INTORQ

setting the standard

INTORQ BFK458-ATEX

Spring-applied brake with electromagnetic release

Translation of the Original Operating Instructions

www.intorq.com

Document history

Material number	Version			Description
33007851	1.0	09/2019	SC	First edition

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
  - unauthorised modifications to the product
  - improper work on or with the drive system
  - operating errors
  - disregarding the documentation

Warranty

Notice

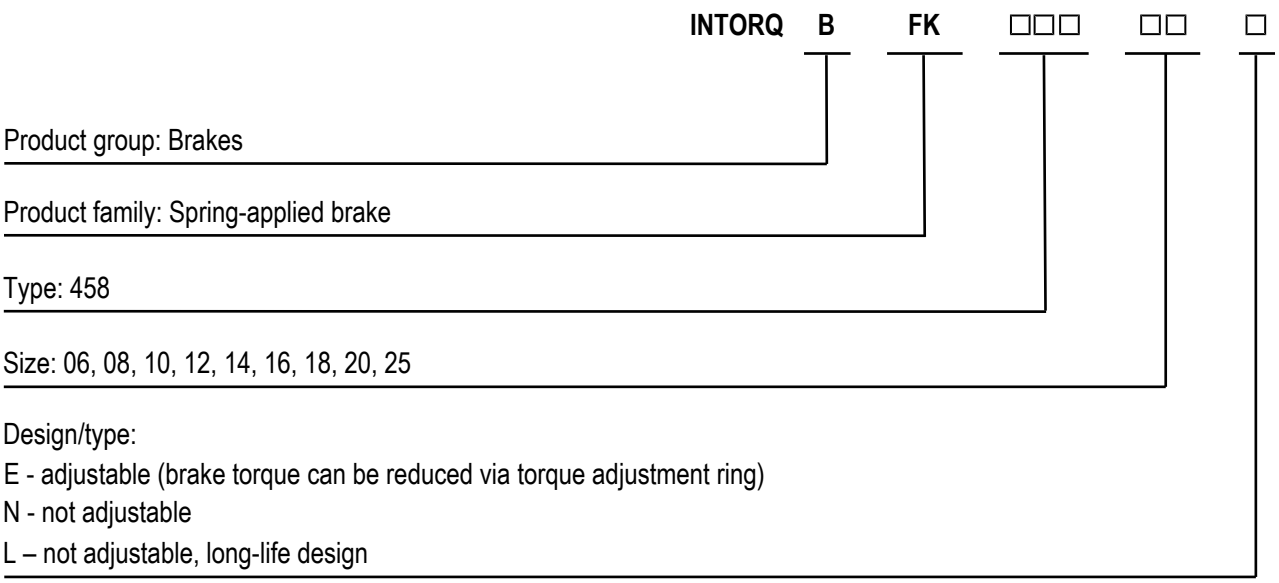
The warranty conditions can be found in the terms of sale and delivery from INTORQ GmbH & Co. KG.

- Warranty claims must be made to 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



Not coded: Connection voltage, hub bore hole, options

Checking the delivery

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

INTORQ does not accept any liability for deficiencies claimed subsequently.

- Claim visible transport damage immediately to the deliverer.
- Claim visible deficiencies or incomplete deliveries immediately to INTORQ GmbH & Co. KG.

Contents

1 General information

1.1 Using these Operating Instructions

- These Operating Instructions will help you to work safely with the spring-applied brake with electromagnetic release. They contain safety instructions that must be followed.
- All persons working on or with electromagnetically released spring-applied brakes must have the Operating Instructions available and observe the information and notes relevant for them.
- The Operating Instructions must always be in a complete and perfectly readable condition.

1.2 Conventions in use

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

Spelling of numbers	Decimal separator	Point	The decimal point is always used. For example: 1234.56
Page reference	Underscore, orange	_____	Reference to another page with additional information For example: Conventions in use
Symbols	Wildcard	□	Wildcard (placeholder) for options or selection details For example: BFK458-□□ = BFK458-10
	Notice		Important notice about ensuring smooth operations or other key information.

1.3 Safety instructions and notices

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

Structure of safety notices:

⚠ CAUTION

Icon

Indicates the type of danger

Signal word

Characterizes the type and severity of danger.

Notice text

Describes the danger.

Possible causes

List of possible consequences if the safety notices are disregarded.

Protective measures

List of protective measures required to avoid the danger.

Danger level

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

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

1.4 Terminology used

Term	In the following text used for
Spring-applied brake	Spring-applied brake with electromagnetic release
Drive system	Drive systems with spring-applied brakes and other drive components

1.5 Abbreviations used

Letter symbol	Unit	Designation
F_R	N	Rated frictional force
I	A	Current
I_H	A	Holding current, at 20 °C and holding voltage
I_L	A	Release current, at 20 °C and release voltage
I_N	A	Rated current, at 20 °C and rated voltage
M_A	Nm	Tightening torque of fastening screws
M_{dyn}	Nm	Braking torque at a constant speed of rotation
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_m	N/mm^2	Tensile strength
R_N	Ohms	Rated coil resistance at 20 °C
R_z	µm	Averaged surface roughness
S_h	1/h	Operating frequency: the number of switching operations evenly spread 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
s_{HL}	mm	Air gap for hand-release
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_K

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	Overexcitation 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 INTORQ components when you notice they are damaged.
- Never make any technical changes to INTORQ components.
- Never operate INTORQ components when they are incompletely mounted or incompletely connected.
- Never operate INTORQ components without their required covers.
- Only use accessories that have been approved by 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, INTORQ components may have both live (voltage carrying), moving and rotating parts. Such components require the appropriate safety mechanisms.
- Surfaces can become hot during operation. Take the 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 INTORQ components may only be carried out by qualified personnel. According to IEC 60364 and CENELEC HD 384, skilled personnel must be qualified in the following areas:
  - Familiarity and experience with the installation, assembly, commissioning and operation of the product.
  - Specialist qualifications for the specific field of activity.
  - Skilled personnel must know and apply all regulations for the prevention of accidents, directives, and laws relevant on site.

2.2 Safety notices for use in potentially explosive areas

⚠ DANGER

Danger of explosion

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

- Operation is only permitted within the specified specifications.

- The characteristic curve for the friction work (in the sections Dust explosive atmosphere (zone 22: non-conductive dusts), Page 31 and Gas explosive atmosphere (zone 2), Page 33) as a function of the operating frequency must not be exceeded when in an explosive atmosphere or even in emergency-stop mode.
- If the facility operator cannot ensure that the specified friction work and operating frequencies will be complied with, then the temperatures defined on the ATEX name plate for the dust zone must be monitored on the brake's magnet housing using a suitable temperature measurement mechanism. If there is no available knowledge of the occurring temperatures, then INTORQ is no longer responsible for this ATEX certification.
- In an explosive gas atmosphere, the resulting frictional heat in the friction gap created during the braking process creates a potential source of ignition. It is not possible here to measure the temperature during braking operations. Thus, it is very important to comply with the specified values for the friction work and operating frequencies. If the values for the actual friction work and operating frequencies are not known, the brake must not be put into operation in this atmosphere.

2.3 Disposal

The 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

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 INTORQ. The INTORQ components may only be operated under the conditions specified in these Operating Instructions. They may never be operated beyond their specified performance limits. The technical specifications (refer to Technical specifications) must be followed to comply with the proper and intended usage. Any other usage is consider improper and prohibited.

3.1.1.1 ATEX

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

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

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

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

NOTICE

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

⚠ DANGER

Danger of explosion

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

- Operation is only permitted within the specified specifications.

The following must always be observed when installing ATEX brakes:

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

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

3.2 Layout

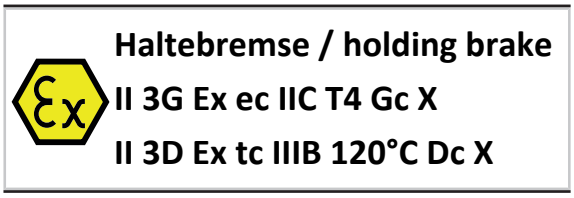
This chapter describes the variants, layout and functionality of the INTORQ BFK458 spring-applied brake. The basic module E is adjustable (the braking torque can be reduced using the torque adjustment ring). The special feature for basic module L (with an identical design) is the more durable materials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

3.2.1 Spring-applied brake as holding/parking brake

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

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

Example of this marking:



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

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

- Use the brake with a cover ring (without a condensate drain hole) and consequently also with the INTORQ flange/friction plate and the corresponding ring nut for attaching the cover ring (refer to the section Cover ring assembly, Page 53).
- Close the rear bore holes in the torque adjustment ring or in the magnet housing with a suitable radial shaft seal or a sealing cover (refer to the section Installing the shaft sealing ring, Page 54).
- Closing the hand vent holes using (for example) suitable plastic plugs and a suitable sealant.

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

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

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

3.2.3 Basic module E

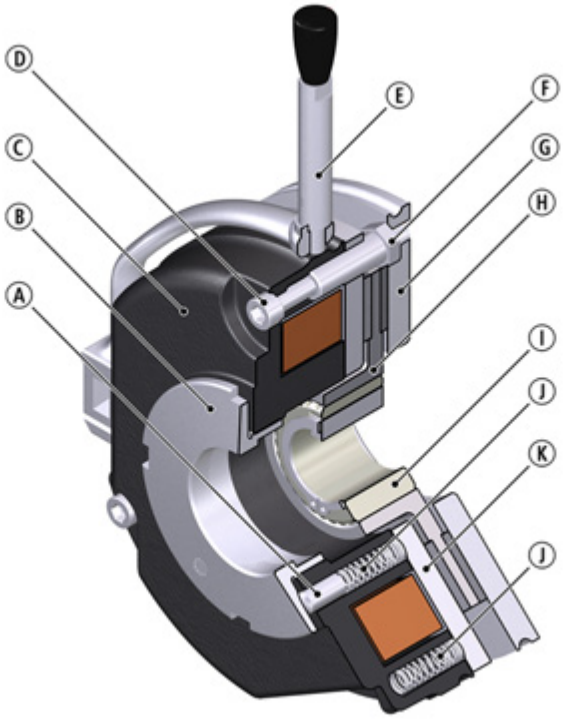


Fig. 1: **Design of the INTORQ BFK458 spring-applied brake: Basic module E (complete stator) + rotor + hub + flange**

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

3.2.4 Basic module N

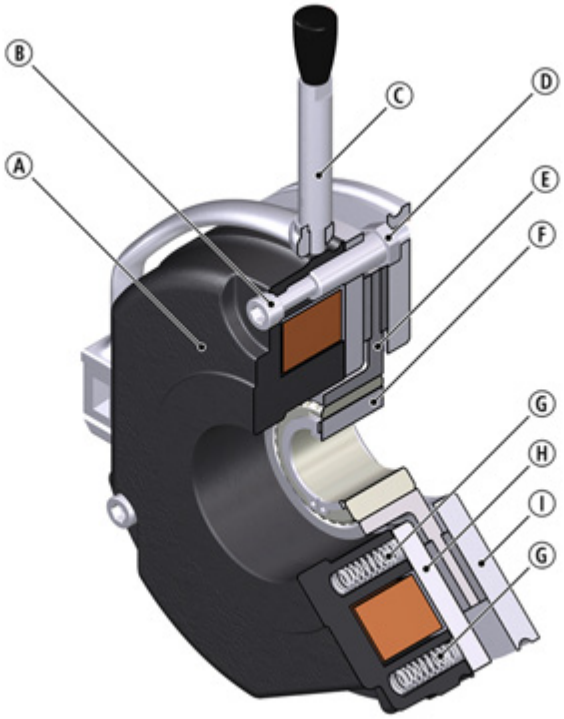


Fig. 2: **Design of the INTORQ BFK458 spring-applied brake: Basic module N (complete stator) + rotor + hub + flange**

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

3.2.5 Basic module L

Description of the long-life design:

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

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

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

3.2.6 Double spring-applied brake

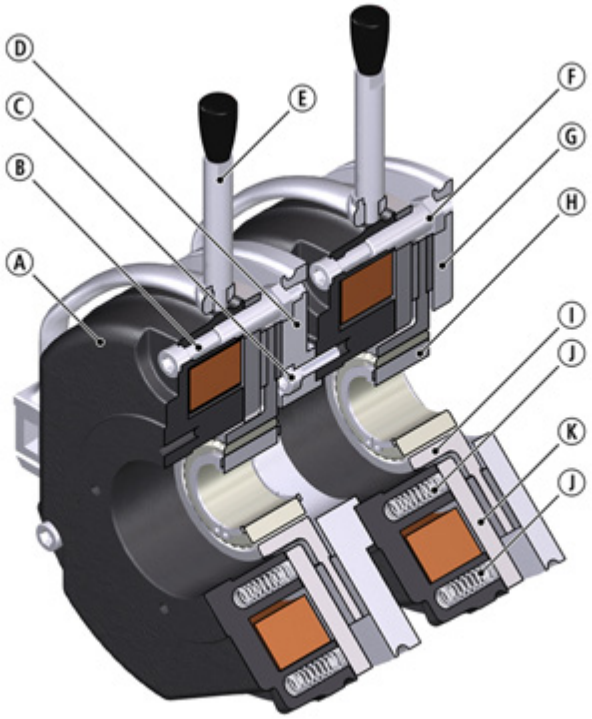


Fig. 3: **Design of the INTORQ BFK458 spring-applied brake: Basic module N, doubled design with intermediate flange**

Ⓐ 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 disc (rotor) that is equipped on both sides with friction linings. In its de-energised 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 an operating 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 inner and outer springs use the armature plate to press the rotor (which can be shifted axially on the hub) against the friction surface. The asbestos-free friction linings ensure high braking torque and low wear. The braking torque is transmitted between the hub and the rotor via gear teeth.

