

Spring-applied brake

INTORQ BFK468

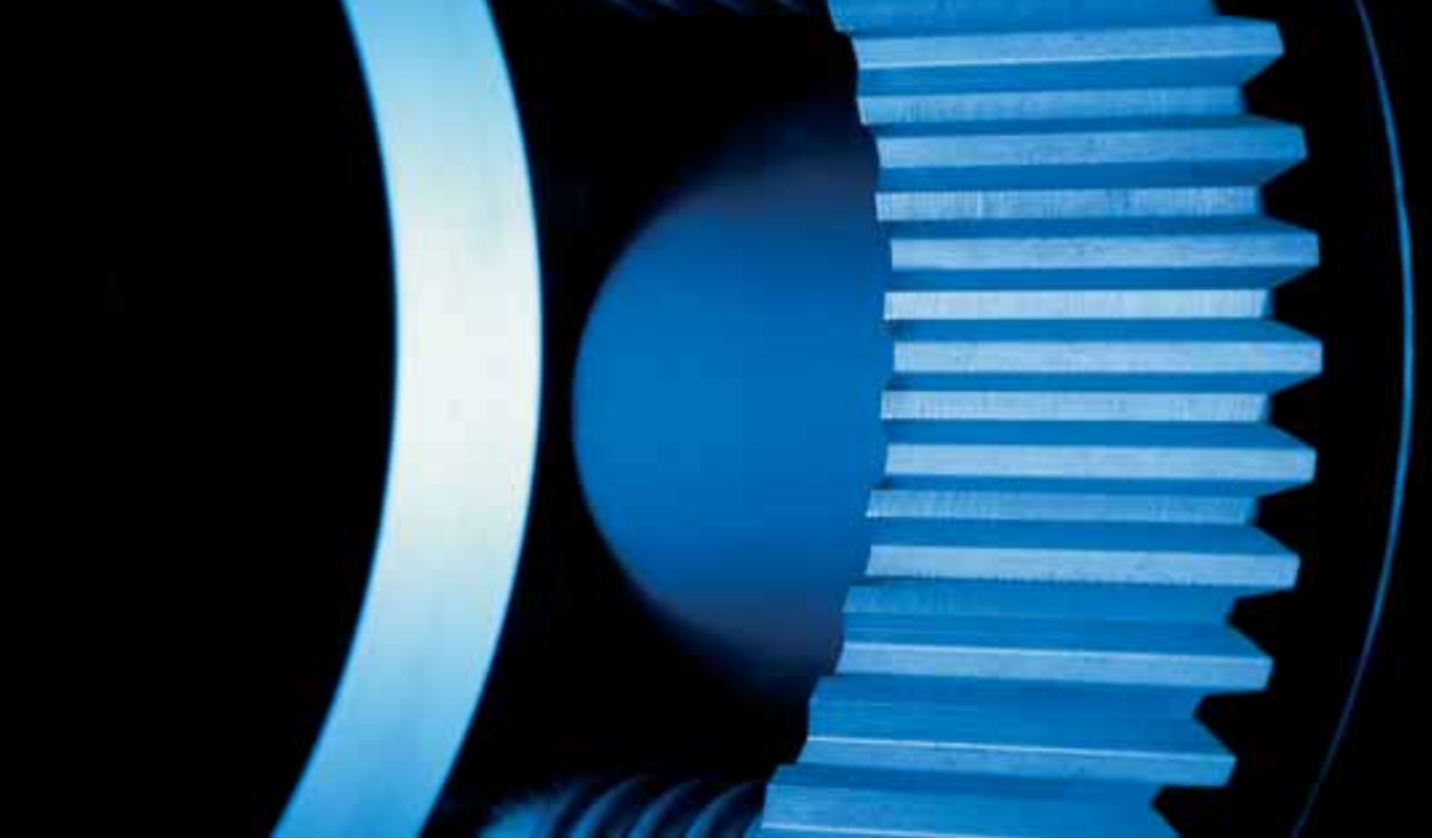
The new performance standard 100 – 2400 Nm



INTORQ

setting the standard

www.intorq.de



INTORQ BFK468 – the new performance standard

High-performance drives are achieving ever higher motor speeds and drive torques. Although performance requirements are increasing, less and less space is generally available for installing the brake.

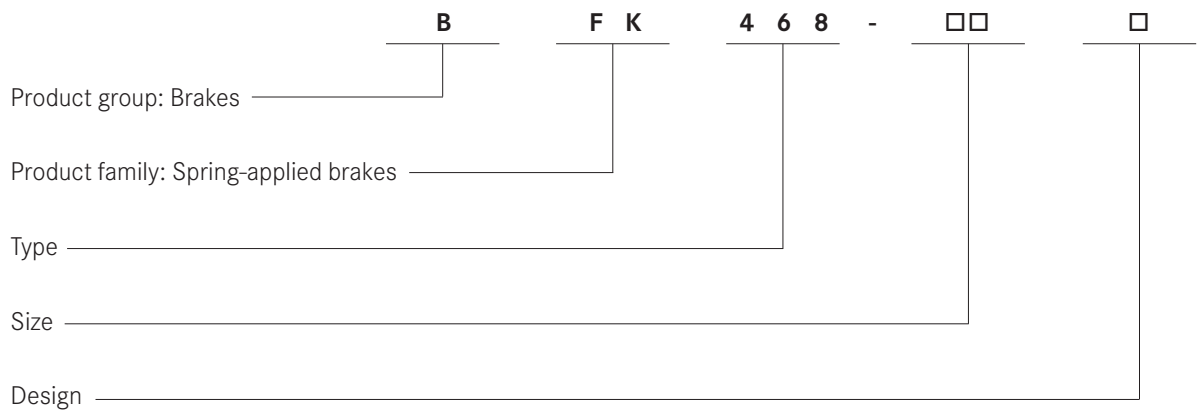
Innovative multipole technology is the basis for a new performance class.

