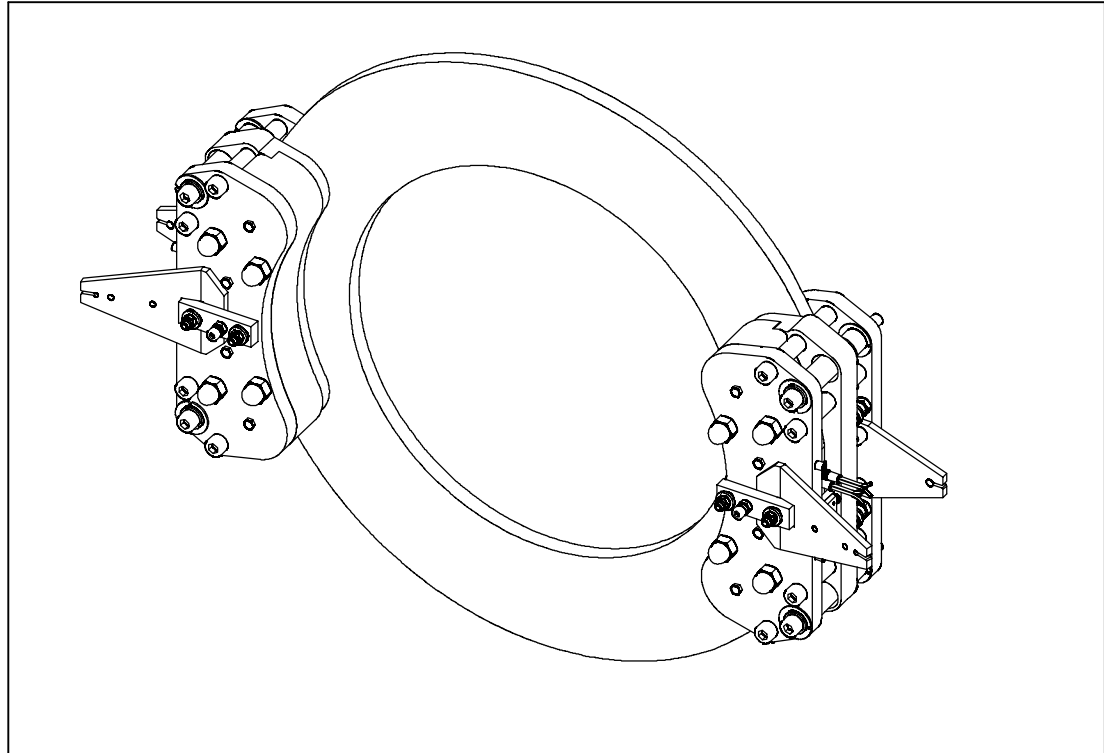
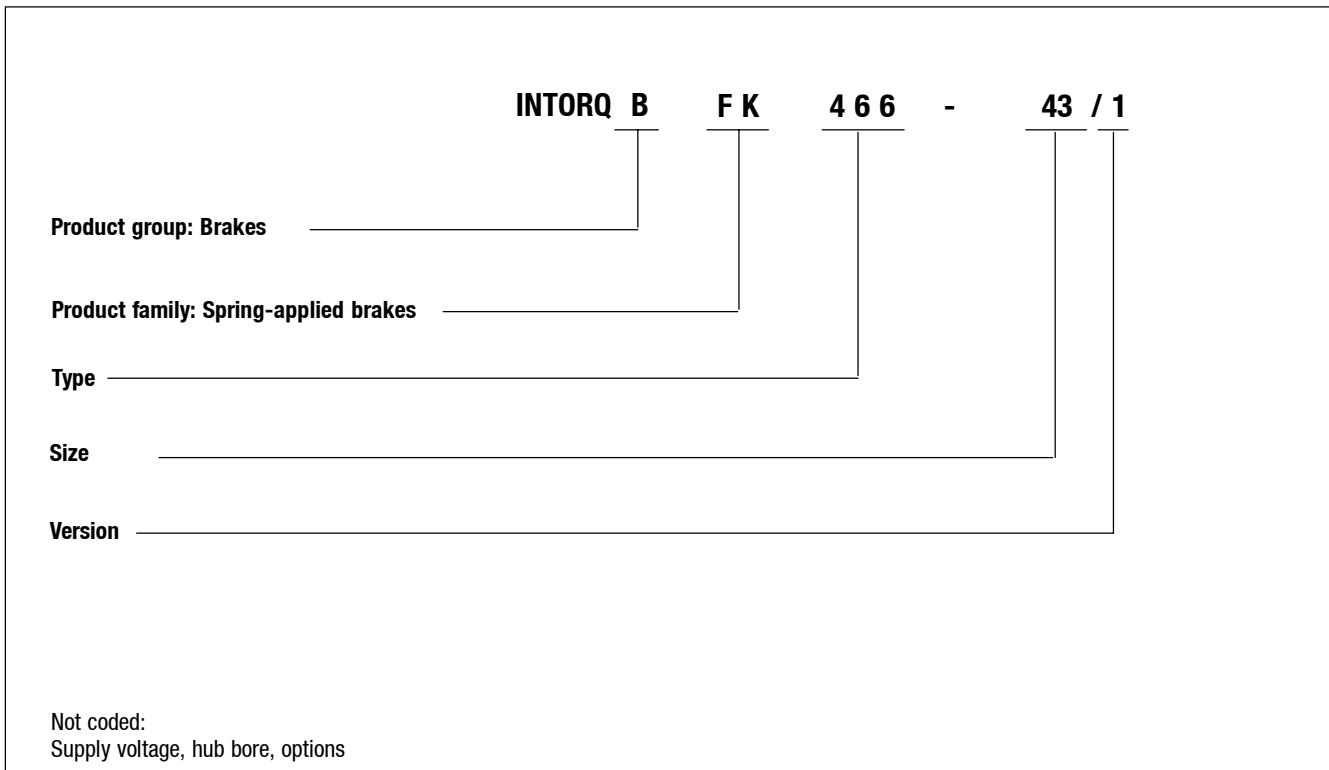


