INTORQ

POWERED BY KENDRION

INTORQ BFK458 with lathed housing for NORD drive systems

Spring-applied brake with electromagnetic release

Translation of the Original Operating Instructions

www.kendrion.com

Document history

Material number	Version			Description
33011832	1.0	10/2024	SC	First edition for the series

Assignments for brake designations

NORD Drive Systems		Kendrion INTORQ
BRE 5Nm	≙	BFK 458-06
BRE 10Nm	≙	BFK 458-08
BRE 20Nm	≙	BFK 458-10
BRE 40Nm	≙	BFK 458-12
BRE 60Nm	≙	BFK 458-14
BRE 100Nm	≙	BFK 458-16

Tab. 1: **Table assigning brake designations of NORD Drive Systems to Kendrion INTORQ**

Legal regulations

Liability

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

Warranty

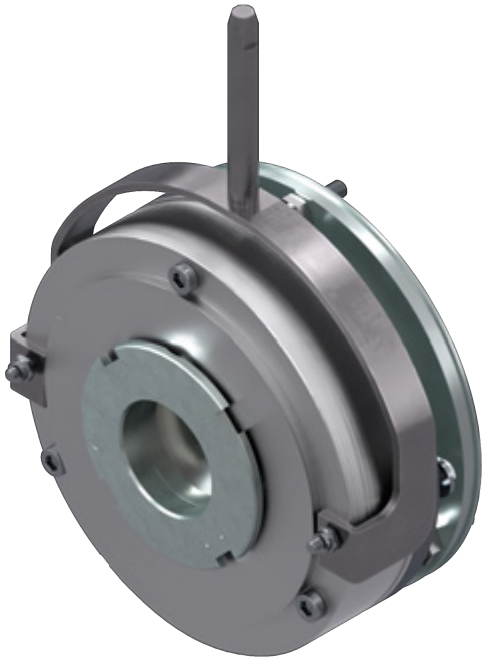
Notice

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

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

Spring-applied brakes of type BFK458-06...16

Design E



Design N

Product key

Kendrion INTORQ B FK □□□ □□ □

Product group: Brakes

Product family: Spring-applied brake

Type: 458

Size: 06, 08, 10, 12, 14, 16

Design/type:
E - adjustable (brake torque can be reduced via torque adjustment ring)
N - not adjustable

Not coded: Connection voltage, hub bore diameter, options

Checking the delivery

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

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

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

Contents

1 General information

1.1 Using these Operating Instructions

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

1.2 Conventions in use

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

Spelling of numbers	Decimal separator	Point	The decimal point is always used. For example: 1234.56
Page reference	Underlined, red	———	Reference to another page with additional information For example: Using these Operating Instructions, Page 7
Symbols	Wildcard	□	Wildcard (placeholder) for options or selection details For example: BFK458-□□ = BFK458-10
	Notice		Important notice about ensuring smooth operations or other key information.

1.3 Safety instructions and notices

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

Structure of safety notices:

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

Danger level

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

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

1.4 Terminology used

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

1.5 Abbreviations used

Letter symbol	Unit	Designation
F_R	N	Rated frictional force
F	N	Spring force
I	A	Current
I_H	A	Holding current, at 20 °C and holding voltage
I_L	A	Release current, at 20 °C and release voltage
I_N	A	Rated current, at 20 °C and rated voltage
M_4	Nm	Torque that can be transmitted without slippage occurring (DIN VDE 0580)
M_A	Nm	Tightening torque of fastening screws
M_{dyn}	Nm	Average torque from initial speed to standstill
M_K	Nm	Rated torque of the brake, rated value at a relative speed of rotation of 100 rpm

Letter symbol	Unit	Designation
n_{max}	rpm	Maximum occurring speed of rotation during the slipping time t_3
P_H	W	Coil power during holding, after voltage change-over and 20 °C
P_L	W	Coil power during release, before voltage change-over and 20 °C
P_N	W	Rated coil power, at rated voltage and 20 °C
Q	J	Quantity of heat/energy
Q_E	J	Max. permissible friction energy for one-time switching, thermal parameter of the brake
Q_R	J	Braking energy, friction energy
Q_{Smax}	J	Maximally permissible friction energy for cyclic switching, depending on the operating frequency
R_N	Ohms	Rated coil resistance at 20 °C
R_z	µm	Averaged surface roughness
S_h	1/h	Operating frequency: the number of switching operations evenly distributed over the time unit
S_{hue}	1/h	Transition operating frequency, thermal parameter of the brake
S_{hmax}	1/h	Maximum permissible operating frequency, depending on the friction energy per switching operation
s_L	mm	Air gap: the lift of the armature plate while the brake is switched
s_{LN}	mm	Rated air gap
s_{Lmin}	mm	Minimum air gap
s_{Lmax}	mm	Maximum air gap
t_1	ms	Engagement time, sum of the delay time and braking torque: rise time $t_1 = t_{11} + t_{12}$
t_2	ms	Disengagement time, time from switching the stator until reaching 0.1 M_{dyn}
t_3	ms	Slipping time, operation time of the brake (according to t_{11}) until standstill
t_{11}	ms	Delay during engagement (time from switching off the supply voltage to the beginning of the torque rise)
t_{12}	ms	Rise time of the braking torque, time from the start of torque rise until reaching the braking torque
t_{ue}	s	Over-excitation period
U	V	Voltage
U_H	V DC	Holding voltage, after voltage change-over
U_{Hmin}	V DC	Minimum permissible holding voltage
U_L	V DC	Release voltage, before voltage change-over
U_N	V DC	Rated coil voltage; in the case of brakes requiring a voltage change-over, U_N equals U_L

2 Safety instructions

2.1 General safety instructions

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

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

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

2.2 Disposal

The Kendrion INTORQ components are made of various differing materials.

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

3 Product description

3.1 Proper and intended usage

3.1.1 Standard applications

Kendrion INTORQ components are intended for use in machinery and facilities. They may only be used for purposes as specified in the order and confirmed by Kendrion INTORQ. The Kendrion INTORQ components may only be operated under the conditions specified in these Operating Instructions. They may never be operated beyond their specified performance limits. The technical specifications (refer to Technical specifications, Page 16) must be followed to comply with the proper and intended usage. Any other usage is consider improper and prohibited.

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

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

Please note the following conditions:

- Proper and intended usage of the brake as described in Standard applications, Page 11
- Compliance with the installation specifications in these Operating Instructions
- The following points are important when mounting the brake with special safety requirements:
  - The material and the surface quality of the counter friction surface are listed in the table End shield as counter friction surface, Page 29.
  - To attach the brake to the motor end shield, use screws of strength class 8.8 which are capable of handling the tightening torque listed in the table Rated data: Screw set for brake mounted on motor / friction plate, Page 18.
  - The fastening screws should be tightened evenly using a standard torque wrench, with a tightening torque tolerance of +/- 10%.
  - The following values apply for the minimum screw-in depths:
    Steel: 1.0 x thread diameter
    Cast aluminum: 1.5 x thread diameter
  - When determining the possible screw-in depths of the fastening screws into the motor flange, the max. adjustment (according to the table Characteristics for air gap specifications, Page 18) and the projection of the screws when the brake is new must be taken into account.
  - The recommended dimensions of the screws and the screw-in depth (including the adjustment reserve for rotor wear) into the mounting holes in the motor flange can be found in the table Rated data: Screw set for brake mounted on motor / friction plate, Page 18.

- Version of the brake with:
  - A characteristic torque corresponding to the standard braking torque of that size or higher.
  - An expected characteristic torque that covers the safety-relevant functionality, even with a drop to 80%.
  - A noise-reduced rotor with toothed intermediate ring.
- Compliance with the technical specifications listed in the Technical specifications, Page 16 chapter.
  - Ambient temperature during operation: -20° to +40°C
- The customer is responsible for ensuring that there is a secure connection between the shaft and the hub.
- Follow the information in the chapter Installing the hub onto the shaft, Page 30 to ensure a safe shaft-to-hub connection.

Observe the following notices:

- The calculation for the safety application does not consider the wear of the friction lining or the load on the brake due to emergency stops. These points must be checked separately when configuring the brake.

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

3.2 Design

This chapter describes the variants, design and functionality of the INTORQ BFK458 spring-applied brake. The basic module E is adjustable (the braking torque can be reduced using the torque adjustment ring).

