



**INTORQ**

setting the standard

## **BFK 470 spring-applied brake**

Degree of protection IP66

40 – 250 Nm

## 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<sup>2</sup> 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



## BFK470 – for increased requirements

The INTORQ range of spring-applied brakes is being expanded with the addition of the BFK470 series of sealed designs. This brake has been specifically developed for application areas that place increased requirements on the degree of protection. It is a self-contained system available in three sizes, and with braking torques of 40 - 250 Nm it is ideal for use in wind power plants, cranes and textile machines.

### Features

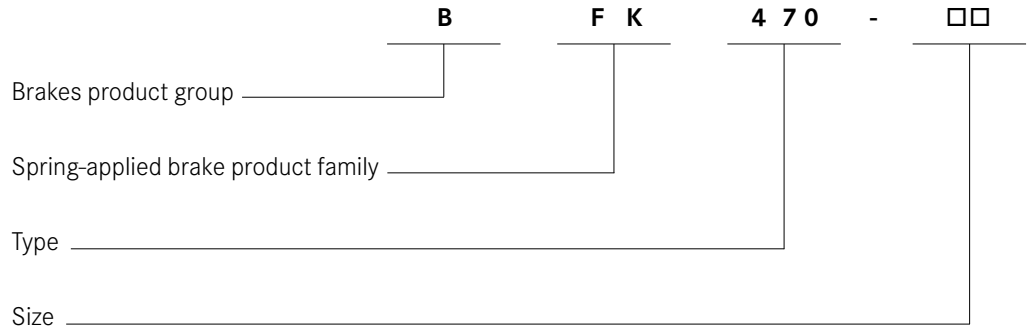
- Degree of protection corresponding to IP66, also available with hand release and inductive proximity switch
- Option of mounting a rotary transducer
- Wear can be measured when mounted
- Can be used up to -40°C (CCV Cold Climate Version)

### Fields of application

- Brake motors
- Wind turbines
- Car wash systems
- Cranes
- Lift applications
- Textile machines