Operating Instructions



***Multi-pole spring-applied brake
INTORQ BFK466-43/1***

Product key



- The specifications in the product key, on the name plate and on the packaging sticker are valid for the INTORQ BFK466-43/1 multi-pole spring-applied brakes.

These Operating Instructions are valid for the following multi-pole spring-applied brakes:

INTORQ BFK466-43/1

Nameplate

Layout for sizes 43/1

Field	Content	Example
1	Manufacturer CE marking	<p>INTORQ D - AERZEN CE BFK466-43/1 0036 ABV 764 48 V AC 353/88 W XX XXXX No.: 491303 450 NM 23.05.05</p>
2	Brake type Design test code	
3	Rated voltage rated power customer requirement no.	
4	Order no. characteristic braking torque date of manufacture	

Packaging sticker

Layout

Field	Content	Example
1	Manufacturer Barcode no.	<p>INTORQ D - AERZEN Typ: BFK466-43/1 Nr. 491303 FEDERKRAFTBREMSE 1 Stück 48 V AC 353/88 W 450 NM 23.05.05 0036 ABV 764 XX XXXX CE Rostschutzverpackung-Reibfläche fettfrei halten</p>
2	Designation Order no.	
3	Type see product key Qty per box	
4	Rated voltage rated power Characteristic braking torque Packing date	
5	Design test code Customer requirement no.	
	Supplement CE designation	

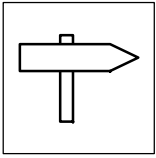
What is new / what has changed in the Operating Instructions?

Material number	Edition	Important	Content
13065798	1.0 08/2005 TD09	1st edition	1st edition for series

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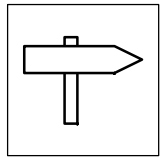
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All information in this document has been carefully selected. Required corrections will be included in updates of this document.

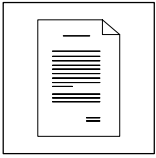


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1 Preface and general information

1.1 About these Operating Instructions

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

1.1.1 Terminology used

Brake

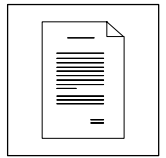
In the following text, the term "spring-applied brake" is used for "multi-pole spring-applied brake".

Drive system

The term "drive system" will be used for drive systems with spring-applied brakes and other drive components.

1.2 Scope of supply

- The spring-applied brakes are supplied pre-assembled, and the scope of supply does not include the brake disc or fastening screws.
- After receipt of the delivery, check immediately whether the items delivered match the accompanying papers. INTORQ GmbH & Co. KG does not accept liability for deficiencies that are reported later. Please report
 - Visible transport damage immediately to the forwarder.
 - Visible deficiencies / incompleteness immediately to your INTORQ representative.



1.3 Drive systems

1.3.1 Labelling

- Drive systems and components are clearly labelled and defined by the indications on the nameplates.
- Manufacturer:
INTORQ GmbH & Co. KG
Postfach 11 03
D-31849 Aerzen
Wülmser Weg 5
D-31855 Aerzen

1.3.2 Application as directed

- Drive systems
 - are to be used in machines and systems.
 - are only to be used for the ordered and acknowledged purposes.
 - must only be operated under the conditions prescribed in the Operating Instructions.
 - must not be used at powers higher or lower than indicated in these Instructions.