Features

- Up to twice the braking torque compared to the BFK458
- Fixed or adjustable braking torque
- Short operating times
- Large working air gap means long maintenance intervals



Product key INTORQ BFK468-□□□



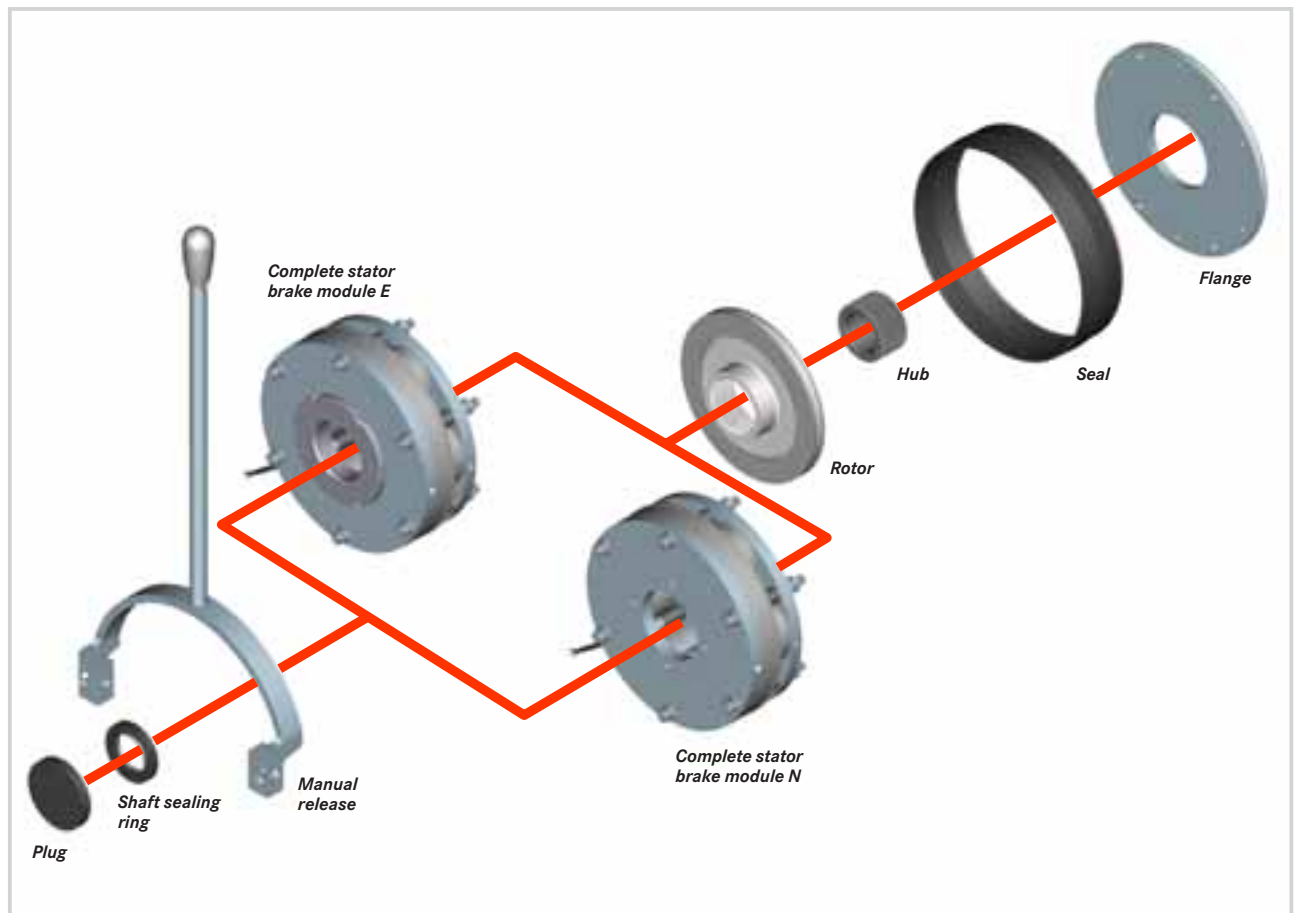
Sizes

18, 20, 25, 31

Stator design

E - Adjustable (braking torque can be reduced using torque adjustment ring)