# INTORQ BFK470-□□ product key



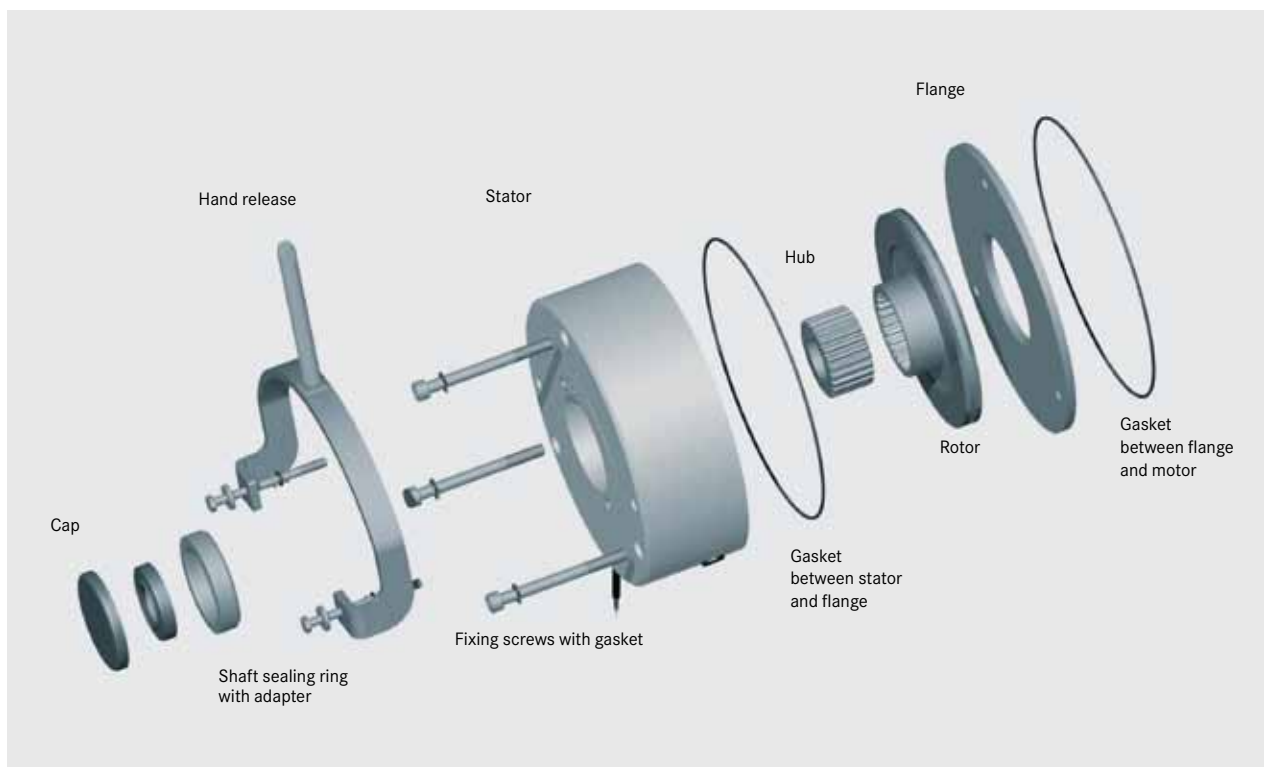
**Sizes**

14, 16, 18

**Stator design**

Brake designs with and without flange  
 Degree of protection up to IP66 (optional)

Not coded:  
 Supply voltage, hub bore,  
 options



## Product information

### A powerful and complete range

- 3 sizes
- Standard voltages [V DC] 24, 103, 180, 205
- Graduated torque range from 40 - 250 Nm
- Degree of protection up to IP66

### Torque transmission

- Designed for dry running

### Quick and easy mounting

- Preset air gap
- Special machining of the friction surfaces ensures that the characteristic 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

### Options

- Hand release according to degree of protection IP66 for all sizes, both directions can be used for release
- Noise-reduced rotor
- Contactless proximity switch according to degree of protection IP66 carries out function monitoring
- Non-standard voltages and bores on request
- Pulse width modulation (PWM)  
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

### Temperature resistant up to -40 °C

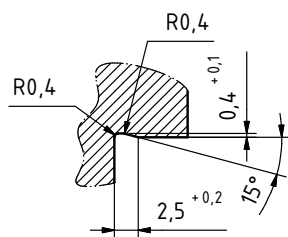
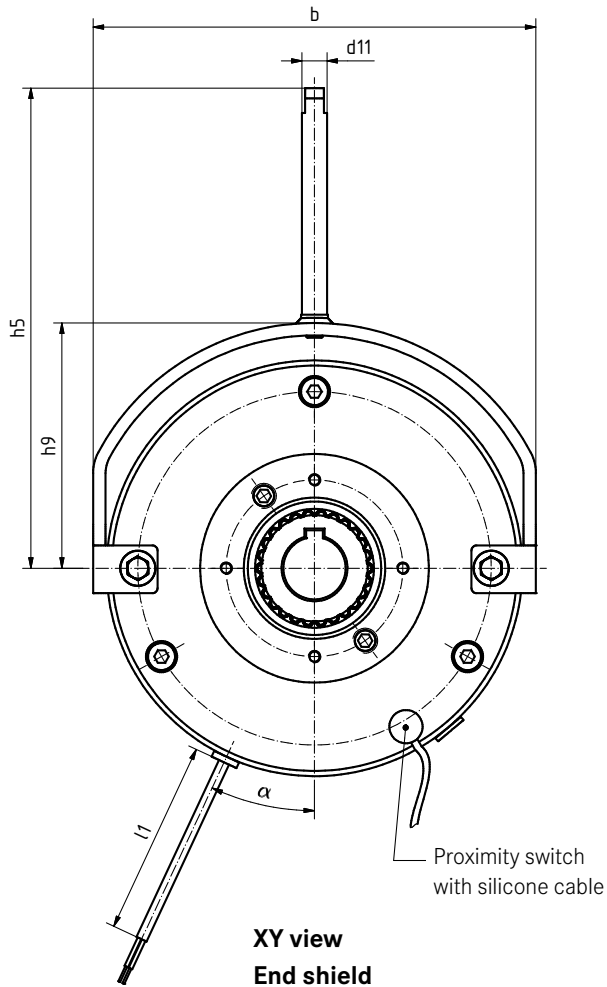
- Optional CCV (Cold Climate Version) design
- Use of temperature-resistant fixing screws is essential
- Also available with noise-reduced rotor
- Contactless proximity switch ready for operation (information evaluation) up to -25°C, approved for use up to -40°C (without component damage)

