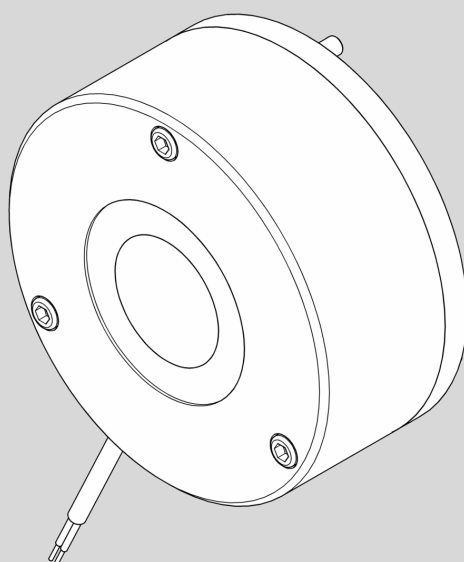


Operating Instructions INTORQ BFK 46 1-□□

Electromagnetically released spring-applied brake



INTORQ

setting the standard

www.intorq.de

Product key

INTORQ **B** **FK** **461** - □□ □

| | | | | |
|----------|--|--|--|--|
| A | | | | |
| B | | | | |
| C | | | | |
| D | | | | |
| E | | | | |

Legend for INTORQ BFK461 product key

| | | |
|----------|----------------|-------------------------------|
| A | Product group | Brakes |
| B | Product family | Spring-applied brake |
| C | Type | 461 |
| D | Size | 06, 08, 10, 12, 14, 16, 18 |
| E | Design | N (stator cannot be adjusted) |

Not coded: Supply voltage, hub bore, options

Nameplate

| Field | Contents | | | Example |
|-------|---------------|--------------|---------------------|---|
| 1 | Manufacturer | CE mark | | INTORQ D-Aerzen CE Typ: BFK461-08N 205V DC 25W 15H7 Nr.: 13147077 8NM 15.02.08 |
| 2 | Brake type | | | |
| 3 | Rated voltage | Rated power | Hub diameter | |
| 4 | Order no. | Rated torque | Date of manufacture | |

Packaging sticker

| Field | Contents | | | Example |
|-------|---|-----------------|--|--|
| 1 | Manufacturer | Bar code of no. | | INTORQ D-Aerzen Typ: BFK461-08N Nr. 13147077 FEDERKRAFTBREMSE 1 Stück 205V DC 25W 8NM 15H7 15.02.08 Rostschutzverpackung-Reibfläche fettfrei halten! CE |
| 2 | Brake type | Order no. | | |
| 3 | Designation | Qty. per box | | |
| 4 | Rated voltage / rated power / rated torque / hub diameter / date of packaging | | | |
| 5 | Supplement | CE mark | | |

This documentation applies to:

INTORQ BFK461-06

INTORQ BFK461-14

INTORQ BFK461-08

INTORQ BFK461-16

INTORQ BFK461-10

INTORQ BFK461-18

INTORQ BFK461-12

Document history

| Material number | Version | | | Description |
|-----------------|---------|---------|------|--|
| 13252772 | 1.0 | 04/2008 | TD09 | First edition for series |
| 13252772 | 1.1 | 12/2008 | TD09 | Supplement in chapter 7.2 - table |
| 13343654 | 2.0 | 07/2010 | TD09 | Values of brake torque and speed modified (☐ Kap. 3.3) |

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1 Preface and general information

1.1 About these Operating Instructions

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

1.2 Terminology used

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

1.3 Scope of supply

- The drive systems are combined individually according to a modular design. The scope of delivery is indicated in the accompanying papers.
- After receipt of the delivery, check immediately whether it corresponds to the accompanying papers. INTORQ does not grant any warranty for deficiencies claimed subsequently. Claim
 - visible transport damage immediately to the forwarder.
 - visible deficiencies / incompleteness immediately to INTORQ GmbH & Co.KG.

1.4 Disposal

The spring-applied brake consists of different types of material.

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

1 Preface and general information

1.5 Drive systems

Labelling

Drive systems and components are unambiguously designated by the indications on the nameplate.

Manufacturer: INTORQ GmbH & Co KG, Wülmser Weg 5, D-31855 Aerzen

- The spring-applied INTORQ brake is also delivered in single modules and individually combined to its modular design. The data - package labels, nameplate, and type code in particular - apply to the complete stator.
- If single modules are delivered, the labelling is missing.

1.6 Legal regulations

Liability

- The information, data and notes in these Operating Instructions met the state of the art at the time of printing. Claims referring to drive systems which have already been supplied cannot be derived from the information, illustrations and descriptions.
- We do not accept any liability for damage and operating interference caused by:
 - inappropriate use
 - unauthorised modifications to the drive system
 - improper working on and with the drive system
 - operating faults
 - disregarding these Operating Instructions

Warranty

- Terms of warranty: see terms of sale and delivery of INTORQ GmbH & Co. KG.
- Warranty claims must be made to INTORQ immediately after detecting defects or faults.
- The warranty is void in all cases where liability claims cannot be made.

2 Safety instructions

2.1 General safety information

- These safety notes do not claim to be complete. If any questions or problems occur, please contact INTORQ GmbH & Co. KG.
- The spring-applied brake met the state of the art at the time of delivery and is generally safe to operate.
- It must be ensured that only qualified personnel work on and with the INTORQ spring-applied brakes.

Qualified personnel are persons who, because of their training, experience and knowledge of all applicable standards and regulations as well as of all operating circumstances, have been entitled by the person responsible for the safety of the system to work on and with the system and to see and avoid all possible dangers.

(Definition for personnel to IEC 364)

- The spring-applied brake is hazardous to persons, the spring-applied brake itself and other properties of the operator if
 - non-qualified personnel work on and with the spring-applied brake.
 - the spring-applied brake is used inappropriately.
- The spring-applied brakes must be planned in such a way that if they are correctly installed and used for their designed purpose in fault-free operation, they fulfil their function and do not put any persons at risk. This also applies to the interaction thereof with the overall system.
- Take appropriate measures to ensure that the failure of the spring-applied brake will not lead to damage to material.

2.2 General application notes

- Do not operate the spring-applied brake unless it is in perfect condition.
- Retrofittings, modifications and changes of the drive system are generally forbidden. In any case, INTORQ GmbH & Co. KG must be contacted beforehand.
- The friction lining and the friction surfaces must be carefully protected from oil or grease since even small amounts of lubricants reduce the brake torque considerably.
- The rated torques specified in the catalog and in these Operating Instructions are torques after a run-in phase.
- The braking torque will usually not be influenced if the brake is used under the environmental conditions that apply to IP66. Because of the numerous possibilities of using the brake, it is however necessary to check the functionality of all mechanical components under the corresponding operating conditions.
- Protect electrical connections against contact.
- The brake consists of different types of material which must be recycled or disposed of according to applicable environmental regulations.

2 Safety instructions

2.3 Application as directed

- Drive systems
 - are intended for use in machinery and systems.
 - must only be used for the purposes ordered and confirmed.
 - must only be operated under the ambient conditions prescribed in these Operating Instructions.
 - must not be operated beyond their corresponding power limits.

Any other use shall be deemed inappropriate!

Possible applications of the INTORQ spring-applied brake

- No explosive or aggressive atmosphere.
- Humidity, no restrictions.
- Ambient temperature: -20°C to +40°C.
- Thermal class F (+155°C)
 - all materials used are designed for a max. operating temperature of 155°C.


2 Safety instructions

2.4 Notes used

The following pictographs and signal words are used in this documentation to indicate dangers and important information:

Safety instructions




Structure of safety instructions:

 **Danger!**
 Characterises the type and severity of danger




Note
 Describes the danger

Possible consequences:
 ■ List of possible consequences if the safety instructions are disregarded.