Any other use shall be deemed to be inappropriate!

1.3.3 Legal regulations

Liability

- The information, data and notes in these Operating Instructions met the state of the art at the time of printing. Claims on modifications 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 errors
 - disregarding these Operating Instructions

Warranty

- Terms of warranty: See terms of sales and delivery of INTORQ GmbH & Co. KG.
- Please submit warranty claims to your INTORQ representative immediately after the deficiency or fault has been discovered.
- The warranty is void in all cases when liability claims cannot be made.



2 Safety instructions

2.1 Personnel responsible for safety

Operator

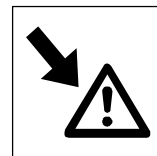
- An operator is any natural or legal person who uses the spring-applied brake or on whose behalf the spring-applied brake is used.
- The operator or his safety personnel must ensure
 - that all relevant regulations, instructions and laws will be complied with,
 - that only qualified personnel will work on and with the spring-applied brake,
 - that the Operating Instructions will be available to the personnel working on and with the brake at all times,
 - that unqualified personnel will not allowed to work on and with the spring-applied brake.

Qualified personnel

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)

2.2 General safety instructions

- These safety notes do not claim to be complete. If any questions or problems occur, please contact your INTORQ representative.
- The spring-applied brake met the state of the art at the time of delivery and is generally safe to operate.
- The spring-applied brake endangers persons, the spring-applied brake itself and other properties of the user if
 - unqualified personnel works 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.
- Operate the spring-applied brake only when it is in perfect condition.
- Retrofitting, modifications and changes of the spring-applied brake are generally forbidden. In any case, INTORQ GmbH & Co. KG must be contacted beforehand.
- The friction lining and the friction surfaces must by no means have contact to oil or grease since even small amounts reduce the braking torque considerably.
- The braking torque will usually not be influenced if the brake is used under the environmental conditions that apply to IP54. 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.



Usage areas of the INTORQ BFK466-43/1 spring-applied brake:

- No potentially explosive or aggressive atmospheres.
- Humidity, no restrictions.
- Ambient temperature -20°C to +40°C.
- At high humidity and low temperature
 - take measures against freezing of the friction lining and the brake disc.
- Protect the electrical connections against contact.

2.3 Layout of the safety information

- All safety information given in these Operating Instructions has the same structure:



Signal word!

Remark

- The pictograph indicates the type of danger:
- The signal word indicates the severity of the danger.
- The note describes the danger and gives information about how the danger can be avoided.

Warning of injury to persons

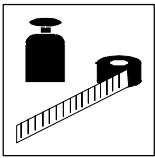
Pictographs used	Signal words
<p>Warning of dangerous electric voltage</p>	Danger! Warns of immediate threat of danger . Consequences if ignored: Death or extremely severe injuries.
	Warning! Warns of a potential, extremely dangerous situation . Possible consequences if ignored: Death or extremely severe injuries.
<p>Warning of a general hazard</p>	Caution! Warns of a potential, dangerous situation . Possible consequences if ignored: minor or slight injuries.

Warning of property damage

Pictographs used	Signal words
	Stop! Warns of possible damage to property . Possible consequences if ignored: Damage to drive system/drive or its environment.

Other notes

Pictographs used	Signal words
	Tip! Marks a general, useful tip. If it is used, the tip will make it the drive system/drive easier to use.