3.2.1 Basic module E

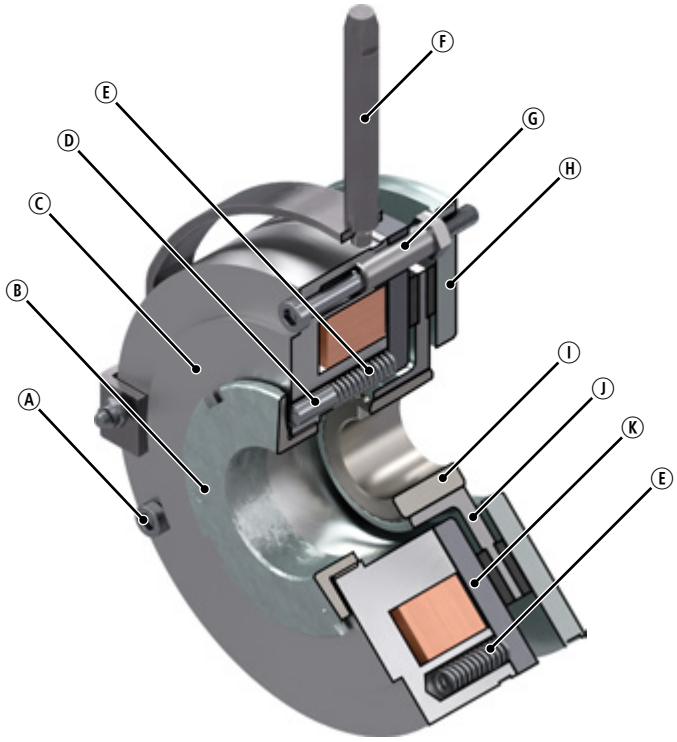


Fig. 1: **Design of a INTORQ BFK458 spring-applied brake Basic module E (complete stator) + rotor + hub + flange / friction plate**

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

3.2.2 Basic module N

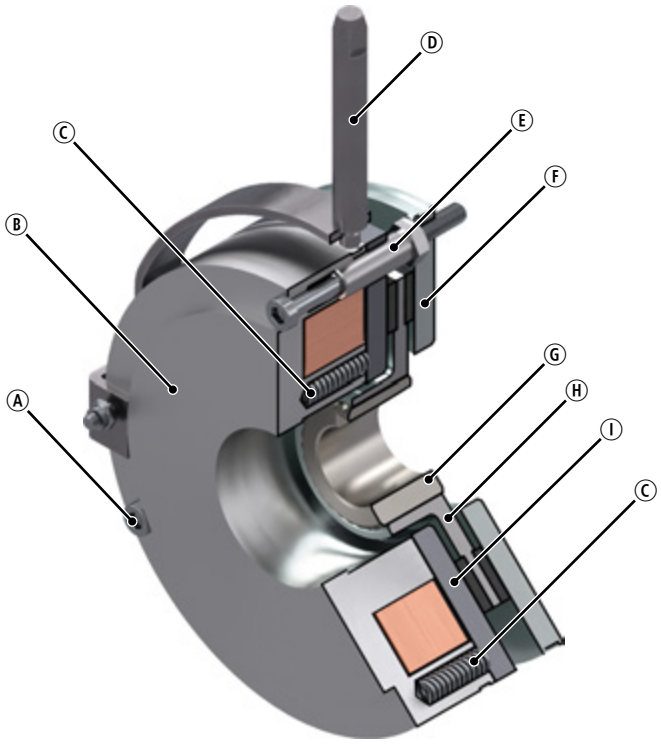


Fig. 2: **Design of a INTORQ BFK458 spring-applied brake Basic module N (complete stator) + rotor + hub + flange / friction plate**

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

3.3 Function

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

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

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

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

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

3.4 Braking and release

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

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

3.5 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. After the run-in process, the tolerance range of the brake torque is: -25% / +35%.
- If the brake is used as a pure holding brake without dynamic load, the run-in process can be carried out using 6 to 8 dynamic braking operations within the technical specifications of the brake.
- Since the material properties of the friction linings are subject to fluctuations and as a result of different environmental conditions, deviations from the specified braking torque are possible. This has to be taken into account by appropriate dimensioning of the tolerances. 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.
  This reactivation can take place, for example, using an emergency stop from maximum drive speed as part of regular maintenance. Refer to Maintenance intervals, Page 49.
- If the brake is used as an operating brake with periodic dynamic loads, the friction lining does not need to be reactivated regularly.

3.6 Brake torque reduction

- For the basic module E, the spring force and thus the brake torque can be reduced by unscrewing the central torque adjustment ring.
- For the basic module N, the spring force and thus the braking torque can be reduced by NORD Drive Systems by removing certain pressure springs, see Kendrion INTORQ spring removal plan T14.2047.

3.7 Optional configuration

3.7.1 Hand-release (optional)

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

4 Technical specifications

4.1 Possible applications of the Kendrion INTORQ spring-applied brake

- Degree of protection:
  - The brake is designed for operation under the environmental conditions that apply to IP54 protection. If a fan cover is mounted to protect the brake from water jets, protection class IP55 can be reached. Because of the many ways the brake can be used, it is necessary to check the functionality of all mechanical components under the corresponding operating conditions.
- Ambient temperature:
  - -20 °C to +40 °C (Standard)

4.2 Brake torques

NOTICE

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

Size	06	08	10	12	14	16
Rated torque MK [Nm] of the brake, rated value at a relative speed of rotation of 100 rpm Standard lining (ST)		5 N/E				
		6 N/E	11 N/E			55 N/E
	3 N/E	7 N/E	14 N/E	23 N/E		70 N/E
	3.5 E	8 N/E	16 N/E	27 N/E	40 N/E	80 N/E
	4 N/E	9 N/E	18 N/E	32 N/E	50 N/E	90 N/E
	5 N/E	10 N/E	20 N/E	40 N/E	60 N/E	100 N/E

Tab. 2: **Braking torques and possible braking torque reductions**
N design without braking torque adjustment
E design with braking torque adjustment

Reduced braking torque

Standard braking torque for operating brakes and holding brakes with emergency stop

For basic module E, the brake torque can be reduced using the torque adjustment ring in the stator, refer to chapter Brake torque reduction (for the optional adjustable braking torque), Page 47. The adjustment ring may only be unscrewed until the maximum protrusion (overhang) h_{Emax}, which must be agreed with the supplier.

NOTICE

When using the spring-applied brake as a safety brake: Observe the information concerning the shaft-hub connection in section Applications with special safety requirements ("Safety Brake"), Page 11.

When using a standard friction lining, the maximum speeds and friction work (Q_E) values specified in the catalog apply for each brake size.

The standard friction lining (ST) is suitable both for pure holding brake applications and for service brake applications with dynamic loads. Progressive wear should be expected under dynamic load.

Size / speed [rpm]	06	08	10	12	14	16
100	3000	7500	12000	24000	30000	36000
1000						
1200						
1500						
1800						
3000						
3600						

Tab. 3: **ST versions: Maximum permissible friction work, in joules**

4.3 Characteristics

Size	Rated brake torque at Δn=100 rpm	Braking torque at Δn_0 [rpm]					Max. speed Δn_{0max}
		1500	1800	3000	3600	maxi-mum	
	[%]	[%]	[%]	[%]	[%]	[%]	[rpm]
06	100	87	86	80	79	74	6000
08		85	83	78		73	5000
10		83	81	76			4000
12		82	80	75	73		3600
14		80	79	74	72	72	
16		78	77	72	70	70	

Tab. 4: **Characteristics for braking torques, depending on the speed and permissible limiting speeds**

Size	s_{LN} +0.1 / -0.05	s_{Lmax}	max. adjustment, permissible wear distance	Rotor thickness	
				min.[1]	Max.
	[mm]	[mm]	[mm]	[mm]	[mm]
06	0.2	0.5	1.5	4.5	6.0
08				5.5	7.0
10				7.5	9.0
12	0.3	0.75	2	8	10
14			2.5	7.5	
16			3.5	8	11.5

Tab. 5: **Characteristics 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 mounting onto the motor/friction plate	Possible screw-in depth [3]	Tightening torque	
				Screws ± 10%	Complete lever ± 10%
	Ø [mm]		[mm]	[Nm]	[Nm]
06	72	3 x M4x40 [1]	12	3.0 [1]	2.8
08	90	3 x M5x45 [1]	13	5.9 [1]	
10	112	3 x M6x50 [2]	18	8.1 [2]	4.8
12	132	3 x M6x65 [2]			
14	145	3 x M8x70 [1]		24.6 [1]	12
16	170	3 x M8x80 [1]	22		

Tab. 6: **Rated data: Screw set for brake mounted on motor / friction plate**

[1] Cylinder head screws according to DIN EN ISO 4762 - 8.8

[2] Cylinder head screws according to DIN 6912 - 8.8

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

NOTICE

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

Dimensions (values in mm)