## List of abbreviations

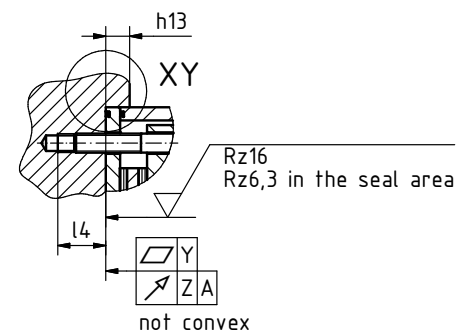
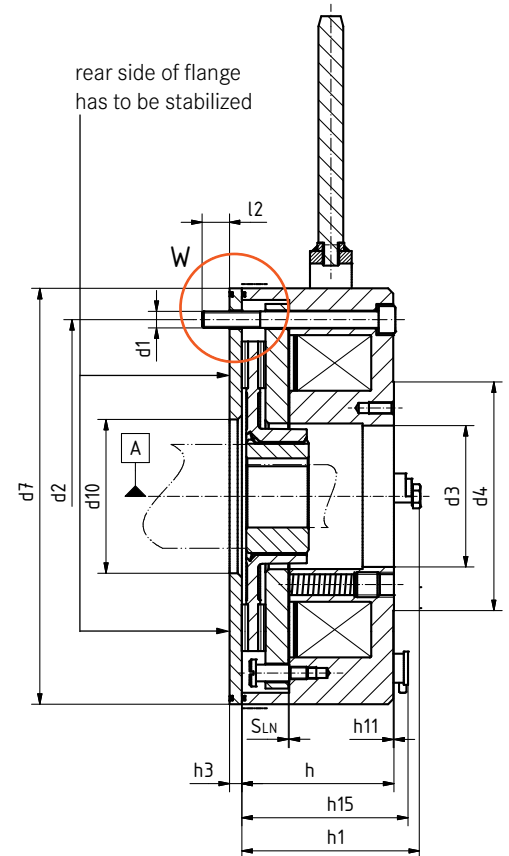
|                         |         |                                                                                                 |                         |      |                                                                                                       |
|-------------------------|---------|-------------------------------------------------------------------------------------------------|-------------------------|------|-------------------------------------------------------------------------------------------------------|
| <b>P<sub>N</sub></b>    | [W]     | Rated coil power at rated voltage and 20°C                                                      | <b>S<sub>LN</sub></b>   | [mm] | Rated air gap                                                                                         |
| <b>U<sub>N</sub></b>    | [V DC]  | Rated coil voltage                                                                              | <b>S<sub>Lmax</sub></b> | [mm] | Maximum air gap                                                                                       |
| <b>M<sub>K</sub></b>    | [Nm]    | Rated torque of the brake, at a relative speed of 100 r/min                                     | <b>t<sub>1</sub></b>    | [s]  | Engagement time, the total of the reaction delay and torque rise time<br>$t_1 = t_{11} + t_{12}$      |
| <b>Δn<sub>0</sub></b>   | [r/min] | Initial relative speed of the brake                                                             | <b>t<sub>2</sub></b>    | [s]  | Disengagement time, time from switching the stator until the torque has reduced to 0.1 M <sub>K</sub> |
| <b>Q</b>                | [J]     | Heat/energy                                                                                     | <b>t<sub>3</sub></b>    | [s]  | Slipping time to standstill (after t <sub>11</sub> )                                                  |
| <b>Q<sub>E</sub></b>    | [J]     | Maximum permissible friction work per switching cycle, thermal rating of the brake              | <b>t<sub>11</sub></b>   | [s]  | Delay time when connecting, time from disconnecting the voltage until the torque begins to rise       |
| <b>Q<sub>Smax</sub></b> | [J]     | maximum permissible friction work during cyclic switching, depending on the operating frequency | <b>t<sub>12</sub></b>   | [s]  | Rise time of braking torque, time from beginning of rise of torque until braking torque is reached    |
| <b>S<sub>h</sub></b>    | [1/h]   | Operating frequency, the number of repeated operations per unit time                            |                         |      |                                                                                                       |
| <b>S<sub>hmax</sub></b> | [1/h]   | Maximum permissible operating frequency, depending on the friction work per operation           |                         |      |                                                                                                       |