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

3.5 Brake torque reduction

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

3.6 Optional configuration

3.6.1 Hand-release (optional)

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

4 Project planning notes

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

5 Technical specifications

5.1 General information

⚠ DANGER

Danger of explosion

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

- Operation is only permitted within the specified specifications.

- The characteristic curve for the friction work (in the sections Dust explosive atmosphere (zone 22: non-conductive dusts), Page 31 and Gas explosive atmosphere (zone 2), Page 33) as a function of the operating frequency must not be exceeded when in an explosive atmosphere or even in emergency-stop mode.
- If the facility operator cannot ensure that the specified friction work and operating frequencies will be complied with, then the temperatures defined on the ATEX name plate for the dust zone must be monitored on the brake's magnet housing using a suitable temperature measurement mechanism. If there is no available knowledge of the occurring temperatures, then INTORQ is no longer responsible for this ATEX certification.
- In an explosive gas atmosphere, the resulting frictional heat in the friction gap created during the braking process creates a potential source of ignition. It is not possible here to measure the temperature during braking operations. Thus, it is very important to comply with the specified values for the friction work and operating frequencies. If the values for the actual friction work and operating frequencies are not known, the brake must not be put into operation in this atmosphere.

5.2 Possible applications of the INTORQ spring-applied brake

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

5.3 Brake torques

NOTICE

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

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

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

N Type without brake torque adjustment

E Type with brake torque adjustment

L Type in the long-life version

Operating brake (s_{Lmax} approx. 2.5 x s_{LN})

Standard braking torque

Holding brake with emergency stop ($s_{Lmax.}$ approx. 1.5 x s_{LN})

For basic module E, the brake torque can be reduced using the torque adjustment ring in the stator. The adjustment ring may only be unscrewed until the maximum protrusion (overhang) h_{Emax}; refer to the Rated data for air gap specifications, Page 24 table and Brake torque reduction (for the optional adjustable braking torque), Page 69.

When using a standard friction lining, the maximum speeds and friction work Q_R per brake frame size, as specified in the sections Dust explosive atmosphere (zone 22: non-conductive dusts), Page 31 and Gas explosive atmosphere (zone 2), Page 33, shall be applicable.

Notice

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

5.4 Rated data

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

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

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

Tab. 4: **Rated data for air gap specifications**

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

Size	Screw hole circle	Screw set for flange attachment DIN EN ISO 4762 (8.8)[1]	Screw set for mounting to the flange	Minimum depth of the free bore holes (in the end shield)	Tightening torque	
					Screws ± 10%	Complete lever ± 10%
	Ø [mm]			[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[2]	6 x M8x80	0.8		23
20	230	4 x M10[2]	6 x M10x90	2.1	48	
25	278	6 x M10[3]	6 x M10x100	5		40

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

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

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

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

Size	Screw hole circle	Screw set for mounting onto the motor/friction plate	Screw set for flange with through hole	Possible screw-in depth[4]	Tightening torque	
					Screws ± 10%	Complete lever ± 10%
	Ø [mm]			[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		23
20	230	6 x M10x100	-	24	48	
25	278	6 x M10x110	-	28		40

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

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

NOTICE

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

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

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

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

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

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

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

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

5.5 Switching times

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

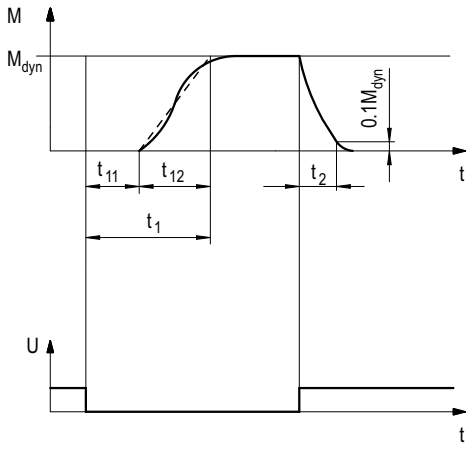


Fig. 4: **Operating/switching times of the spring-applied brakes**

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 brake torque
M_{dyn}	Braking torque at a constant speed of rotation	U	Voltage

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

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

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

Engagement time

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

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

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

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

NOTICE

Connect the spark suppressors in parallel to the contact. If this is not admissible for safety reasons (e.g. with hoists and lifts), the spark suppressor can also be connected in parallel to the brake coil.

- If the drive system is operated with a frequency inverter so that the brake will not be de-energized before the motor is at standstill, AC switching is also possible (not applicable to emergency braking).
- The specified engagement times are valid for DC switching with a spark suppressor.
  - Circuit proposals: refer to DC switching at mains – fast engagement, Page 60.

Notice

Spark suppressors are available for the rated voltages.

Notice

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

Disengagement time

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

5.6 Friction work / operating frequency

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

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

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

The permissible operating frequency S_{hmax} depends on the amount of heat Q_R (refer to Figure Friction work / operating frequency, Page 31). At a pre-set operating frequency S_h, the permissible amount of heat is Q_{Smax}.

Notice

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

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

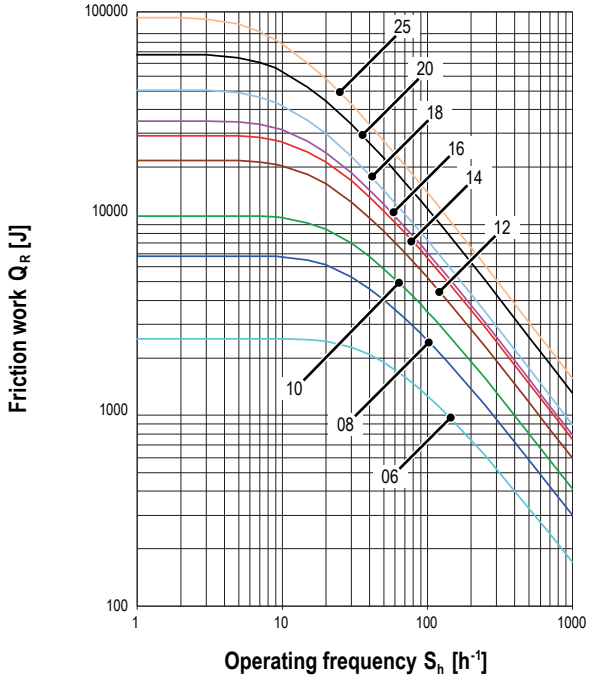


Fig. 5: **Friction work as a function of the operating frequency BFK-458-ATEX for dust atmospheres**

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

Notice

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

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

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

5.8 Gas explosive atmosphere (zone 2)

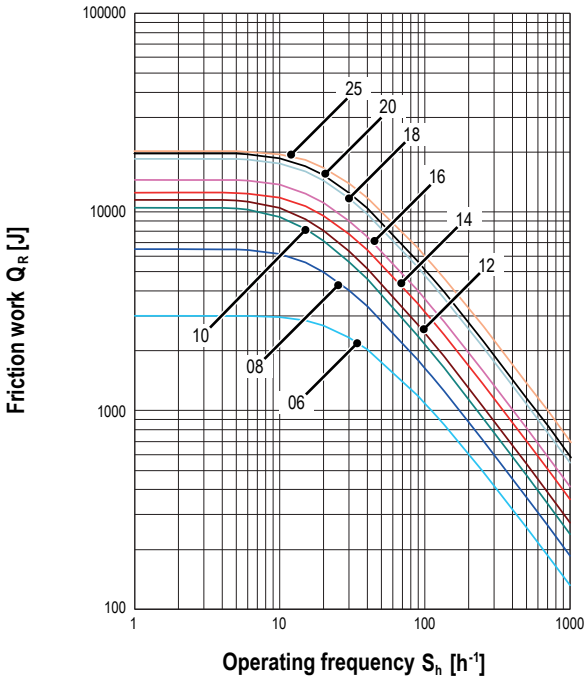


Fig. 6: Friction work as a function of the operating frequency for the BFK-458-ATEX, for gas atmospheres, for the speed 800 rpm

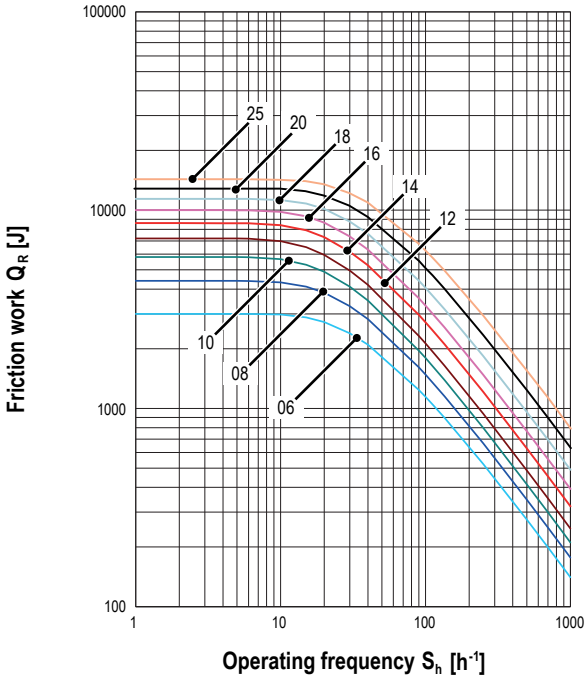


Fig. 7: Friction work as a function of the operating frequency for the BFK-458-ATEX, for gas atmospheres, for the speed 1500 rpm

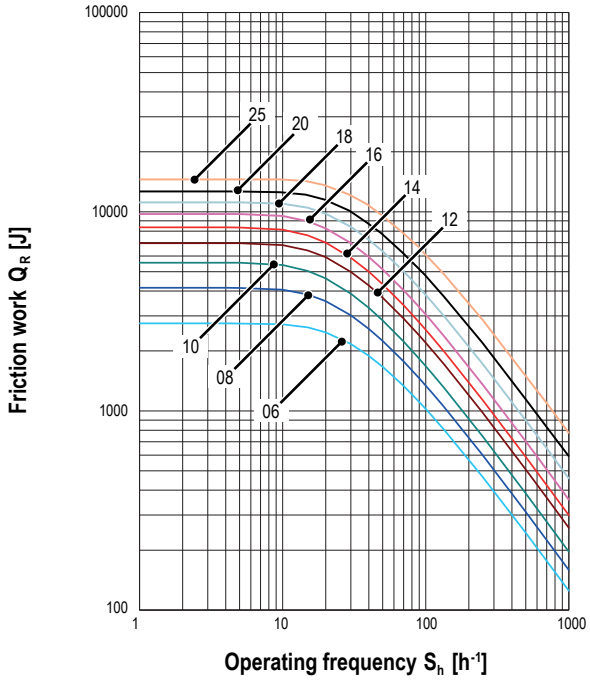


Fig. 8: Friction work as a function of the operating frequency for the BFK-458-ATEX, for gas atmospheres, for the speed 1800 rpm