Protective measure:
 ■ List of protective measures to avoid the danger.

| Pictograph and signal word | Meaning |
|--|---|
|  Danger! | Danger of personal injury through dangerous electrical voltage Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken. |
|  Danger! | Danger of personal injury through a general source of danger Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken. |
|  Stop! | Danger of property damage Reference to a possible danger that may result in property damage if the corresponding measures are not taken. |

Application notes

| Pictograph and signal word | Meaning |
|--|--|
|  Note! | Important note to ensure troublefree operation |
|  Tip! | Useful tip for simple handling |
|  | Reference to another documentation |

3 Technical data

3.1 Product description

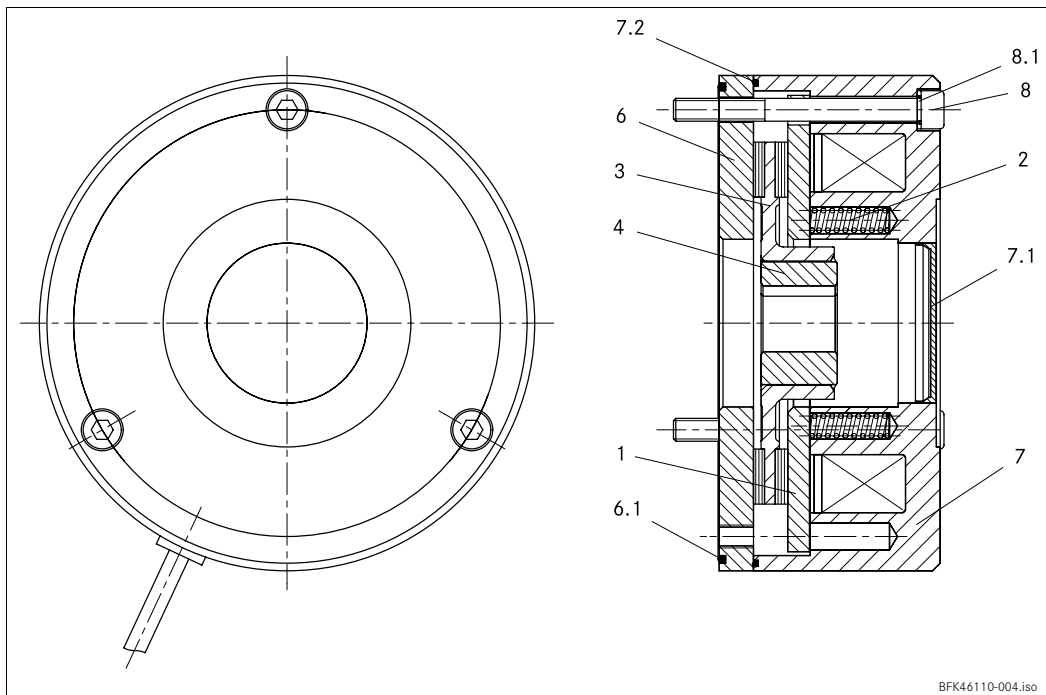


Fig. 1 Structure of an INTORQ BFK461 spring-applied brake

| | | | | | |
|---|----------------------------|-----|-----------------|-----|--------------------------|
| 1 | Armature plate | 6 | Flange (option) | 7.2 | O-ring |
| 2 | Compression spring | 6.1 | O-ring | 8 | Cheese head screw DIN912 |
| 3 | Rotor with friction lining | 7 | Stator | 8.1 | USIT ring |
| 4 | Hub | 7.1 | Cover | | |

3 Technical data

3.1.1 General information

The INTORQ BFK461-□□ spring-applied brake is a single-disk brake with two friction surfaces. The brake torque is generated by several compression springs (2) by friction. The brake is released electromagnetically.

The spring-applied brake converts mechanical work and kinetic energy into heat. For operating speed, see chapter 3.3 Rated data. Due to the static brake torque, the brake can hold loads without speed difference. Emergency braking is possible at high speed, see chapter 3.3 Rated data. The more friction work the higher the wear. Please take into account that the friction value and thus the brake torque depend on the speed.



Stop!

Due to the design of the stator, the air gap of the INTORQ BFK461 spring-applied brake cannot be readjusted. In case of wear, replace the rotor (3), if necessary.

To guarantee the IP66 enclosure, an O-ring is used to seal the brake on the motor flange side (6.1 and as option 7.2). A cover (7.1) closes the stator (7) on the back. Alternatively, you can also use a V-seal ring as axial shaft seal (is not part of the INTORQ delivery package).



Note!

Mount USIT rings (8.1) underneath the fixing screws (8) to avoid the penetration of dust and fluid into the interior of the brake!

3.1.2 Braking

During braking, the rotor (3), which is axially movable on the hub (4), is pressed against the friction surface - via the armature plate (1) - by means of the inner and outer springs (2). The asbestos-free friction linings ensure a high brake torque with low wear. The brake torque is transmitted between hub (4) and rotor (3) via the splines.

3.1.3 Brake release

In braked state, there is an air gap s_{air} between stator (7) and armature plate (1). To release the brake, the stator coil (7) is excited with the DC voltage provided. The magnetic force generated attracts the armature plate (1) towards the stator (7) against the spring force. The rotor (3) is then released and can rotate freely.

3 Technical data

3.2 Rated torques

| Sizes | 06 | 08 | 10 | 12 | 14 | 16 | 18 |
|--|-----|-----|----|----|----|-----|-----|
| Rated torques [Nm], referring to the relative speed $\Delta n = 100 \text{ min}^{-1}$ | 2 | 3.5 | 7 | 14 | 25 | 35 | 65 |
| | 2.5 | 5 | 9 | 18 | 40 | 45 | 80 |
| | 3 | 6 | 11 | 23 | 45 | 55 | 100 |
| | 3.5 | 7 | 14 | 27 | 55 | 60 | 115 |
| | 4 | 8 | 16 | 32 | 60 | 70 | 130 |
| | 4.5 | 9 | 18 | 36 | 65 | 80 | 150 |
| | 6 | 12 | 23 | 40 | 75 | 90 | 165 |
| | | | | | 80 | 100 | 185 |
| | | | | | | 105 | 200 |
| | | | | | | 125 | 235 |
| | | | | | | | |

Tab. 1 Rated torques in [Nm] - INTORQ BFK461

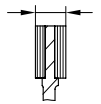
Standard brake torque

3.3 Rated data

| Type | Electrical power P_{20} [W] | Voltage $U^{3)}$ [V] | Rated current I_N [A] | Coil resistance R_{20} [Ω] | | |
|------------------|----------------------------------|-------------------------|----------------------------|---------------------------------------|--------|--------|
| | | | | rated | max. | min. |
| INTORQ BFK461-06 | 20 | 103 | 0.194 | 530.5 | 564.9 | 496.6 |
| | | 205 | 0.098 | 2101.0 | 2269.0 | 1933.0 |
| INTORQ BFK461-08 | 25 | 103 | 0.243 | 424.4 | 449.8 | 398.9 |
| | | 205 | 0.122 | 1681.0 | 1807.0 | 1555.0 |
| INTORQ BFK461-10 | 32 33 | 103 | 0.311 | 331.5 | 349.8 | 313.3 |
| | | 205 | 0.161 | 1273.5 | 1356.0 | 1191.0 |
| INTORQ BFK461-12 | 40 | 103 | 0.388 | 265.2 | 279.8 | 250.6 |
| | | 205 | 0.195 | 1051.0 | 1114.0 | 987.6 |
| INTORQ BFK461-14 | 53 | 103 | 0.515 | 200.2 | 210.2 | 190.2 |
| | | 205 | 0.259 | 792.9 | 836.5 | 749.3 |
| INTORQ BFK461-16 | 56 | 103 | 0.544 | 189.5 | 198.9 | 180.0 |
| | | 205 | 0.273 | 750.5 | 791.7 | 709.2 |
| INTORQ BFK461-18 | 85 | 103 | 0.825 | 124.8 | 130.4 | 119.2 |
| | | 205 | 0.415 | 494.4 | 519.1 | 469.7 |