## Technical data

### BFK470 spring-applied brake



### Brake with flange on motor end shield with centring for tacho mounting

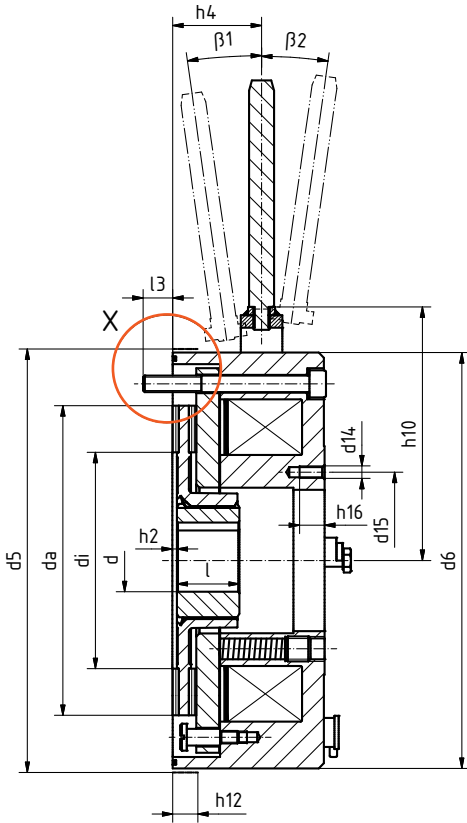


| Size | b   | dJ <sup>7 1)</sup><br>spec. | dH <sup>7 2)</sup><br>standard | d <sub>1</sub> | d <sub>2</sub> | d <sub>3</sub> <sup>h7</sup> | d <sub>4</sub> | d <sub>5</sub> <sup>h7</sup> | d <sub>6</sub> | d <sub>7-0.2/-0.3</sub> | d <sub>9</sub> | d <sub>10</sub> | d <sub>11</sub> | d <sub>14</sub> | d <sub>15</sub> | d <sub>16</sub> <sup>H8</sup> | d <sub>i</sub> | d <sub>a</sub> | h    | h <sub>1</sub> | h <sub>2</sub> | h <sub>3</sub> | h <sub>4</sub> | h <sub>5</sub> |
|------|-----|-----------------------------|--------------------------------|----------------|----------------|------------------------------|----------------|------------------------------|----------------|-------------------------|----------------|-----------------|-----------------|-----------------|-----------------|-------------------------------|----------------|----------------|------|----------------|----------------|----------------|----------------|----------------|
| 14   | 179 | 14                          | 20/25/30                       | 3xM8           | 145            | 60                           | 100            | 168                          | 168            | 168                     | 52             | 64              | 12              | 4xM6            | 75              | 168                           | 80             | 124            | 67.1 | 75.3           | 2              | 6              | 38.8           | 185.5          |
| 16   | 213 | 15                          | 25/30/35                       | 3xM8           | 170            | 68                           | 110            | 200                          | 200            | 200                     | 52             | 74              | 12              | 4xM6            | 85              | 200                           | 104            | 149            | 73.1 | 85.8           | 2.25           | 6              | 42.8           | 231            |
| 18   | 243 | 20                          | 30/35/40/45                    | 6xM8           | 196            | 75                           | 125            | 226                          | 226            | 226                     | 62             | 95              | 14              | 4xM8            | 95              | 226                           | 129            | 174            | 83.1 | 96.4           | 2.75           | 6              | 47.8           | 290            |

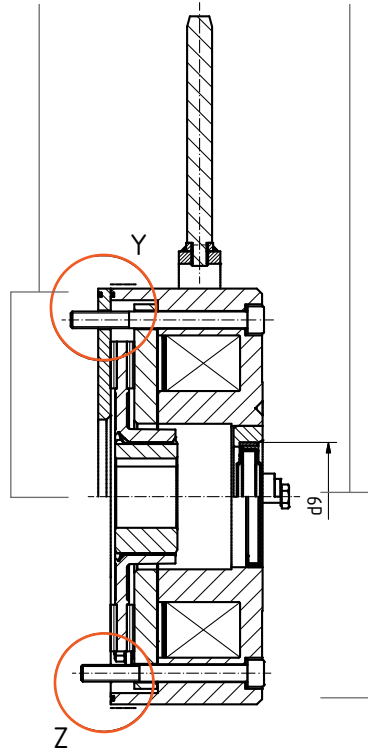
<sup>1)</sup> Predrilled without keyway

<sup>2)</sup> Standard keyway in accordance with DIN 6885/1 P9  
in case of high torques and/or reversing duty, a special hub has to be used

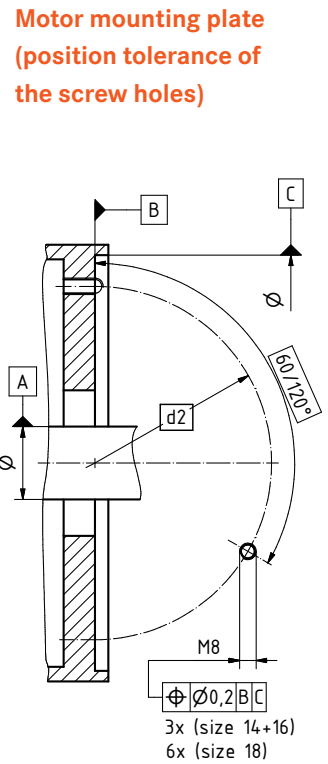
**Brake without flange on motor end shield with centring for tacho mounting**



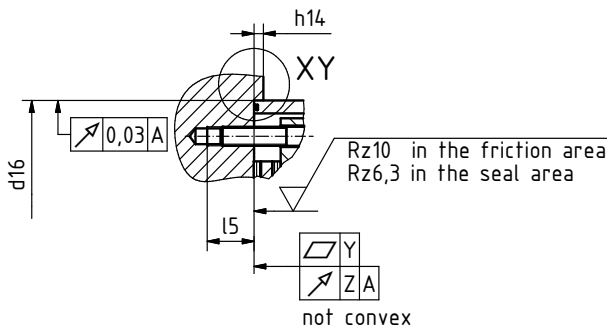
**Brake with flange on motor end shield without centring**



