INTORQ

setting the standard

BFK458 spring-applied brake

The versatile modular system

1.5 – 600 Nm

www.intorq.de

We set the standards

The INTORQ brand stands for reliable brake solutions of the highest standard. Whether in cranes, wind turbines or lift systems – INTORQ products are used in the most diverse of applications. Rely on us to create the right solution for your drive – individually and reliably.

With its broad scope of different versions, the modular range of INTORQ products is used in many motors and geared motors and has set standards worldwide. With the establishment of facilities in Shanghai and Atlanta, we have also consistently expanded our international presence. So wherever you are in the world, our network of sales and service staff is always close at hand to support you.

INTORQ at a glance

- Products: electromagnetic brakes and clutches
- Sales volume € 45 million per year
- 800,000 units per year
- 8,000 m^2 production area
- Development and production in Aerzen
- Companies in Shanghai and Atlanta
- 200 employees
- 63 sales partners in 49 countries
- Certified to DIN ISO 9001 and DIN ISO 14001

INTORQ

BFK458 – The modular system

This modular system forms the basis for a product range that offers versions tailored for almost any task. The BFK458 spring-applied brake, as a standard product, can be used anywhere, but its modular structure also meets the requirements of specific industries. Its strength lies in its versatility.

Electromagnetically released spring-applied brakes are used wherever masses in motion have to be decelerated as quickly as possible or where masses must be held in a defined position. The braking force is applied by tappet springs. Thus the braking torque generated by friction locking remains available in the deenergised status – even in the event of mains failure. The brake is released electromagnetically.

The main components of the modular system are the two basic modules E (adjustable braking torque) and N (non-adjustable braking torque).

The greatest degree of flexibility is achieved for a broad range of applications by combining the basic modules with specific modules. This catalogue is designed to assist you in selecting and ordering your desired spring-applied brake quickly and easily.

Fields of application

- Brake motors
- Conveyors
- Cranes
- Storage technology
- Industrial trucks
- Wood working machines
- Stage machinery
- Vehicles for the disabled
- Automation technology
- Controlled drives
- Gate drives
- Escalators

Wind turbines

Cranes

Industrial trucks

Stage machinery

INTORQ BFK458-□□□ product key

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

Stator design
E – Adjustable (braking torque can be reduced using torque adjustment ring)
N – Non-adjustable
L – Non-adjustable, LongLife design

Not coded:
Supply voltage, hub bore, options

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List of abbreviations

P_N	[W]	Rated coil power at rated voltage and 20 °C
U_N	[V DC]	Rated coil voltage
M_K	[Nm]	Rated torque of the brake at a relative speed of 100 r/min
M_L	[Nm]	Load torque, torque that the static load produces at the motor shaft
Δn_0	[r/min]	Initial relative speed of the brake
J_L	[kgm^2]	moment of inertia of the load, referred to referred to the output shaft (load shaft)
Q	[J]	Heat/energy
Q_E	[J]	Maximum permissible friction work per switching cycle, thermal rating of the brake
Q_{smax}	[J]	maximum permissible friction work during cyclic switching, depending on the operating frequency
S_h	[1/h]	Operating frequency, the number of repeated operations per unit time
S_{hmax}	[1/h]	Maximum permissible operating frequency, depending on the friction work per operation
s_{LN}	[mm]	Rated air gap
s_{HL}	[mm]	Hand-release air gap, setting dimension of hand-release
t_1	[s]	Engagement time, the total of the reaction delay and torque rise time $t_1 = t_{11} + t_{12}$
t_2	[s]	Disengagement time, time from switching the stator until the torque has reduced to 0.1 M_K
t_3	[s]	Slipping time to standstill (after t_{11})
t_{11}	[s]	Delay time when connecting, time from disconnecting the voltage until the torque begins to rise
t_{12}	[s]	Rise time of braking torque, time from beginning of rise of torque until braking torque is reached

Product information

INTORQ 155-1
C US E318895

A powerful and complete range
- 9 sizes
- Standard voltages [V DC] 24, 96, 103, 170, 180, 190, 205
- Graduated torque range from 1.5 - 600 Nm
- Short delivery times for the complete range thanks to optimised logistics
- Enclosure according to IP00 ... IP55, depending on the special operating conditions, see technical data sheet
- **ATEX:** In accordance with Group II, Category 3G/D, the product is suitable for use in potentially explosive atmosphere of zone 2 (gases and vapours) and zone 22 (dust) for steady-state operation (holding or parking brake) and temperature class T4.

Versatile
- Modular structure for virtually all applications

Torque transmission
- Designed for dry running

Quick and easy mounting
- Preset air gap
- Special machining of the friction surfaces ensures that the rated torques are achieved after very few switching operations
- No locating bearing is required on the brake

Durable
- The insulation system to temperature class F (155°C) ensures that the winding has a long service life
- The brakes are designed for 100% duty time (current applied to the brake)

Low maintenance
- Long rotor/hub connection with low rate of wear and a tried-and-tested involute gear
- Asbestos-free and solvent-free friction lining with low rate of wear

Reliable
- The certified ISO 9001 and ISO 14001 quality assurance system provides the basis for consistently high-quality products
- Production and testing to VDE 0580

Options
- Hand release for all sizes, both directions can be used for release and mounting (exception: tacho brake)
- Noise-reduced designs
- Various types of corrosion protection and enclosures
- Microswitches used to monitor air gap and wear (size 12 and above)
- Monitoring of Hand release function
- Non-standard voltages and bores on request
- Pulse width modulation (PWM), sizes 06 – 18
  Partial discharge free brake has been developed for operation with the pulse width modulated DC bus voltage of a frequency inverter
  Rated coil voltage U_N=103V DC

LongLife design BFK458-L
- Armature plate with low backlash and reinforced torque support
- Tappet springs with guide pins for protection against shearing forces
- Aluminium rotor with toothed intermediate ring: friction lining and tooth system with low rates of wear

up to -40 °C

CCV (Cold Climate Version), temperature-resistant up to -40 °C
- CCV design configurable for all sizes in the modular system
  - Use of chrome-plated friction surfaces (armature plate and flange)
  - Use of temperature-resistant fixing screws is essential

- The following components are also approved for use up to -40 °C
  - Rotor with sleeve (noise-reduced)
  - Hand release
  - Terminal box
  - Microswitch
  - Caps E and N
  - Shaft sealing rings (available on request)

Functional principle

Basic module E

Basic module N

INTORQ BFK458 spring-applied brakes are single-disk brakes with two friction surfaces. When deenergised, several springs are used to generate the braking torque through friction locking. The brake is released electromagnetically. During braking, the springs use the armature plate to press the rotor (which can be shifted axially on the hub) against the counter friction face. When the brakes are applied, an air gap s_L is present between the armature plate and the stator. The stator's coil is energised with DC voltage in order to release the brake.