Tab. 2 Rated data - INTORQ BFK461 spring-applied brake

3) Other voltages (24V; 96V; 170V; 180V; 190V) on request

| Type | Rated torque at $\Delta n = 100$ r/min $M_K^{1)}$ [Nm] | Rated torque at Δn_0^1 [Nm] | | | Max. speed $\Delta n_{0max.}$ [r/min] | Brake mass | | Outer diameter [mm] | Pitch circle | | Tightening torque of fixing screws [Nm] | Air gap $s_{air} \pm 0.1$ | | Moment of inertia of rotor [kg cm ²] | Rotor thickness  | |
|------------------|---|-------------------------------------|-------|-------|--|------------------------|---------------------|------------------------|--------------------|--------|--|-----------------------------|--------------|---|--|-----------|
| | | 1500 | 3000 | max. | | without Flange [kg] | with Flange [kg] | | \varnothing [mm] | Thread | | rated ²⁾ [mm] | max. [mm] | | min. [mm] | max. [mm] |
| INTORQ BFK461-06 | 4 | 3,5 | 3,2 | 3,0 | 6000 | 1,2 | 1,4 | 87 | 72 | 3 x M4 | 3,0 | 0,2 | 0,6 | 0,130 | 6 _{-0,05} | 5,4 |
| | 6 | 5,2 | 4,8 | 4,4 | | | | | | | | | 0,4 | | | 5,6 |
| INTORQ BFK461-08 | 8 | 6,8 | 6,2 | 5,8 | 5000 | 2,2 | 2,57 | 103 | 90 | 3 x M5 | 5,9 | 0,2 | 0,6 | 0,450 | 7 _{-0,05} | 6,4 |
| | 12 | 10,2 | 9,3 | 8,8 | | | | | | | | | 0,45 | | | 6,55 |
| INTORQ BFK461-10 | 16 | 13,3 | 12,2 | 11,7 | 4000 | 4,1 | 4,9 | 130 | 112 | 3 x M6 | 10,1 | 0,2 | 0,7 | 2,000 | 9 _{-0,1} | 8,3 |
| | 23 | 19,1 | 17,5 | 16,8 | | | | | | | | | 0,5 | | | 8,5 |
| INTORQ BFK461-12 | 32 | 25,9 | 23,7 | 23,4 | 3600 | 6,1 | 7,2 | 148 | 132 | 3 x M6 | 10,1 | 0,2 | 0,6 | 4,500 | 10 _{-0,1} | 9,3 |
| | 46 | 37,3 | 34,0 | 33,6 | | | | | | | | | 0,4 | | | 9,5 |
| INTORQ BFK461-14 | 60 | 48,0 | 43,8 | 43,2 | 3600 | 8,9 | 10,5 | 165 | 145 | 3 x M8 | 24,6 | 0,3 | 0,8 | 6,300 | 10 _{-0,1} | 9,2 |
| | 90 | 72,0 | 65,7 | 64,8 | | | | | | | | | 0,5 | | | 9,5 |
| INTORQ BFK461-16 | 80 | 63,2 | 57,6 | 56,0 | 3600 | 14,0 | 16,4 | 200 | 170 | 3 x M8 | 24,6 | 0,3 | 0,9 | 15,000 | 11,5 _{-0,1} | 10,6 |
| | 125 | 98,8 | 90,0 | 87,5 | | | | | | | | | 0,6 | | | 10,9 |
| INTORQ BFK461-18 | 150 | 115,5 | 105,0 | 102,0 | 3600 | 16,7 | 19,6 | 221 | 196 | 6 x M8 | 24,6 | 0,4 | 1,0 | 29,000 | 13 _{-0,1} | 12,0 |
| | 235 | 181,0 | 164,5 | 164,5 | | | | | | | | | 0,6 | | | 12,4 |

- 1) Minimum rated torque when all components are run in
2) Minimum air gap, effective value results from the sum tolerances of the single components.

3 Technical data

3.4 Operating times

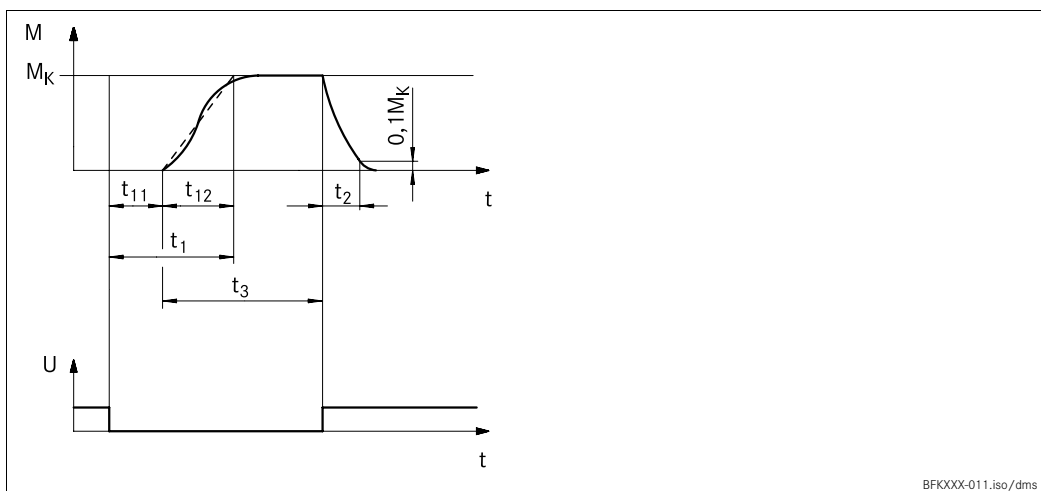


Fig. 2 Operating times of the spring-applied brakes

- t_1 Engagement time
- t_2 Disengagement time (up to $M = 0.1 M_r$)
- t_3 Slipping time
- t_{11} Reaction delay during engagement
- t_{12} Rise time of the brake torque
- m Brake torque
- U Excitation

| Type | Rated brake torque at $\Delta n = 100r/min$ $M_K^{1)}$ [Nm] | Friction work per switching operation Q_E [J] | Transition operating frequency $S_{h\ddot{u}}$ [h ⁻¹] | Operating times [ms] at $s_{L\ddot{u}}$ Nenn and $0.7 \times I_N$ | | | |
|------------------|--|--|--|--|----------|-------|------------------------|
| | | | | DC engagement | | | Disengagement t_2 |
| | | | | t_{11} | t_{12} | t_1 | |
| INTORQ BFK461-06 | 4 | 3000 | 79 | 14 | 29 | 43 | 62 |
| INTORQ BFK461-08 | 8 | 7500 | 50 | 39 | 28 | 67 | 61 |
| INTORQ BFK461-10 | 16 | 12000 | 40 | 30 | 40 | 70 | 100 |
| INTORQ BFK461-12 | 32 | 24000 | 30 | 42 | 38 | 80 | 150 |
| INTORQ BFK461-14 | 60 | 30000 | 28 | 26 | 55 | 81 | 230 |
| INTORQ BFK461-16 | 80 | 36000 | 27 | 30 | 48 | 78 | 335 |
| INTORQ BFK461-18 | 150 | 60000 | 20 | 68 | 68 | 136 | 320 |

Tab. 3 Switching energy - operating frequency - operating times

¹⁾ Minimum brake torque when all components are run in

The transition from the state without braking torque to the steady braking torque is not without delay. The engagement times are valid for switching on the DC side with a spark suppressor (see Fig. 9). The diagram shows the delay during engagement t_{11} , the rise time of the braking torque t_{12} and the engagement time $t_1 = t_{11} + t_{12}$, as well as the disengagement time t_2 .

Disengagement time

The disengagement time is not influenced by DC or AC switching operations. It can only be shortened by special equipment for fast-response excitation or overexcitation.

3 Technical data

Engagement time

With switching on the AC side, the engagement times are prolonged approximately by the factor 10, for connection see page 23, Fig. 7.

Spark suppressors for the rated voltages, which are to be connected in parallel to the contact, are available for engagement on the DC side. If this is not admissible for safety reasons, e.g. with hoists and lifts, the spark suppressor can also be connected in parallel to the brake coil, for connection see page 23, Fig. 8.