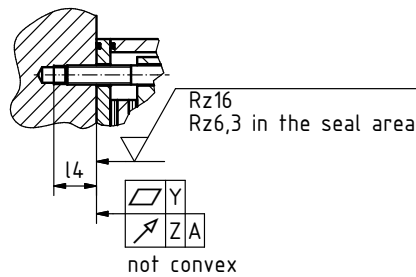
**Brake without flange on motor end shield without centring**



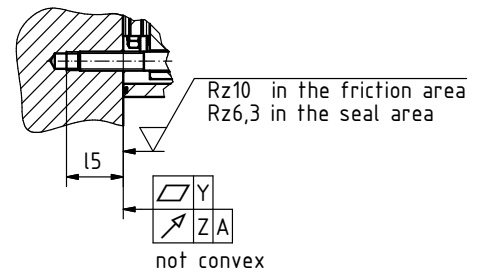
**X view**



**Y view**



**Z view**



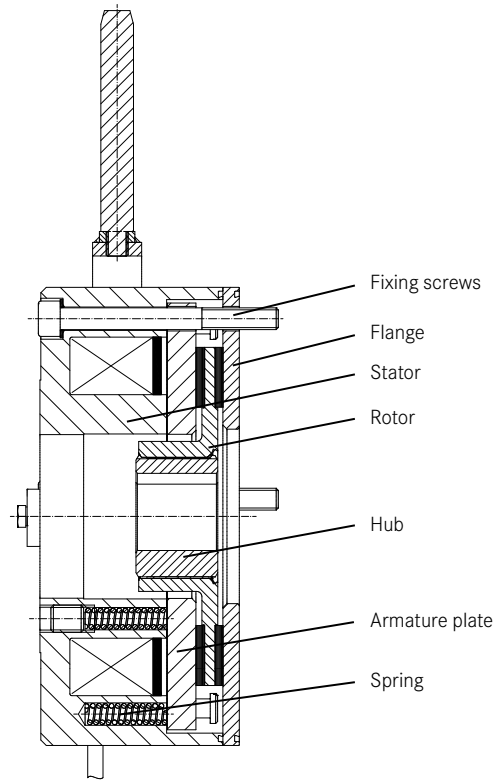
| Size | h <sub>9</sub> | h <sub>10</sub> | h <sub>11</sub> | h <sub>12</sub> | h <sub>13 min.</sub> | h <sub>13 max.</sub> | h <sub>14 min.</sub> | h <sub>14 max.</sub> | h <sub>15</sub> | h <sub>16</sub> | i  | l <sub>1</sub> | l <sub>2</sub>          | l <sub>3</sub> | l <sub>4 min.</sub> | l <sub>5 min.</sub> | S <sub>L</sub>             | α   | β <sub>1+3</sub> | β <sub>2+3</sub> | Y    | Z    |
|------|----------------|-----------------|-----------------|-----------------|----------------------|----------------------|----------------------|----------------------|-----------------|-----------------|----|----------------|-------------------------|----------------|---------------------|---------------------|----------------------------|-----|------------------|------------------|------|------|
| 14   | 100.5          | 104.5           | 0.3             | 12              | 10                   | 16                   | 6.5                  | 10                   | 79.4            | 12              | 30 | 400            | 14.3                    | 15.3           | 19                  | 20                  | 0.3 <sub>+0.10/-0.10</sub> | 25° | 9°               | 8°               | 0.05 | 0.05 |
| 16   | 118            | 122             | 0.3             | 12              | 10                   | 16                   | 6.5                  | 10                   | 81.5            | 12              | 30 | 600            | 13.2/18.2 <sup>3)</sup> | 14.2           | 17/22 <sup>3)</sup> | 18                  | 0.3 <sub>+0.15/-0.05</sub> | 25° | 8°               | 8°               | 0.08 | 0.05 |
| 18   | 135            | 140             | 0.3             | 12              | 10                   | 16                   | 6.5                  | 10                   | 91.6            | 16              | 35 | 600            | 19.3                    | 15.3           | 23                  | 19                  | 0.4 <sub>+0.20/-0.10</sub> | 25° | 10°              | 9°               | 0.1  | 0.08 |

<sup>3)</sup> For the CCV design  
 Dimensions in mm

## Functional principle

### BFK470 spring-applied brake

BFK470 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.



### 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



# Characteristic torques

## General information

INTORQ brakes are dimensioned so that the specified characteristic 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 characteristic 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.