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. Basic module E supports the use of the torque adjustment ring to reduce the braking torque.

BFK458, redundant and noise-reduced

BFK458, with terminal box

BFK458-L, LongLife for high switching cycles

Technical data

Rated torques

The basic modules E and N are available in the graduated torques listed below. A pole shim (brass film) must be placed between the stator and the armature plate if you want to achieve short engagement times at low torques. INTORQ brakes are dimensioned so that the specified rated torques can usually be achieved reliably after a short running-in period. 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 being used on friction surfaces provided by the customer, the rated torque must be checked. If the brake is to be used solely as a holding brake without dynamic load, the friction lining must be reactivated at regular intervals.

Size	**06**	**08**	**10**	**12**	**14**	**16**	**18**	**20**	**25**
								80 E	
	1.5 E	3.5 N/E/L			25 N/E	35 N/E	65 N/E	115 N/E	175 N/E
	2 N/E/L	4 E	7 N/E/L	14 N/E/L	35 N	45 N/E	80 N/E	145 N/E	220 N
	2.5 N/E/L	5 N/E/L	9 N/E/L	18 N/E/L	40 N/E	55 N/E	100 N/E	170 N/E	265 N/E
Rated torque M_k [Nm] **of the brake, rated value at a relative speed of 100 r/min**	3 N/E/L	6 N/E/L	11 N/E/L	23 N/E/L	45 N/E	60 N/E	115 N/E	200 N/E	300 N/E
	3.5 N/E/L	7 N/E/L	14 N/E/L	27 N/E/L	55 N/E	70 N/E	130 N/E	230 N/E	350 N/E
	4 N/E/L	**8 N/E**/L	**16 N/E**/L	**32 N/E**/L	**60 N/E**	**80 N/E**	**150 N/E**	**260 N/E**	**400 N/E**
	4.5 N/E	9 N/E	18 N/E	36 N/E	65 N/E	90 N/E	165 N/E	290 N/E	445 N/E
	5 E	10 E	20 E	40 E	75 N/E	100 N/E	185 N/E	315 N/E	490 N/E
	5.5 E	11 E	23 N/E	46 N/E	80 N/E	105 N/E	200 N/E	345 N/E	530 N/E
	6 N/E	12 N/E				125 N/E	235 N/E	400 N/E	600 N/E

- N ... Braking torque for the N design (without torque adjustment ring)
- E ... Braking torque for the E design (with torque adjustment ring)
- L ... LongLife design

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})

Basic module L, LongLife design

The LongLife design can be configured for sizes 06 to 12 in combination with the specified rated torques in the modular system. The stator corresponds to design N; bores and built-on accessories are not possible at the rear side. It is not possible to configure a microswitch for size 12.

Basic module E, reduced rated torque

The rated torque on basic module E can be reduced using the torque adjustment ring located in the stator. The torque adjustment ring may only be unscrewed to a maximum dimension of h_{1max} (see table on page 11).

It should be noted that the engagement and disengagement times change in accordance with the rated torque. Torque reduction is independent of the rated torque used.

Size	06	08	10	12	14	16	18	20	25
Torque reduction per detent position [Nm]	0.2	0.35	0.8	1.3	1.7	1.6	3.6	5.6	6.2

Noise-reduced designs

The noise reduction required in many applications can be achieved in two ways:

1. Impact-noise-reduced armature plate

The brake's operating noise can be minimised using special damping elements, which are installed between the pole face and the armature plate as shock absorbers.

2. Noise-reduced aluminium rotor

The rotor with plastic sleeve reduces the rattling noises in the rotor/hub connection. At the same time, this increases the service life of this connection.

Features and advantages

- Low rate of wear between rotor and hub
- Recommended for frequency inverter operation
- Noise-reduced design
- Also available in combination with CCV

Technical data

Basic module E (with torque adjustment ring)

Without counter friction surface, hand release (as option)

Size	b	d^{j7} 1) spec.	d^{H7} 2) standard	d_1	d_2	d_5	d_{6j7}	d_7	d_8	d_9	d_{10}	d_{11}	d_{12}	d_{13}	d_{16}	d_{17}	d_{18}	di	da
06	88	10	10/11/12/14/15	3xM4	72	91	87	87	52	24 ^{H9}	31	8	13	9.6	3x4.4	86	36	40	60
08	106.5	10	11/12/14/15/20	3xM5	90	109	105	105	60	26 ^{H9}	41	10	13	9.6	3x5.5	106	45	56.1	76.5
10	132	10	11/12/14/15/20	3xM6	112	135.4	130	130	68	35 ^{H9}	45	10	13	12	3x6.6	132	52	66.1	95
12	152	14	20/25	3xM6	132	155	150	150	82	40 ^{H9}	52	10	13	12	3x6.6	153	68	70.1	115
14	169	14	20/25/30	3xM8	145	171	165	165	92	52 ^{H9}	55	12	24	14	3x9	169	78	80.1	124
16	187.6	15	25/30/35/38 3)	3xM8	170	196	190	190	102	52 ^{H9}	70	12	24	14	3x9	194	90	104.1	149
18	218.6	20	30/35/40/45	6xM8	196	223	217	217	116	62 ^{H9}	77	14	24	15	4x9 6)	-	-	129.1	174
20	252.6	25	35/40/45/50	6xM10	230	259	254	254	135	72 ^{H8}	90	14	24	17	4x11 6)	-	-	148.1	206
25	297.6	30	40/45/50/55/60/65/70 3)	6xM10	278	308	302	302	165	85 ^{H8}	120	16	24	18.4	6x11	-	-	199.1	254