3.5 Operating frequency / friction work

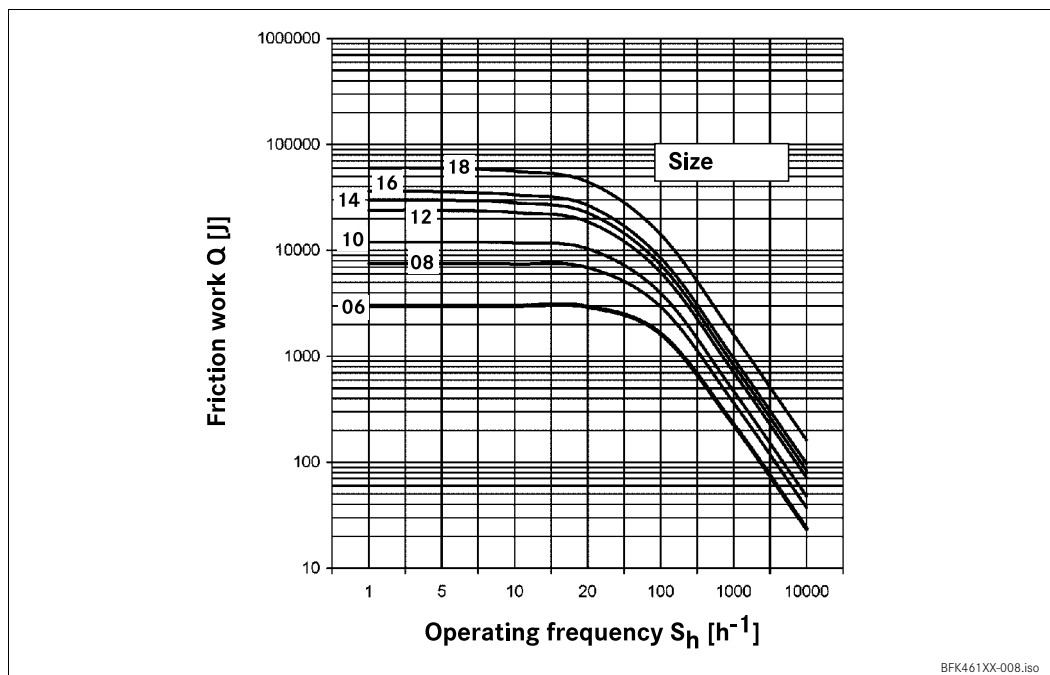


Fig. 3 Friction work as a function of the operating frequency

$$S_{fperm} = \frac{-S_{tf}}{\ln\left(1 - \frac{Q}{Q_E}\right)} \quad Q_{perm} = Q_E \left(1 - e^{-\frac{S_{tf}}{S_f}}\right)$$

The permissible operating frequency "S_{hperm}" depends on the friction work "Q" (see Fig. 3). An operating frequency of "S_h" results in the permissible friction work "Q_{perm}".

With high speed and friction work, the wear increases strongly, because very high temperatures occur at the friction faces for a short time.

3 Technical data

3.6 Emission

Electromagnetic compatibility

**Note!**

The user must ensure compliance with EMC Directive 2004/108/EC using appropriate controls and switching devices.

If an INTORQ rectifier is used for the DC switching of an INTORQ spring-applied brake and if the operating frequency exceeds five switching operations per minute, the use of a mains filter is required. If the INTORQ spring-applied brake uses a rectifier of another manufacturer for the switching, it may become necessary to connect a spark suppressor in parallel with the AC voltage. Spark suppressor according to coil voltage on request.

Heat

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

Noises

The switching noises during engagement and disengagement depend on the air gap "s_{air}" and the brake size.

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



Others

The abrasion of the friction parts produces dust.

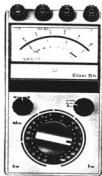

In case of high load, the friction face will become so hot that odours may occur.

4 Mechanical installation

4.1 Necessary tools

| Type | Torque wrench | Insertion for hexagon socket screws |
|------------------|---|---|
| |  |  |
| | Measuring range [Nm] | Wrench size [mm] |
| INTORQ BFK461-06 | 1 - 12 | 3x1/4" square |
| INTORQ BFK461-08 | | 4x1/4" square |
| INTORQ BFK461-10 | | 5x1/4" square |
| INTORQ BFK461-12 | 20 - 100 | 6x1/2" square |
| INTORQ BFK461-14 | | |
| INTORQ BFK461-16 | | |
| INTORQ BFK461-18 | | |


* for flange mounting insertion with journal guide

| Multimeter | Caliper gauge |
|---|--|
|  |  |

4 Mechanical installation

4.2 Mounting

4.2.1 Preparation

1. Unpack spring-applied brake.
2. Check for completeness.
3. Check nameplate data, especially rated voltage.
4. Fit threaded holes in end shield (dimensions  LEERER MERKER).

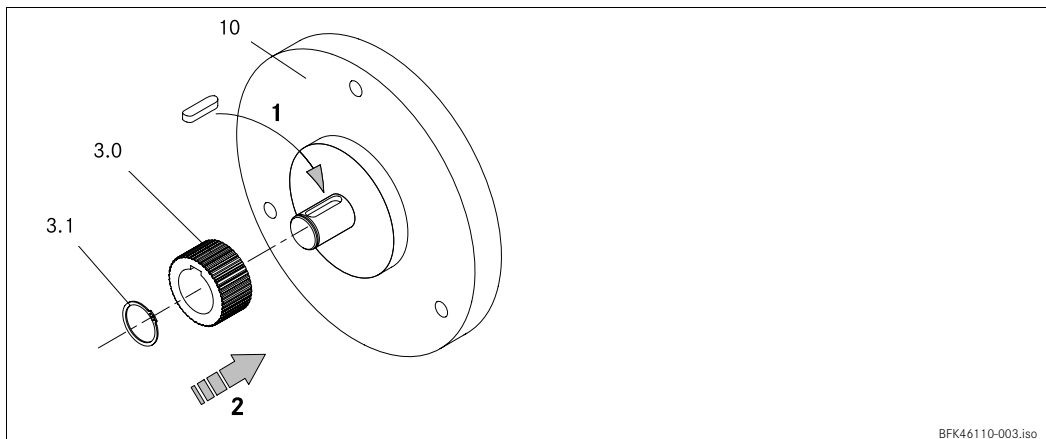
4.3 Installation



Stop!

Toothed hub and screws must not be lubricated with grease or oil!

4.3.1 Installation of the hub onto the shaft



BFK46110-003.iso

Fig. 4 Installation of the hub onto the shaft

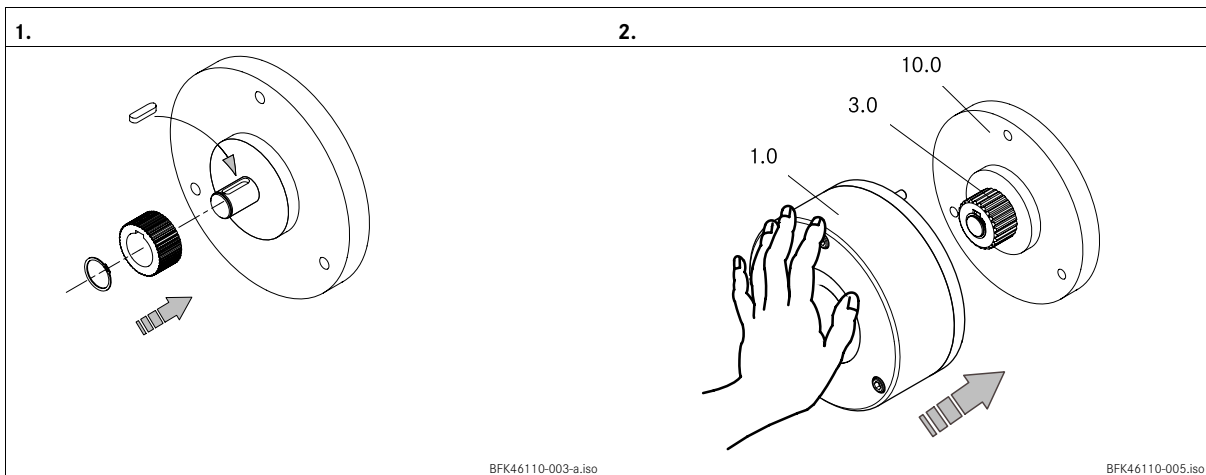
- 3.0 Hub
- 3.1 Circlip
- 10.0 Endshield