## Friction lining qualities

Various friction lining qualities are available for different uses and areas of application:

- **ST** Standard friction lining
- **WR** Friction lining with low rate of wear
- **HFC** High friction coefficient friction lining for high braking torques
- **RIF** Run-in-free friction lining, does not require a running-in period
- **HT** High-temperature friction lining, temperature resistant and suitable for high friction energies

The characteristic torques listed in the table apply to the standard (**ST**) and low-wear (**WR**) friction linings. The other friction linings are used primarily in holding brake and emergency stop applications. With the **HFC** and **RIF** linings, it is also possible to achieve higher characteristic torques.

## Characteristic torques

| Size | Characteristic torque $M_k$ [Nm] |                                                      |                       | Reduction of characteristic torque at specified speed to x% |              |      |
|------|----------------------------------|------------------------------------------------------|-----------------------|-------------------------------------------------------------|--------------|------|
|      | ST/WR operating brake            | ST/WR/RIF/HT holding brake <sup>2)</sup>             | HFC/RIF holding brake | 1500 [r/min]                                                | 3000 [r/min] | max. |
| 14   | 40/50/ <b>60</b> <sup>1)</sup>   | 40/50/ <b>60</b> <sup>1)</sup> / 65/70/75/80/100/110 | > 110                 | 80%                                                         | 73%          | 67%  |
| 16   | 55/ <b>80</b> <sup>1)</sup>      | 55/ <b>80</b> <sup>1)</sup> / 90/100/105/125/150     | > 150                 | 80%                                                         | 73%          | 67%  |
| 18   | 100/ <b>150</b> <sup>1)</sup>    | 100/ <b>150</b> <sup>1)</sup> / 165/185/200/235/250  | > 250                 | 80%                                                         | 73%          | 67%  |

■ <sup>1)</sup> Standard characteristic torques

■ <sup>2)</sup> HT friction lining is approved for use up to 100 Nm for size 14, and up to 125 Nm for size 16

## Characteristic torques

### Features of the special friction linings

#### HFC (high friction coefficient)

- For higher braking torques
- Use as holding brake
- Running-in period required

#### RIF (run-in-free)

- Stable, static torque
- Use as holding brake
- No running-in period required
- Developed for the strict requirements placed on pitch drives in wind turbines
- Restricted maximum speed

#### HT (high-temperature)

- Friction lining resistant to high temperatures, allows friction energies up to a factor of 5 (in comparison with standard aluminium rotor)
- Use as holding brake
- Stable, static torque
- Particularly well suited to pitch and azimuth drives in wind turbines

As the special friction linings have been developed for specific uses and areas of application, this flyer does not contain any additional information on them. For more details, please consult the manufacturer during the project planning stage.



BFK470, aluminium

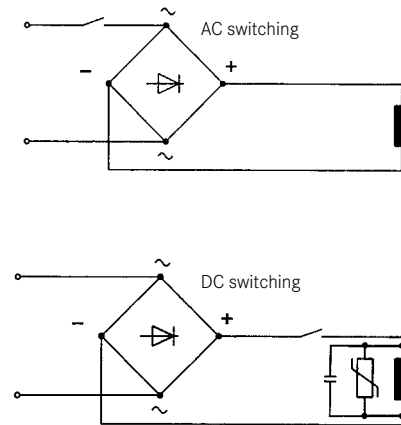
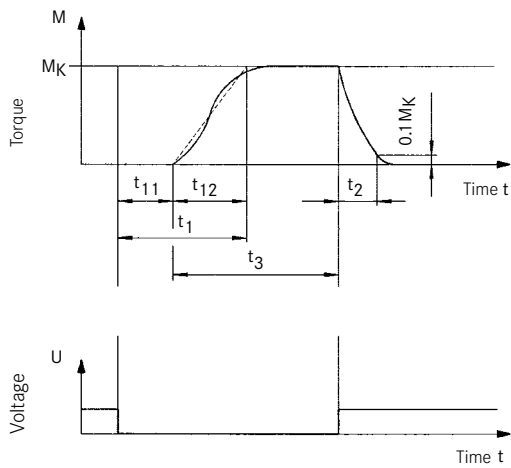


# Technical data

## Rated data

| Size | $P_N$ [W] | $s_{LN}$ [mm]                         | $s_{L \max}$ [mm]<br>Operating brake | $s_{L \max}$ [mm]<br>Holding brake |
|------|-----------|---------------------------------------|--------------------------------------|------------------------------------|
| 14   | 60        | 0.3 ±0.1                              | 0.75                                 | 0.45                               |
| 16   | 68        | 0.3 <sup>+0.15</sup> <sub>-0.05</sub> | 0.80                                 | 0.50                               |
| 18   | 85        | 0.4 <sup>+0.2</sup> <sub>-0.1</sub>   | 1.0                                  | 0.65                               |

Torque time characteristic dependent on excitation voltage



## Standard aluminium rotor (ST)

The listed operating times are guide values which apply to DC switching with rated air gap  $s_{LN}$ , warm coil and standard characteristic torque.