N - Non-adjustable



BFK468 modular system

List of abbreviations

| | | |
|-------------------------|--------------------|---|
| P | [kW] | Drive motor power |
| P_{max} | [W] | Maximum power when releasing the brake with overexcitation |
| P₂₀ | [W] | Coil power at 20°C in continuous operation with holding current derating |
| M_K | [Nm] | Rated torque of brake |
| Δn₀ | [rpm] | Initial relative speed of the brake |
| t₁ | [s] | Engagement time, $t_1 = t_{11} + t_{12}$ |
| t₂ | [s] | Disengagement time (time from the beginning of the torque drop until 0.1 M _K is reached) |
| t₃ | [s] | Slipping time (time during which a relative movement occurs between input and output with brake applied) |
| t₁₁ | [s] | Delay time (time from disconnecting the voltage until the torque begins to rise) |
| t₁₂ | [s] | Rise time of braking torque |
| Q_{perm} | [J] | Max. permissible friction energy per switching cycle |
| S_h | [h ⁻¹] | Operating frequency, i.e. the number of periodical brake operations |
| S_{Iü} | | Rated air gap |



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Example applications

Slew, lift, move – whenever cranes are in motion, INTORQ BFK468 spring-applied brakes are never far away.

A special version is also available for theatre applications.

- Brake motors
- Storage technology
- Escalators
- Cranes
- Dockyards
- Stage machinery



Product information

INTORQ BFK468 spring-applied brake

A powerful and complete range

- 4 sizes
- Standard voltages 205/103 V, 360/180 V (release voltage/holding voltage)
- Torque range from 100 – 2400 Nm

Versatile

- Modular structure for virtually all applications
- Connection compatible with the BFK458 range

Torque transmission

- Designed for dry running

Ready for operation immediately

- Preset air gap, quick and easy mounting
- Special machining of the friction surfaces ensures that the rated torques are achieved after very few switching operations.
- No fixed 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
- Brakes are designed for 100 % duty time (with holding current derating) using an INTORQ bridge/half-wave rectifier
- Long rotor/hub connection with low rate of wear and a tried-and-tested involute gear
- Asbestos-free friction linings with low rate of wear

Reliable

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

Options

- Manual release for sizes 18–25, both directions can be used for release
- Noise-reduced designs
- Different types of corrosion protection and enclosures
- Microswitches used to monitor air gap and wear

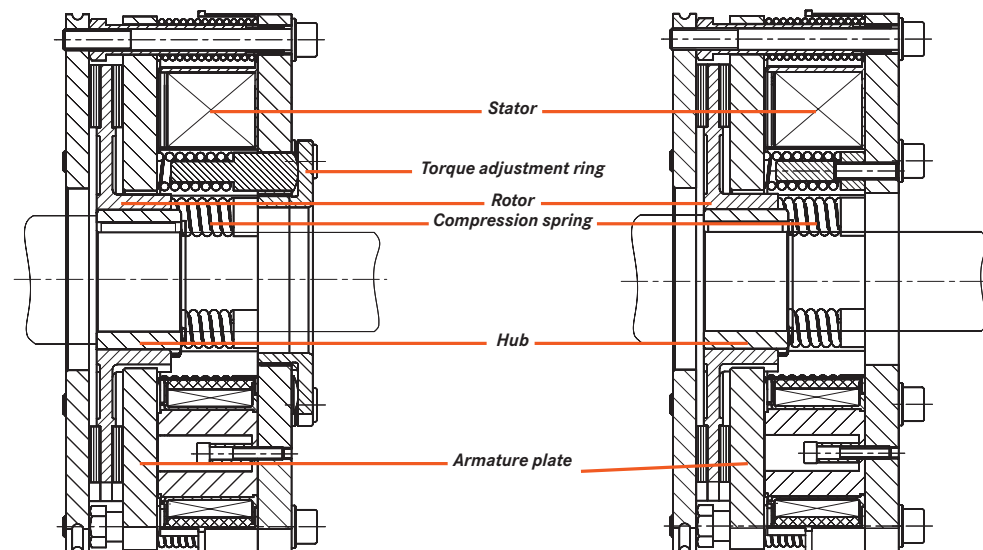


Principle of operation

INTORQ BFK468 spring-applied brake

Brake module E + rotor + hub + flange

Brake module N + rotor + hub + flange



INTORQ BFK458 spring-applied brakes are single-disc brakes with two friction surfaces. When a de-energised, several compression springs are used to generate the braking torque through friction. The brake is released electromagnetically. During the braking, the rotor, which can slide axially on the hub, is pressed against the counter friction face via the armature plate, by means of the compression springs. When the brakes are applied, an air gap s_{air} 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. Brake module E supports the use of the torque adjustment ring (8) to reduce the braking torque.

Technical data

Braking torques

Depending on the individual application, the graduated torques listed in the tables below are available. The braking torque on brake module E can be reduced using the torque adjustment ring located in the stator. The torque adjustment ring can be unscrewed to a maximum dimension of h_{1max} (see table on page 9).