1) Pilot bored without keyway
2) Standard keyway in accordance with DIN 6885/1 P9, selection of the shaft diameter dependent upon type of load (see the operating instructions)
3) Ø 38 and Ø 70 mm, keyway in accordance with DIN 6885/3 P9
4) Hand release angle tolerance +3°
5) Recommended lever length for 1.5 M_K
6) The thread in the mounting surface is offset by 30° in relation to the centre axis of the manual release lever

Recommended ISO shaft tolerances: up to Ø 50 mm = k6
over Ø 50 mm = m6

Dimensions in mm

With flange, hand release and seal ring (as option)

With flange, hand release (as option), mounted on flange

With friction plate, hand release (as option)

Size	h	h_1 min.	h_1 max.	h_2	h_3	h_4	h_5 standard	h_5 [5] max.	h_6	h_7	h_8	h_9	h_{11}	l	l_1	S_{LN}	α	β [4]
06	36.3	39.3	43.2	1	6	15.8	107	-	54	23	32.8	56	1.5	18	400	0.2	25°	10°
08	42.8	46.8	50.8	1	7	16.3	116	–	63	23	41.3	65	1.5	20	400	0.2	25°	10°
10	48.4	52.4	55.9	2	9	27.4	132	-	73.3	23	42.4	77.8	1.5	20	400	0.2	25°	10°
12	54.9	58.9	67.5	2	9	29.4	161	-	85	23	47.4	88	1.5	25	400	0.3	25°	10°
14	66.3	71.3	77.3	2	11	33.8	195	–	97.9	32	50	101	1.5	30	400	0.3	25°	10°
16	72.5	77.5	85.5	2.25	11	37	240	–	111	32	53.5	114	1.5	30	600	0.3	25°	10°
18	83.1	89.1	97.1	3	11	41.6	279	394	125	32	59.1	128	-	35	600	0.4	25°	10°
20	97.6	104.6	114.6	3.5	11	48.1	319	416	146	32	68.6	148.5	-	40	600	0.4	25°	10°
25	106.7	115.7	127.7	4.5	12.5	57.7	445	501	170	32	88.7	175	-	50	600	0.5	25°	10°

Technical data

Basic module N (without torque adjustment ring)

Without counter friction face, hand release (as option)

Size	b	d^{j7} 1) spec.	d^{H7} 2) standard	d_1	d_2	d_{3H7}	d_5	d_{6j7}	d_7	d_{10}	d_{11}	d_{12}	d_{13}	d_{14} 4)	d_{15}	d_{16}	d_{17}	d_{18}	di	da
06	88	10	10/11/12/14/15	3xM4	72	25	91	87	87	31	8	13	9.6	4xM4	37.7	3x4.4	86	36	40	60
08	106.5	10	11/12/14/15/20	3xM5	90	32	109	105	105	41	8	13	9.6	4xM5	49	3x5.5	106	45	56.1	76.5
10	132	10	11/12/14/15/20	3xM6	112	42	135	130	130	45	10	13	12	4xM5	54	3x6.6	132	52	66.1	95
12	152	14	20/25	3xM6	132	50	155	150	150	52	10	13	12	4xM5	64	3x6.6	153	68	70.1	115
14	169	14	20/25/30	3xM8	145	60	171	165	165	55	12	24	14	4xM6	75	3x9	169	78	80.1	124
16	187.6	15	25/30/35/38 3)	3xM8	170	68	196	190	190	70	12	24	14	4xM6	85	3x9	194	90	104.1	149
18	218.6	20	30/35/40/45	6xM8	196	75	223	217	217	77	14	24	15	4xM8	95	4x9 7)	-	-	129.4	174
20	252.6	25	35/40/45/50	6xM10	230	85	259	254	254	90	14	24	17	4xM10	110	4x11 7)	-	-	148.1	206
25	297.6	30	40/45/50/55/60/65/70 3)	6xM10	278	115	308	302	302	120	16	24	18.4	4xM10	140	6x11	-	-	199.1	254

1) Pilot bored without keyway
2) Standard keyway in accordance with DIN 6885/1 P9, selection of the shaft diameter dependent upon type of load (see the operating instructions)
3) Ø 38 and Ø 70 mm, keyway in accordance with DIN 6885/3 P9
4) Bores are made on customer request for sizes 06 – 12
5) Hand release angle tolerance +3°
6) Recommended lever length for 1.5 M_K
7) The thread in the mounting surface is offset by 30° in relation to the centre axis of the manual release lever

Recommended ISO shaft tolerances: up to Ø 50 mm = k6
over Ø 50 mm = m6

Dimensions in mm

With flange, hand release and seal ring (as option)

Hand release mounted in a rotated position

Not possible for sizes 18 and 20

With flange, hand release (as option), mounted on flange

With friction plate, hand release (as option)

Size	h	h_2	h_3	h_4	h_5 standard	h_5 [6] max.	h_6	h_7	h_8	h_9	h_{11}	l	l_1	S_{LN}	α	β [5]
06	36.3	1	6	15.8	107	–	54	23	32.8	56	1.5	18	400	0.2	25°	10°
08	42.8	1	7	16.3	116	–	63	23	41.3	65	1.5	20	400	0.2	25°	10°
10	48.4	2	9	27.4	132	–	73.3	23	42.4	77.8	1.5	20	400	0.2	25°	10°
12	54.9	2	9	29.4	161	–	85	23	47.4	88	1.5	25	400	0.3	25°	10°
14	66.3	2	11	33.8	195	–	97.9	32	50	101	1.5	30	400	0.3	25°	10°
16	72.5	2.25	11	37	240	–	111	32	53.5	114	1.5	30	600	0.3	25°	10°
18	83.1	3	11	41.6	279	394	125	32	59.1	128	-	35	600	0.4	25°	10°
20	97.6	3.5	11	48.1	319	416	146	32	68.6	148.5	-	40	600	0.4	25°	10°
25	106.7	4.5	12.5	57.7	445	501	170	32	88.7	175	-	50	600	0.5	25°	10°

Technical data

2 x basic module N + connection flange

Double brake as redundant braking system, suitable for use in stage machinery and many other areas of application. Available with hand release as an option.