The times specified are mean values. The engagement time  $t_1$  is approximately 8 to 10 times longer for AC switching.

| Size | Characteristic torque $M_K$ [Nm] | Maximum speed $n_{max}$ [r/min] | $Q_E$ [J] | $S_{hue}$ [1/h] | Operating times [ms]      |          |       |               |
|------|----------------------------------|---------------------------------|-----------|-----------------|---------------------------|----------|-------|---------------|
|      |                                  |                                 |           |                 | Connection on the DC side |          |       | Disconnection |
|      |                                  |                                 |           |                 | $t_{11}$                  | $t_{12}$ | $t_1$ | $t_2$         |
| 14   | 60                               | 3600                            | 30,000    | 28              | 30                        | 47       | 76    | 162           |
| 16   | 80                               | 3600                            | 36,000    | 27              | 46                        | 62       | 109   | 225           |
| 18   | 150                              | 3600                            | 60,000    | 20              | 62                        | 92       | 155   | 343           |

## Technical data

### Aluminium rotor with low rate of wear (WR)

The wear values in the table apply to the friction lining with low rate of wear and to the standard characteristic 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                                                                                                                                                                                |                     | 14     | 16         | 18         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------|------------|------------|
| <b>Q<sub>E</sub> Maximum permissible friction work per switching cycle [J]</b><br><br>100 r/min<br>1000 r/min<br>1200 r/min<br>1500 r/min<br>1800 r/min<br>3000 r/min<br>3600 r/min |                     |        |            |            |
|                                                                                                                                                                                     |                     | 30,000 | 36,000     | 60,000     |
|                                                                                                                                                                                     |                     | 30,000 | 36,000     | 60,000     |
|                                                                                                                                                                                     |                     | 30,000 | 36,000     | 60,000     |
|                                                                                                                                                                                     |                     | 30,000 | 36,000     | 60,000     |
|                                                                                                                                                                                     |                     | 30,000 | 36,000     | 36,000     |
|                                                                                                                                                                                     |                     | 18,000 | 11,000     | on request |
|                                                                                                                                                                                     |                     |        | on request |            |
| Q <sub>BW</sub>                                                                                                                                                                     | [10 <sup>6</sup> J] | 571    | 966        | 1542       |
| S <sub>hue</sub>                                                                                                                                                                    | [h <sup>-1</sup> ]  | 28     | 27         | 20         |

Q<sub>BW</sub> = Friction energy of brake until maintenance  
 S<sub>hue</sub> = Transitional operating frequency

In the region of the load limit (operation > 50% Q<sub>E</sub>) the value for Q<sub>BW</sub> can drop as low as 40%.

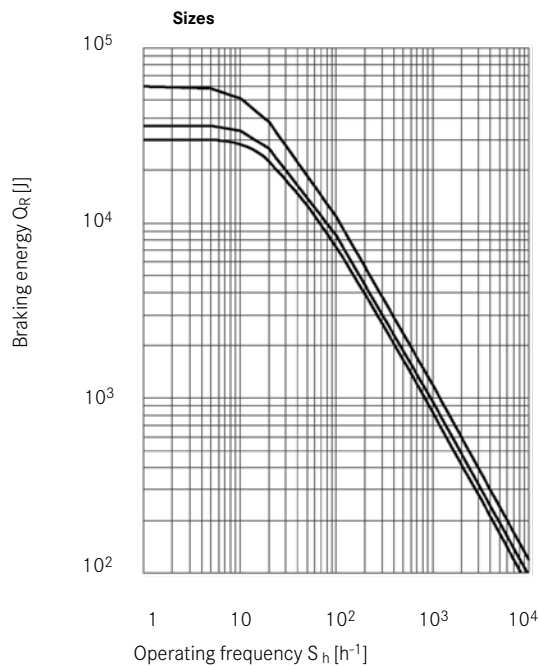


# Technical data

## Service life and wear

### Friction energy and operating frequency

For the standard (ST) and low-wear (WR) friction linings



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

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

The friction energy that can be withstood up to the wear limit of the brake 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. In addition, increased wear should be expected with a vertical brake shaft.

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.