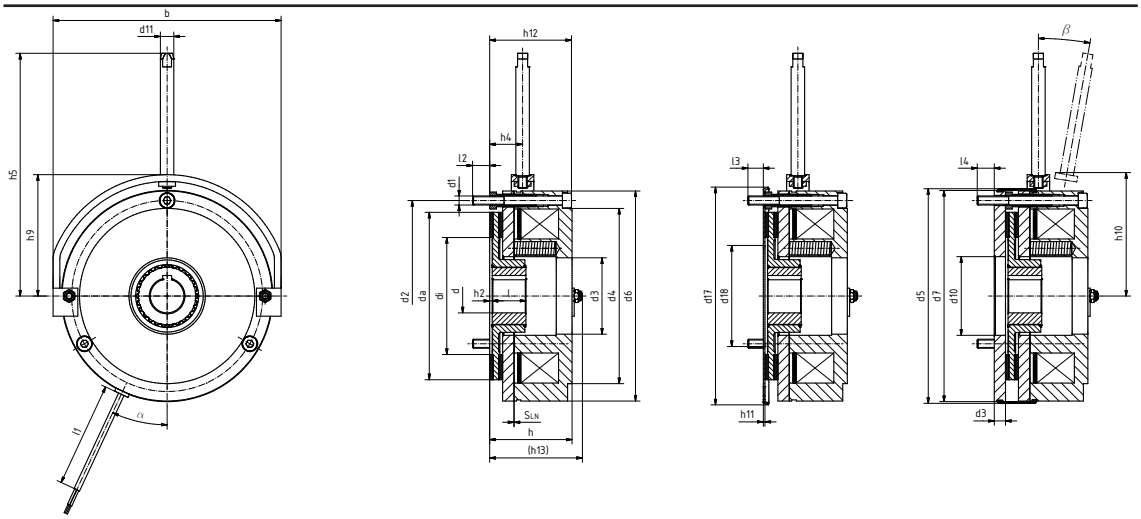


Fig. 3: **Basic module N, without adjusting ring; without counter friction surface**

Size	b	d^{J7} 1) spec.	d^{H7} 2) standard	d_1	d_2	d_3^{H8}	d_4
06	90	10	10/11/12/14/15	3xM4	72	25	64
08	109		11/12/14/15/20	3xM5	90	32	80
10	137			3xM6	112	42	100
12	157	14	20/25		132	50	121
14	174		20/25/30	3xM8	145	60	131
16	203	15	25/30/35		170	68	156

Size	d_5	d_6^{J7}	d_7	d_{10}	d_{11}	d_{17}	d_{18}	di	da
06	87	83	83	31	8	86	36	40	60
08	107	102	102	41		106	45	56	77
10	134	127	127	45	10	132	52	66	95
12	154	147	147	52		153	68	70	115
14	170	163	163	55	12	169	78	80	124
16	195	187	188	70		194	90	104	149

Tab. 7: **Technical data – dimensions**

1) Pre-drilled without groove

2) Standard keyway according to DIN 6885/1 P9, select shaft diameter depending on load type

Size	h	h_2	h_3	h_4	h_5	h_9	h_{10}	h_{11}
06	35.7	1	5	16.7	104	49	52.4	1.5
08	40.2		6		114	59	64	
10	49.7	2	8	25.7	147	73	75.5[1)]	
12	54.8			25.8	157	84	88.3	
14	66.3		10	29.3	174	94	99.7	
16	73.7	2.25			216	108	114.8	

Size	h_{13}	l	l_1	l_2	s_{LN}	α	β
06	40.4	18	400	6.8	0.2	25°	10°
08	45.2	20		9.3			
10	56.6			8.3			
12	58	25		-	0.3		
14	73.5	30		-			
16	82.5		600	-			

Tab. 8: **Technical data – dimensions**

[1)] Height of the yoke bend; yoke clip: 76.5 mm

Size	Mass of stator		Rotor mass	$J_{Alurotor}$
	Cpl.	Cpl. incl. hand-release		
	[kg]	[kg]	[kg]	[kgcm²]
06	0.9	1.0	0.06	0.15
08	1.4	1.5	0.08	0.61
10	3	3.2	0125	2
12	3.7	3.9	0.25	4.5
14	6.5	6.8	0297	6.3
16	9.4	10.0	0446	15

Tab. 9: **Characteristics masses**

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
		105	530.5	0194
		180	1620	0111
		205	2101	0098
		225	2531	0089
08	25	24	23	1.04
		105	424.4	0242
		180	1296	0138
		205	1681	0121
		225	2025	0111
10	30	24	19.2	1.25
	32	105	331.5	0.31
	32	180	1013	0177
	33	205	1273	0160
	32	225	1582	0142
12	40	24	14.4	1667
		105	265.2	0388
		180	810	0222
		205	1051	0195
		225	1868	0178
14	50	24	11.52	2083
	53	105	200.2	0515
	53	180	611.3	0294
	53	205	792.9	0259
	54	225	937.5	0.24
16	55	24	10.47	2292
	56	105	189.5	0544
	56	180	589.1	0306
	56	205	750.5	0273
	55	225	920.5	0244

Tab. 10: **Rated data for coil power**

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

4.4 Switching times

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

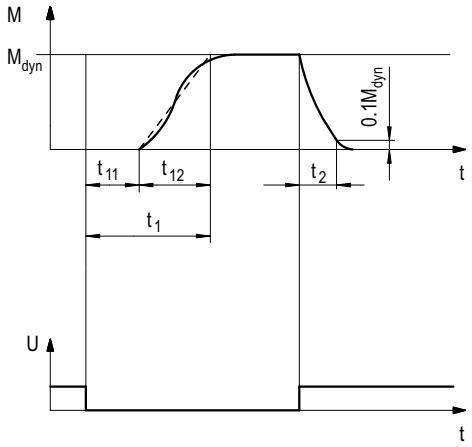


Fig. 4: **Operating/switching times of the spring-applied brakes**

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

Size	Rated torque	Q_E	S_{hue}	Operating times [1]				
				DC-side engagement		AC-side engagement		Disengaging
	M_K			$t_{11, DC}$	$t_{1, DC}$	$t_{11, AC}$	$t_{1, AC}$	t_2
	[Nm]	[J]	[1/h]	[ms]	[ms]	[ms]	[ms]	[ms]
06	5	3000	79	12	25	64	133	65
	4			17	30	95	169	51
	3			21	34	126	204	36
08	10	7500	50	12	28	99	231	84
	9			14	33	119	255	76
	8			16	38	139	278	68
	6			21	49	178	325	53
	5			23	54	198	349	45
10	20	12000	40	36	72	198	482	103
	18			43	81	255	531	95
	16			51	91	312	580	86
	14			58	100	369	629	78
	11			69	114	454	703	65

Size	Rated torque	Q_E	S_{hue}	Operating times [1]				
				DC-side engagement		AC-side engagement		Disengaging
	M_K			$t_{11,\,DC}$	$t_{1,\,DC}$	$t_{11,\,AC}$	$t_{1,\,AC}$	t_2
	[Nm]	[J]	[1/h]	[ms]	[ms]	[ms]	[ms]	[ms]
12	40	24000	30	[2]	[2]	[2]	[2]	[2]
	32			39 [3]	64 [3]	312 [3]	512 [3]	145 [3]
	27			[2]	[2]	[2]	[2]	[2]
14	60	30000	28	26 [3]	51 [3]	208 [3]	408 [3]	205 [3]
	50			[2]	[2]	[2]	[2]	[2]
	40			[2]	[2]	[2]	[2]	[2]
16	100	36000	27	[2]	[2]	[2]	[2]	[2]
	90			[2]	[2]	[2]	[2]	[2]
	80			40 [3]	70 [3]	320 [3]	560 [3]	258 [3]
	70			[2]	[2]	[2]	[2]	[2]
	55			[2]	[2]	[2]	[2]	[2]

Tab. 11: **Switching energy - operating frequency - operating times**

[1] These operating times are specified for usage of Kendrion INTORQ bridge/half-wave rectifiers and coils with a connection voltage of 205 V DC at s_{LN} and 0.7 I_N.
For rectifiers from the manufacturer Nord Drive Systems, the same operating times can be applied

[2] on request

[3] in review

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 must be configured with a suitable spark suppressor.

Engagement time for AC-side switching: The engagement time is significantly longer (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.

Notice

Spark suppressors are available for the rated voltages.

Disengagement time

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

4.5 Friction work / operating frequency

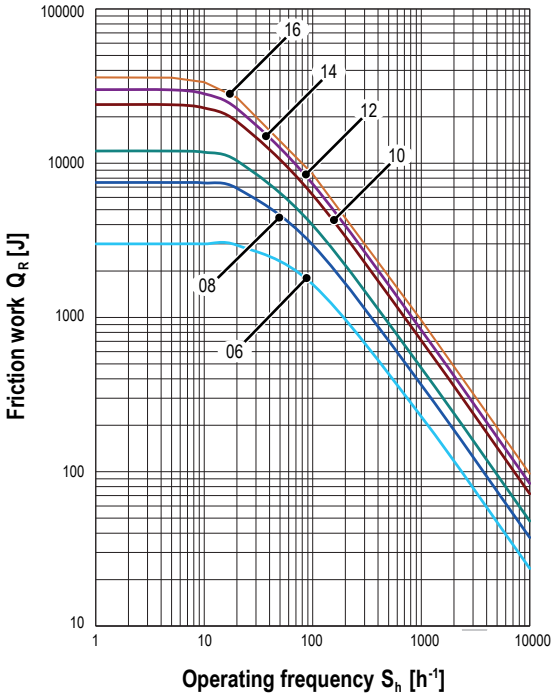


Fig. 5: **Friction work as a function of the operating frequency**

$$S_{hmax} = \frac{-S_{hue}}{\ln\left(1 - \frac{Q_R}{Q_E}\right)}$$

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

The permissible operating frequency S_{hmax} depends on the amount of friction work Q_R (refer to Figure Friction work as a function of the operating frequency, Page 24). At a pre-set operating frequency S_h, the max. permissible amount of friction work is Q_{Smax}.