3 Technical data

3.1 Product description

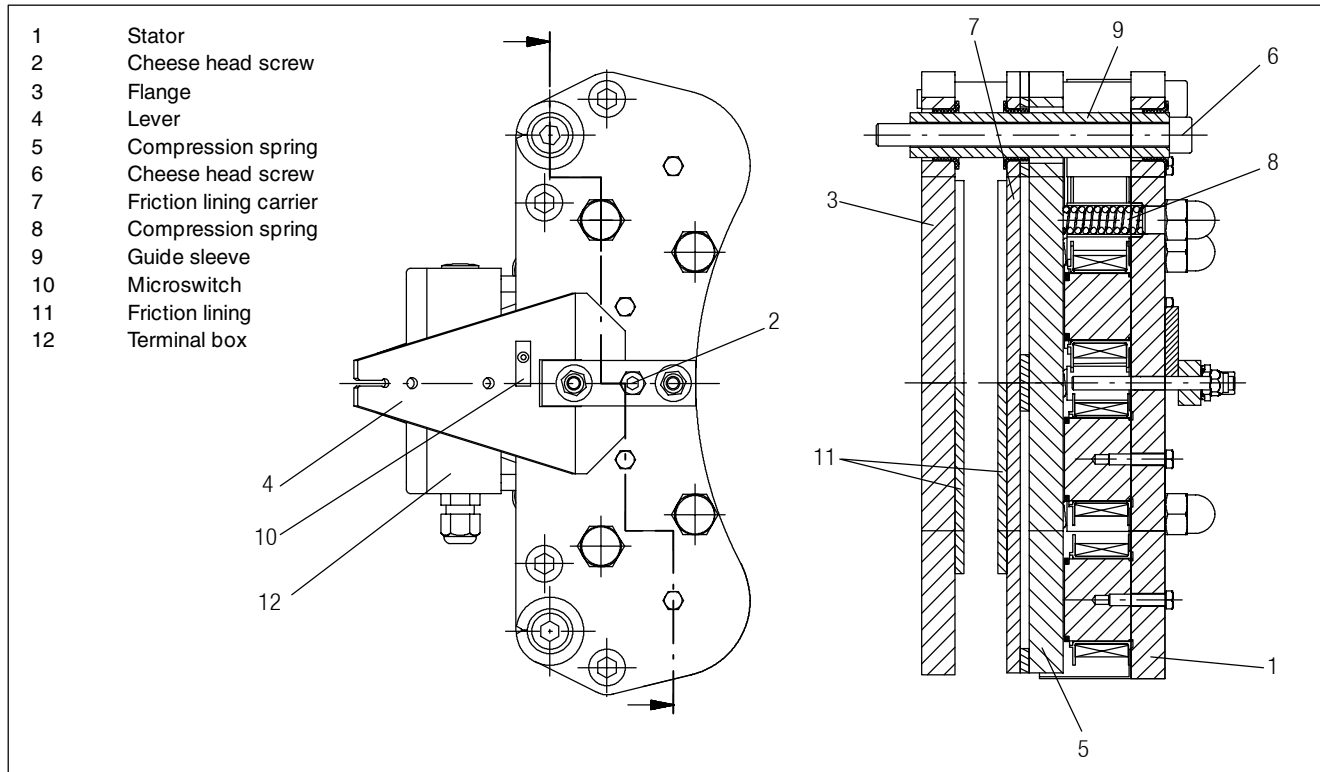


Fig. 1 Design of a INTORQ BFK466-43/1 spring-applied brake

3.1.1 General information

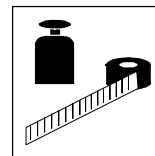
The INTORQ BFK466-43/1 spring-applied brake is designed as a floating caliper brake for mounting on direct drive motors. The brake disc is not included in the scope of supply. The use of two or more spring-applied brakes on one brake disc means that the redundancy requirement for special applications such as lift and stage technology can be met.

The braking torque is generated by the pressure of several compression springs (8) via friction locking between the two friction linings (11) of the friction lining carrier (7) and the flange (3) and the brake disc. The brake is released electromagnetically. The associated switching device rectifies the supply voltage (AC voltage) and decreases it after a short time when the brake is released. This reduces the average electrical brake power. The switching device can optionally be installed in a terminal box.

The INTORQ BFK466-43/1 spring-applied brake is designed for converting mechanical work and kinetic energy into heat energy at sliding speeds up to 12m/s. Thanks to the static breakaway torque, loads can be held without speed difference.

Emergency braking at higher speeds is possible. Here, the maximum permissible speed (see chapter 3.2) must not be exceeded.

The stator (1) is designed to be of thermal class F. The limit temperature of the coils is 155°C.



3.1.2 Braking

During braking, the friction lining carrier (7) and the affixed friction lining are pushed against the axially fixed brake disc. Almost simultaneously, the caliper moves in the opposite direction on the guide sleeves (9), so that the friction lining on the flange (3) is also pushed against the brake disc. The braking torque is supported by the mounting flange via the guide sleeves (9). The asbestos-free friction linings provide high braking torque and low wear.

3.1.3 Release

When the brake is applied, there is an air gap " $s_{Lü}$ " between the friction lining carrier (7) and the pole surfaces of the stator (1). To release the brake, the associated switching device supplies the coils of the stator (1) with DC voltage. The resulting magnetic force pulls the friction lining carrier (7) against the spring force towards the pole surfaces of the stator (1). The friction lining support is then relieved of the spring force (1). The caliper can now move on the guide sleeves (9) until the brake disc (2) is relieved and can rotate freely again.

3.1.4 Emergency release option

An optional manual release (4) is available for briefly releasing of the brake. This allows the load to be reduced in the event of a power failure.

3.1.5 Release monitoring

The INTORQ BFK466-55/1 spring-applied brake is equipped with a microswitch (changeover contact) for monitoring the switching status. During brake release, the microswitch (10) switches over. This prevents the drive from operating against an applied brake.