1. Press hub (3.0) onto the shaft
2. Secure hub against axial displacement, e.g. using a circlip (3.1).

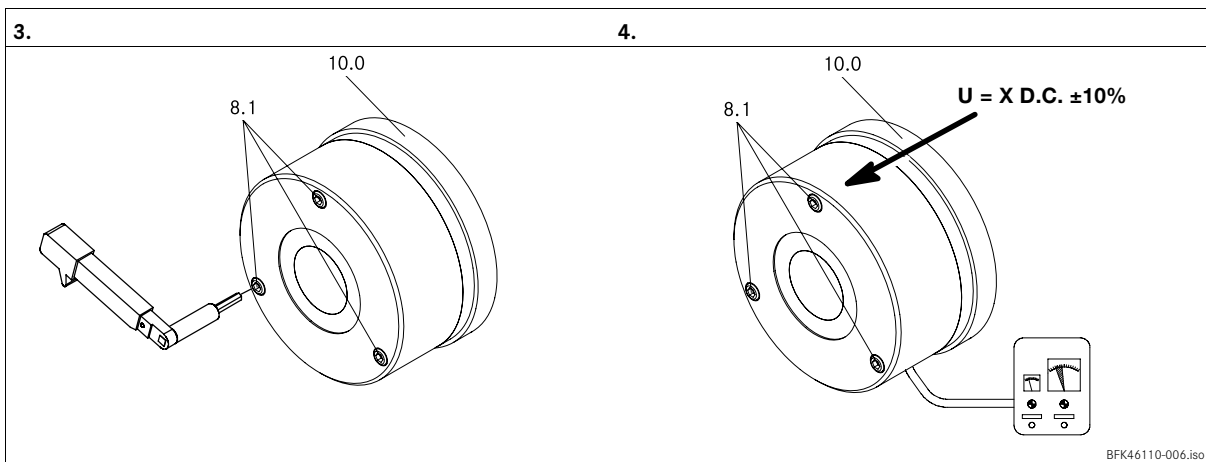
4 Mechanical installation

4.3.2 Installation of the brake

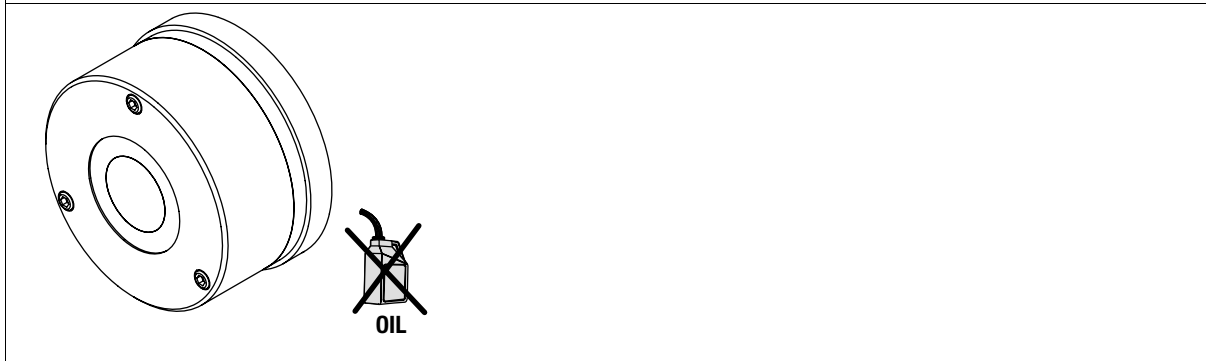
1. Installation of the hub (3.0), chapter 4.3.1
2. Push the spring-applied brake (1.0) onto the hub (3.0).



3. Screw the spring-applied brake (1.0) onto the endshield (10.0) using the integrated fixing screws.
4. Tighten the screws (8.1) evenly (for torques, see the table Rated data, chapter 3.3).



Note



5 Electrical installation

5.1 Bridge/half-wave rectifiers (option)

BEG-561

After a defined overexcitation time, the bridge/half-wave rectifiers change from bridge rectification to half-wave rectification. Depending on the dimensioning of the load, the switching performance can thus be improved or the power can be derated.

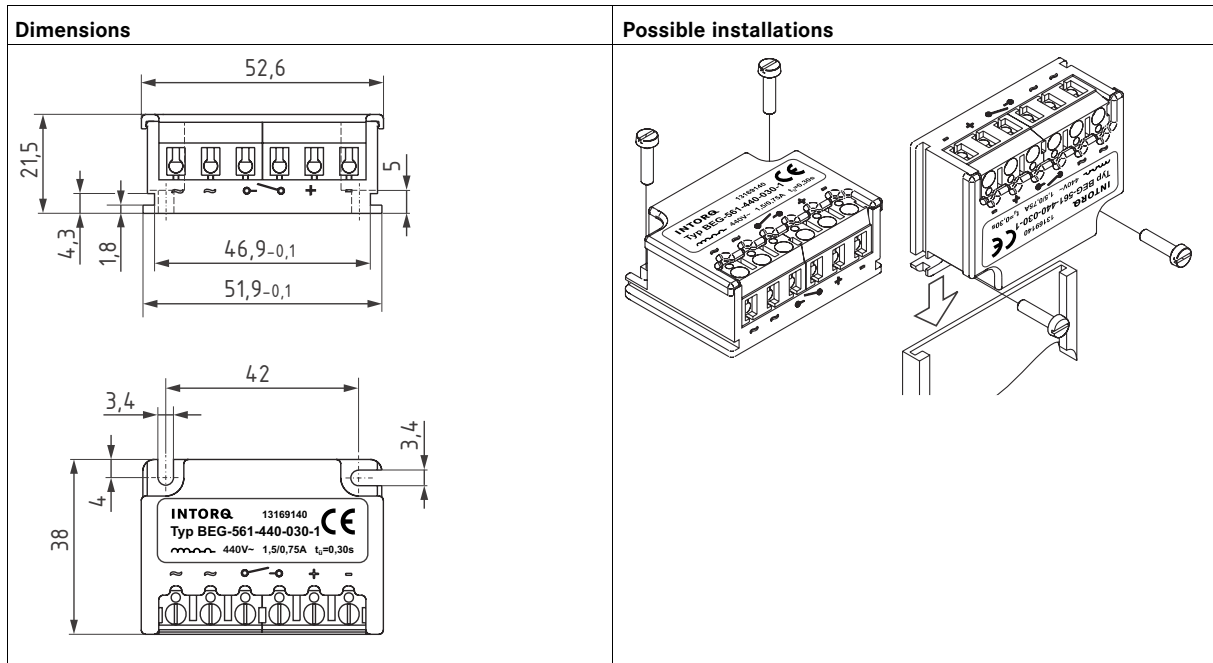


Fig. 5 Dimensions and possible installations of bridge/half-wave rectifier

5.1.1 Technical data

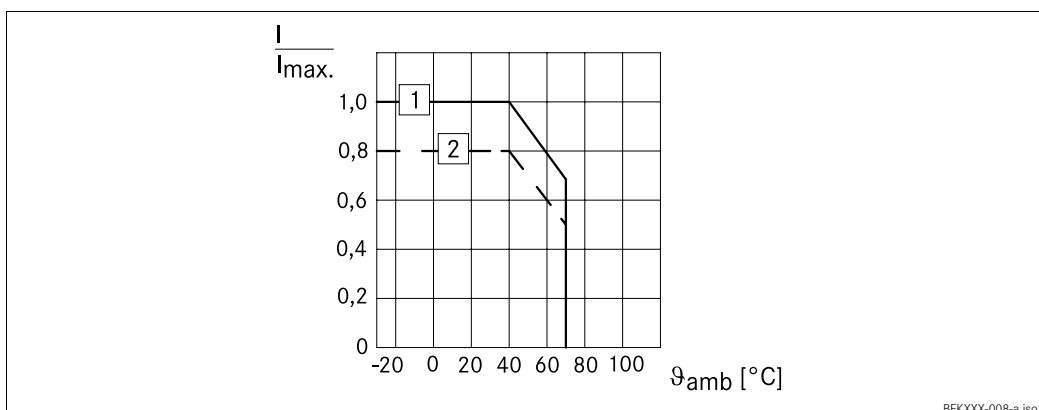
| Rectifier type | Bridge/half-wave rectifier |
|--|----------------------------|
| Output voltage for bridge rectification | $0.9 \times U_1$ |
| Output voltage for half-wave rectification | $0.45 \times U_1$ |
| Ambient temperature (storage/operation) [C°] | -25 ... +70 |