Size	d^{J7} 1) spec.	d^{H7} 2) standard	d_1	d_2	d_{3H7}	d_{6j7}	d_{14}	d_{15}	di	da	h	h_2	h_{14}	h_{15}	l	l_1	S_{LN}	α
06	10	10/11/12/14/15	3xM4	72	25	87	4xM4	37.7	40	60	36.3	1	12	84.6	18	400	0.2	25°
08	10	11/12/14/15/20	3xM5	90	32	105	4xM5	49	56.1	76.5	42.8	1	12	97.6	20	400	0.2	25°
10	10	11/12/14/15/20	3xM6	112	42	130	4xM5	54	66.1	95	48.4	2	13	109.8	20	400	0.2	25°
12	14	20/25	3xM6	132	50	150	4xM5	64	70.1	115	54.9	2	16	125.8	25	400	0.3	25°
14	14	20/25/30	3xM8	145	60	165	4xM6	75	80.1	124	66.3	2	17	149.6	30	400	0.3	25°
16	15	25/30/35/38 3)	3xM8	170	68	190	4xM6	85	104.1	149	72.5	2.25	20	165	30	600	0.3	25°
18	20	30/35/40/45	6xM8	196	75	217	4xM8	95	129.4	174	83.1	3	20	186.2	35	600	0.4	25°
20	25	35/40/45/50	6xM10	230	85	254	4xM10	110	148.1	206	97.6	3.5	20	215.2	40	600	0.4	25°
25	30	40/45/50/55/60/65/70 3)	6xM10	278	115	302	4xM10	140	199.1	254	106.7	4.5	25	238.4	50	600	0.5	25°

1) Pilot bored without keyway

2) Standard keyway in accordance with DIN 6885/1 P9, selection of the shaft diameter dependent upon type of load (see the operating instructions)

3) Ø 38 and Ø 70 mm, keyway in accordance with DIN 6885/3 P9

Dimensions in mm

Technical data

Basic module N + tacho flange

Size	d^{j7} 1) spec.	d^{H7} 2) standard	d_1	d_2	d_{3H7}	d_{6j7}	d_{14}	d_{15}	d_{19H7}	d_{20h7}	d_{21}	di	da	h	h_2	h_{12}	h_{13}	l	l_1	S_{LN}	α
06	10	10/11/12/14/15	3xM4	72	25	87	4xM4	37.7	40	95	98	40	60	36.3	1	42.3	4	18	400	0.2	25°
08	10	11/12/14/15/20	3xM5	90	32	105	4xM5	49	50	115	116	56.1	76.5	42.8	1	49.8	4	20	400	0.2	25°
10	10	11/12/14/15/20	3xM6	112	42	130	4xM5	54	60	140	141	66.1	95	48.4	2	57.4	4	20	400	0.2	25°
12	14	20/25	3xM6	132	50	150	4xM5	64	60	162	165	70.1	115	54.9	2	63.9	4	25	400	0.3	25°
14	14	20/25/30	3xM8	145	60	165	4xM6	75	80	177	181	80.1	124	66.3	2	77.3	4	30	400	0.3	25°
16	15	25/30/35/38 3)	3xM8	170	68	190	4xM6	85	85	204	206	104.1	149	72.5	2.25	83.5	4	30	600	0.3	25°
18	20	30/35/40/45	6xM8	196	75	217	4xM8	95	90	233	237	129.4	174	83.1	3	94.1	4	35	600	0.4	25°
20	25	35/40/45/50	6xM10	230	85	254	4xM10	110	90	271	274	148.1	206	97.6	3.5	108.6	4	40	600	0.4	25°
25	30	40/45/50/55/60/65/70 3)	6xM10	278	115	302	4xM10	140	120	322	324	199.1	254	106.7	4.5	119.2	4	50	600	0.5	25°

1) Pilot bored without keyway

2) Standard keyway in accordance with DIN 6885/1 P9, selection of the shaft diameter dependent upon type of load (see the operating instructions)

3) Ø 38 and Ø 70 mm, keyway in accordance with DIN 6885/3 P9

Dimensions in mm

Technical data

Rated data

Size	P_N [W]	$S_{LN\ max}$ **Operating brake** [mm]	$S_{L\ max}$ **Holding brake** [mm]	**max. Adjustment** [mm]	**min.** [1] **Rotor thickness** [mm]	$J_{aluminium\ rotor}$ [kgcm²]
06	20	0.5	0.3	1.5	4.5	0.15
08	25	0.5	0.3	1.5	5.5	0.61
10	30	0.5	0.3	1.5	7.5	2.0
12	40	0.75	0.45	2.0	8.0	4.5
14	50	0.75	0.45	2.5	7.5	6.3
16	55	0.75	0.45	3.5	8.0	15
18	85	1.0	0.6	3.0	10.0	29
20	100	1.0	0.6	4.0	12.0	73
25	110	1.25	0.75	4.5	15.5	200

[1] The friction lining is dimensioned so that the brake can be readjusted at least five times

Rated torques

Size	**Rated torque M_K** [Nm]	**Reduction of rated torque at specified speed to x%** **1500** r/min	**3000** r/min	**Maximum speed** **max.**	n_{max} [r/min]
06	4	87%	80%	74%	6000
08	8	85%	78%	73%	5000
10	16	83%	76%	73%	4000
12	32	81%	74%	73%	3600
14	60	80%	73%	72%	3600
16	80	79%	72%	70%	3600
18	150	77%	70%	68%	3600
20	260	75%	68%	66%	3600
25	400	73%	66%	66%	3000

As speed increases, so does wear

Maximum permissible rotational speed referred on standard friction lining

Operating times

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

Torque time rated dependent on excitation voltage

t_{11} = Delay time when connecting
t_{12} = Rise time of braking torque
t_1 = Engagement time
t_2 = Disengagement time
t_3 = Slipping time