Notice

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

4.6 Electromagnetic compatibility

Notice

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

NOTICE

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

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

4.7 Emissions

Heat

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

Noise

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

4.8 Hand-release

The hand-release mechanism is used to release the brake by hand and can be retrofitted (refer to Mounting the hand-release (retrofitting), Page 36).

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

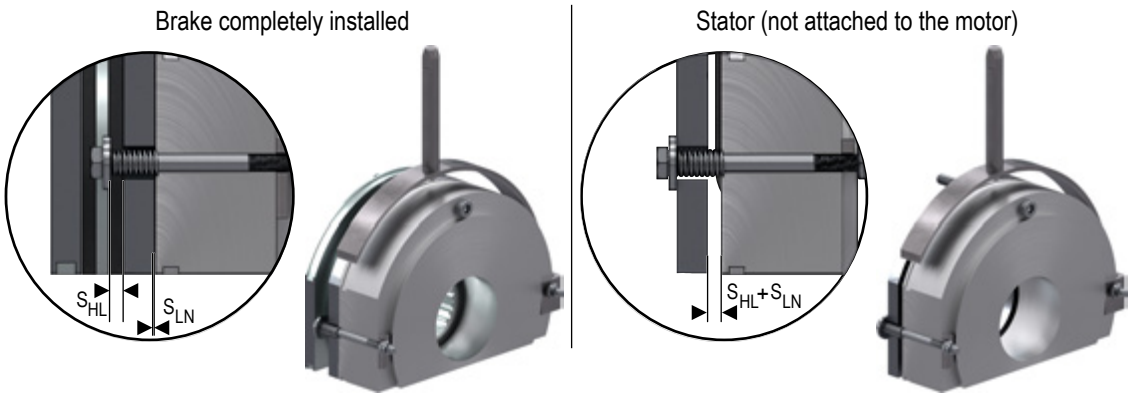


Fig. 6: **Positions of the adjustment dimensions that must be checked**

Size	$S_{LN}^{+0.1 / -0.05}$	$S_{HL}^{+0.1}$
	[mm]	[mm]
06	0.2	1.0
08		
10		
12	0.3	1.5
14		
16		

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

4.9 Labels on product

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

Fig. 7: **Packaging label**

Kendrion INTORQ	Manufacturer
33010238 / NORD: 19022017	ID number
BFK458-08N	Type (refer to Product key, Page 3)
	Bar code
SPRING-APPLIED BRAKE	Designation of the product family
205 V DC	Rated voltage
10 NM	Rated torque
1 pc.	Qty. per box
25 W	Rated power
07/03/2024	Packaging date
Anti-rust packaging: keep friction surface free of grease!	Addition
CE	CE mark
UK CA	UKCA mark

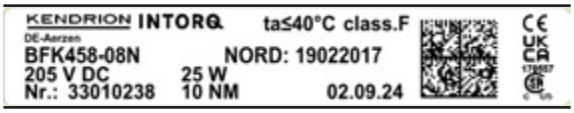


Fig. 8: **Name plate (example)**

Kendrion INTORQ	Manufacturer
ta=40°C	Permissible ambient temperature
Class. F	Insulation class F
BFK458-08N	Type (refer to Product key, Page 3)
205 V DC	Rated voltage
25 W	Rated power
No. 33010238 / NORD: 19022017	ID number
10 NM	Rated torque
07/03/2024	Date of manufacture
	Data matrix code
CE	CE mark
UKCA	UKCA mark
C US	CSA/CUS acceptance

Fig. 9: **UL marking (example)**

INTORQ 155-1 E318895	UL marking of the insulation system

5 Mechanical installation

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

Important notices and information

NOTICE

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

5.1 Design of end shield and shaft

- Comply with the specified minimum requirements regarding the end shield and the shaft to ensure a correct function of the brake.
- The diameter of the shaft shoulder must not be greater than the tooth root diameter of the hub.
- The form and position tolerances apply only to the materials mentioned. Consult with Kendrion INTORQ before using other materials; written confirmation is required for such usage.
- If a friction plate is used as a counter friction surface, the customer must ensure that it is fully supported by the motor end shield.
- Depending on the type of installation, additional clearing bore holes may be required.
- Threaded holes with minimum thread depth: refer to Rated data: Screw set for brake mounted on motor / friction plate, Page 18.
- Keep the end shield free from grease or oil.

Minimum requirements of the end shield

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

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

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

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

5.2 Tools

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

NOTICE

Tightening torques: refer to the table Rated data: Screw set for brake mounted on motor / friction plate, Page 18.

Multimeter	Caliper gauge	Feeler gauge
		

5.3 Preparing the installation

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

5.4 Installing the hub onto the shaft

Notice

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

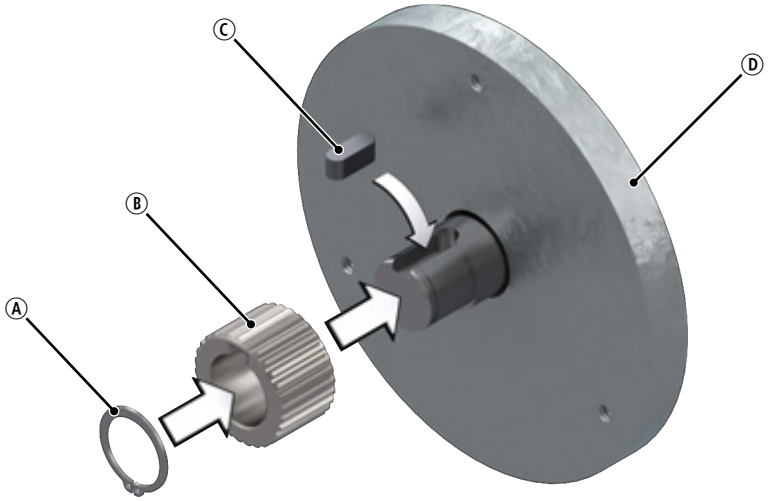


Fig. 10: **Installing the hub onto the shaft**

Ⓐ Circlip Ⓑ Hub Ⓒ Key
Ⓓ End shield

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

Note the following when mounting the hub on the brake:

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

NOTICE

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

NOTICE

When using the spring-applied brake as a safety brake: Observe the information concerning the shaft-hub connection in section Applications with special safety requirements ("Safety Brake"), Page 11.