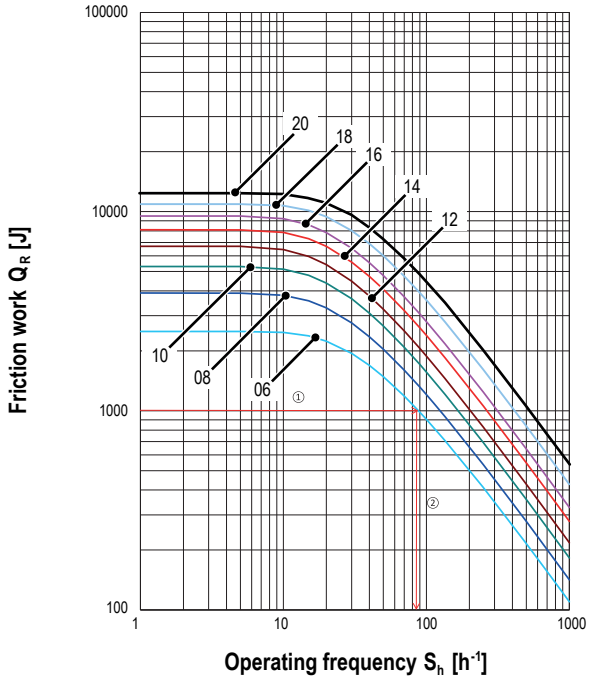


Fig. 9: Friction work as a function of the operating frequency for the BFK-458-ATEX, for gas atmospheres, for the speed 2500 rpm

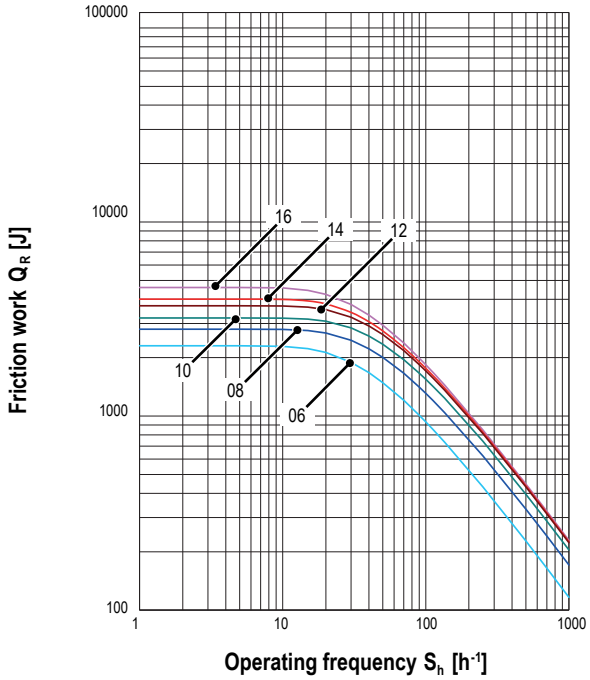


Fig. 10: **Friction work as a function of the operating frequency for the BFK-458-ATEX, for gas atmospheres, for the speed 3000 rpm**

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

Notice

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

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

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

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

5.9 Example calculation for the charts

Notice

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

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

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

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

5.10 Electromagnetic compatibility

Notice

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

NOTICE

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

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

5.11 Emissions

Heat

Since the brake converts kinetic energy as well as mechanical and electrical energy into heat, the surface temperature varies considerably, depending on the operating conditions and possible heat dissipation. Under unfavourable conditions, the surface temperature can reach 130 °C.

Noise

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

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

5.12 Hand-release

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

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

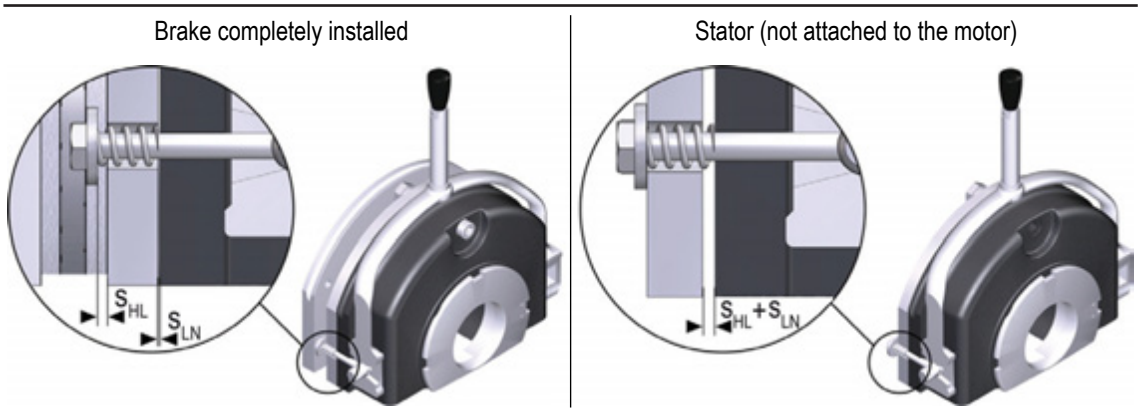


Fig. 11: **Positions of the adjustment dimensions that must be checked**

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

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

5.13 Labels on product

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

Fig. 12: **Packaging label**

INTORQ	Manufacturer
13.227.500	ID number
BFK458-12E	Type (refer to Product key)
	Bar code
SPRING-APPLIED BRAKE	Designation of the product family
205 V DC	Rated voltage
32 NM	Rated torque
Pieces	Qty. per box
40 W	Rated power
25 H7	Hub diameter
1 Jun. 2017	Packaging date
Anti-rust packaging: keep friction surface free of grease!	Addition
CE	CE mark

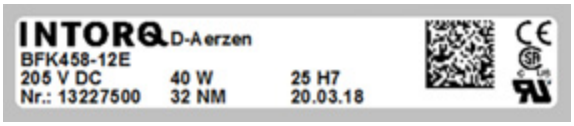


Fig. 13: **Name plate (example)**

INTORQ	Manufacturer
BFK458-12E	Type (refer to Product key)
205 V DC	Rated voltage
40 W	Rated power
20 H7	Hub diameter
No. 15049627	ID number
32 NM	Rated torque
20 Mar. 2018	Date of manufacture
	Data matrix code
	CE mark
C US	CSA/CUS acceptance
	UL mark

5.14 ATEX marking

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

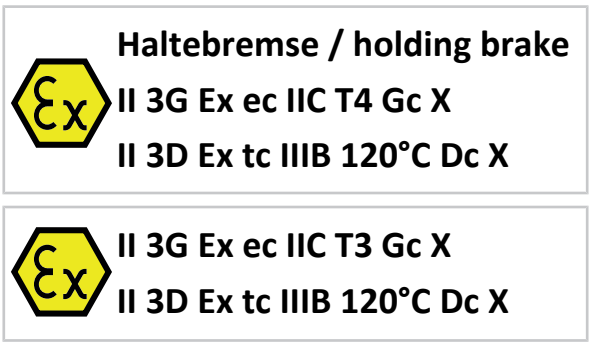


Fig. 14: **Name plate ATEX holding brake (an example)**

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

6 Mechanical installation

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

Important notes

⚠ DANGER

Danger of explosion

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

- Operation is only permitted within the specified specifications.

The following must always be observed when installing ATEX brakes:

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

NOTICE

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

6.1 Design of end shield and shaft

- Comply with the specified minimum requirements regarding the end shield and the shaft to ensure a correct function of the brake.
- The diameter of the shaft shoulder must not be greater than the tooth root diameter of the hub.
- The form and position tolerances apply only to the materials mentioned. Consult with INTORQ before using other materials; INTORQ's written confirmation is required for such usage.
- The brake flange must be supported by the end shield across the full surface.
- Depending on the type of installation, additional clearing bore holes may be required.
- Threaded holes with minimum thread depth: refer to Rated data: 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	Run-out	Material [1) 2)]	Levelness	Roughness [2)]	Tensile strength R_m
	[mm]		[mm]		[N/mm²]
06	0.03	S235JR; C15; EN-GJL-250	< 0.06	Rz6	250
08	0.03				
10	0.03				
12	0.05				
14	0.05		< 0.10	Rz10	
16	0.08				
18	0.08				
20	0.08				
25	0.10				

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

[1)] Consult with INTORQ before using other materials.

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

6.2 Tools

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

NOTICE

Tightening torques: refer to the table Rated data: screw kit for brake assembly on separately screwed-on flange, Page 25.

Multimeter	Caliper gage	Feeler gage
		

6.3 Preparing the installation

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

6.4 Installing the hub onto the shaft

Notice

Recommended ISO fitting for shaft:	Up to 50 mm diameter: k6
	Greater than 50 mm diameter: m6
Recommended roughness of the shaft:	R_{zmax} 10

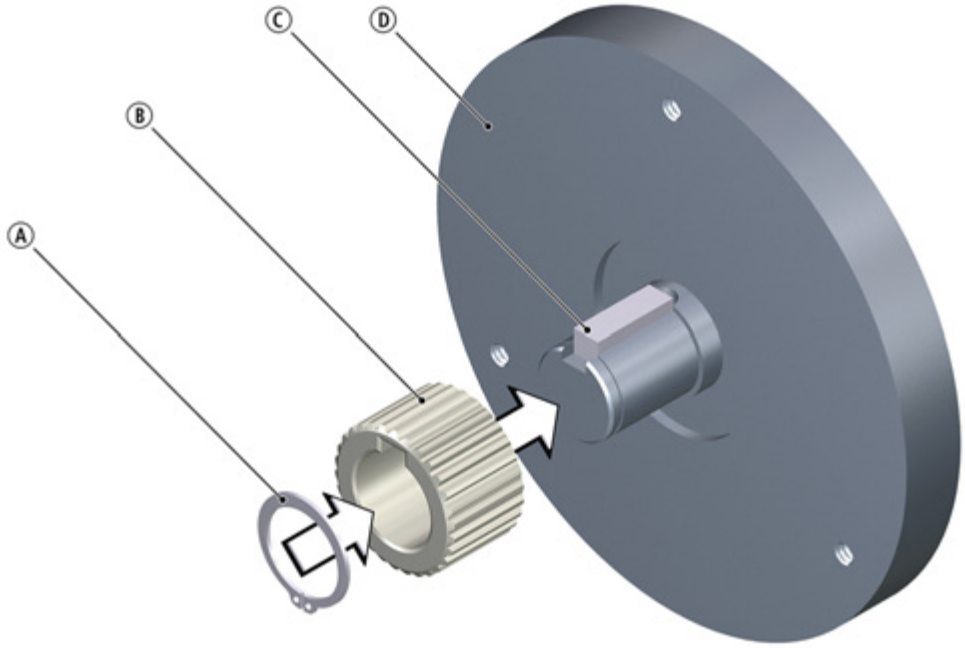


Fig. 15: **Installing the hub onto the shaft**

Ⓐ Circlip Ⓑ Hub Ⓒ Key

Ⓓ End shield

Note the following when mounting the hub on the brake:

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

NOTICE

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

6.5 Mounting the brake

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

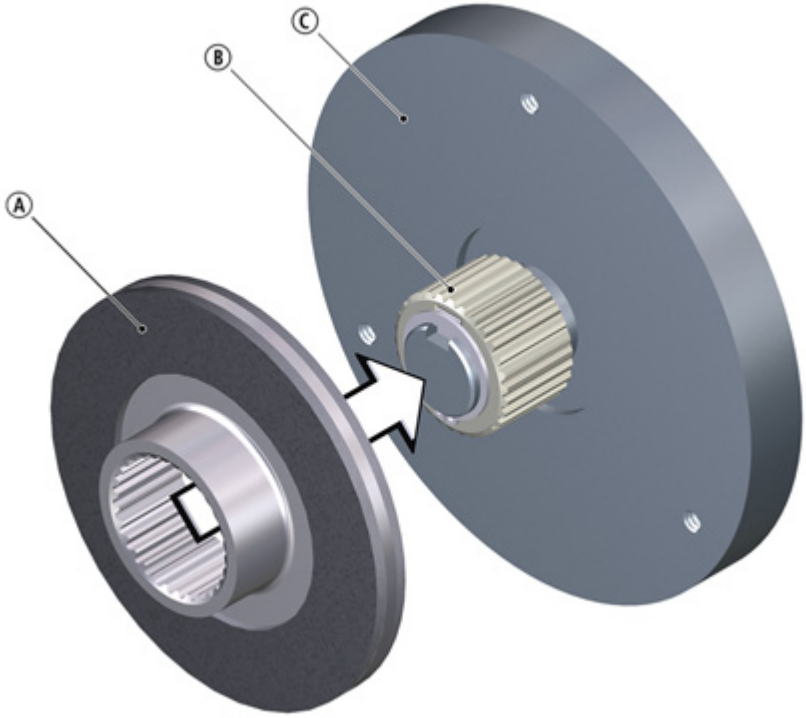


Fig. 16: **Assembly of the rotor**

Ⓐ Rotor Ⓑ Hub Ⓒ End shield

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

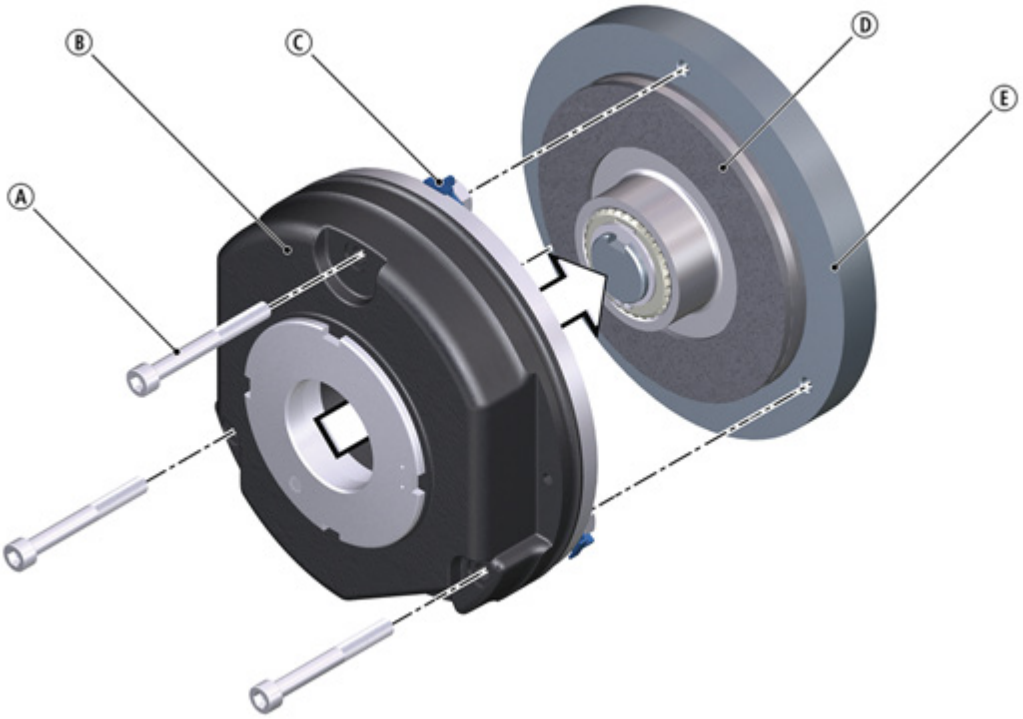


Fig. 17: **Mounting the complete stator**

Ⓐ Socket head cap screw
Ⓑ Stator, complete
Ⓒ Terminal clip
Ⓓ Rotor
Ⓔ End shield

3. Screw the complete stator to the end shield Use the supplied screw set and a torque wrench (for tightening torque, refer to the table Rated data: screw kit for brake assembly on separately screwed-on flange, Page 25).
4. Remove the terminal clips and dispose of properly.

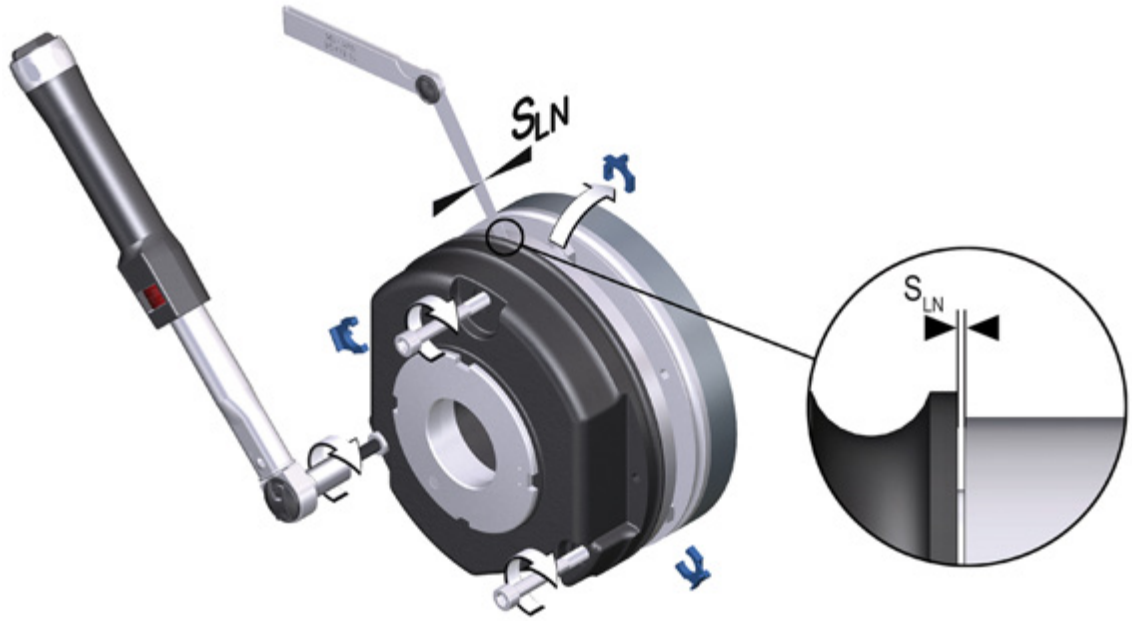


Fig. 18: **Tightening the screws with a torque wrench**

Notice

Do not push on the feeler gauge 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 Rated data for air gap specifications, Page 24.

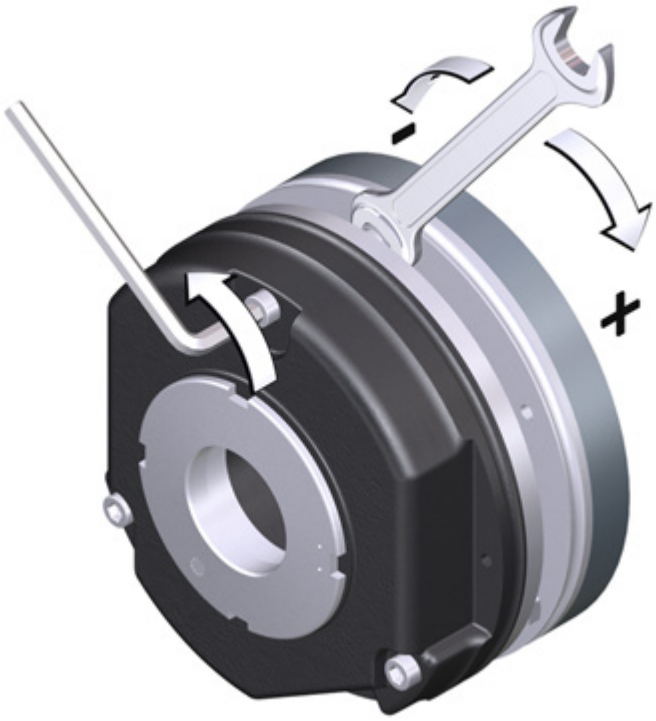


Fig. 19: **Adjusting the air gap**

6. If the measured value s_L is outside of the tolerance s_{LN}, readjust this dimension. Loosen the socket head cap screws slightly and adjust the air gap (turn the sleeve bolts using a wrench).
7. Use a torque wrench to tighten the socket head cap screws (refer to the Figure Tightening the screws with a torque wrench, Page 46).

NOTICE

Tightening torques: refer to the table Rated data: screw kit for brake assembly on separately screwed-on flange, Page 25.

6.6 Installing the friction plate (optional)

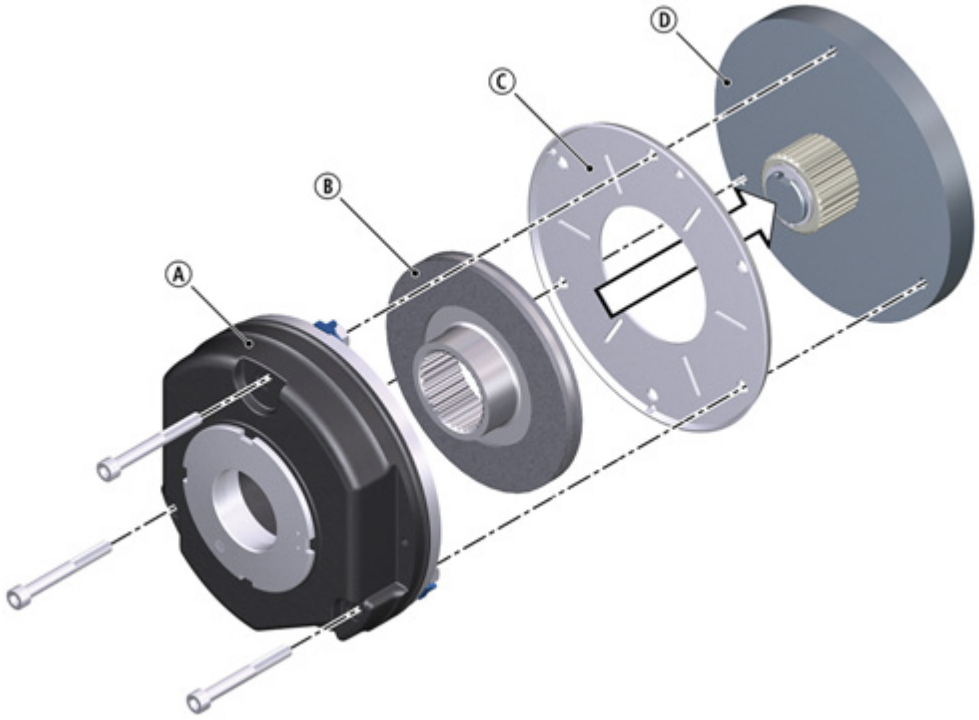


Fig. 20: **Mounting the friction plate**

Ⓐ Stator Ⓑ Rotor Ⓒ Friction plate
Ⓓ End shield

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

6.7 Mounting the flange

6.7.1 Mounting the flange without additional screws

NOTICE

When dimensioning the thread depth in the end shield, be sure to take into account the permissible wear distance (refer to Table Rated data 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 45 and Spare parts list, Page 77).

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

The flange can be screwed to the end shield on the outer hole circle (for screw dimensioning, refer to the table Rated data: screw kit for brake assembly on separately screwed-on flange, Page 25).