Technical data

Operating times

Size	Rated torque M_K [Nm]	Q_E [J]	S_{hue} [1/h]	Operating times[1] [ms]			
				Connection on the DC side			Disconnection
				t_{11}	t_{12}	t_1	t_2
06	4	3000	79	15	13	28	45
08	8	7500	50	15	16	31	57
10	16	12,000	40	28	19	47	76
12	32	24,000	30	28	25	53	115
14	60	30,000	28	17	25	42	210
16	80	36,000	27	27	30	57	220
18	150	60,000	20	33	45	78	270
20	260	80,000	19	65	100	165	340
25	400	120,000	15	110	120	230	390

[1] The operating times specified relate to the use of INTORQ rectifiers and coils with a supply voltage of 205 V DC

The maximum permissible friction work per switching cycle Q_E relates to the standard friction lining

Aluminium rotor design with low rate of wear

The wear values in the table apply to the friction lining with low rate of wear and to the standard rated torque. The friction energies specified up to the point of maintenance are rough guide values that are subject to a high degree of variation depending on various influencing factors.

Size		06	08	10	12	14	16	18	20	25
Q_E Maximum permissible friction work per switching cycle [J]										
	100 r/min	3000	7500	12000	24,000	30,000	36,000	60,000	80,000	120,000
	1000 r/min	3000	7500	12,000	24,000	30,000	36,000	60,000	80,000	120,000
	1200 r/min	3000	7500	12,000	24,000	30,000	36,000	60,000	80,000	120,000
	1500 r/min	3000	7500	12,000	24,000	30,000	36,000	60,000	24,000	36,000
	1800 r/min	3000	7500	12,000	24,000	30,000	36,000	36,000	on request	
	3000 r/min	3000	7500	12,000	24,000	18,000	11,000	on request		
	3600 r/min	3000	7500	12,000	7000	on request				
Q_{BW}	[10^6 J]	85	158	264	530	571	966	1542	2322	3522
S_{hue}	[h^{-1}]	79	50	40	30	28	27	20	19	15

Q_{BW} = Friction energy of brake until maintenance
S_{hue} = Transitional operating frequency

In the region of the load limit (operation > 50 % Q_E) the value for Q_{BW} can drop as low as 40 %

Technical data

Service life and wear

Friction energy and operating frequency

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

The maximum permissible operating frequency S_{hmax} depends on the braking energy Q_R. The operating frequency S_h results in the maximum permissible friction work during cyclic switching Q_{smax}. Higher speed and switching energy values increase wear, because the friction surfaces are briefly subjected to very high temperatures.

Maintenance

Brakes are components which are subject to a great deal of wear. When installing the brake, it must be ensured that it can be easily accessed for inspection and maintenance purposes. Intervals between inspections should be set in accordance with the expected service life and load. For more information, please see the operating instructions.

The brake has to be adjusted when s_{Lmax} is reached. The friction energy to be withstood up to this point is dependent on a number of factors: in particular, the inertias to be braked, the braking speed, the operating frequency and the resulting temperature on the friction surfaces. For this reason, no universal value for all operating conditions can be given in respect of the amount of friction energy that can be handled before adjustment is required. In addition, increased wear should be expected with a vertical brake shaft. The BFK458 can be adjusted when the maximum permissible working air gap is reached (s_{Lmax}). The dimensioning of the friction lining allows it to be readjusted at least 5 times .

Where the amount of friction energy per switching operation is low, the brake's mechanical components can impose limitations in terms of service life. In particular, the rotor/hub connection, springs, armature plate and sleeves are subject to operational wear. The expected service life of the standard design is around 1 million load alternations. Solutions that are optimised in terms of service life are available in cases where a longer service life is required (consult the manufacturer).

BFK458-L

Guaranteed performance data for the LongLife design

- Guaranteed service life of brake mechanism:
  $10x10^6$ repetitive cycles of operation
  $15x10^6$ reversing cycles of operation
- The brake warranty covers either a period of two years or the guaranteed number of cycles – whichever is reached first.
- The scope of the warranty in the event of premature failure covers replacement of the brake, including a flat-rate replacement fee

Accessories

Hand release

The hand release is used to release the brake by hand and can be retrofitted. The hand release springs back to its base position automatically after operation (1). The hand release requires an additional air gap S_{HL} in order to function; this is factory-set prior to delivery. Dimension S_{HL} (see the mounting instructions) must be checked once the equipment has been mounted.

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

Flange

A flange can be used if no suitable counter friction face is available. The flange can also be fitted with a cover ring.

Friction plate

A friction plate is available for sizes 06 up to and including 16. This should be used if the counter face is smooth and machined, but is not suitable as a friction surface. The plate can be combined with a cover ring.

Flange

Friction plate
(sizes 06 – 16)

Accessories

Centring flange (tacho brake)

Basic module N combined with a centring flange is suitable for mounting a tacho generator.

Connection flange (double brake)

The connection flange can be used to adapt a second basic module to basic module N; the resulting double brake is suitable for use in stage machinery or other applications with increased safety requirements.

Seal

To a large extent, the cover ring prevents the exit or ingress of dust, humidity, dirt, etc., out of or into the braking area. The seal is inserted into the groove on the stator. If no suitable groove is available on the counter friction face, we recommend the use of a flange or a friction plate.

Centring flange

Connection flange

Seal

Accessories

Brake cover

A brake cover can be mounted onto basic module E and basic module N as an option, to protect the brake from water and dust (degree of protection acc. to IP65). This design is not available in conjunction with a hand release and a flange.

Size	d_1	d_2	d_3^{H8}	d_4	d_5	h	h_1	h_2	h_3 [1)]
06	135	120	98	4x4.5	M16x1.5	55	28	16.5	3
08	155	142	118	4x5.5	M20x1.5	61	34	20	3
10	185	166	143	4x5.5	M20x1.5	72	39	21	3
12	205	192	163	4x6.6	M20x1.5	82	42	23	3
14	225	212	183	4x6.6	M20x1.5	92	51	24	3
16	250	236	208	4x6.6	M20x1.5	98	52	25	3
18	285	268	238	4x6.6	M20x1.5	115	60	29	3
20	330	314	283	4x9	M20x1.5	131	69	35	3
25	390	368	328	4x9	M20x1.5	142	78	40	3

[1)] Recommended recess length on motor end shield

Accessories

Microswitch

The brake can be fitted with a microswitch for the purpose of monitoring the release or wear. The microswitch can be built into the circuit as an NC contact or an NO contact.