5.5 Mounting the brake

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

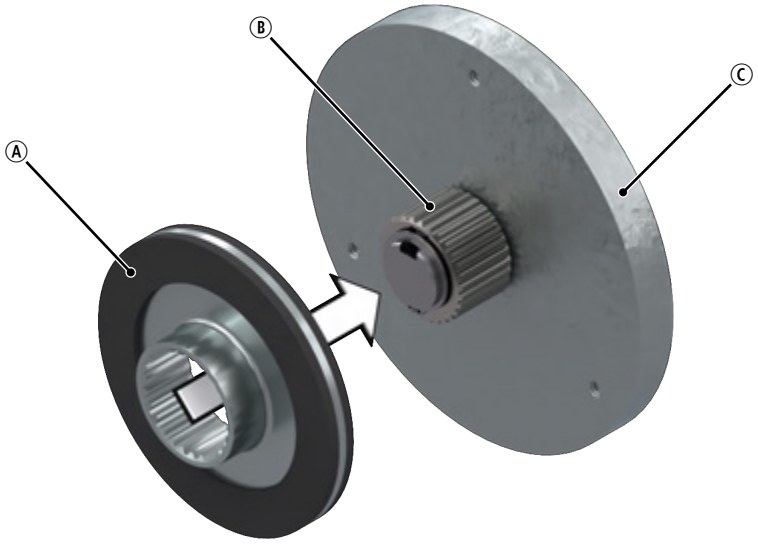


Fig. 11: **Assembly of the rotor**

Ⓐ Rotor Ⓑ Hub Ⓒ End shield

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

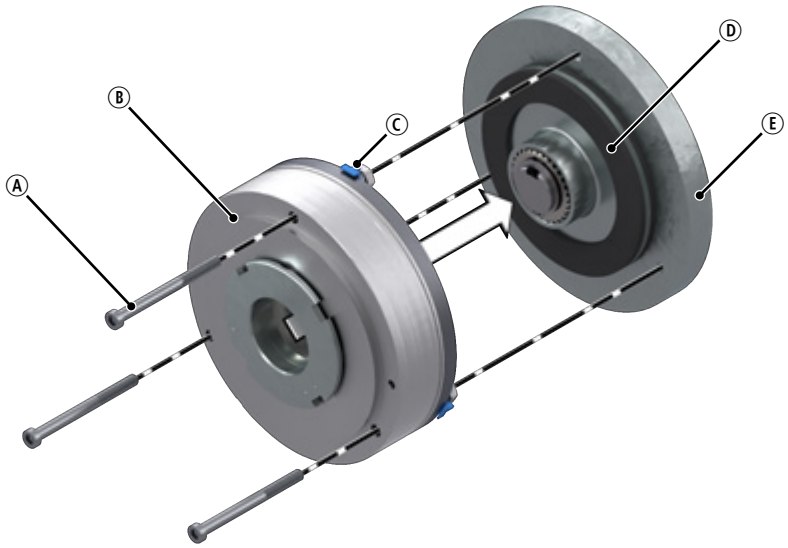


Fig. 12: **Mounting the complete stator**

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

3. Screw the complete stator to the end shield Use the supplied screw set and a torque wrench (for tightening torque, refer to the table Rated data: Screw set for brake mounted on motor / friction plate, Page 18).

4. Remove the terminal clips and dispose of properly.

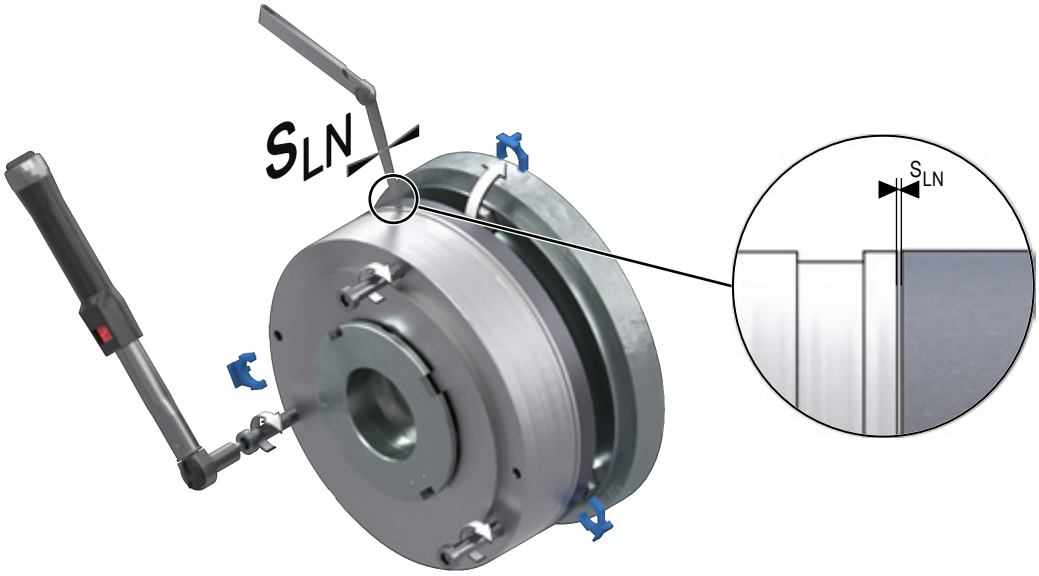


Fig. 13: **Tightening the screws with a torque wrench**

Notice

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

5. Check the air gap near the screws using a feeler gauge. These values must match the specifications for s_{LN} found in the table Characteristics for air gap specifications, Page 18.

Fig. 14: **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 33).

NOTICE

Tightening torques: refer to the table Rated data: Screw set for brake mounted on motor / friction plate, Page 18.

5.6 Installing the friction plate (optional)

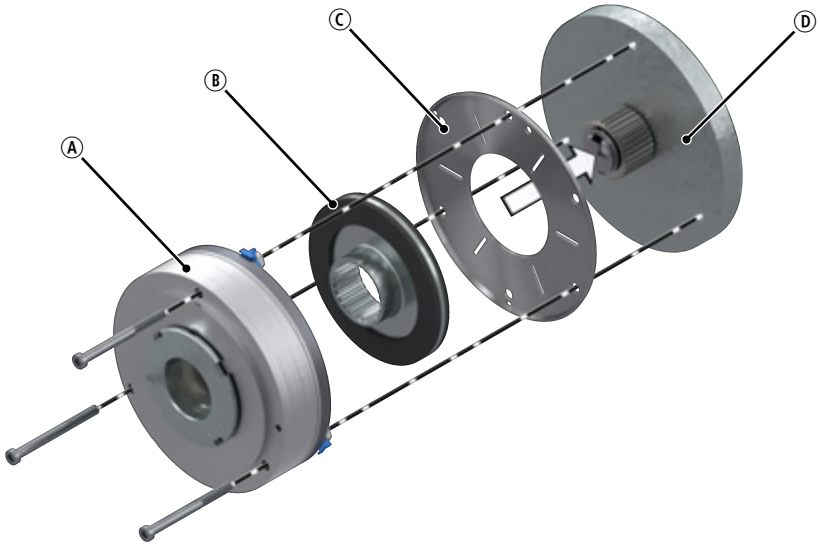


Fig. 15: **Mounting the friction plate**

Ⓐ 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.

5.7 Cover ring assembly

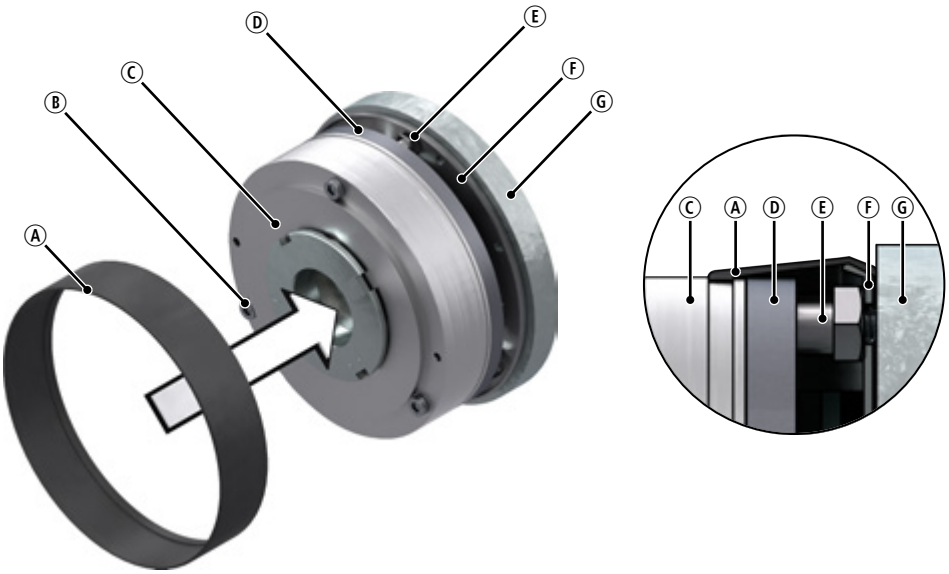


Fig. 16: **Cover ring assembly**

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

NOTICE

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

1. Pull the cables through the cover ring.
2. Slide the cover ring over the stator.
3. Press the respective lips of the cover ring into the groove of the stator. Then, pull the lip over the flared edge of the flange or the friction plate.

5.8 Mounting the hand-release (retrofitting)

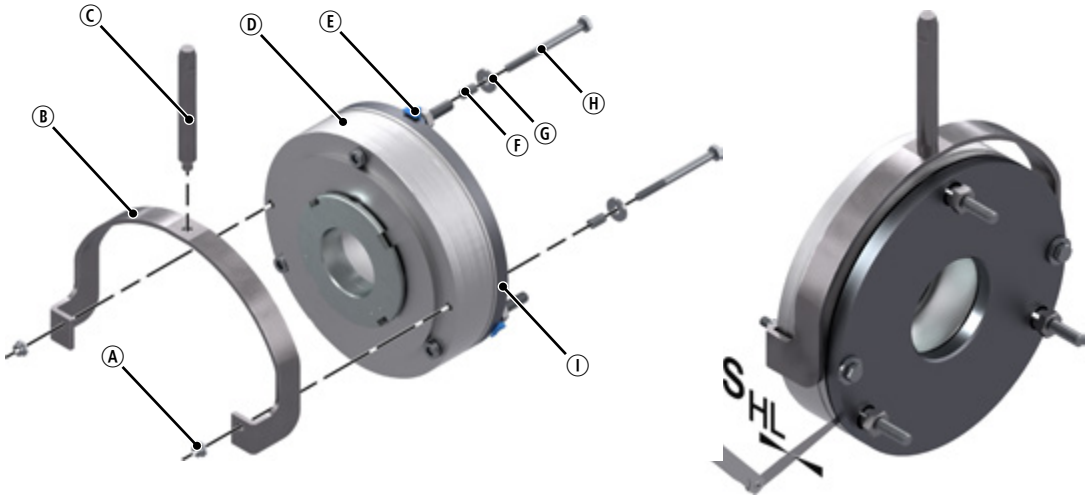


Fig. 17: **Assembly of the hand-release BFK458**

Ⓐ Nut	Ⓑ Yoke	Ⓒ Lever
Ⓓ Stator	Ⓔ Terminal clip	Ⓕ Pressure spring
Ⓖ Washer	Ⓗ Hex head screw	Ⓘ Armature plate

1. Insert the pressure springs in the bores of the armature plate.
2. Push the hex head screws through the washers, the pressure springs in the armature plate and through the bore hole in the stator.
3. Screw the hex head screws with the nuts onto the yoke.
4. Tighten the hex head screws to fasten the armature plate against the stator.
5. 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!