It should be noted that the engagement and disengagement times change in accordance with the braking torque.

| Size | 18 | | 20 | | 25 | | 31 |
|---|----------------------------|--|----------------------------|--|----------------------------|--|----------------------------|
| | Rated torque 1) [Nm] | Torque reduction E per detent [Nm] | Rated torque 1) [Nm] | Torque reduction E per detent [Nm] | Rated torque 1) [Nm] | Torque reduction E per detent [Nm] | Rated torque 1) [Nm] |
| <p>Rated torques in relation to the relative speed $\Delta n = 100$ rpm</p> <p>Depending on the rated torque (spring configuration) the angle of rotation for reducing the braking torque on basic module E can be 60°, 120° or 180°</p> | | | | | 230 N | | |
| | 100 N/E | 6.4 | 170 N/E | 19.8 | 260 N/E | 16.5 | |
| | 115 N/E | 6.4 | 200 N/E | 19.8 | 300 N/E | 8.2 | 720 N |
| | 130 N/E | 6.4 | 230 N/E | 9.9 | 350 N/E | 8.2 | 960 N |
| | 150 N/E | 3.2 | 260 N/E | 9.9 | 400 N/E | 8.2 | 1200 N |
| | 165 N/E | 3.2 | 300 N/E | 19.8 | 445 N/E | 16.5 | 1440 N |
| | 185 N/E | 6.4 | 345 N/E | 19.8 | 490 N/E | 8.2 | 1680 N |
| | 200 N/E | 6.4 | 400 N/E | 19.8 | 520 N/E | 16.5 | 1920 N |
| | 235 N/E | 6.4 | 440 N/E | 19.8 | 600 N/E | 16.5 | 2160 N |
| | 265 N/E | 6.4 | 480 N/E | 19.8 | 700 N/E | 16.5 | 2400 N |
| | 300 N/E | 6.4 | 520 N/E | 19.8 | 800 N/E | 16.5 | |

■ N ... Braking torque for design N (without torque adjustment ring)

1) Minimum braking torque for run-in friction pairs

■ E ... Braking torque for design E (with torque adjustment ring)

- Holding brake with emergency stop operation ($s_{li,max}$ approx. $2.0 \times s_{li}$)
- Service brake ($s_{li,max}$ approx. $4.0 \times s_{li}$)
- Standard braking torque

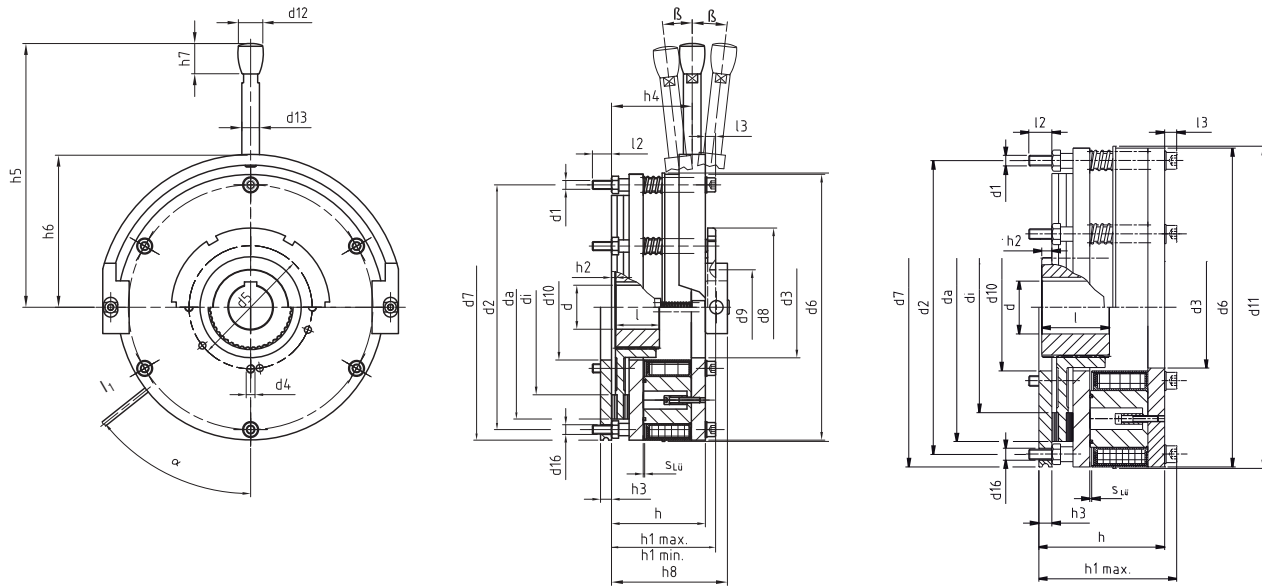
Technical data

BFK468 with manual release and flange

Dimensions

Sizes 18–25

Size 31



| Size | d _{H7} | d ₁ | d ₂ | d ₃ | d ₄ | d ₅ | d ₆ | d ₇ | d ₈ | d ₉ | d ₁₀ | d ₁₁ | d ₁₂ | d ₁₃ | d _i |
|------|----------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|-----------------|-----------------|-----------------|----------------|
| 18 | 30/35/40/45 | 6xM8 | 196 | 75 | 4xM8 | 95 | 217 | 217 | 116 | 62 | 77 | 220 | 24 | 14 | 129 |
| 20 | 35/40/45/50 | 6xM10 | 230 | 85 | 4xM10 | 110 | 254 | 254 | 135 | 72 | 90 | 257 | 36 | 20 | 148 |
| 25 | 40/45/50/55/60/65/70 | 6xM10 | 278 | 115 | 4xM10 | 140 | 302 | 302 | 180 | 85 | 120 | 305 | 36 | 25 | 199 |
| 31 | 80 | 8xM16 | 360 | 150 | 4xM16* | 200 | 390 | 390 | 200 | 110 | 150 | - | - | - | 243 |