As of June 2012, a new small microswitch (with UL acceptance) is in use, which is perfectly adapted to the contour of the brake. The old switch design can be converted by connecting an adapter to the same threaded holes.

Mounting the microswitch onto basic module E

Dimensions

Size	12	14	16	18	20	25
Overall radius r	81	88.5	101	114.5	133	157

Dimensions in mm

Microswitch for hand release monitoring in combination with basic module N

Gate drives, for instance, are provided with brakes with hand release, and a microswitch for monitoring the hand release. In this case, the hand release must make it possible to move the gate to the desired position in manual operation, e.g. using a crank. This manual operation has to be detected via a microswitch, whose switching signal must be combined with the motor control so that the motor can be prevented from starting (thus also preventing any possible injury to the operator). The microswitch for hand release monitoring is a built-on option.

The fixing bracket is screwed onto the stator via the threaded holes on the rear face. The fixing bracket enables a microswitch to be fastened to it. The two directions of release, towards and away from the motor, can be implemented by using different fixing brackets and microswitch settings.

Accessories

Terminal box in combination with basic module N

The connecting cables can easily be integrated into higher-level controls via the terminal box (brake sizes 12-25) in order to support different wiring options (total of 3 inputs/outputs). 2/4-pole terminal strips, 4-pole half-wave and bridge rectifiers and a microswitch connection can be integrated into the terminal box at the customer's request.

The terminal box is mounted on the spring-applied brake using a fixing bracket and screws, as shown in the illustration. You can select the mounting angle according to your requirements by using the assembly kit.

Size	12	14	16	18	20	25
b	-5	5.5	12.5	23	37.5	45.5
h	122	130	142	155	174	198
r	126	134	146	158.5	177	201

Dimensions in mm

Accessories

Bridge rectifiers and half-wave rectifiers

Type code **B E G – 5 6 1 – 440**

Brake
Electronics
Rectifier

1-Bridge rectifier
2-Half-wave rectifier
5-Bridge/half-wave rectifier

4-pole
6-pole

1-Mounting position horizontal
2-Mounting position vertical
3-Mounting position horizontal with snap-in stud

440 Voltage 440 V AC

INTORQ 14.198.00 universal spark suppressor

The universal spark suppressor limits the induced voltage arising when inductive direct current consumers are switched off on the DC side. These induced voltages can damage coils and switches. VDE 0580 therefore requires that, in order to avoid impermissibly high switch-off voltages and overvoltages, suitable protective measures must be provided by the user. The universal spark suppressor is available in 4 versions for the following voltage ranges:

INTORQ	Coil voltage [V DC]	Max. connection voltage	Max. coil power [W]	Capacitor-voltage	b	b_1 approx.	d	e approx.	h	l	l_1 approx.	m [g]
14.198.00.01	24 – 50	60 V~	110	250 V~	7	11	0.7	20	17	26.5	16	7
14.198.00.02	50 – 120	250 V~	110	630 V~	15	19	0.7	22.5	25	31.5	12	22
14.198.00.03	120 – 200	400 V~	110	1000 V~	8.5	15	0.7	20	19	26.5	16	17
14.198.00.04	200 – 250	555 V~	110	1000 V~	8.5	15	0.7	20	19	26.5	16	10

Dimensions

Wiring example

Parallel to contact

Parallel to coil

Accessories

Bridge rectifiers and half-wave rectifiers, 4-pole

Dimensions

Bridge rectifiers, 4-pole

BEG-142-270 vertical mounting position
BEG-143-270 horizontal mounting position with snap-in stud

Application area

Current supply for spring-applied brakes from AC mains (normal excitation)
Example: 205 V DC coil on 230 V AC mains

Technical data

Max. supply voltage	270 V~
Max. DC current at 60°C	1.0 A
Max. ambient temperature	-25°C to +80°C

For the selection of associated coil voltages, please refer to the table

The rectifiers are protected against overvoltage by input and output varistors.

Half-wave rectifiers, 4-pole

BEG-242-555 vertical mounting position
BEG-243-555 horizontal mounting position with snap-in stud

Application area

Current supply for spring-applied brakes from AC mains (normal excitation)
Example: 180 V DC coil on 400 V AC mains

Technical data

Max. supply voltage	555 V~
Max. DC current at 60°C	1.0 A
Max. ambient temperature	-25°C to +80°C

For the selection of associated coil voltages, please refer to the table

The rectifiers are protected against overvoltage by input and output varistors.

Accessories

Bridge rectifiers, 6-pole

Dimensions

BEG-162-270

BEG-161-270

Bridge rectifiers, 6-pole

BEG-162-270 vertical mounting position
BEG-161-270 horizontal mounting position

Application area

Current supply for spring-applied brakes from AC mains (normal excitation)
Example: 205 V DC coil on 230 V AC mains

Technical data

Max. supply voltage	270 V~
Max. DC current at 60°C	0.75 A
Max. ambient temperature	-25°C to +80°C

The rectifiers are protected against overvoltage by input and output varistors.

BEG-162-270/161-270/
262-460/261-460 rectifiers also contain the required spark suppressor.
For the selection of associated coil voltages, please refer to the table

$$Ug = \frac{U\sim}{1.11} = \frac{230\ V\sim}{1.11} = 205\ V\ DC$$

Accessories

Half-wave rectifiers, 6-pole

Dimensions

BEG-262-460
BEG-262-555

BEG-261-460
BEG-261-555

Half-wave rectifiers, 6-pole

BEG-262-460 vertical mounting position
BEG-261-460 horizontal mounting position
BEG-262-555 vertical mounting position
BEG-261-555 horizontal mounting position

Application area

Current supply for spring-applied brakes from AC mains (normal excitation)
Example: 180 V DC coil on 400 V AC mains

$$Ug = \frac{U\sim}{2.22} = \frac{400\ V\sim}{2.22} = 180\ V\ DC$$

Technical data

Max. supply voltage	460 V~/555 V~
Max. DC current at 60°C	0.75 A
Max. ambient temperature	-25°C to +80°C

The rectifiers are protected against overvoltage by input and output varistors. BEG-162-270/161-270/262-460/261-460 rectifiers also contain the required spark suppressor.
For the selection of associated coil voltages, please refer to the table

Accessories

Bridge/half-wave rectifier

Once a set overexcitation time has elapsed, the bridge/half-wave rectifiers switch from bridge rectification to half-wave rectification. This makes it possible to improve switching performance or reduce power in accordance with coil dimensioning.