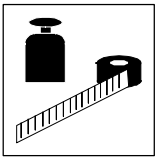
3.2 Rated data

Type	Rated torque M_k [Nm]	Brake disc diameter d_a [mm]	Voltage ¹⁾ U [V] DC	Power ²⁾ P_{20} [W]	Coil resistance $R_{20} \pm 5\%$ [Ω]	Max. current I_{max} [A]	Air gap $s_{Lü \text{ nom.}}$ [mm]	Max. air gap $s_{Lü \text{ max.}}$ [mm]
INTORQ BFK466-43/1	350	350	205	342 / 85.5	122,9	1,67	0,4 ±0,1	0,7
	450	430						
	850	800						

Type	Max. speed n_{max} [rpm]	Fixing screws	Tightening torque M_a [Nm]	max. perm. switching energy Q_E [J]	Transition operating frequency $S_{hü}$ [h ⁻¹]	Weight (without brake disc) m [kg]
INTORQ BFK466-43/1	735	2 x M10 - 8.8	46	45000	34	11,5
	575					
	300					

1) With 230V AC rectifier installed in terminal box

2) Coil power at 20°C when releasing / holding



3.3 Switching times

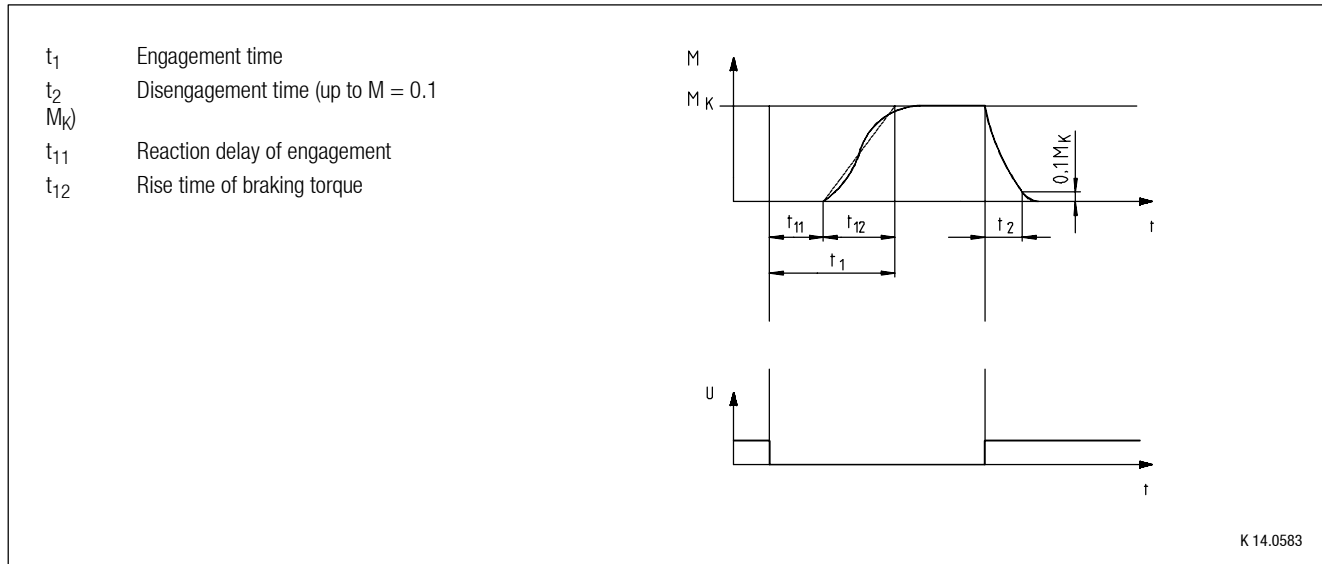


Fig. 2 Switching times

Type	Operating times [ms] at $S_{Lü}$ nom.			
	Engaging			Disengaging
	t_{11}	t_{12}	t_1	t_2
INTORQ BFK466-43/1	22	28	50	58

The transition from a state free of braking torque to one of steady braking torque is not immediate. The engagement times apply to switching on the DC side with a spark suppressor at induction voltages of approx. 5 to 10 times of the rated voltage. The diagram (Fig. Fig. 2) shows the response 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 .

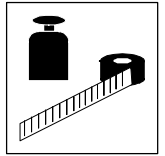
Disengagement time:

The disengagement time is not affected by DC or AC switching.

Engagement time

Short brake engagement times are vital for emergency braking. DC switching together with a suitable spark suppressor must therefore be provided.

If the drive system includes a frequency inverter so that the brake is deenergised only when the motor is at standstill, switching at the AC side is also possible (not valid for emergency braking). In this case, engagement times will be 5 times longer.