NOTICE

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

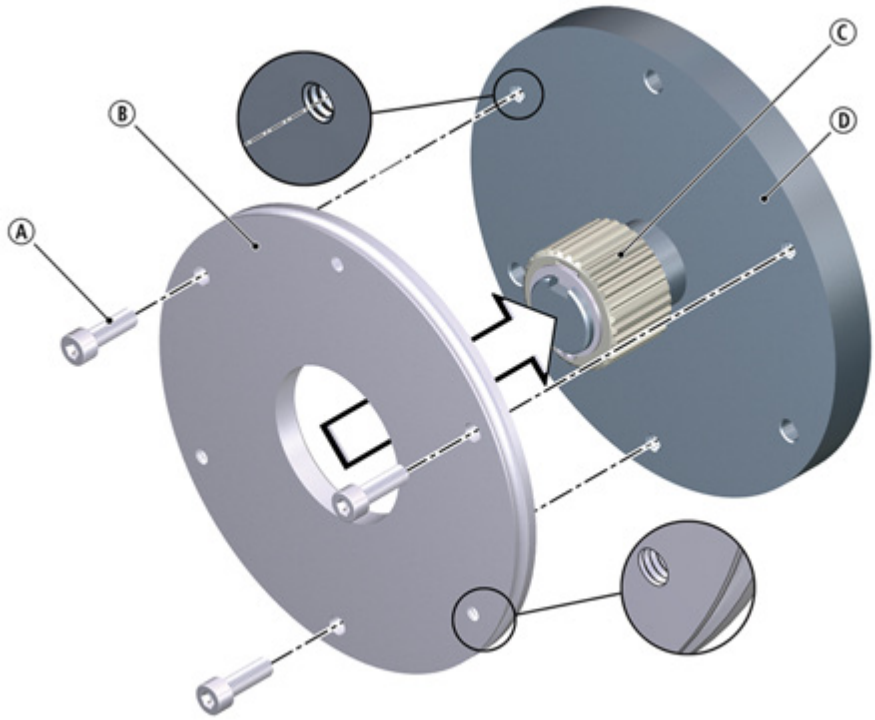


Fig. 21: **Flange mounting for sizes 06 - 16**

Ⓐ Screw [1)] Ⓑ Flange Ⓒ Hub

Ⓓ End shield

[1)] According to the table Rated data: 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 Rated data: screw kit for brake assembly on separately screwed-on flange, Page 25).
2. Place the flange against the end shield.

NOTICE

Tighten the screws evenly (for tightening torques, refer to the table Rated data: screw kit for brake assembly on separately screwed-on flange, Page 25).

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 Rated data: 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.

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

The flange can be screwed to the end shield onto the outer hole circle (refer to the table Rated data: screw kit for brake assembly on separately screwed-on flange, Page 25).

NOTICE

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

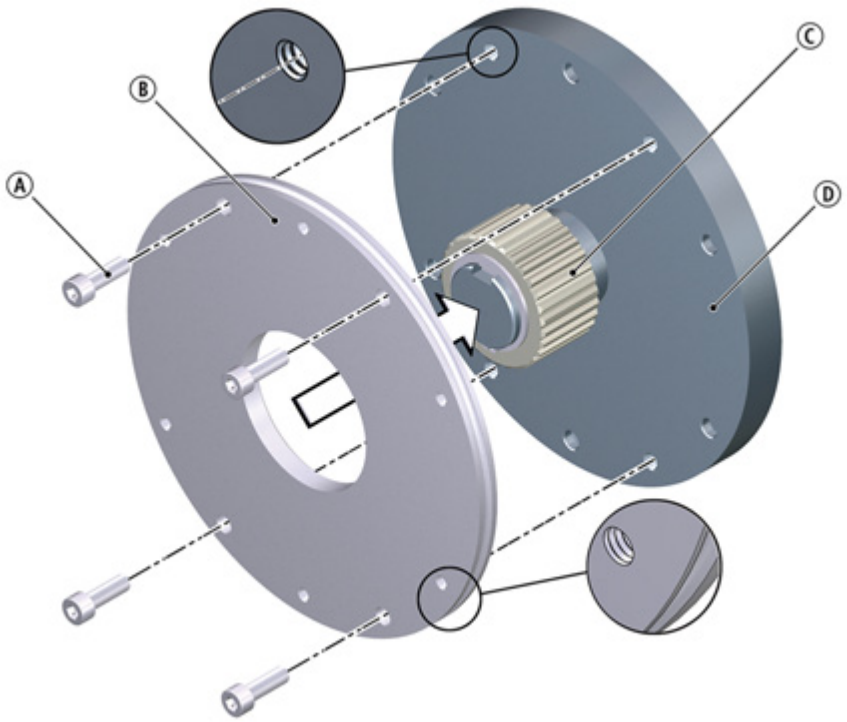


Fig. 22: **Flange mounting for sizes 18 – 20**

Ⓐ Screw [1)] Ⓑ Flange Ⓒ Hub

Ⓓ End shield

[1)] According to the table Rated data: screw kit for brake assembly on separately screwed-on flange, Page 25

1. Place the flange against the end shield.

NOTICE

Tighten the screws evenly (for tightening torques, refer to the table Rated data: screw kit for brake assembly on separately screwed-on flange, Page 25).

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 Rated data: screw kit for brake assembly on separately screwed-on flange, Page 25.

6.7.4 Installing the flange (variants: size 25)

The flange can be screwed to the end shield onto the outer hole circle (refer to the table Rated data: screw kit for brake assembly on separately screwed-on flange, Page 25).

NOTICE

- Clearing holes for the screws in the end shield must be behind the threaded screw holes in the flange (refer to the table Rated data: screw kit for brake assembly on separately screwed-on flange, Page 25). Without the clearing holes, the minimal rotor thickness cannot be used. The screws must not press against the end shield.

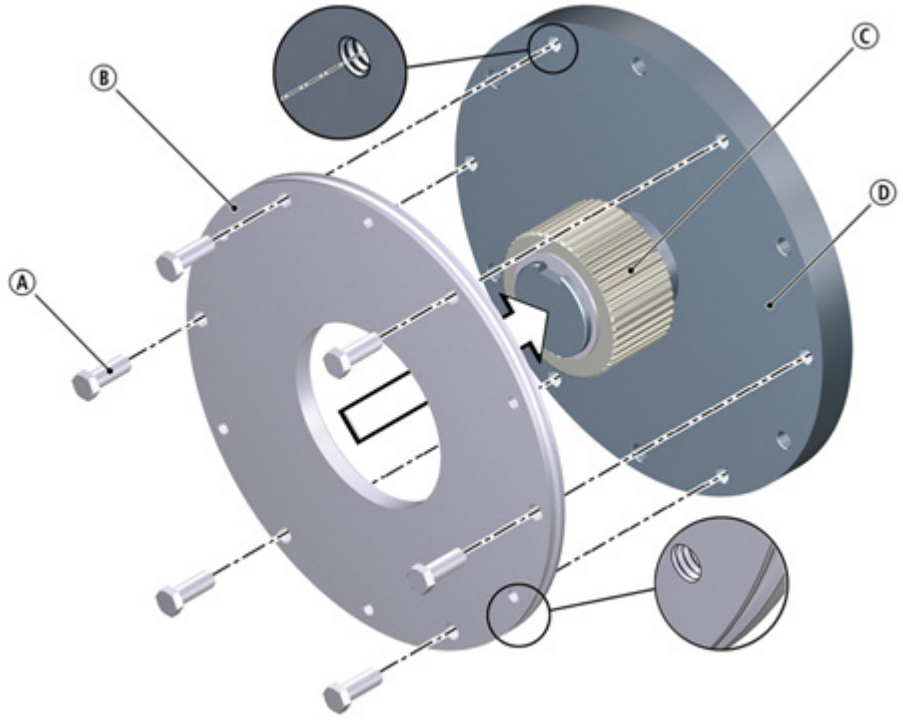


Fig. 23: **Flange mounting for size 25**

Ⓐ Hex screw [1)] Ⓑ Flange Ⓒ Hub

Ⓓ End shield

[1)] According to the table Rated data: 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.

NOTICE

Tighten the screws evenly (for tightening torques, refer to the table Rated data: screw kit for brake assembly on separately screwed-on flange, Page 25).

6.8 Installing the double spring-applied brake

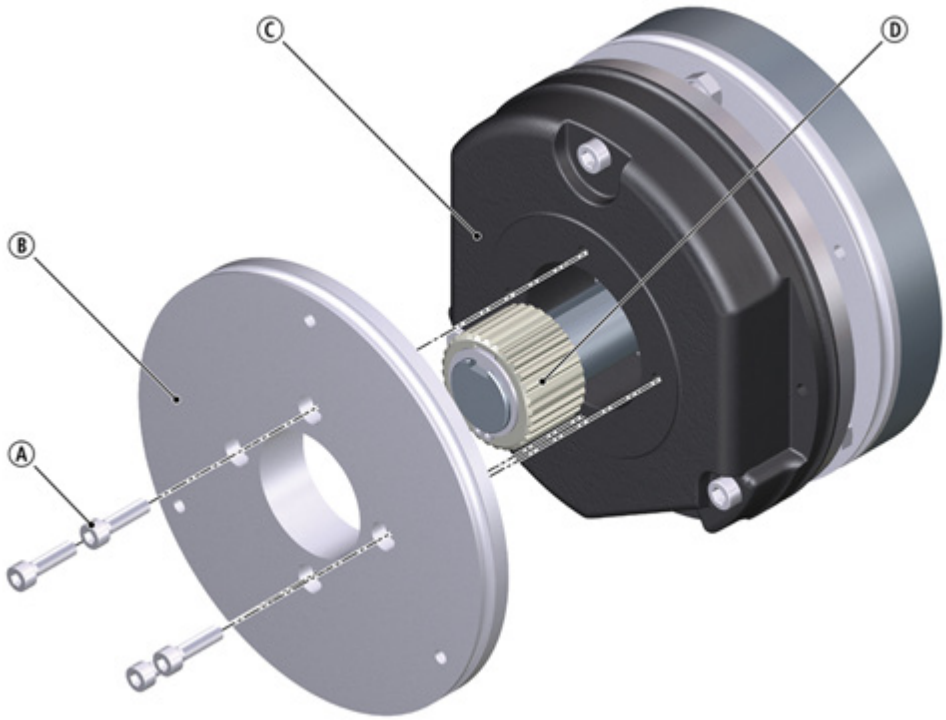


Fig. 24: **Installing the intermediate flange**

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

NOTICE

When installing the double spring-applied brake, use screws of the required strength class. Install them using the tightening torque specified in the table for the screw kit for intermediate flange mounting for double spring-applied brakes as well as the table Rated data: screw kit for brake assembly on separately screwed-on flange, Page 25 (in the column "Screw kit for mounting on flange").

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 45.

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 INTORQ first!

