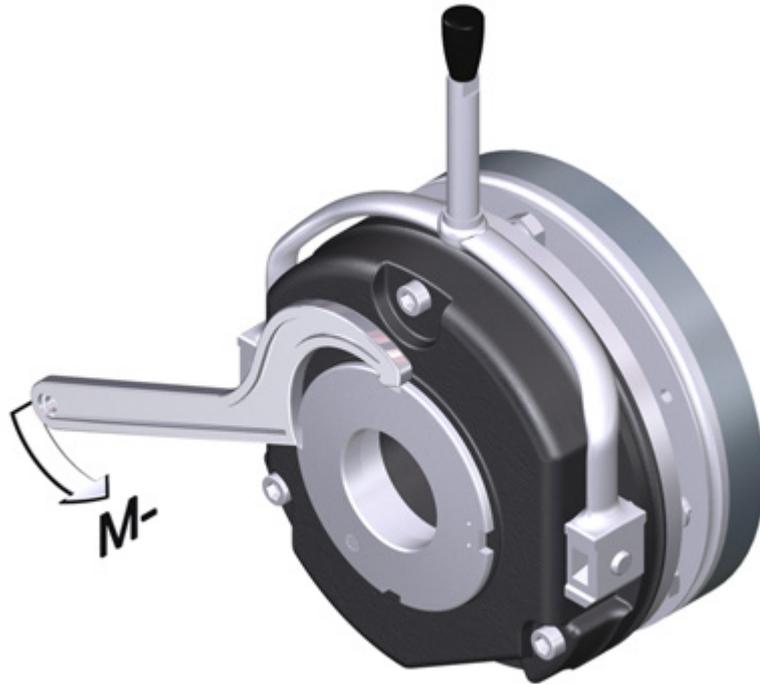


Fig. 33: Reducing the braking torque

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 ( $h_{E_{max}}$ ) of the torque adjustment ring over the stator. (Refer to the table [Characteristics for braking torques, depending on the speed and permissible limiting speeds](#), Page 24 for values of  $h_{E_{max}}$ .)

	<b>⚠ DANGER</b>
<p>The reduction of the braking torque does not increase the maximum permissible air gap <math>s_{L_{max}}</math>. Do not change the hand-release setting for designs with hand-release.</p> <p>Increasing the braking torque by screwing in the torque adjustment ring is only permitted up to the default (as delivered) torque value .</p>	

## 8 Maintenance and repair

### 8.1 Wear of spring-applied brakes

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

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. 20: Causes for wear

## 8.2 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 65 in the chapter Verschleiß von Federkraftbremsen, Page 65. 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.

### 8.2.1 Maintenance intervals

	<p><b>⚠ WARNING</b></p>
	<p>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.</p>

Versions	Service brakes	Holding brakes with emergency stop
BFK458-□□ E / N BFK458-□□ L	<ul style="list-style-type: none"> <li>■ according to the service life calculation</li> </ul>	<ul style="list-style-type: none"> <li>■ at least every 2 years</li> </ul>
	<ul style="list-style-type: none"> <li>■ or else every six months</li> </ul>	<ul style="list-style-type: none"> <li>■ after 1 million cycles at the latest*</li> </ul>
	<ul style="list-style-type: none"> <li>■ after 4000 operating hours at the latest</li> </ul>	<ul style="list-style-type: none"> <li>■ Plan shorter intervals for frequent emergency stops.</li> </ul>

\* NOTICE: 10 million cycles for the L design type

### 8.3 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.

#### 8.3.1 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.

<b>Simplified inspection/ maintenance with the mounted brake</b>	<ul style="list-style-type: none"> <li>■ Check the air gap (CAUTION: If the air gap needs to be readjusted, the extended inspection is required after the brake is removed.)</li> </ul>	Refer to <u>Checking the air gap, Page 68</u>
	<ul style="list-style-type: none"> <li>■ Check release function and control</li> </ul>	Refer to <u>Release / voltage, Page 69</u>