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

Tab. 4 Data for bridge/half-wave rectifier type BEG-561
Input voltage U_1 (40 ... 60 Hz)

5 Electrical installation

5.1.2 Permissible current load - ambient temperature



- 1 For screw assembly with metal surface (good heat dissipation)
- 2 For other assembly (e.g. glue)

5 Electrical installation

5.2 Electrical connection



Danger!

- Electrical connection must only be carried out by skilled personnel!
- Connections must only be made when the equipment is de-energised! Danger through unintended starts or electric shocks.



Stop!

- It must be ensured that the supply voltage corresponds to the nameplate data.
- Voltages must be adapted to the local environment!

Circuit proposals

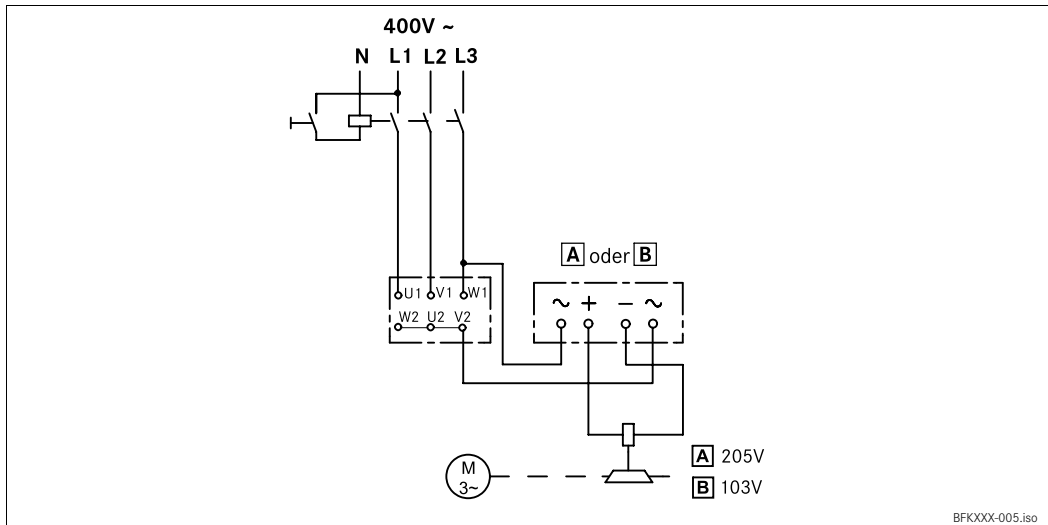


Fig. 6 Switching parallel to the motor, extremely delayed engagement

- A Bridge rectifier
 B Half-wave rectifier

5 Electrical installation

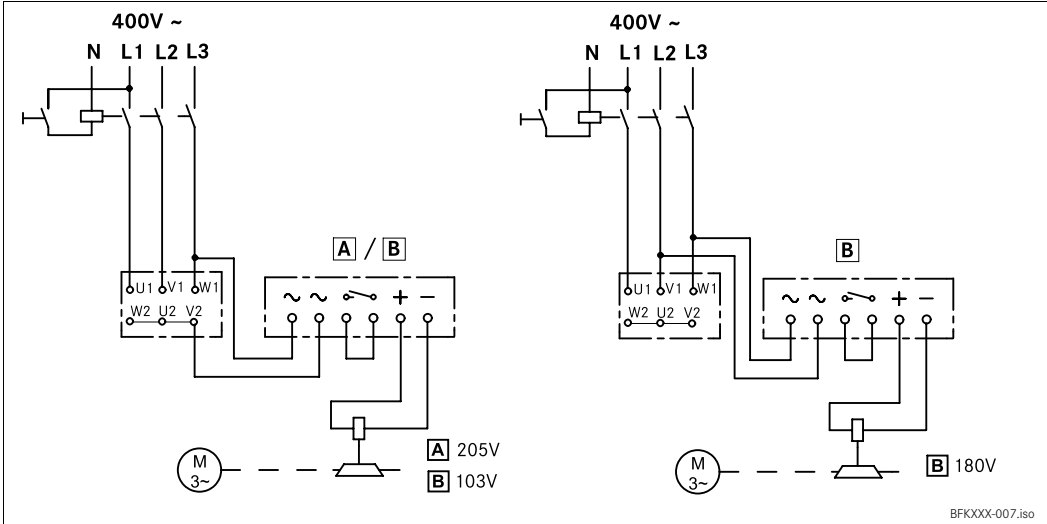


Fig. 7 Delayed engagement

- A** Bridge rectifier
- B** Half-wave rectifier

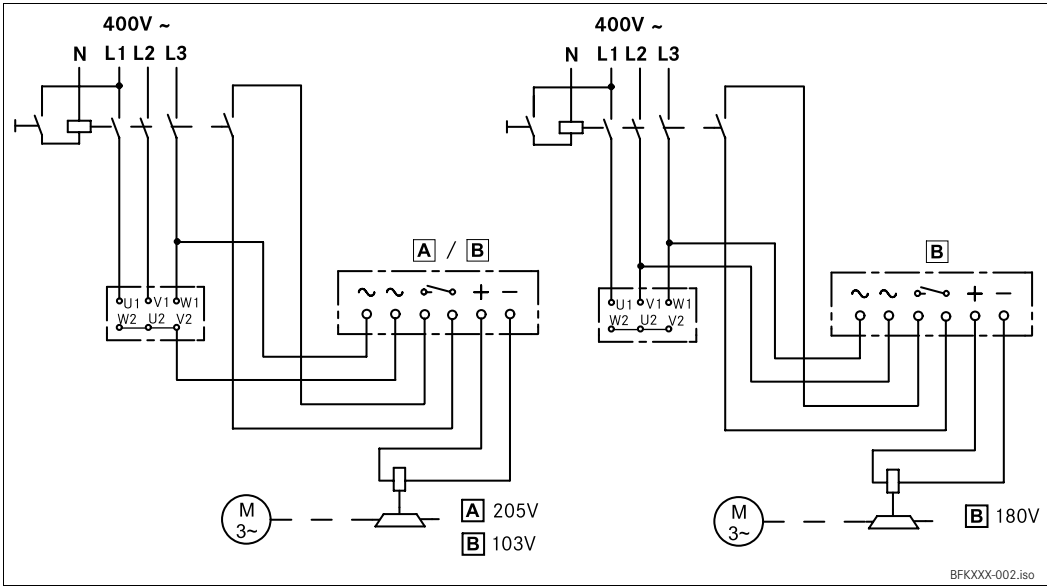


Fig. 8 Fast engagement

- A** Bridge rectifier
- B** Half-wave rectifier

5 Electrical installation

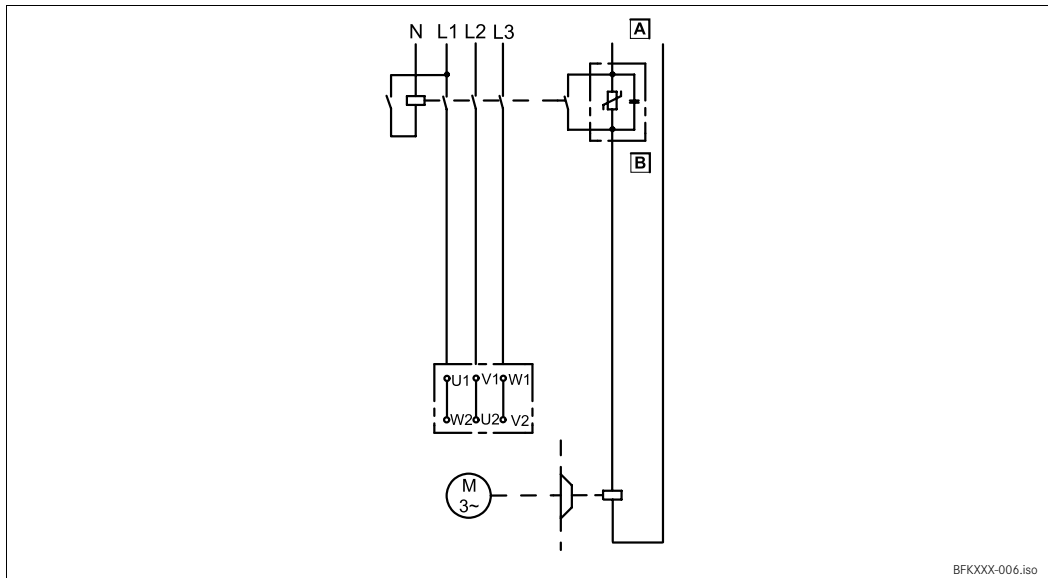


Fig. 9 Separated DC voltage (fast engagement)

Connection diagram also valid for star connection

A DC voltage (e.g. 24V)

B Spark suppressor



Stop!

For switching on the DC side the brake must be operated with a spark suppressor to avoid impermissible overvoltages.

6 Commissioning and operation



Danger!

The live connections and the rotating rotor must not be touched.
The drive must not be running when checking the brake.

6.1 Functional test

In the event of failures, refer to the troubleshooting table in chapter 8. If the fault cannot be eliminated, please contact the aftersales service.

6.1.1 Checking the voltage



Danger!

The brake must be free of residual torque. The motor must not rotate.



Danger!

Live connections must not be touched.

1. Remove two bridges from the motor terminals. Do **not** switch off the DC brake supply. When connecting the rectifier to the neutral point of the motor, the PE conductor must **also** be connected to this point.
2. Connect the mains supply.
3. Measure the DC voltage at the brake.
 - Compare the DC voltage measured with the voltage specified on the nameplate. A 10 % deviation is permissible.
4. Switch off the current.
5. Bolt bridges to the motor terminals. Remove additional PEN conductor.

6 Commissioning and operation

6.2 During operation

- Check the brake regularly during operation. Take special care of:
 - unusual noises and temperatures
 - loose fixing elements
 - the condition of the electrical cables.
- The armature plate must be attracted and the rotor must move without residual torque.
- Measure the DC voltage at the brake.
 - Compare the DC voltage measured with the voltage specified on the nameplate. A $\pm 10\%$ deviation is permissible.
- In the event of failures, refer to the troubleshooting table in chapter 8. If the fault cannot be eliminated, please contact the aftersales service.

7 Maintenance/repair

7.1 Wear of spring-applied brakes

INTORQ spring-applied brakes are wear-resistant and designed for long maintenance intervals. The friction lining and the mechanical brake components are subject to function-related wear. For safe and trouble-free operation, the brake must be checked and readjusted at regular intervals, and, if necessary, be replaced.

The following table describes different causes of wear and their effects on the components of the spring-applied brake. For calculating the service life of rotor and brake and determining the maintenance intervals to be observed, the relevant factors of influence must be quantified. The most important factors are the friction work, initial speed of braking and the operating frequency. If several of the causes of wear indicated for the friction lining occur in an application at the same time, the influencing factors must be added for calculating the wear. The INTORQ Select dimensioning program can be used to calculate the maintenance intervals.

| Component | Cause | Effect | Influencing factors |
|--|--|---|---|
| Friction lining | Braking during operation | Wear of friction lining | Friction work |
| | Emergency stops | | |
| | Overlapping wear during start and stop of drive | | |