6.9 Cover ring assembly

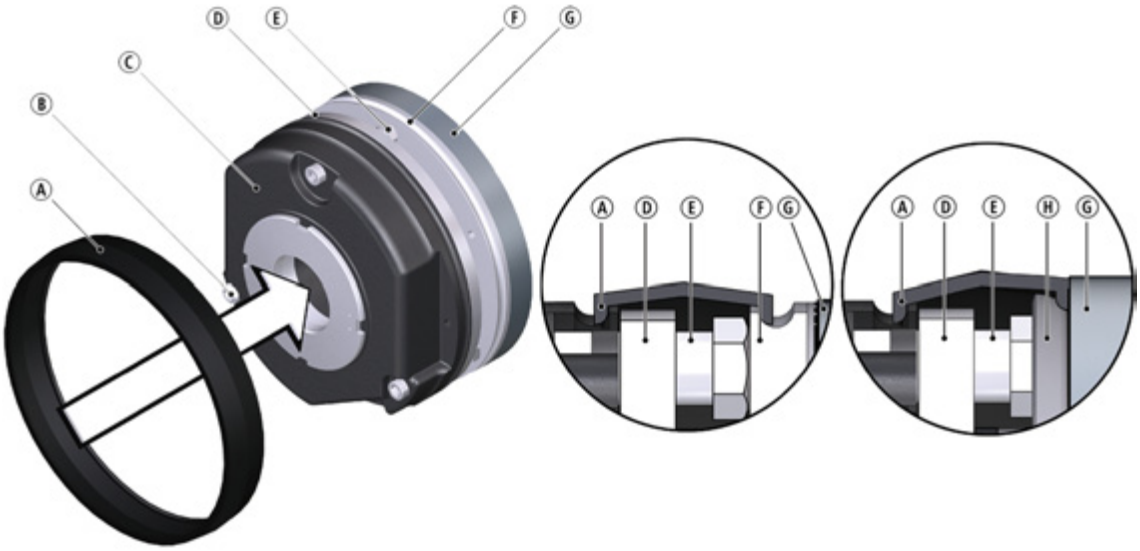


Fig. 25: **Cover ring assembly**

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

NOTICE

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

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

6.10 Installing the shaft sealing ring

NOTICE

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

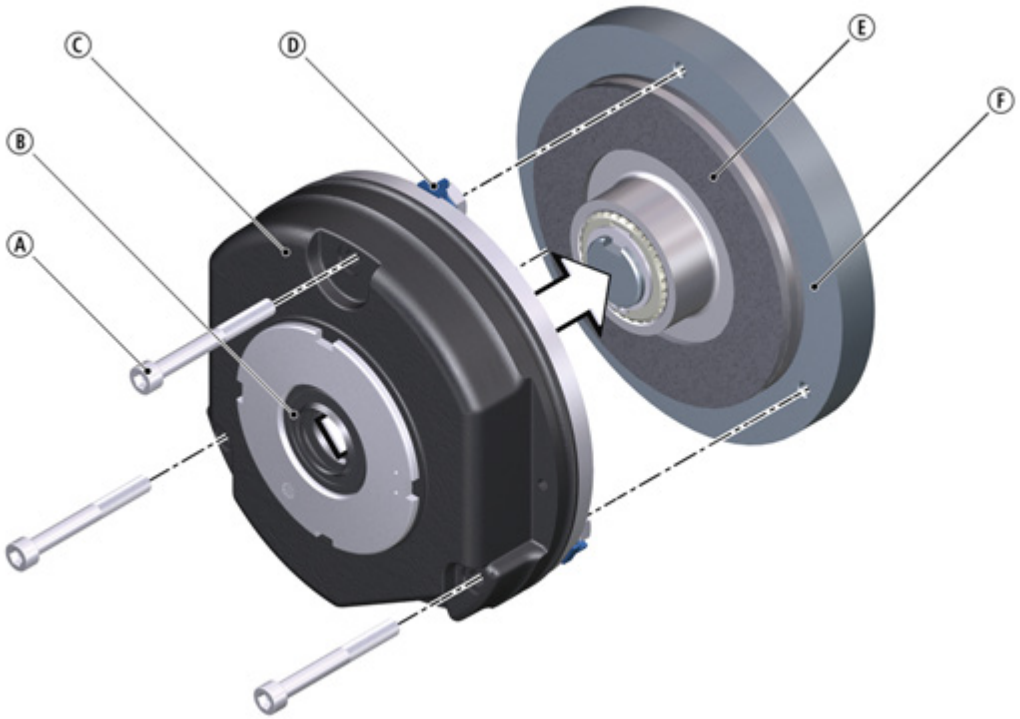


Fig. 26: **Installing the shaft sealing ring**

Ⓐ Socket head cap screw
Ⓑ Shaft sealing ring
Ⓒ Stator, complete
Ⓓ Terminal clip
Ⓔ Rotor
Ⓕ End shield

Notice

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

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

6.11 Installing the hand-release (retrofitting)

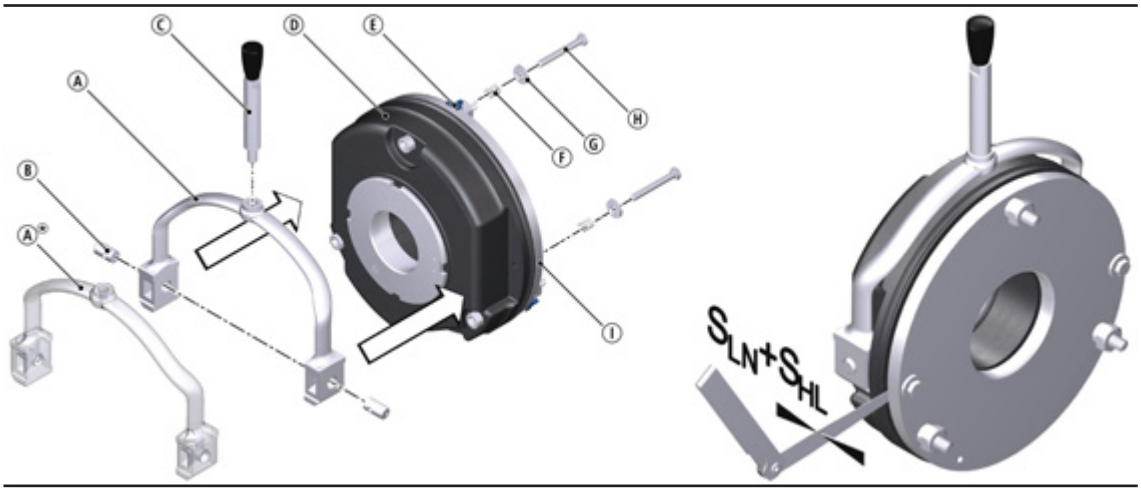


Fig. 27: **Assembly of the hand-release BFK458**

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

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

NOTICE

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

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

7. Set the gap $s_{LN} + s_{HL}$ evenly using the hex head screws and the feeler gauge. Refer to the table Adjustment setting for hand-release, Page 37 for the values for the dimension $s_{LN} + s_{HL}$.

7 Electrical installation

Important notes

⚠ DANGER

There is a risk of injury by electrical shock!

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

NOTICE

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

7.1 Electrical connection

Switching suggestions

NOTICE

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

Notice

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

7.2 AC switching at the motor – extremely delayed engagement

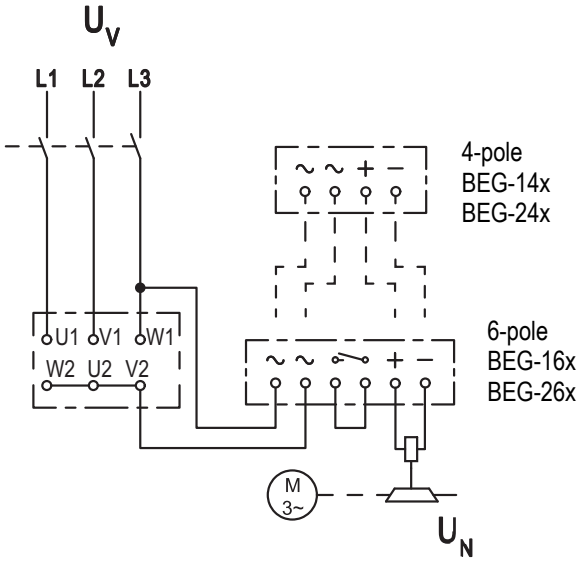


Fig. 28: **Supply: Phase-neutral**

Bridge rectifiers

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

Half-wave rectifiers

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

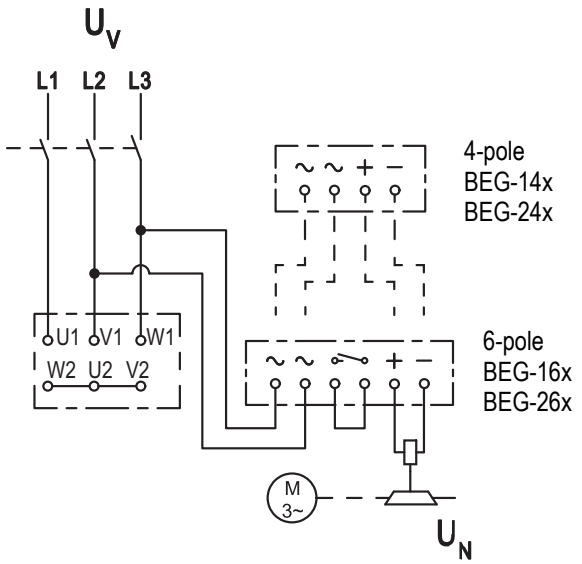


Fig. 29: **Supply: Phase-phase**

Bridge rectifier [1)]

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

Half-wave rectifiers

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

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

7.3 DC switching at the motor – fast engagement

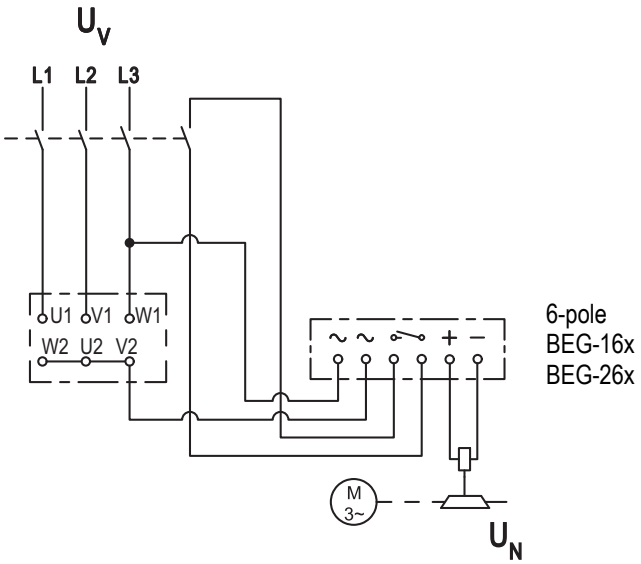


Fig. 30: **Supply: Phase-neutral**

Bridge rectifiers

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

Half-wave rectifiers

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

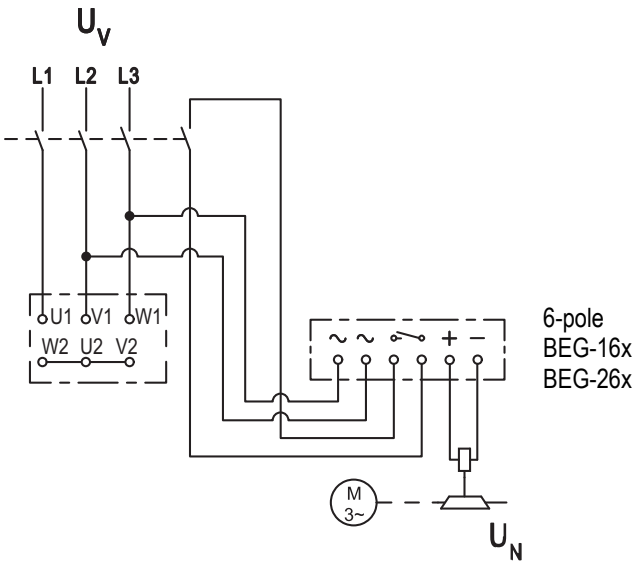


Fig. 31: **Supply: Phase-phase**

Bridge rectifier [1)]

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

Half-wave rectifiers

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

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

7.4 AC switching at mains – delayed engagement

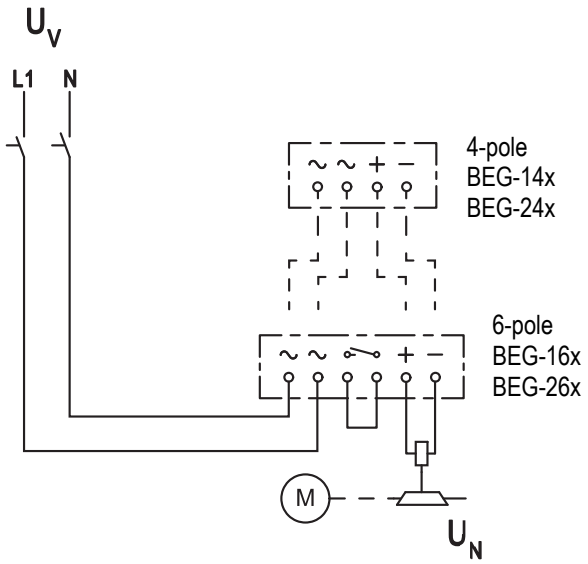


Fig. 32: **Supply: Phase-N**

Bridge rectifiers	Half-wave rectifiers
BEG-1xx: U_N [V DC] = 0.9 • U_V [V AC]	BEG-2xx: U_N [V DC] = 0.45 • U_V [V AC]