| Size | d _a | h | h _{1 min.} | h _{1 max.} | h ₂ | h ₃ | h ₄ | h _{5 max.} | h ₆ | h ₇ | h ₈ | l | l ₁ | l ₂ | l ₃ | s _{air} | α | β |
|------|----------------|-------|---------------------|---------------------|----------------|----------------|----------------|---------------------|----------------|----------------|----------------|----|----------------|----------------|----------------|------------------|-------|------|
| 18 | 174 | 83.1 | 89 | 96.5 | 2.75 | 11 | 70.6 | 385 | 128 | 34 | 108.1 | 35 | 600 | 15.3 | 9.6 | 0.4 | 51.5° | 8° |
| 20 | 206 | 97.6 | 104 | 110 | 3.5 | 11 | 82.6 | 650 | 150 | 69 | 122.6 | 40 | 600 | 10.4 | 12 | 0.4 | 51.5° | 8° |
| 25 | 254 | 110.7 | 118 | 128 | 4.5 | 12.5 | 95.7 | 1045 | 173.5 | 69 | 135.7 | 50 | 600 | 17.3 | 12 | 0.5 | 51.5° | 6.5° |
| 31 | 330 | 149 | - | 173 | 10 | 10 | - | - | - | - | - | 70 | 600 | 33 | 19 | 0,5 | 5° | - |

■ d_{H7}: Hubs with a keyway in accordance with DIN 6885/1-P9 can only be used for the bore diameter indicated (d) up to the maximum standard braking torque. The dimensions of the shaft/hub connection for higher braking torques are to be determined in conjunction with the manufacturer.

■ * 4x M16 rotated by an angle of 45° in relation to illustration

■ l₁: Connecting cable length

■ m: Mass in kg

■ All dimensions in mm

Technical data

Rated data

| Size | P ₂₀ ¹⁾ holding [W] | P ₂₀ releasing [W] | s _{airmax} to standard torque [mm] | s _{airmax} increased torque [mm] | max. adjustment [mm] | min. ²⁾ rotor thickness [mm] | J _{Ai} rotor [kgcm ²] | Mass brake assembly [kg] | Mass stator [kg] |
|------|--|----------------------------------|--|--|-------------------------|--|---|--------------------------|------------------|
| 18 | 88 | 352 | 1.5 | 1.0 | 3.0 | 10.0 | 29 | 19 | 13.4 |
| 20 | 99 | 396 | 1.5 | 1.0 | 4.0 | 12.0 | 73 | 32 | 20 |
| 25 | 117 | 469 | 1.8 | 1.2 | 4.5 | 15.5 | 200 | 50 | 31 |
| 31 | 221 | 884 | 2 | 1.5 | 3 | 15 | 457 | 73.2 | 55.1 |

■ P₂₀: Coil power at 20 °C in W

■ ²⁾ The friction lining is dimensioned so that the brake can be readjusted at least 2 times.

■ ¹⁾ with holding current derating, possible deviation of up to + 10 % depending on supply voltage selected

Braking torques, depending on speed and permissible limit speeds

| Size | Reference variable rated torque at Δn = 100 rpm [%] | Braking torque at Δn ₀ [rpm] | | | Max. speed Δn _{0max} [rpm] |
|------|---|---|----------|----------|-------------------------------------|
| | | 1500 [%] | 3000 [%] | max. [%] | |
| 18 | 100 | 77 | 70 | 66 | 4.400 |
| 20 | 100 | 75 | 68 | 66 | 3.700 |
| 25 | 100 | 73 | 66 | 66 | 3.000 |
| 31 | 100 | 69 | – | – | 2300 |

■ As speed increases, so does wear

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

Rattling noises, which can occur in the rotor/hub connection, for example, during frequency inverter operation, or as a result of load alternation, or non-constant speeds, are reduced by using a rotor with a plastic sleeve. With size 31, the noise is reduced by inserting an O-ring between the rotor and the hub.



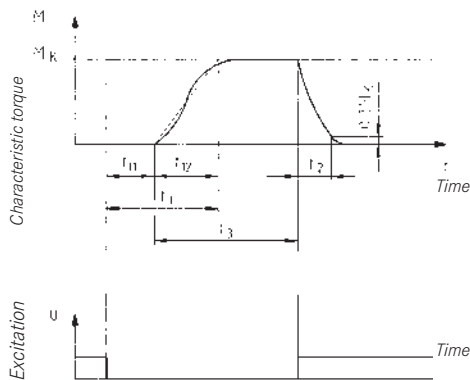
Technical data

Operating times

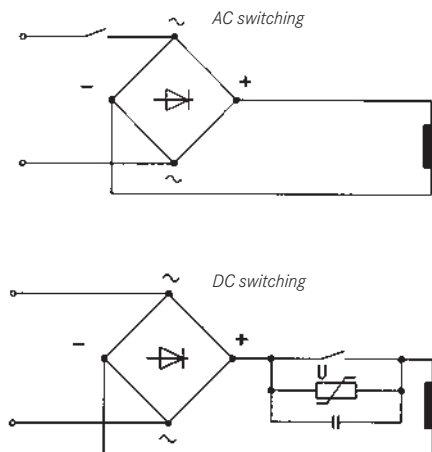
The listed operating times apply to DC switching with rated air gap s_{i0} , a warm coil and standard rated torque. The times shown are mean values. The engagement time t_1 is approximately 5 times higher for AC switching.