<b>Extended inspection/ maintenance after re- moval of brake</b>	■ Adjusting the air gap	Refer to <a href="#">Adjusting the air gap, Page 69</a>
	■ Checking the rotor thickness	Refer to <a href="#">Checking the rotor thickness, Page 70</a>
	■ Check the play of the rotor gear teeth (replace worn-out rotors)	Refer to <a href="#">Replacing the rotor, Page 70</a>
	■ 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  – Max. run-in depth = rated air gap for the size	Refer to the <a href="#">Design of end shield and shaft, Page 36</a> table.  Refer to the <a href="#">Characteristics for air gap specifications, Page 24</a> table.

### 8.3.2 Checking the air gap

	<b>⚠ DANGER</b>
	<p><b>Danger: rotating parts!</b></p> <p>The motor must <b>not</b> run while the air gap is being checked.</p>

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 24](#) 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 24](#) table for the values.)
3. Adjust the air gap to  $s_{LN}$ . (Refer to [Adjusting the air gap, Page 69](#)).

## 8.3.3 Release / voltage

	<b>⚠ DANGER</b>
	<b>Danger: rotating parts!</b> The running rotor must not be touched.

	<b>⚠ DANGER</b>
	<b>There is a risk of injury by electrical shock!</b> 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.

## 8.3.4 Adjusting the air gap

	<b>⚠ DANGER</b>
	<b>Danger: rotating parts!</b> The brake must be free of residual torque.

	<b>NOTICE</b>
	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 41](#) ).
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 25](#) for the torque values.)
4. Check the value of  $s_{\perp}$  near the screws using a feeler gauge. (Refer to table [Characteristics for air gap specifications, Page 24](#).)

### 8.3.5 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 24.](#)) If the measured rotor thickness is insufficient, the rotor must be replaced completely. (Refer to [Replacing the rotor, Page 70](#) for the description.)

### 8.3.6 Replacing the rotor

	 <b>DANGER</b>
	<p><b>Danger: rotating parts!</b></p> <p>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.</p>

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 24.](#))
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 39.](#))
12. Re-connect the connection cables.
13. If necessary, deactivate the mechanical shutdown of the system.

## 8.4 Spare parts list

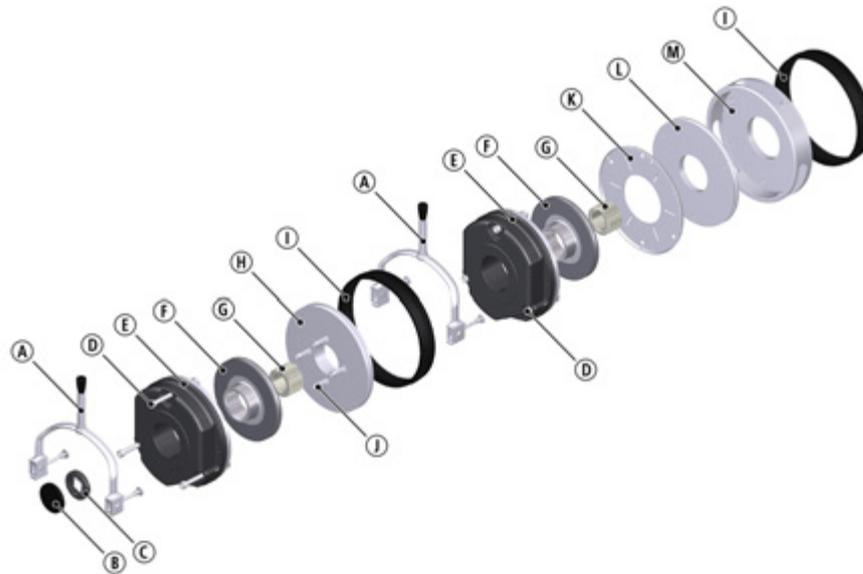
### INTORQ spring-applied brake BFK458-06 to 25