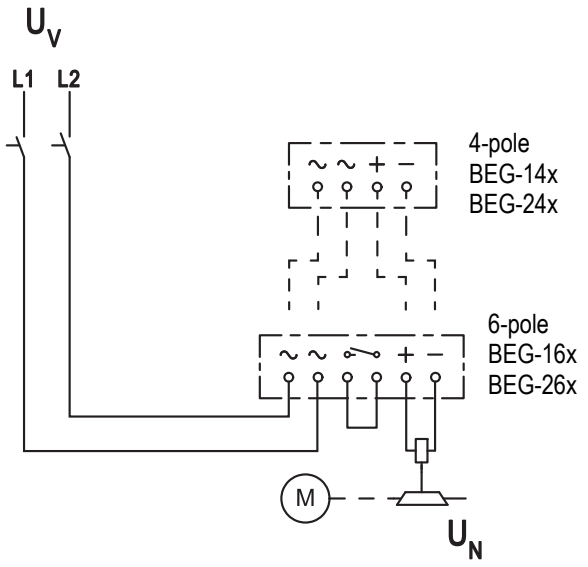


Fig. 33: **Supply: Phase-phase**

Bridge rectifier [1]	Half-wave rectifiers
BEG-1xx: U_N [V DC] = 0.9 • U_V [V AC]	BEG-2xx: U_N [V DC] = 0.45 • U_V [V AC]

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

7.5 DC switching at mains – fast engagement

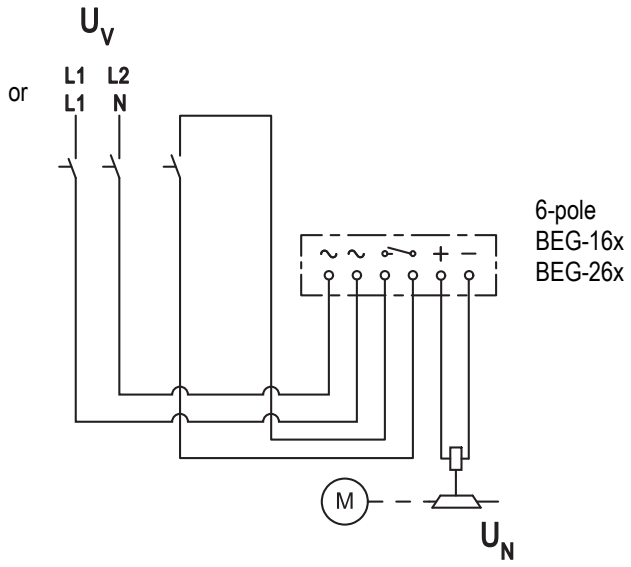


Fig. 34: **Supply: Phase-phase or phase-N via 6-pole rectifier**

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

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

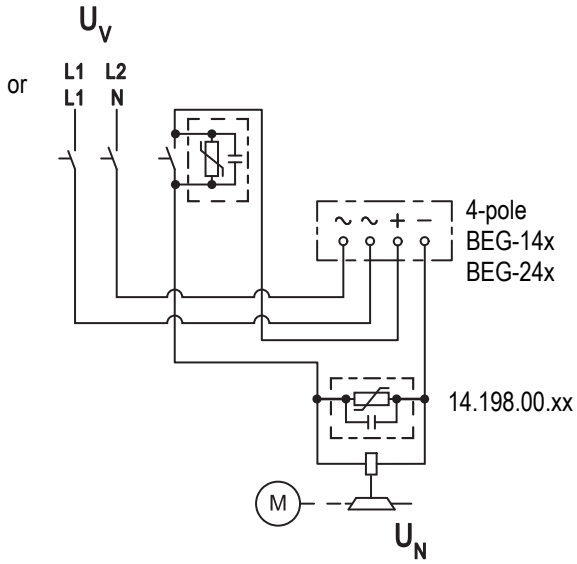


Fig. 35: **Supply: Phase-phase or phase-N via 4-pole rectifier**

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

Spark suppressor:

14.198.00.xx (required once, select position)

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

7.6 Minimum bending radius for the brake connection line

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

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

7.7 Bridge/half-wave rectifier (optional)

BEG-561-□□□-□□□

The bridge-half-wave rectifiers are used to supply electromagnetic DC spring-applied brakes which are approved for use with such rectifiers. Other use is only permitted with the approval of 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 58) is limited by an integrated overvoltage protection at terminals 5 and 6.

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

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

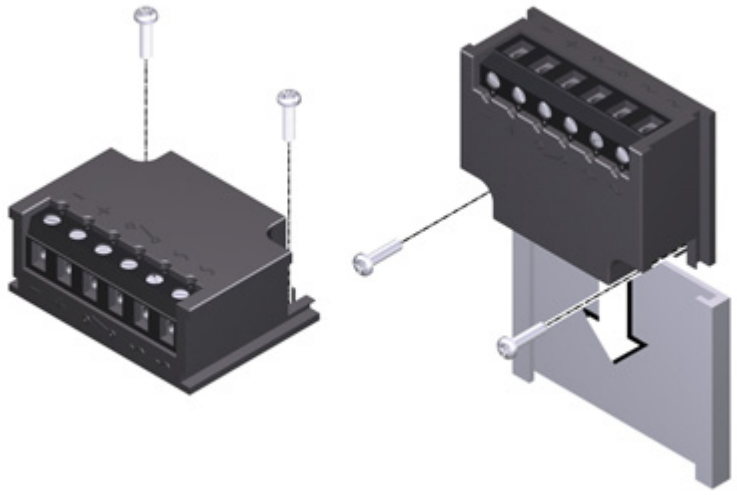


Fig. 36: **BEG-561 fastening options**

7.7.2 Technical specifications

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

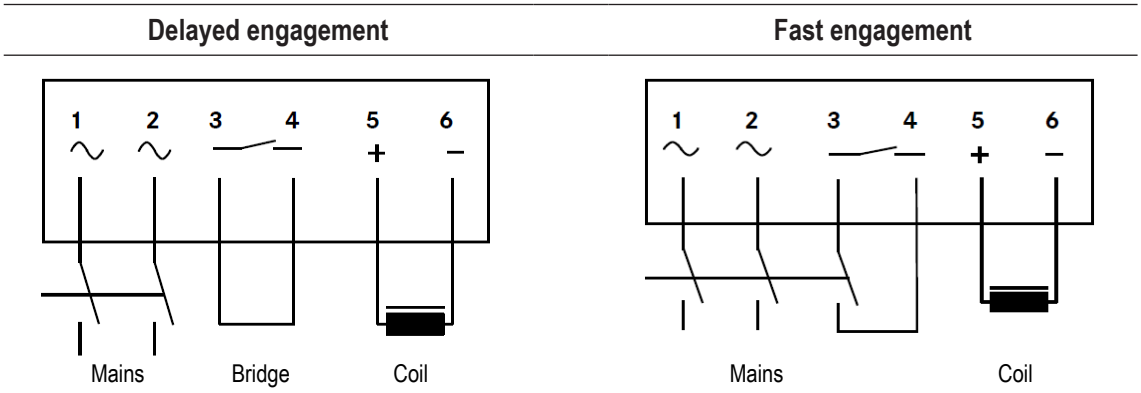
U_1 input voltage (40 – 60 Hz)

Type	Input voltage U_1 (40 Hz – 60 Hz)			Max. current I_{max}		Overexcitation period t_{ue} (± 20 %)		
	Min.	Rated	Max.	Bridge	half-wave	at $U_{1\,min}$	at $U_{1\,Nom}$	at $U_{1\,max}$
	[V~]	[V~]	[V~]	[A]	[A]	[s]	[s]	[s]
BEG-561-255-030	160	230	255	3.0	1.5	0.430	0.300	0.270
BEG-561-255-130						1.870	1.300	1.170
BEG-561-440-030-1	230	400	440	1.5	0.75	0.500	0.300	0.270
BEG-561-440-130				3.0	1.5	2,300	1.300	1.200

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

7.7.3 Reduced switch-off times

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



7.7.4 Permissible current load at ambient temperature

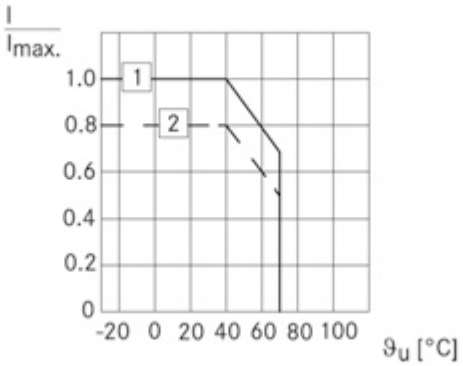


Fig. 37: **Permissible current load**

① If screwed to metal surface (good heat dissipation)

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

8 Commissioning and operation

Possible applications of the INTORQ spring-applied brake

NOTICE

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

8.1 Protect the electrical connections against any contact or touching.

Important notices and information

⚠ DANGER

Danger: rotating parts!

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

⚠ DANGER

There is a risk of injury by electrical shock!

The live connections must not be touched.

- The brake is designed for operation under the environmental conditions that apply to IP54 protection. Because of the numerous possibilities of using the brake, it is still 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.
- However, as the organic friction linings used do not all have identical properties and because environmental conditions can vary, deviations from the specified braking torques are possible. These must be taken into account in the form of appropriate dimensioning tolerances. Increased breakaway torque is common, in particular after long downtimes in humid environments where temperatures vary.

Notice

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

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

8.2 Function checks before initial commissioning

8.2.1 Function check of the brake

If a fault or malfunction arises during the function check, you can find important information for troubleshooting in the chapter Troubleshooting and fault elimination, Page 80. If the fault cannot be fixed or eliminated, please contact your customer service.

8.2.2 Release / voltage control

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

⚠ DANGER

Danger: rotating parts!

Your system should be mechanically immobilized in the event that it could start moving when the brake is released.

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

8.2.3 Testing the hand-release functionality

NOTICE

This operational test must also be carried out!

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

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

Tab. 16: **Actuating forces**

* When used with a long lever

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

NOTICE

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

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

Notice

If faults occur, refer to the error search table (Troubleshooting and fault elimination, Page 80). If the fault cannot be fixed or eliminated, please contact the customer service department.

8.3 Commissioning

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

8.4 Operation

⚠ DANGER

Danger: rotating parts!

- The running rotor must not be touched.
- Take structural design measures on your final product and implement organizational safety rules to ensure that nobody can touch a rotor.

⚠ DANGER

There is a risk of injury by electrical shock!

- Live connections must not be touched.
- Take structural design measures on your final product and implement organizational safety rules to ensure that nobody can touch a connection.

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

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

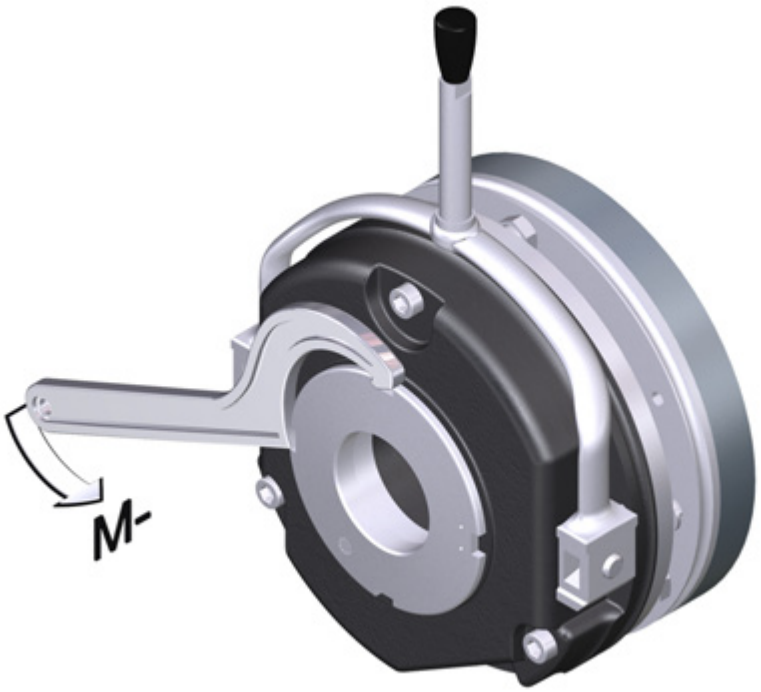


Fig. 39: **Reducing the braking torque**

1. Use a hook wrench to turn the torque adjustment ring counter-clockwise. This reduces the braking torque.
   - Note the correct position of the tappet notches on the torque adjustment ring: Only the latched-in positions are permitted. It is forbidden to operate the brake when the notches are adjusted between these latched-in positions! (Refer to chapter Brake torques, Page 23 for the values for the braking torque reduction for each latched-in position.)
   - Observe the max. permissible protrusion (h_{Emax}) of the torque adjustment ring over the stator. (Refer to the table Rated data for braking torques, depending on the speed and permissible limiting speeds for values of h_{Emax} .)