The engagement time t_1 increases if inching mode is shorter than the overexcitation time of the bridge/half-wave rectifier.

Torque time characteristic, dependent on excitation voltage



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



| Size | Braking torque rated value at $\Delta n = 100$ rpm M_K [Nm] | Maximum permissible switching energy with single operating Q_E [J] | Transition operating frequency S_h [h ⁻¹] | Operating times [ms] ¹⁾ at S_{i0} Switching on DC side | | | |
|------|--|---|--|--|--------------|-----------|----------------------------|
| | | | | [t_{11}] | [t_{12}] | [t_1] | Disengagement [t_2] |
| 18 | 150 | 60.000 | 20 | 26 | 30 | 56 | 70 |
| 20 | 260 | 80.000 | 19 | 56 | 112 | 168 | 106 |
| 25 | 400 | 120.000 | 15 | 62 | 135 | 197 | 120 |
| 31 | 1200 | 300.000 | 13 | 65 | 133 | 198 | 250 |

¹⁾ Operating times valid for 205 V DC coils

Technical data

Service life and wear

The brake has to be adjusted when $s_{\ddot{u}max}$ 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 vertical mounting.

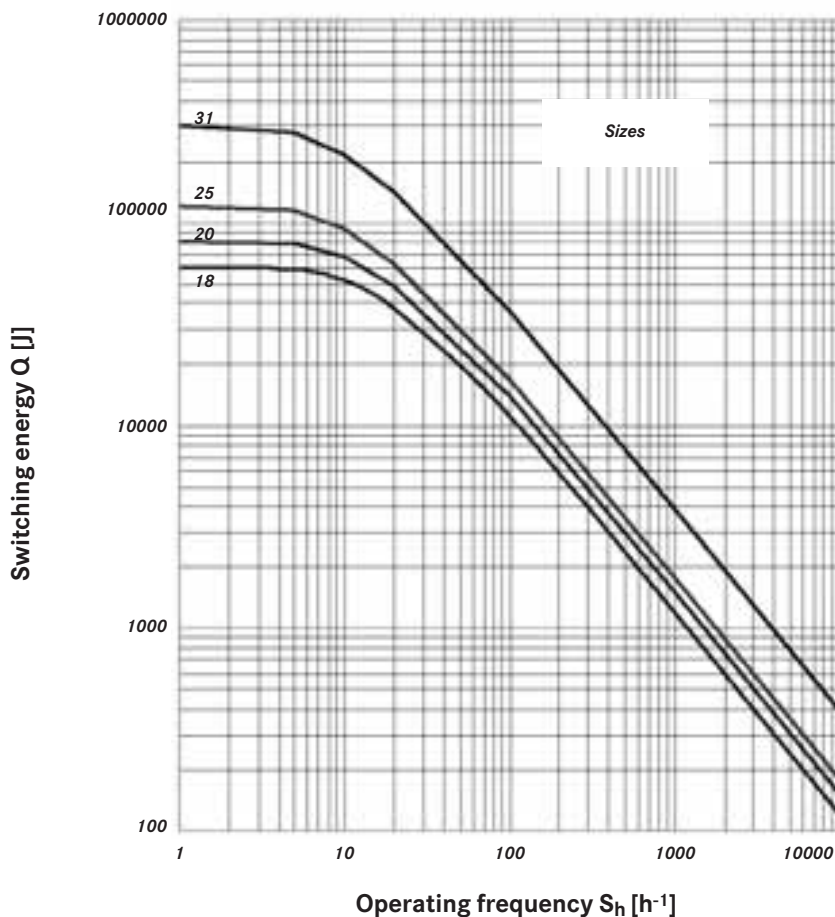
The BFK468 can be adjusted when the maximum permissible working air gap is reached ($s_{\ddot{u}max}$). The dimensioning of the friction lining allows adjustment to be carried out at least twice.

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).

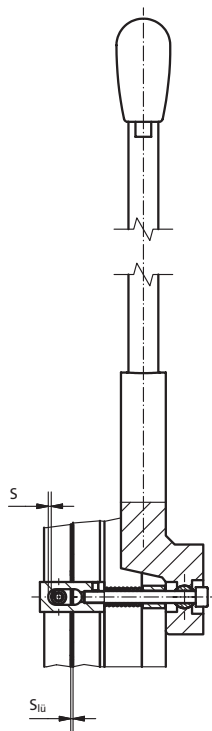
Maintenance

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.