| | Active braking via the drive motor with support of brake (quick stop) | | |
| | Starting wear in case of motor mounting position with vertical shaft, even when the brake is not applied | | |
| Armature plate and counter friction face | Rubbing of brake lining | Run-in of armature plate and counter friction face | Friction work |
| Splining of brake rotor | Relative movements and shocks between brake rotor and brake shaft | Wear of splining (primarily on the rotor side) | Number of start/stop cycles |
| Armature plate support | Load alternation and jerks in the backlash between armature plate, sleeve bolts and guide bolt | Breaking of armature plate, sleeve bolts and guide bolt | Number of start/stop cycles, braking torque |
| Springs | Axial load cycle and shear stress of springs through radial backlash on reversal of armature plate | Reduced spring force or fatigue failure | Number of switching operations of brake |

7 Maintenance/repair

7.2 Inspections

To ensure safe and trouble-free operation, spring-applied brakes must be checked and maintained at regular intervals. Servicing can be made easier if good accessibility of the brakes is provided in the plant. This must be considered when installing the drives in the plant.

Primarily, the necessary maintenance intervals for industrial brakes result from the load during operation. When calculating the maintenance interval, all causes for wear must be taken into account (see chapter 7.1). For brakes with low loads such as holding brakes with emergency stop, we recommend a regular inspection at a fixed time interval. To reduce the cost, the inspection can be carried out along with other regular maintenance work in the plant if necessary.



Stop!

Stable properties of the organic friction lining are only achieved in the case of continuous use. The readiness for operation of the brake has to be ensured with a braking energy that is equivalent to one emergency stop per week. Unplanned emergency stops occurring at a sufficient frequency have the same effect.

If the brakes are not maintained, failures, production losses or damage to the system may occur. Therefore, a maintenance concept adapted to the particular operating conditions and brake loads must be defined for every application. For the INTORQ spring-applied brakes, the maintenance intervals and maintenance operations listed in the below table must be provided. The maintenance operations must be carried out as described in the detailed descriptions.

7.2.1 Maintenance intervals

| | |
|------------------------------------|---|
| Service brakes | <ul style="list-style-type: none"> ■ according to service life calculation ■ otherwise every six months ■ after 4000 operating hours at the latest |
| Holding brakes with emergency stop | <ul style="list-style-type: none"> ■ at least every 2 years ■ after 1 million cycles at the latest |

7.2.2 Checking the component parts

| | | |
|--------------------------|---|---|
| for built-on brakes | <ul style="list-style-type: none"> ■ Check release function and control ■ Measure rotor thickness (replace rotor if necessary) ■ Thermal damage to armature plate or flange (dark blue tarnishing) | <p>see chapter 7.3.3</p> <p>see chapter 7.3.1</p> |
| after removing the brake | <ul style="list-style-type: none"> ■ Check clearance of the rotor toothing (replace rotors with worn out teeth) ■ Play of torque plate at pins and armature plate ■ Check springs for damage ■ Check armature plate and flange/endshield <ul style="list-style-type: none"> - Evenness sizes 06...12 > 0.06 mm - Evenness from size 14 > 0.1 mm - Max. run-in depth = rated air gap of brake size | <p>see chapter 7.3.2</p> |

7 Maintenance/repair

7.3 Maintenance



Note!

Brakes with defective armature plates, cheese head screws, springs or counter friction faces must always be replaced completely.

Generally observe the following for inspections and maintenance works:

- Remove impurities through oil and grease using brake cleaning agents, if necessary, replace brake after identifying the cause of the contamination. Dirt deposits in the air gap between stator and armature plate impair the function of the brake and must be removed.
- After replacing the rotor, the original braking torque will not be reached until the run-in operation of the friction surfaces has been completed. After replacing the rotor, run-in armature plates and counter friction faces have an increased initial rate of wear.