6. 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 26 for the values for the dimension $s_{LN} + s_{HL}$.

6 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.

6.1 Electrical connection

Switching suggestions

NOTICE

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

6.2 AC switching at the motor – extremely delayed engagement

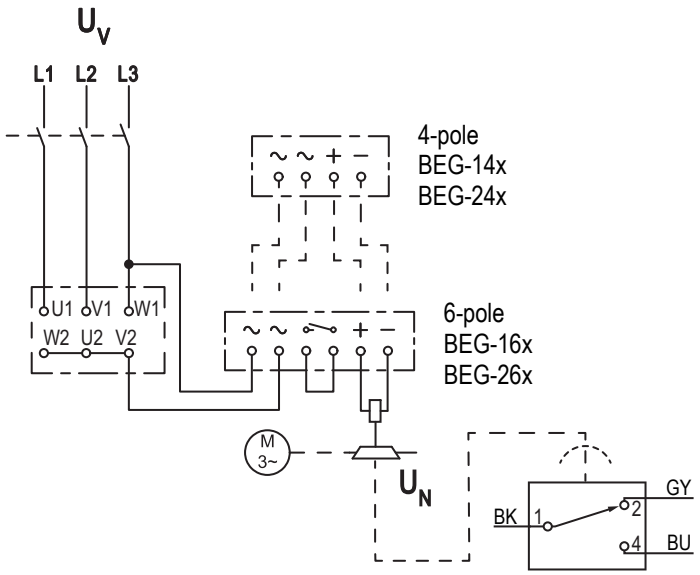


Fig. 18: **Supply: Phase-neutral**

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]

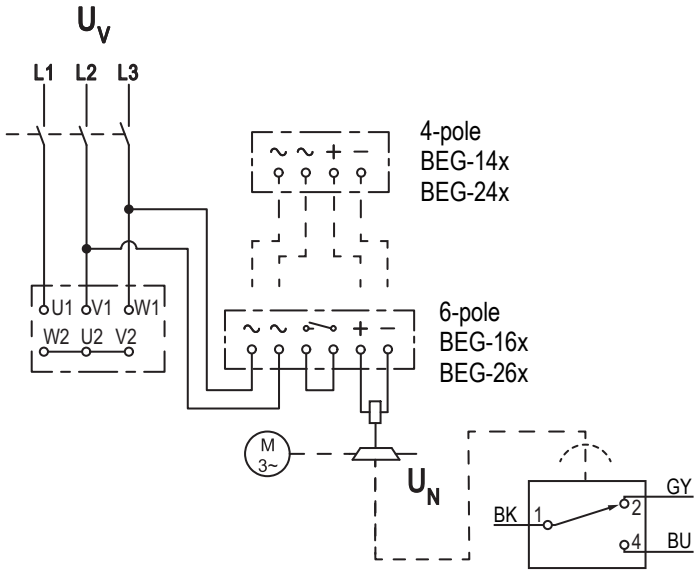


Fig. 19: **Supply: Phase-phase**

Bridge rectifier [1)]

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

Half-wave rectifier

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

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

6.3 DC switching at the motor – fast engagement

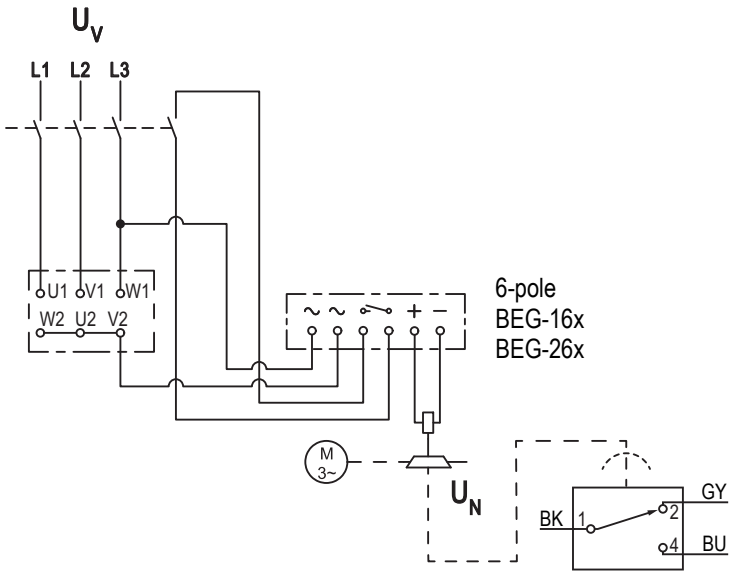


Fig. 20: **Supply: Phase-neutral**

Bridge rectifiers

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

Half-wave rectifiers

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

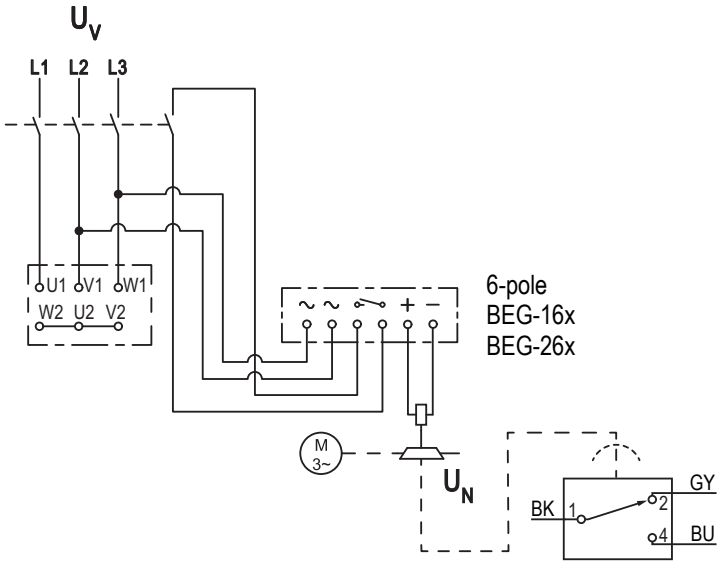


Fig. 21: **Supply: Phase-phase**

Bridge rectifier [1)]