Permissible friction energy Q_{perm} depending on operating frequency S_h



Accessories



Manual release

Manual release

The manual release is used to release the brake by hand and can also be retrofitted. It springs back into its original position (0 setting) automatically after operation. The release screws that are carried in a ball joint are only in tension. When installing the manual releases, care must be taken when setting dimension "s":

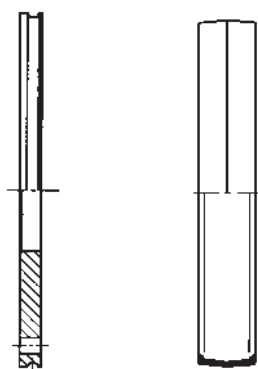
| Size | $s_{lü} \begin{smallmatrix} + 0.1 \\ - 0.05 \end{smallmatrix}$ [mm] | $s \begin{smallmatrix} + 0.1 \\ \end{smallmatrix}$ [mm] |
|------|--|--|
| 18 | 0.4 | 2 |
| 20 | 0.4 | 2 |
| 25 | 0.5 | 2.5 |
| 31 | - | - |

Caution:

Even with a reduced rated torque, the air gap must be readjusted when $s_{lümax}$ is reached for safety reasons.

Flange

If no suitable counter friction face is available, a flange on which the seal can be installed can be used.



Flange

Seal

Seal

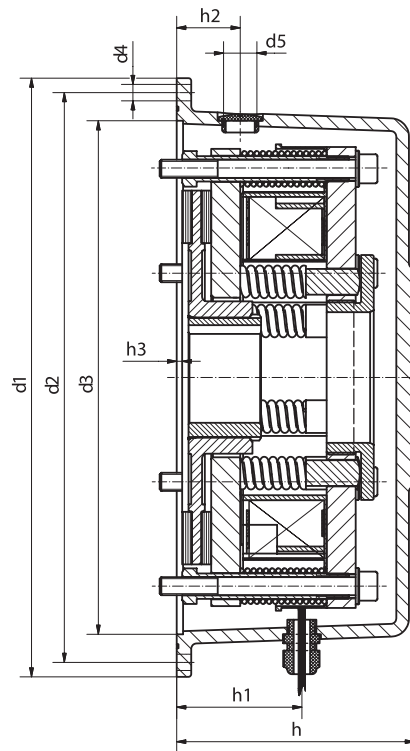
To a large extent, the cover ring prevents the exit or ingress of dust, humidity, dirt, etc., out of or into the braking area. The cover ring is inserted into the groove on the stator. If no suitable groove is available on the counter friction face, we recommend the use of a flange.

Accessories

Brake cover

Brake module E, N + cover = encapsulated design

A cover can be mounted onto basic module E and basic module N as an option, to protect the brake from water and dust (enclosure acc. to IP 65). This cover cannot be combined with a manual release.



| Size | d ₁ | d ₂ | d ₃ ^{H8} | d ₄ | d ₅ | h | h ₁ | h ₂ | h ₃ ¹⁾ |
|------|----------------|----------------|------------------------------|----------------|----------------|-----|----------------|----------------|------------------------------|
| 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 endshield

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.

Bridge/half-wave rectifier

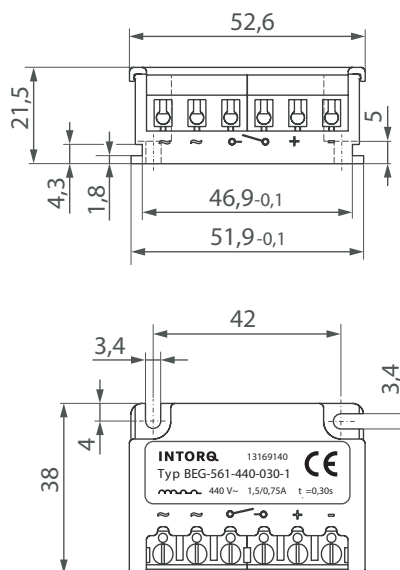
BEG-561-□□□-□□□

BFK468 brakes must only be operated with a bridge/half-wave rectifier.

Following a fixed overexcitation time, the bridge/half-wave rectifiers switch from bridge rectification to half-wave rectification.

Terminals 3 and 4 are in the DC circuit of the brake. With switching on the DC side, integrated overvoltage protection at terminals 5 and 6 limits the induced voltage peak (see "Reduced switch off times" diagram).

Dimensions



Technical data

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

U_1 = Input voltage (40 to 60 Hz)

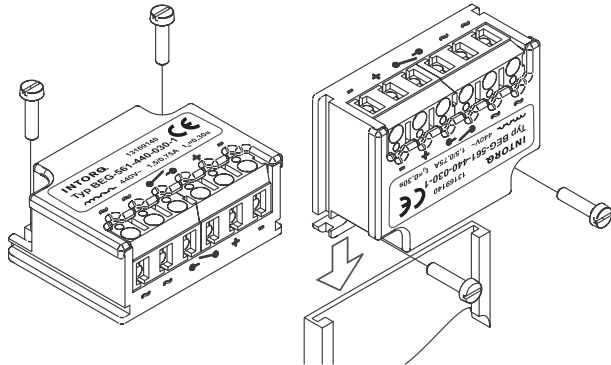
| Type | Input voltage U_1 (40 Hz to 60 Hz) | | | Max. current I_{max} | | Overexcitation time t_o ($\pm 20\%$) | | |
|-------------------|--------------------------------------|-----------------|-------------|------------------------|-------------------|--|-------------------|-------|
| | Min. [V~] | Rated Max. [V~] | Bridge [V~] | Half-wave [A] | At U_{1min} [A] | At U_{1r} [s] | At U_{1max} [s] | [s] |
| BEG-561-255-030 | 160 | 230 | 255 | 3.0 | 1.5 | 0.430 | 0.300 | 0.270 |
| BEG-561-255-130 | | | | 3.0 | 1.5 | 1.870 | 1.300 | 1.170 |
| BEG-561-440-030-1 | 230 | 400 | 440 | 1.5 | 0.75 | 0.500 | 0.300 | 0.270 |
| BEG-561-440-130 | | | | 3.0 | 1.5 | 2.300 | 1.300 | 1.200 |