3.4 Switching frequency / switching energy

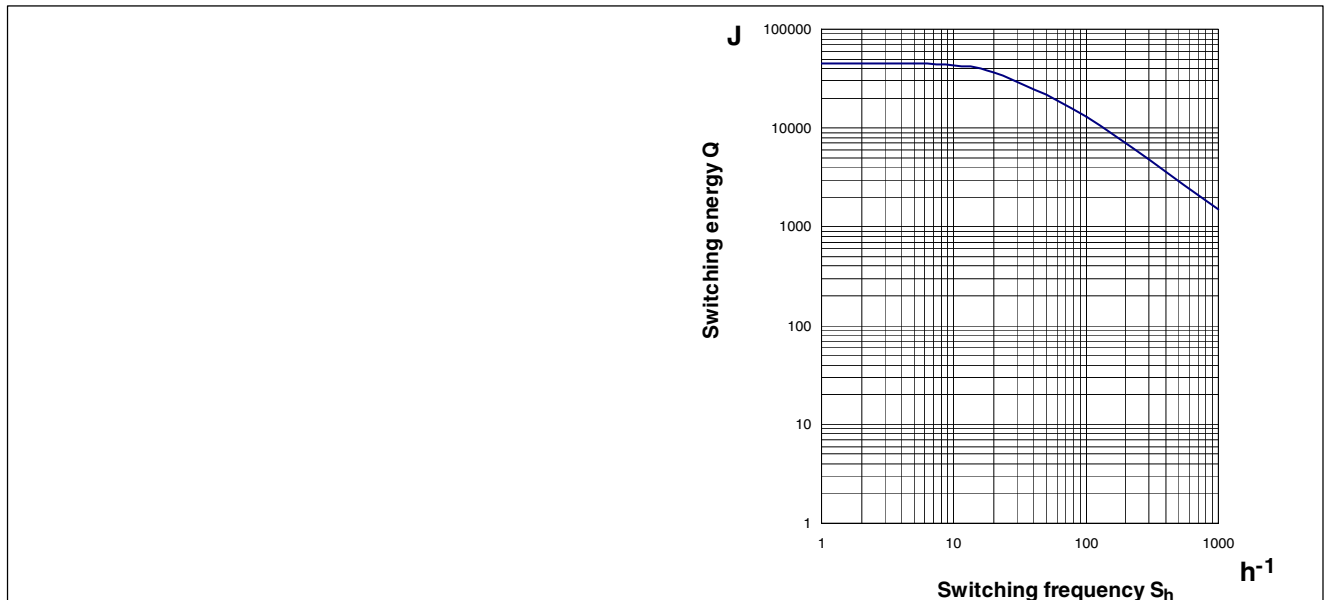


Fig. 3 Switching energy as a function of switching frequency INTORQ BFK466-43/1

The permissible switching frequency “ S_{hperm} ” depends on the switching energy Q .

$$S_{hzul} = \frac{-S_{h\ddot{u}}}{\ln\left(1 - \frac{Q}{Q_E}\right)}$$

At a preset switching frequency “ S_h ”, the permissible switching energy is “ Q_{perm} ”.

$$Q_{zul} = Q_E \left(1 - e^{-\frac{S_h \ddot{u}}{S_h}}\right)$$

3.5 Emissions

Heat

Since the brake converts kinetic energy as well as mechanical and electrical energy into heat energy, the surface becomes hot depending on the operating conditions and possible heat dissipation. Under unfavourable operating conditions, a surface temperature of 130°C can be reached.

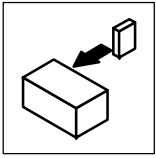
Noises

The switching noise during engagement and disengagement varies depending on the air gap “ S_{air} ”. It is between approx. 50 and 55 db (A).

Others

Abrasion due to emergency braking occurs in the form of dust.

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



Installation





4 Installation

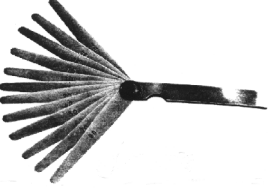
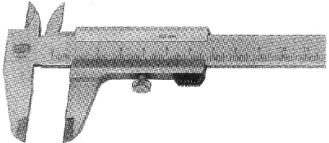
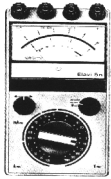


Warning!

Do not lubricate the screws with oil or grease.

4.1 Necessary tools

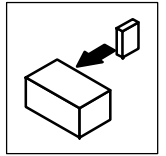
Type	Torque wrench Measuring range [Nm]	Insert for hexagon socket screws width across flats	Transport screw	Crosstip screwdriver
				
INTORQ BFK466-55/1	120	8 x 1/2" square	4 x 1/4" square	

Feeler gauge	Caliper gauge	Multimeter
		

4.2 Assembly

4.2.1 Preparation

1. Unpack the spring-applied brake.
2. Check the delivery package for completeness.
3. Check the nameplate data, especially the rated voltage.