Fig. 34: 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	<ul style="list-style-type: none"> <li>■ for mounting to the flange</li> <li>■ for mounting to the motor / friction plate</li> <li>■ for flange with through hole</li> </ul>
Ⓔ	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	
⓵	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. 35:** INTORQ double spring-applied brake BFK458-06 to 25

	<b>Designation</b>	<b>Variant</b>
Ⓐ	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	<ul style="list-style-type: none"> <li>■ for mounting to the flange</li> <li>■ for mounting to the motor / friction plate</li> <li>■ for flange with through hole</li> </ul>
Ⓔ	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	
	[V AC]	Coil voltage [V DC]	Size	Coil voltage [V DC]	Size
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	-	-

## 9 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	<ul style="list-style-type: none"> <li>■ Measure coil resistance using a multimeter:                             <ul style="list-style-type: none"> <li>– Compare the measured resistance with the nominal resistance. Refer to <u>Rated data for coil power, Page 26</u> for the values.</li> <li>– If resistance is too high, replace the complete spring-applied brake.</li> </ul> </li> </ul>
	Coil has contact to earth or between windings	<ul style="list-style-type: none"> <li>■ Measure coil resistance using a multimeter:                             <ul style="list-style-type: none"> <li>– Compare the measured resistance with the nominal resistance. Refer to <u>Rated data for coil power, Page 26</u> for the values. If resistance is too low, replace the complete stator.</li> </ul> </li> <li>■ Check the coil for short to ground using a multimeter:                             <ul style="list-style-type: none"> <li>– If there is a short to ground, replace the complete spring-applied brake.</li> </ul> </li> <li>■ Check the brake voltage (refer to section on defective rectifier, voltage too low).</li> </ul>
	Wiring defective or wrong	<p>Check the wiring and correct.</p> <ul style="list-style-type: none"> <li>■ Check the cable for continuity using a multimeter                             <ul style="list-style-type: none"> <li>– Replace a defective cable.</li> </ul> </li> </ul>
	Rectifier defective or incorrect	<ul style="list-style-type: none"> <li>■ Measure rectifier DC voltage using a multimeter.</li> <li>■ If DC voltage is zero:                             <ul style="list-style-type: none"> <li>■ Check AC rectifier voltage.</li> <li>■ If AC voltage is zero:                                     <ul style="list-style-type: none"> <li>– Switch on power supply</li> <li>– Check fuse</li> <li>– Check wiring.</li> </ul> </li> <li>■ If AC voltage is okay:                                     <ul style="list-style-type: none"> <li>– Check rectifier,</li> <li>– Replace defective rectifier</li> </ul> </li> </ul> </li> <li>■ Check coil for inter-turn fault or short circuit to ground.</li> <li>■ 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.</li> </ul>

Fault	Cause	Remedy
Brake cannot be released, air gap is not zero	Incorrect micro-switch wiring	Check the wiring of the micro-switch and correct it.
	Micro-switch incorrectly set	Replace the complete stator and make a complaint about the setting of the micro-switch to the manufacturer.
	Air gap "s <sub>L</sub> " is too large	Adjust the air gap ( <a href="#">Adjusting the air gap, Page 69</a> ).
Rotor cannot rotate freely	Wrong setting of hand-release	Check the dimensions s <sub>LN</sub> + s <sub>HL</sub> with the brake energized. The dimensions must be the same on both sides. Correct if required. (Refer to <a href="#">Mounting the hand-release (retrofitting), Page 49</a> .)
	Air gap "s <sub>L</sub> " too small	Check the air gap "s <sub>L</sub> " and adjust if necessary ( <a href="#">Adjusting the air gap, Page 69</a> ).
Rotor is too thin	Rotor has not been replaced in time	Replace the rotor ( <a href="#">Replacing the rotor, Page 70</a> ).
Voltage too high	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.
	Defective rectifier diode	Replace the defective rectifier with a suitable undamaged one.
AC voltage is not mains voltage	Fuse is missing or defective	Select a connection with a proper fuse.

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