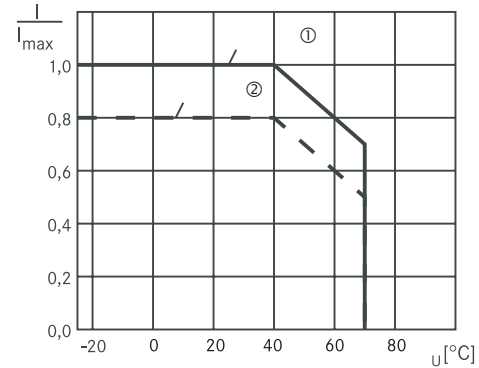
Bridge/half-wave rectifier

BEG-561-□□□-□□□

Fixing options



Permissible current load – ambient temperature



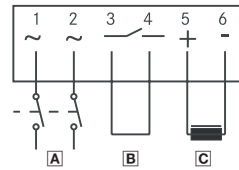
- ① Screw mounting with metal surface (good heat dissipation)
- ② Other mounting (e.g. adhesive)

Shortened release times

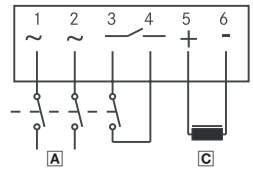
In the case of switching on the DC side (shorter release times) switching must also occur on the AC side! Otherwise, overexcitation will not occur on restarting.

Connection

Release times on the AC side



Release times on the DC side



- Ⓐ Mains
- Ⓑ Bridge
- Ⓒ Coil

Assignment of the bridge/half-wave rectifier to the brake size

| Brakes type | Half-wave rectifier type | Supply voltage [V AC] | Coil voltage release/holding [V DC] |
|-------------|--------------------------|-----------------------|-------------------------------------|
| BFK468-18 | BEG-561-255-030 | 230 ^{+10%} | 205/103 |
| BFK468-20 | BEG-561-255-130 | | |
| BFK468-25 | BEG-561-440-030-1 | 400 ^{+10%} | 360/180 |
| BFK468-18 | BEG-561-440-030-1 | | |
| BFK468-20 | BEG-561-440-130 | | |
| BFK468-25 | BEG-561-440-130 | | |
| BFK468-31 | | | |



Available variants

INTORQ BFK468□□□

Complete stator

| | |
|------------------------------|--|
| Size | <input type="checkbox"/> 18 <input type="checkbox"/> 20 <input type="checkbox"/> 25 <input type="checkbox"/> 31 |
| Design | <input type="checkbox"/> E (with torque adjustment ring, sizes 18, 20, 25) <input type="checkbox"/> N (without torque adjustment ring) |
| Brake voltage | <input type="checkbox"/> 205 V/103 V DC for 230 V AC supply voltage (not available for size 31) <input type="checkbox"/> 360 V/180 V DC for 400 V AC supply voltage |
| Braking torque | _____ Nm (see graduated torques) |
| Cable length | <input type="checkbox"/> Standard _____ mm (from 100 mm to 1000 mm in 100 mm steps, from 1000 mm to 2500 mm in 250 mm steps) |
| Manual release fitted | <input type="checkbox"/> (not available for size 31) |
| Armature plate | <input type="checkbox"/> Standard <input type="checkbox"/> Chromium-plated |
| Microswitch | <input type="checkbox"/> Switching function monitoring (release control) <input type="checkbox"/> Wear monitoring |
| Operating noise | <input type="checkbox"/> Reduced |

Accessories

| | |
|--------------------------|--|
| Rotor | <input type="checkbox"/> Standard <input type="checkbox"/> Noise-reduced (rotor with sleeve) |
| Hub | _____ mm (for bore diameter, see Dimensions) |
| Fixing screws set | <input type="checkbox"/> For mounting on flange/motor <input type="checkbox"/> For mounting on flange with through holes |
| Sealing | <input type="checkbox"/> Seal <input type="checkbox"/> Shaft sealing ring (shaft diameter on request) <input type="checkbox"/> Cap |
| Brake cover | <input type="checkbox"/> 18 <input type="checkbox"/> 20 <input type="checkbox"/> 25 |

Electrical accessories

| | |
|-----------------------------------|--|
| Bridge/half-wave rectifier | <input type="checkbox"/> BEG-561-255-030 <input type="checkbox"/> BEG-561-255-130 <input type="checkbox"/> BEG-561-440-030-1 <input type="checkbox"/> BEG-561-440-130 |
|-----------------------------------|--|



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