## Product overview

### BFK470 spring-applied brake

|                                     |                                                                                                                                                                                                                                                                                                                                |                                                          |                                                               |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------|
| <b>Size</b>                         | <input type="checkbox"/> 14                                                                                                                                                                                                                                                                                                    | <input type="checkbox"/> 16                              | <input type="checkbox"/> 18                                   |
| <b>Degree of protection</b>         | <input type="checkbox"/> IP54                                                                                                                                                                                                                                                                                                  | <input type="checkbox"/> IP66                            |                                                               |
| <b>Design</b>                       | <input type="checkbox"/> With flange                                                                                                                                                                                                                                                                                           | <input type="checkbox"/> Without flange                  |                                                               |
| <b>Voltage</b>                      | <input type="checkbox"/> 24 V                                                                                                                                                                                                                                                                                                  | <input type="checkbox"/> 103 V                           | <input type="checkbox"/> 180 V <input type="checkbox"/> 205 V |
| <b>Characteristic torque</b>        | <input type="checkbox"/> Size 14: 40/50/ <b>60</b> <sup>1)</sup> /65/70/75/80/100/110*<br><input type="checkbox"/> Size 16: 55/ <b>80</b> <sup>1)</sup> /90/100/105/125/150*<br><input type="checkbox"/> Size 18: 100/ <b>150</b> <sup>1)</sup> /165/185/200/235/250*                                                          |                                                          |                                                               |
|                                     | <sup>1)</sup> Standard characteristic torque<br>* Higher braking torques possible in combination with a special friction lining<br>Consultation with manufacturer required                                                                                                                                                     |                                                          |                                                               |
| <b>Cable length</b>                 | <input type="checkbox"/> Size 14: 400 mm <input type="checkbox"/> Size 16: 600 mm <input type="checkbox"/> Size 18: 600 mm<br><input type="checkbox"/> Special lengths: from 100 – 1000 mm in 100 mm graduations<br>from 1000 – 2500 mm in 250 mm graduations                                                                  |                                                          |                                                               |
| <b>Temperature range</b>            | <input type="checkbox"/> Standard -20 to +50 °C<br><input type="checkbox"/> Optional -40 to +50 °C (CCV, Cold Climate Version)                                                                                                                                                                                                 |                                                          |                                                               |
| <b>Hand release mounted</b>         | <input type="checkbox"/> Standard                                                                                                                                                                                                                                                                                              |                                                          |                                                               |
| <b>Tacho mounting</b>               | <input type="checkbox"/> Bores on rear side (taking into account customer sealing)                                                                                                                                                                                                                                             |                                                          |                                                               |
| <b>Contactless proximity switch</b> | <input type="checkbox"/> Switching function monitoring only available as holding brake (wear monitoring not possible)                                                                                                                                                                                                          |                                                          |                                                               |
| <b>Cap</b>                          | <input type="checkbox"/>                                                                                                                                                                                                                                                                                                       |                                                          |                                                               |
| <b>Shaft sealing ring</b>           | <input type="checkbox"/> Size 14: ø 20 - 25 - 30 mm <input type="checkbox"/> according to CCV<br><input type="checkbox"/> Size 16: ø 25 - 30 - 35 mm <input type="checkbox"/> according to CCV<br><input type="checkbox"/> Size 18: ø 30 - 35 - 40 - 45 mm <input type="checkbox"/> according to CCV                           |                                                          |                                                               |
| <b>Aluminium rotor</b>              | <input type="checkbox"/> Standard<br><input type="checkbox"/> Standard and noise-reduced<br><input type="checkbox"/> Low rate of wear<br><input type="checkbox"/> Low rate of wear and noise-reduced<br><input type="checkbox"/> Special friction lining<br><input type="checkbox"/> Special friction lining and noise-reduced |                                                          |                                                               |
| <b>Hub</b>                          | <input type="checkbox"/> Size 14: ø 20 - 25 - 30 mm<br><input type="checkbox"/> Size 16: ø 25 - 30 - 35 mm<br><input type="checkbox"/> Size 18: ø 30 - 35 - 40 - 45 mm                                                                                                                                                         |                                                          |                                                               |
|                                     | } other bore diameters<br>on request<br>Standard bore diameter; in case of high torques and/or reversing duty, a special hub has to be used                                                                                                                                                                                    |                                                          |                                                               |
| <b>Flange</b>                       | <input type="checkbox"/> Standard                                                                                                                                                                                                                                                                                              | <input type="checkbox"/> Sealed                          |                                                               |
| <b>Fixing screw set</b>             | <input type="checkbox"/> For mounting with flange                                                                                                                                                                                                                                                                              | <input type="checkbox"/> For mounting without flange     |                                                               |
|                                     | <input type="checkbox"/> For mounting with CCV flange                                                                                                                                                                                                                                                                          | <input type="checkbox"/> For mounting without CCV flange |                                                               |