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 to 25	205	06 to 14
BEG-561-255-130					16 to 25
BEG-561-440-030-1	400	180	06 to 25		–

The information in this table is valid for the BFK458 with standard rated torque and for designs without pole shim (assignment for other brakes on request)

Connection diagrams

AC switching

DC switching

Technical data

Rectifier type	
Output voltage with bridge rectification	0.9xU1
Output voltage with half-wave rectification	0.45xU1
Ambient temperature (storage/operation) [°C]	-25 to +70

In the case of switching on the DC side (fast engagement), switching must also occur on the supply side. Otherwise, overexcitation will not occur on restarting.

Type	Input voltage U1 (40 Hz to 60 Hz)			Max. current $I_{max.}$		Overexcitation time t_o (±20%)		
	min [V~]	Rated [V~]	max [V~]	Bridge [A]	Half-wave [A]	at U 1 $_{min}$ [s]	at U 1 $_{Rated}$ [s]	at U 1 $_{max}$ [s]
BEG-561-255-030 BEG-561-255-130	160	230	255	3.0	1.5	0.430	0.300	0.270
						1.870	1.300	1.170
BEG-561-440-030-1	230	400	440	1.5	0.75	0.500	0.300	0.270

Accessories

Fastening options

4-pole rectifier

Fastening options

6-pole rectifier and bridge/half-wave rectifier

Accessories

Connection diagrams

DC switching

AC switching

AC switching parallel to the motor

When using AC switching parallel to the motor, the engagement time is increased further by the motor voltage in generator mode.

Accessories

Supply voltage selection table for bridge rectifiers and half-wave rectifiers

Rectifier type and rated coil voltage for mains voltage

AC voltage V AC	**Rectifier**	**Rectifier type 4-pole 1 A at 60°C**	**Spark suppressor**	**Rectifier type 6-pole 0.75 A at 60°C**	**Rated coil voltage ± 10%** V DC
42 V	Half-wave	BEG-243/242-555	14.198.00.01	BEG-262/261-460	20 V
48 V	Bridge Half-wave	BEG-142/143-270 BEG-243/242-555	14.198.00.01 14.198.00.01	BEG-162/161-270 BEG-262/261-460	42 V 20 V
110 V	Bridge	BEG-142/143-270	14.198.00.02	BEG-162/161-270	103 V
220 V	Bridge Half-wave	BEG-142/143-270 BEG-243/242-555	14.198.00.04 14.198.00.02	BEG-162/161-270 BEG-262/261-460	205 V 103 V
230 V	Bridge Half-wave	BEG-142/143-270 BEG-243/242-555	14.198.00.04 14.198.00.02	BEG-162/161-270 BEG-262/261-460	205 V 103 V
240 V	Bridge Half-wave	BEG-142/143-270 BEG-243/242-555	14.198.00.04 14.198.00.02	BEG-162/161-270 BEG-262/261-460	215 V 103 V
255 V	Bridge	BEG-142/143-270	14.198.00.04	BEG-162/161-270	225 V
277 V	Half-wave	BEG-243/242-555	14.198.00.03	BEG-262/261-460	127 V
290 V	Half-wave	BEG-243/242-555	14.198.00.03	BEG-262/261-460	127 V
380 V	Half-wave	BEG-243/242-555	14.198.00.03	BEG-262/261-460	180 V
400 V	Half-wave	BEG-243/242-555	14.198.00.03	BEG-262/261-460	180 V
415 V	Half-wave	BEG-243/242-555	14.198.00.03	BEG-262/261-460	180 V
420 V	Half-wave	BEG-243/242-555	14.198.00.03	BEG-262/261-460	180 V
440 V	Half-wave	BEG-243/242-555	14.198.00.04	BEG-262/261-460	205 V
460 V	Half-wave	BEG-243/242-555	14.198.00.04	BEG-262/261-460	205 V
480 V	Half-wave	BEG-243/242-555	14.198.00.04	BEG-262/261-555	215 V
500 V	Half-wave	BEG-243/242-555	14.198.00.04	BEG-262/261-555	225 V
555 V	Half-wave	BEG-243/242-555	14.198.00.04	BEG-262/261-555	250 V

* Spark suppressor without capacitor. For optimum spark suppression, we recommend the use of spark suppressor 14.198.00.04

Max. rated coil voltage: 250 V
Standard rated voltages: 24, 96, 103, 170, 180, 190, 205 V

Dimensioning

Basics

A brake is dimensioned essentially on the basis of the required braking torque M_{erf}.
The inertias to be braked (moments of inertia), the relative speeds, the braking times and the operating frequencies also have to be considered in the calculations. Marginal conditions, such as ambient temperature, air humidity, dust and mounting position should be known. In the event of extreme/critical operating conditions, please consult the manufacturer. The brake is dimensioned in accordance with VDI guideline 2241.
Friction surfaces must always be kept free of oil and grease.
For explanations of the terms used in the calculation, please refer to the list of abbreviations on page 5.