4.3 Installation procedure

The brake is delivered preassembled with two transport screws.



Stop!

The transport protection may differ depending on the type of brake.

1. Position the brake radially over the brake disc (2).
2. Insert the mounting screws (3) and tighten them with the torque given (chapter 3.2).
3. Check clearance of brake disc (2) and check air gap " s_{Lu} " between both friction linings (4) and brake disc (2) with feeler gauge (5).



Stop!

The sum total of the distances measured must not exceed " $s_{Lümax.}$ "!

4. Removing the transport protection
 - Brake **without** emergency manual release
 - Remove transport screws (1) Fig. 5.
 - Brake **with** emergency manual release
 - Undo locknut and slacken transport screw (6) Fig. 4, until screw is approx. 1 mm from the stator.
 - Re-tighten locknut.
5. Switch the current on and off several times, checking the movability of the brake on the guide sleeves.

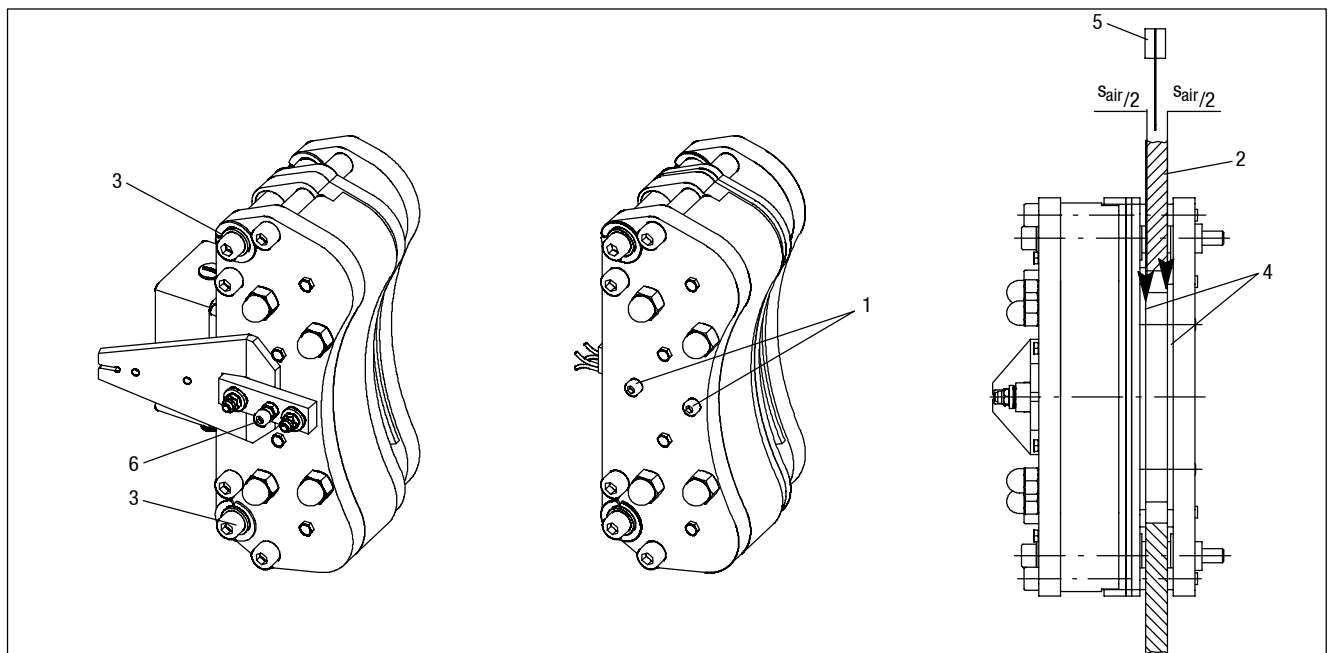
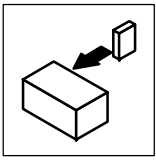


Fig. 4 BFK466-43/1 with emergency manual release

Fig. 5 BFK 466-43/1 without emergency manual release



Installation

4.4 Electrical connection



Warning!

Perform electrical connection only when no voltage is applied.

If an "emergency stop" is carried out without the protective circuit provided, the control device may be destroyed. Observe the correct polarity of the protective circuit!