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

Half-wave rectifiers

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

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

6.4 AC switching at mains – delayed engagement

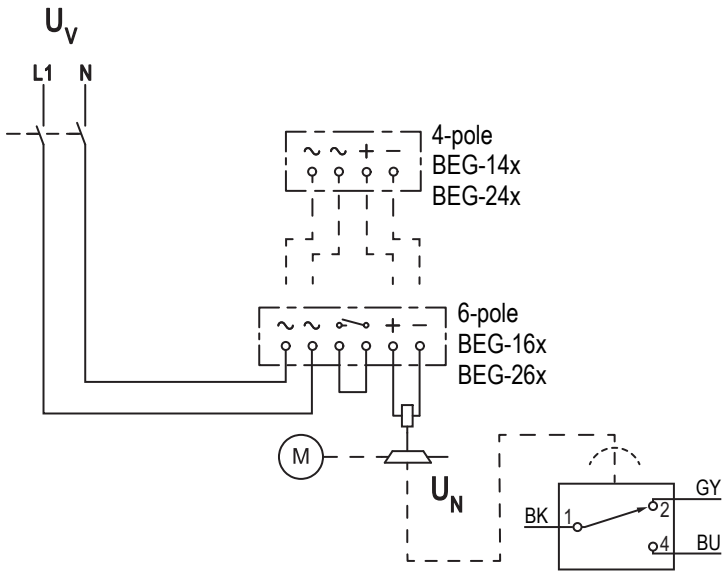


Fig. 22: **Supply: Phase-N**

Bridge rectifiers

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

Half-wave rectifiers

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

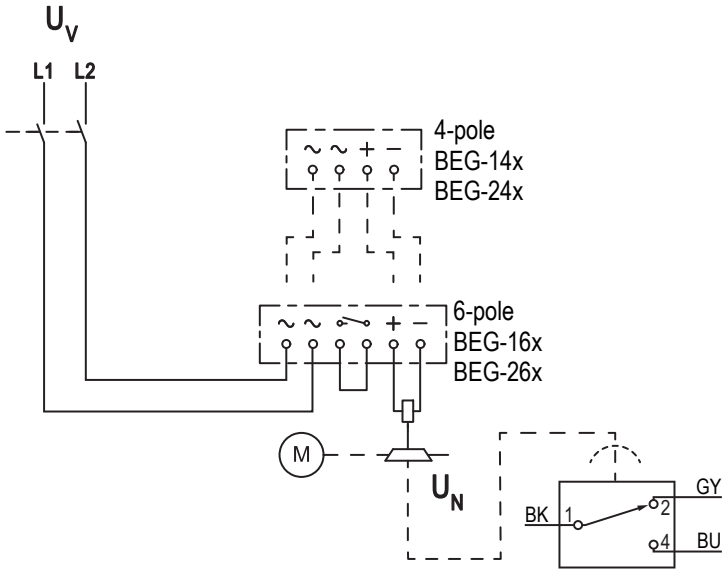


Fig. 23: **Supply: Phase-phase**

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

6.5 DC switching at mains – fast engagement

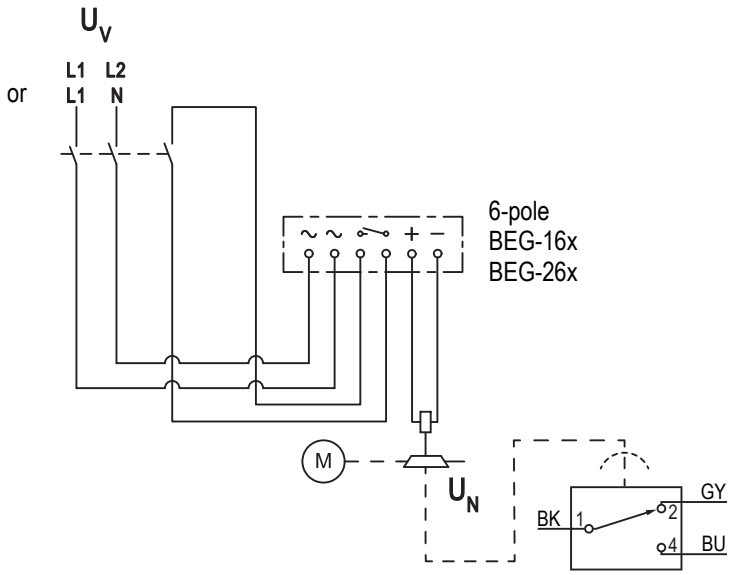


Fig. 24: **Supply: Phase-phase or phase-N via 6-pole rectifier**

Bridge rectifier [1)]

BEG-16x: U_N [V DC] = 0.9 • U_V [V AC]

Half-wave rectifiers

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

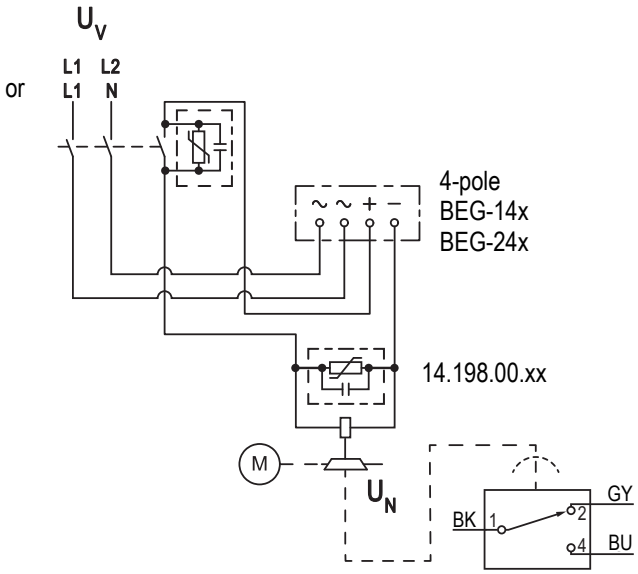


Fig. 25: **Supply: Phase-phase or phase-N via 4-pole rectifier**

Bridge rectifier [1)]

BEG-14x: U_N [V DC] = 0.9 • U_V [V AC]

Half-wave rectifiers

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

6.6 Minimum bending radius for the brake connection cable

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

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

7 Commissioning and operation

7.1 Possible applications of the Kendrion INTORQ spring-applied brake

NOTICE

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

Important notes

⚠ DANGER

Danger: rotating parts!

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

⚠ DANGER

There is a risk of injury by electrical shock!

The live connections must not be touched.

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

Notice

Functionality for different operating conditions

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

Notice

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

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

7.2 Function checks before initial commissioning

⚠ DANGER

Danger: rotating parts!

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

⚠ DANGER

There is a risk of injury by electrical shock!

The live connections must not be touched.

7.2.1 Function check of the brake

If a fault or malfunction arises during the function check, you can find important information for troubleshooting in the chapter Troubleshooting and fault elimination, Page 54. If the fault cannot be fixed or eliminated, please contact the customer service department.

7.2.2 Release / voltage control

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

⚠ 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. Adjust the air gap to s_{LN}.
9. If necessary, deactivate the mechanical shutdown of the system.

7.2.3 Testing the hand-release functionality

NOTICE

This operational test must also be carried out!

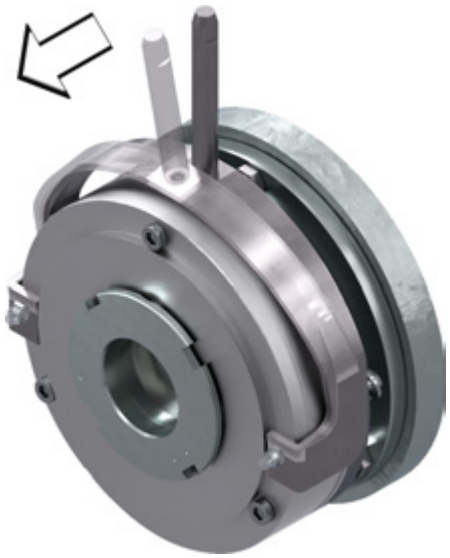


Fig. 26: **Turning direction of the lever**

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

Tab. 15: **Actuating forces**

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 is 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 to be 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 54). If the fault cannot be fixed or eliminated, please contact the customer service department.

7.3 Commissioning

⚠ DANGER

Danger: rotating parts!

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

⚠ DANGER

There is a risk of injury by electrical shock!

The live connections must not be touched.

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

7.4 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.

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

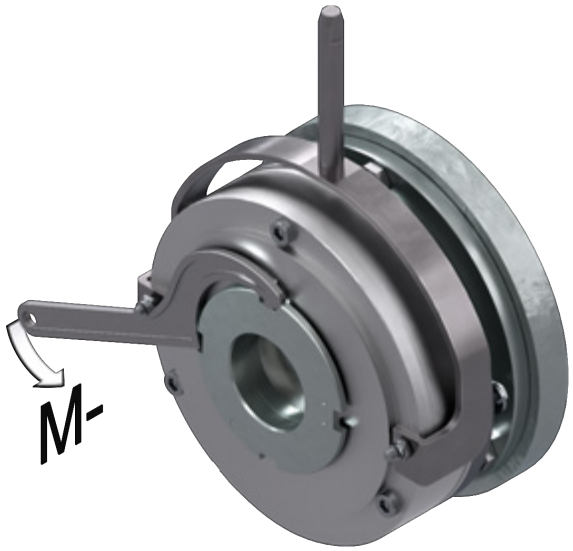


Fig. 27: **Reducing the braking torque**

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!
   - Observe the max. permissible projection ("h_{Emax}") of the torque adjustment ring over the stator (the values must be agreed with Kendrion INTORQ).

⚠ 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 Maintenance and repair

8.1 Wear of spring-applied brakes

⚠ WARNING

Braking torque reduction

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

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

Component	Cause	Effect	Influencing factors
Rotor	Service braking	Wear of the friction lining	Friction work
	Emergency stops		
	Overlapping wear during start and stop of drive		
	Active braking via the drive motor with support of brake (quick stop)		
	Start-up wear in case of motor mounting position with vertical shaft, even when the brake is not applied		Number of start/stop cycles
Armature plate and counter friction surface	Rubbing and friction of the brake lining	Run-in of armature plate and counter friction surface	Friction work
Gear teeth of brake rotor	Relative movements and shocks between brake rotor and brake shaft	Wear of gear teeth (primarily on the rotor side)	Number of start/stop cycles
Armature plate support	Load reversals and jerks in the backlash between armature plate, adjustment tubes and guide/cylinder pins	Breaking of armature plate, sleeve bolts and bolts or cylinder pins	Number of start/stop cycles, braking torque
Springs	Axial load cycle and shear stress of springs through radial backlash on reversal of armature plate	Reduced spring force or fatigue failure	Number of switching operations of brake

Tab. 16: **Causes for wear**

8.2 Inspections

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

Primarily, the required maintenance intervals for industrial brakes result from their load during operation. When calculating the maintenance interval, all causes for wear must be taken into account. Refer to the table Causes for wear, Page 48 in chapter Wear of spring-applied brakes, Page 48. For brakes with low loads (such as holding brakes with emergency stop function), we recommend a regular inspection at a fixed time interval. To reduce costs, the inspection can be carried out along with other regular maintenance work in the facility.