⚠ DANGER

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

8.4.2 Operating procedures

Operating procedures

⚠ DANGER

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

9 Maintenance and repair

⚠ DANGER

Danger of explosion

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

- Operation is only permitted within the specified specifications.

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

- All work related to the dismantling of the brake must be carried out with non-sparking tools.
- If spark-generating tools are used for further work, then such work on the brake must always be performed outside the explosive atmosphere.
- For every servicing or repair that is carried out, the brake must be cleaned in accordance with the instructions in the Maintenance, Page 72 section, and the entire brake must be cleared of impurities caused by the explosive dust atmosphere.
- In order to eliminate the risk of ignition and injury, the spring-applied brakes may only be dismantled after they cool down.

9.1 Wear of spring-applied brakes

⚠ WARNING

Braking torque reduction

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

The table below shows the different causes of wear and their impact on the components of the spring-applied brake. The influential factors must be quantified so that the service life of the rotor and brake can be calculated and so that the prescribed maintenance intervals can be specified accurately. The most important factors in this context are the applied friction work, the initial speed of rotation of 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
Friction lining	Braking during operation	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)		
	Starting 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 pins	Breaking of armature plate, adjustment tubes and guide pins	Number of start/stop cycles, braking torque
Springs	Axial load cycle and shear stress of springs through radial backlash on reversal of armature plate	Reduced spring force or fatigue failure	Number of switching operations of brake

Tab. 17: **Causes for wear**

9.2 Inspections

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

Primarily, the required maintenance intervals for industrial brakes result from their load during operation. When calculating the maintenance interval, all causes for wear must be taken into account. (Refer to the table Causes for wear, Page 71). 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 plant.

Failures, production losses or damage to the system may occur when the brakes are not serviced. Therefore, a maintenance strategy that is adapted to the particular operating conditions and brake loads must be defined for every application. For the spring-applied brakes, the maintenance intervals and maintenance operations listed in the table below must be followed. The maintenance operations must be carried out as described in the detailed descriptions.

9.2.1 Maintenance intervals

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

* NOTICE: 10 million cycles for the L design type

9.3 Maintenance

Notice

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

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

9.3.1 Checking the components

With mounted brake	▮ Check release function and control	Refer to Release / voltage, Page 74
	▮ Measure the air gap (adjust if required)	Refer to Adjusting the air gap, Page 75
	▮ Measure the rotor thickness (replace rotor if required)	Refer to Check the rotor thickness, Page 73
	▮ Thermal damage of armature plate or flange (dark-blue tarnishing)	
After removing the brake	▮ Check the play of the rotor gear teeth (replace worn-out rotors)	Refer to Replace rotor, Page 75
	▮ 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 end shield	
	– Flatness depending on the size	Refer to the table Design of end shield and shaft, Page 42
	– Max. run-in depth = rated air gap for the size	Refer to the table Rated data for air gap specifications, Page 24

9.3.2 Check the rotor thickness

⚠ DANGER

Danger: rotating parts!

The motor must **not** be running when checking the rotor thickness.

1. Remove the fan cover.
2. Remove the cover ring, when present.
3. Measure the rotor thickness using a calliper gauge. For the friction-plate design: observe the edging on outer diameter of friction plate.
4. Compare the measured rotor thickness with the minimum permissible rotor thickness. (Refer to the values in the table Rated data for air gap specifications, Page 24.) If the measured rotor thickness is insufficient, the rotor must be replaced completely. (Refer to Replace rotor, Page 75 for the description.)

9.3.3 Checking the air gap

⚠ DANGER

Danger: rotating parts!

The motor must **not** run while the air gap is being checked.

1. Measure the air gap s_L between the armature plate and the stator near the fastening screws using a feeler gauge. (Refer to table Rated data for air gap specifications, Page 24 for the values.)
2. Compare the measured air gap to the value for the max. permissible air gap s_{Lmax} . (Refer to table Rated data for air gap specifications, Page 24 for the values.)
3. Adjust the air gap to s_{LN}. (Refer to Adjusting the air gap, Page 75).

9.3.4 Release / voltage

⚠ DANGER

Danger: rotating parts!

The running rotor must not be touched.

⚠ DANGER

There is a risk of injury by electrical shock!

The live connections must not be touched.

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

9.3.5 Adjusting the air gap

⚠ DANGER

Danger: rotating parts!

The brake must be free of residual torque.

NOTICE

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

1. Loosen the screws (refer to the figure Adjusting the air gap, Page 47).
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 Rated data: screw kit for brake assembly on separately screwed-on flange, Page 25 for the torque values.)
4. Check the value of s_L near the screws using a feeler gauge. (Refer to table Rated data for air gap specifications, Page 24.)

9.3.6 Replace rotor

⚠ DANGER

Danger: rotating parts!

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

1. Remove the connection cables.
2. Loosen the screws evenly and then remove them.
3. Pay attention to the connection cable during this step! Remove the complete stator from the end shield.
4. Pull the rotor off the hub.
5. Check the hub's gear teeth.
6. Replace the hub if wear is visible.
7. Check the end shield's friction surface. Replace the friction surface on the end shield when there is clearly visible scoring at the running surface. In case of strong scoring on the end shield, rework the friction surface.
8. Measure the rotor thickness of the new rotor and the head thickness of the sleeve bolts (use a calliper 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 Rated data 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 45.)
12. Re-connect the connection cables.
13. If necessary, deactivate mechanical shutdown of the system.

9.4 Spare parts list

Spring-applied brake INTORQ BFK458-06 to 25

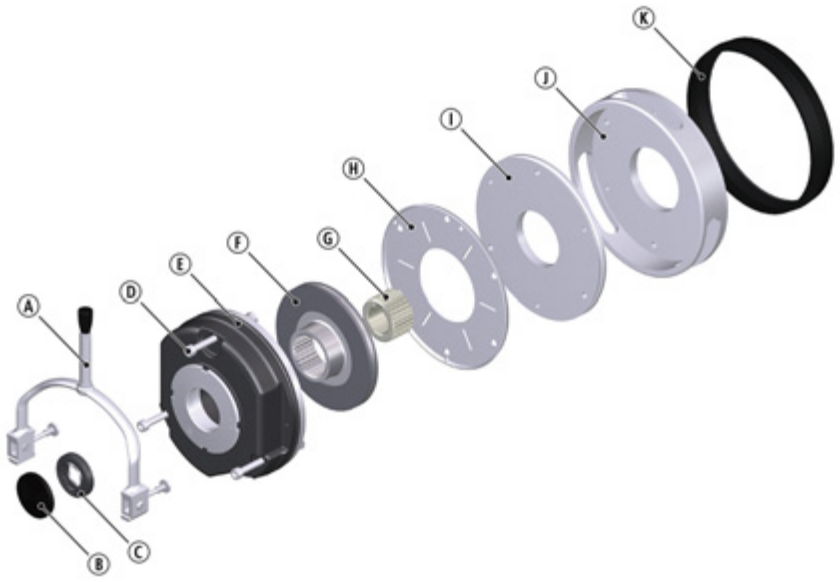


Fig. 40: **Spring-applied brake INTORQ BFK458-06 to 25**

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

Double spring-applied brake INTORQ BFK458-06 to 25

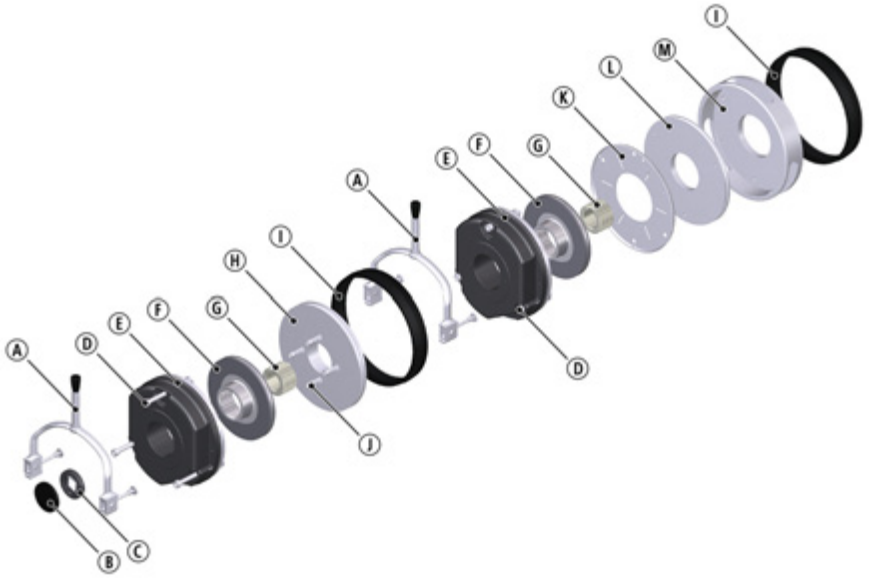


Fig. 41: **Double spring-applied brake INTORQ BFK458-06 to 25**

	Designation	Variant
Ⓐ	Hand-release with standard lever	Mounting kit
Ⓑ	Cap	Basic module N
Ⓒ	Shaft sealing ring	Shaft diameter on request
Ⓓ	Screw set DIN EN ISO 4762 - 8.8 in various designs and lengths	▮ for mounting to the flange ▮ for mounting to the motor / friction plate ▮ for flange with through hole
Ⓔ	Complete stator, module N	Voltage / braking torque - Optionally with rear threads
Ⓕ	Complete rotor	Aluminium rotor
		Aluminium 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	
Ⓜ	Centring flange (tacho flange)	

Electrical accessories

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

10 Troubleshooting and fault elimination

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

Fault	Cause	Remedy
Brake cannot be released, air gap is not zero	Coil interruption	▮ Measure coil resistance using a multimeter: - Compare the measured resistance with the nominal resistance. Refer to Rated data for coil powers, Page 26 for the values. - If resistance is too high, replace the complete spring-applied brake.
	Coil has contact to earth or between windings	▮ Measure coil resistance using a multimeter: - Compare the measured resistance with the nominal resistance. Refer to Rated data for coil powers, Page 26 for the values. If resistance is too low, replace the complete stator. ▮ Check the coil for short to ground using a multimeter: - If there is a short to ground, replace the complete spring-applied brake. ▮ Check the brake voltage (refer to section on defective rectifier, voltage too low).
	Wiring defective or wrong	Check the wiring and correct. ▮ Check the cable for continuity using a multimeter - Replace the defective cable.
	Rectifier defective or incorrect	▮ Measure rectifier DC voltage using a multimeter. ▮ If DC voltage is zero: ▮ Check AC rectifier voltage. ▮ If AC voltage is zero: - Switch on the voltage - Check the fuse - Check the wiring ▮ If AC voltage is okay: - Check the rectifier - Replace the defective rectifier ▮ Check coil for inter-turn fault or short circuit to ground. ▮ If the rectifier defect occurs again, replace the entire spring-applied brake, even if you cannot find any fault between turns or short circuit to ground. The error may only occur on warming up.

Fault	Cause	Remedy
Brake cannot be 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_L" is too large	Adjust the air gap (Adjusting the air gap, Page 75).
Rotor cannot rotate freely	Wrong setting of hand-release	Check the dimensions s_{LN} + s_{HL} with the brake energized. The dimensions must be the same on both sides. Correct if required. (Refer to Installing the hand-release (retrofitting), Page 55.)
	Air gap "s_L" too small	Check the air gap "s_L" and adjust if necessary (Adjusting the air gap, Page 75).
Rotor is too thin	Rotor has not been replaced in time	Replace the rotor (Replace rotor, Page 75).
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 proper fusing.

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