7.3.1 Checking the rotor thickness



Danger!

Disconnect voltage. The brake must be free of residual load torque.

1. Loosen connection cable.
2. Unbolt fixing screws and remove brake from endshield. Observe connection cable.
3. Pull rotor from hub.
4. Measure the rotor thickness using a caliper gauge.
5. Compare the measured rotor thickness with the minimum permissible rotor thickness (see chapter 3.3).
6. If necessary, replace the rotor (see chapter 7.3.2).

7 Maintenance/repair

7.3.2 Rotor replacement



Danger!

Disconnect voltage. The brake must be free of residual load torque.

1. Loosen connection cable.
2. Unbolt fixing screws and remove brake from endshield. Observe connection cable.
3. Pull rotor from hub.
4. Check hub splining. In case of wear, replace hub.
5. Check friction surfaces.
 - In case of strong scoring at the flange, replace the flange.
 - If scoring occurs at the endshield, re-finish friction surface.
6. Measure the rotor thickness using a caliper gauge and compare the values with the values given in chapter 3.3. If necessary, replace the rotor.
7. Check the brake, chapter 7.2.
8. If necessary, install new brake.
9. Reconnect the supply cable.



Note!

After replacing the rotor, the original braking torque will not be reached until the run-in operation of the friction surfaces has been completed. After replacing the rotor, run-in armature plates and flanges have an increased initial rate of wear.

7.3.3 Release / voltage



Danger!

Live connections must not be touched.

1. Observe the brake function during operation of the drive. The armature plate must be attracted and the rotor must move without residual torque.
2. Measure the DC voltage at the brake.
 - Compare the DC voltage measured with the voltage specified on the nameplate. A 10 % deviation is permissible.

7.4 Spare-parts list

- Only parts with item numbers are available.
- The item numbers are only valid for the standard design.

7 Maintenance/repair

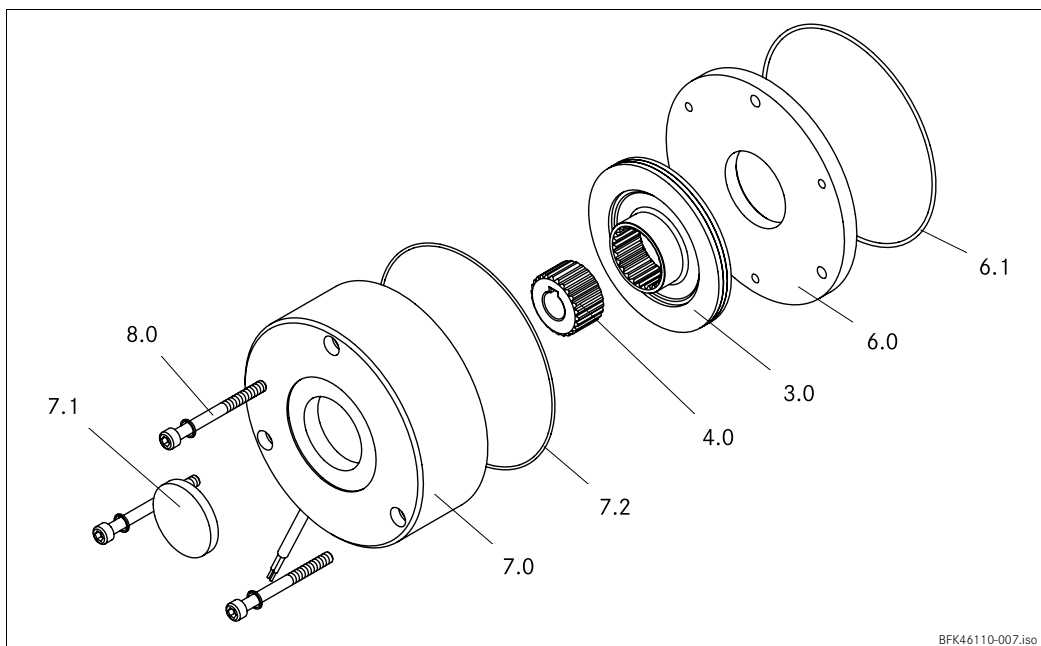


Fig. 10 Spare parts for INTORQ BFK461-01...18 spring-applied brake

| Item | Name | Variant | | | |
|------|----------------------|---------|---------|--------------|---|
| | | Size | — | — | — |
| 3.0 | Rotor | Size | — | — | — |
| 4.0 | Hub | Size | Bore | — | — |
| 6.0 | Flange | Size | | | |
| 6.1 | O-ring | Size | | | |
| 7.0 | Stator | | Voltage | Rated torque | |
| 7.1 | Cover | Size | | | |
| 7.2 | O-ring | Size | | | |
| 8.0 | Set of fixing screws | Size | | | |

Electrical accessories

| Spark suppressor | Coil voltage | Coil power | Order no. |
|------------------|--------------|------------|-----------|
| | [V AC] | [W] | |
| | 24 ... 50 | up to 100 | 045798 |
| | 50 ... 120 | | 045800 |
| | 120 ... 200 | | 045801 |
| | 200 ... 250 | | 411926 |

8 Troubleshooting and fault elimination

If any malfunctions should occur during operation of the drive system, please check the possible causes using the following table. If the fault cannot be eliminated by one of the listed measures, please contact the aftersales service.

| Fault | Cause | Remedy |
|--|---|---|
| Spring-applied brake cannot be released, air gap is not zero | Coil is interrupted | <ul style="list-style-type: none"> ■ Measure the coil resistance using a multimeter: <ul style="list-style-type: none"> - Replace the spring-applied brake when the resistance is too high. |
| | Coil has interturn fault or short circuit to ground | <ul style="list-style-type: none"> ■ Measure the coil resistance using a multimeter: <ul style="list-style-type: none"> - Compare the measured resistance with the rated resistance. The rated data is given in chapter 3.3 Rated data. Replace the spring-applied brake when the resistance is too low. ■ Test the coil for short circuit to ground using a multimeter: <ul style="list-style-type: none"> - If a short circuit to ground occurs, replace the spring-applied brake. ■ Check the brake voltage (see defective rectifier, voltage too low). |
| | Defective or wrong wiring | <ul style="list-style-type: none"> ■ Check and correct wiring. ■ Check the cable using a multimeter: <ul style="list-style-type: none"> - Replace defective cable. |
| | Defective or wrong rectifier | <ul style="list-style-type: none"> ■ Measure the DC voltage at the rectifier using a multimeter. <p>When the DC voltage is zero:</p> <ul style="list-style-type: none"> ■ Measure the AC voltage at the rectifier. <p>When the AC voltage is zero:</p> <ul style="list-style-type: none"> - Apply voltage - Check fuse - Check wiring <p>When the AC voltage is ok:</p> <ul style="list-style-type: none"> - Check rectifier - Replace defective rectifier <p>When the DC voltage is too low:</p> <ul style="list-style-type: none"> - Check rectifier - Half-wave rectifier used instead of bridge rectifier. Install bridge rectifier. - Defective diode, use an appropriate rectifier. <ul style="list-style-type: none"> ■ Check the coil for fault between turns and short circuit to ground. ■ If the rectifier defect occurs again, replace the spring-applied brake, even if you cannot find any fault between turns or short circuit to ground. The fault may occur later during heating-up. |
| | Air gap too big | <ul style="list-style-type: none"> ■ Replace rotor for INTORQ BFK461-06...18 spring-applied brake. |
| Rotor not thick enough | Spring-applied brake has not been replaced in time | Replace spring-applied brake (chapter 4.3.1 and 4.3.2) |
| Voltage too high | Brake voltage does not match the rectifier | Adapt rectifier and brake voltage to each other. |
| Voltage too low | Brake voltage does not match the rectifier | Adapt rectifier and brake voltage to each other. |
| | Defective rectifier diode | Replace rectifier by a suitable new one. |
| AC voltage is not mains voltage | Fuse missing or defective | Select a connection with proper fusing. |



Notes



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