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

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

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

8.2.1 Maintenance intervals

⚠ WARNING

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

Versions	Service brakes	Holding brakes with emergency stop
BFK458-□□ E / N	▮ 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

8.3 Maintenance

Notice

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

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

8.3.1 Brake testing

Extended inspection/ maintenance after removal of brake	▮ Adjusting the air gap	refer to Adjusting the air gap, Page 51
	▮ Checking the rotor thickness	refer to Checking the rotor thickness, Page 52
	▮ Check the play of the rotor gear teeth (replace worn-out rotors)	refer to Replacing the rotor, Page 52
	▮ Check for breaking out of the torque support at the guide parts and the armature plate	
	▮ Check the springs for damage	
	▮ Check the armature plate and flange or counter friction surface	
	– Thermal damage (dark blue tarnish)	
	– Flatness depending on the size	see table End shield as counter friction surface, Page 29
	– Max. run-in depth = rated air gap for the size	refer to the Characteristics for air gap specifications, Page 18 table

8.3.2 Checking the air gap

⚠ DANGER

Danger: rotating parts!

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

1. Measure the air gap s_L between the armature plate and the stator near the fastening screws using a feeler gauge (refer to table Characteristics for air gap specifications, Page 18 for the values).
2. Compare the measured air gap with the value for the max. permissible air gap s_{Lmax} (refer to the Characteristics for air gap specifications, Page 18 table for the values).
3. Adjust the air gap to s_{LN} (refer to Adjusting the air gap, Page 51).

8.3.3 Release / voltage

⚠ DANGER

Danger: rotating parts!

The running rotor must not be touched.

⚠ DANGER

There is a risk of injury by electrical shock!

The live connections must not be touched.

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

8.3.4 Adjusting the air gap

⚠ DANGER

Danger: rotating parts!

The brake must be free of residual torque.

NOTICE

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

1. Loosen the screws (refer to the figure Adjusting the air gap, Page 33).
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 set for brake mounted on motor / friction plate, Page 18 for the torque values).
4. Check the air gap near the screws using a feeler gauge. These values must match the specifications for s_{LN} (see table Characteristics for air gap specifications, Page 18).

8.3.5 Checking the rotor thickness

1. Pull the rotor off the hub.
2. Check for possible damage (e.g. chipping in the friction lining or worn gear teeth).
3. Measure the rotor thickness using a caliper gauge at three different points on the rotor's circumference.
4. Compare the measured rotor thickness with the minimum permissible rotor thickness (refer to the values in the table Characteristics for air gap specifications, Page 18). If the measured rotor thickness is insufficient, the rotor must be replaced completely (refer to Replacing the rotor, Page 52 for the description).

8.3.6 Replacing the rotor

⚠ DANGER

Danger: rotating parts!

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

1. Remove the connection cables.
2. Loosen the screws evenly and then remove them.
3. Pay attention to the connection cable during this step! Remove the complete stator from the end shield.
4. Pull the rotor off the hub.
5. Check the hub's gear teeth.
6. Replace the hub if wear is visible.
7. Check the end shield's friction surface. Replace the friction surface on the end shield when there is clearly visible scoring at the running surface. In case of strong scoring on the end shield, rework the friction surface.
8. Measure the rotor thickness of the new rotor and the head thickness of the sleeve bolts (use a caliper gauge).
9. Calculate the distance between the stator and the armature plate as follows:
   – **Distance = rotor thickness + s_{LN} - head height**
   (for values of s_{LN} , refer to the table Characteristics for air gap specifications, Page 18).
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 32).
12. Re-connect the connection cables.
13. If necessary, deactivate the mechanical shutdown of the system.

8.4 Spare parts list

INTORQ spring-applied brake BFK458-06 to 16

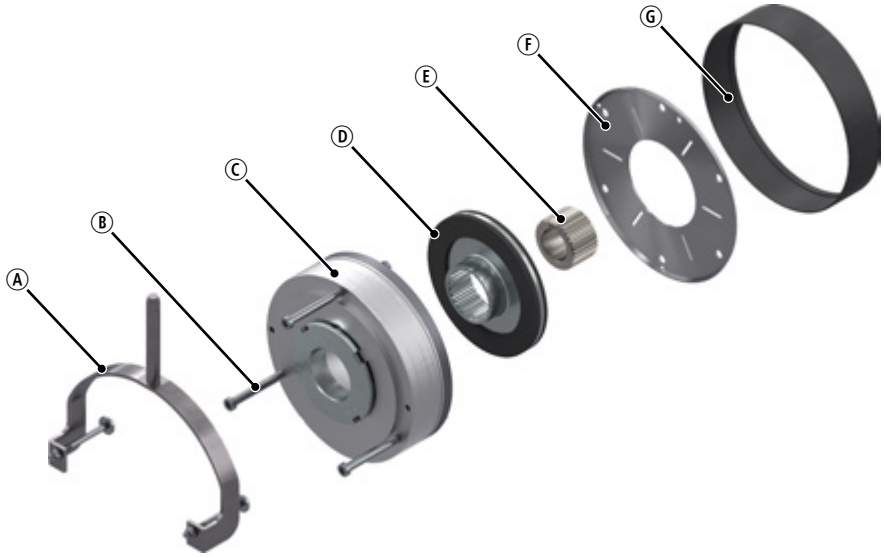


Fig. 28: **INTORQ spring-applied brake BFK458-06 to 16**

	Designation	Variant
Ⓐ	Hand-release with standard lever	Mounting kit
Ⓑ	Screw set DIN EN ISO 4762 - 8.8 oder DIN 6912 - 8.8 in various designs and lengths	for mounting to the motor / friction plate
Ⓒ	Complete stator, module E Complete stator, module N	Voltage / braking torque ▮ Module E: Optionally with rear threads
Ⓓ	Complete rotor	Aluminum rotor
Ⓔ	Hub	Bore diameter [mm] keyway according to DIN 6885/1
Ⓕ	Friction plate	
Ⓖ	Cover ring	

9 Troubleshooting and fault elimination

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

Fault	Cause	Remedy
Brake cannot be released, air gap is not zero	Coil interruption	▮ Measure coil resistance using a multimeter: – Compare the measured resistance with the nominal resistance. Refer to Rated data for coil power, Page 21 for the values. – If resistance is too high, replace the complete spring-applied brake.
	Coil has contact to earth or between windings	▮ Measure coil resistance using a multimeter: – Compare the measured resistance with the nominal resistance. Refer to Rated data for coil power, Page 21 for the values. If resistance is too low, replace the complete stator. ▮ Check the coil for short to ground using a multimeter: – If there is a short to ground, replace the complete spring-applied brake. ▮ Check the brake voltage (refer to section on defective rectifier, voltage too low).
	Wiring defective or wrong	Check the wiring and correct. ▮ Check the cable for continuity using a multimeter. – Replace a defective cable.
	Rectifier defective or incorrect	▮ Measure rectifier DC voltage using a multimeter. ▮ If DC voltage is zero: ▮ Check AC rectifier voltage. ▮ If AC voltage is zero: – switch on power supply, – check fuse, – check wiring. ▮ If AC voltage is okay: – check rectifier, – replace defective rectifier. ▮ Check coil for inter-turn fault or short circuit to ground. ▮ If the rectifier defect occurs again, replace the entire spring-applied brake, even if you cannot find any fault between turns or short circuit to ground. The error may only occur on warming up.

Fault	Cause	Remedy
Brake cannot be released, air gap is not zero	Air gap "s_L" is too large	Adjust the air gap (Adjusting the air gap, Page 51).
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 Mounting the hand-release (retrofitting), Page 36).
	Air gap "s_L" too small	Check the air gap "s_L" and adjust if necessary (Adjusting the air gap, Page 51).
Rotor is too thin	Rotor has not been replaced in time	Replace the rotor (Replacing the rotor, Page 52).
Voltage too high	Brake voltage does not match the rectifier	Adjust rectifier and brake voltage to each other.
Voltage too low	Brake voltage does not match the rectifier	Adjust rectifier and brake voltage to each other.
	Defective rectifier diode	Replace the defective rectifier with a suitable undamaged one.
AC voltage is not mains voltage	Fuse is missing or defective	Select a connection with a proper fuse.

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