Safety factor

To ensure the necessary transmission security even under extreme operating conditions, braking torque need to include the safety factor K, the value of which should be set dependent upon the operating conditions.

$$K \geqq 2$$

Load types

The following load types are primarily encountered in practice:

$$M_{erf} = M_a \cdot K \leqq M_K$$

$$M_a = \frac{J_L \cdot \Delta n_0}{9.55 \cdot \left(t_3 - \frac{t_{12}}{2}\right)}$$

$$M_{erf} = \frac{J_L \cdot \Delta n_0}{9.55 \cdot \left(t_3 - \frac{t_{12}}{2}\right)} \cdot K$$

Dynamic and static load

Most applications belong to this category, as in most cases there is not only a static torque but also a dynamic load.

$$M_{erf} = (M_a \pm M_L) \cdot K \leqq M_K$$

$$M_{erf} = \left(\frac{J_L \cdot \Delta n_0}{9.55 \cdot \left(t_3 - \frac{t_{12}}{2}\right)} \pm M_L\right) \cdot K \leqq M_K$$

+ M_L = To be used with driving load torque (e.g. when lowering a load)

– M_L = For braking operation

Estimating the required braking torque and/or size

If only the drive power to be transmitted is known, the required torque or braking torque can be determined as follows:

$$M_{erf} = 9550 \frac{P}{\Delta n_0} \cdot K \leqq MK$$

Thermal load

If high operating frequencies and friction energy/ switching cycle are to be expected, we recommend recalculating the thermal data for the brake. The friction energy per switching cycle is calculated as follows:

$$Q = \frac{J_L \cdot \Delta n_0^2}{182.5} \cdot \frac{M_K}{M_K \pm M_L}$$

– M_L = To be used when lowering the load, for example
+ M_L = For braking operation

The permissible friction energy per switching cycle at a given operating frequency can be taken from the diagrams on page 14. If the friction energy per switching cycle is known, the permissible operating frequency can be taken from the diagrams mentioned above.

Dimensioning

Example calculation

The following technical data is known:

$P = 3$ kW

$\Delta n_0 = 1450$ rpm

$J_L = 0.13$ kgm^2 total

$t_3 = 2$ s

$M_L = 15$ Nm

$S_h = 100$ switching operations/h

Estimating the required braking torque and/or size

$$M_{erf} = 9550 \frac{P}{\Delta n_0} \cdot K$$

$$M_{erf} = 9550 \frac{3}{1450} \cdot 2 = 40 \text{ Nm}$$

Assume BFK458-14

Determining the required braking torque

$$M_{erf} = \left(\frac{J_L \cdot \Delta n_0}{9.55 \cdot \left(t_{12} \frac{t_{12}}{2} \right)} + M_L \right) \cdot K$$

$t_{12} = 0.025$ s (see page 14)

$$M_{erf} = \left(\frac{0.13 \cdot 1450}{9.55 \cdot \left(\frac{0.025}{2} \right)} + 15 \right) \cdot 2 = 50 \text{ Nm}$$

Therefore, BFK458-14 is chosen.

$$M_K = 60 \text{ Nm} > M_{req} = 50 \text{ Nm}$$

Thermal recalculation

$$Q = \frac{J_L \cdot \Delta n_0^{\,2}}{182.5} \cdot \frac{M_K}{M_K \pm M_L}$$

$$Q = \frac{0.52 \cdot 1450^2}{182.5} \cdot \frac{60}{(60 + 15)} = 1997 \text{ J}$$

Calculated switching energy Q = 1997 J/switching cycle. The diagram on page 14 shows a max. permissible friction work of 30,000 J for size 14 at $S_h = 100$ h^{-1}.

$$Q = 1997 \text{ J} < Q_{Smax} = 7326 \text{ J}$$

The brake is correctly dimensioned.

Example order

Brake type BFK458-14E or design N (with or without torque adjustment ring) is required, with additional hand release and seal ring.

Supply voltage 205 V =, shaft diameter 25 mm.

BFK458-14E, 205 V =, d = 25 mm

Product overview

BFK458 spring-applied brake

INTORQ BFK458-□□□

Size	☐ 06 ☐ 08 ☐ 10 ☐ 12 ☐ 14 ☐ 16 ☐ 18 ☐ 20 ☐ 25
Design	☐ E (with torque adjustment ring) ☐ N (without torque adjustment ring)
Voltage	☐ 24 V ☐ 96 V ☐ 103 V ☐ 170 V ☐ 180 V ☐ 190 V ☐ 205 V
Braking torque	1.5 – 600 Nm (see torque graduations)
Cable length	☐ Standard from 100 mm – 1000 mm in 100 mm steps, from 1000 mm – 3000 mm in 250 mm steps
Hand release	☐ Mounted ☐ As mounting kit
Armature plate	☐ Standard ☐ Hard chrome-plated (size 06 and above) ☐ Noise-reduced (O-ring design) ☐ With pole shim/brass film
Microswitch	☐ Switching function monitoring (size 12 and above) ☐ Wear monitoring (size 12 and above) ☐ Hand release monitoring, direction of release away from motor (sizes 06-25) ☐ Hand release monitoring, direction of release towards motor (sizes 06-10)
Terminal box	☐ Mounted (size 12 and above)
Temperature resistance -40 °C	☐ With hard chrome-plated friction surfaces (armature plate and flange are essential) ☐ With temperature-resistant fixing screws
Rotor	☐ Aluminium ☐ Noise-reduced (rotor with sleeve)
Rotor with low rate of wear	☐ Aluminium ☐ Noise-reduced (rotor with sleeve)
Hub	For bore diameter, see Dimensions
Fixing screw set	☐ For mounting onto the flange ☐ For mounting onto the motor/friction plate ☐ For flange with through hole (up to and including size 16) ☐ For connection flange/double brake
Terminal box	☐ As mounting kit
Counter friction face	☐ Friction plate (up to and including size 16) ☐ Flange ☐ Tacho flange ☐ Connecting flange double brake
Sealing	☐ Seal ☐ Shaft sealing ring (shaft diameter on request) ☐ Cap ☐ Brake cover

Electrical accessories

Bridge rectifier	☐ 4-pole without snap-in stud ☐ 4-pole with snap-in stud ☐ 6-pole vertical, integrated spark suppressor ☐ 6-pole horizontal, integrated spark suppressor
Half-wave rectifier	☐ 4-pole without snap-in stud ☐ 4-pole with snap-in stud ☐ 6-pole vertical, integrated spark suppressor ☐ 6-pole horizontal, integrated spark suppressor
Spark suppressor	☐ Yes