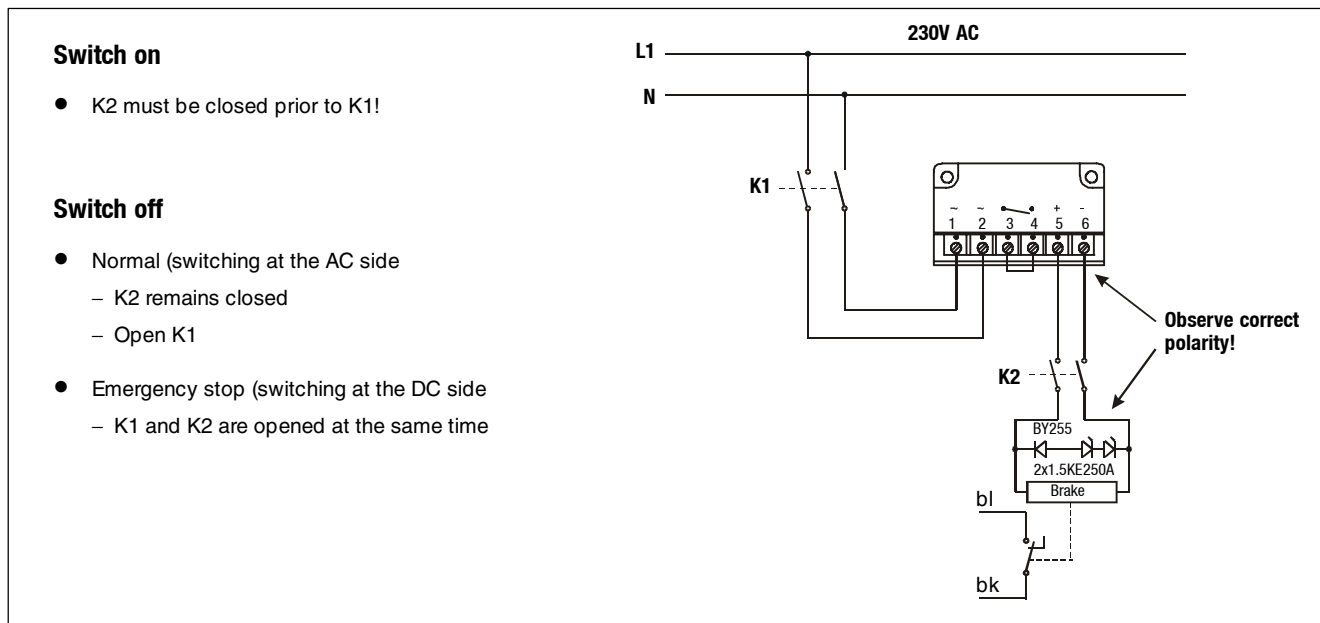


Fig. 6 INTORQ BFK466 connection plan (circuit proposal for switching at the DC side)

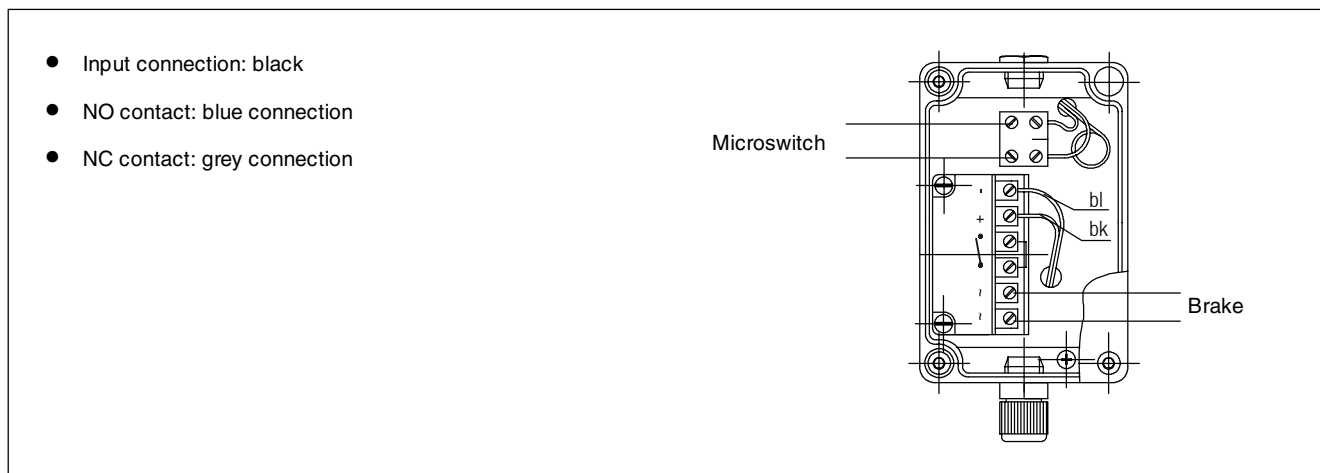
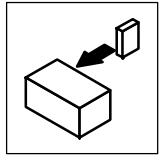


Fig. 7 INTORQ BFK466 terminal box (optional)



When current is fed to the spring-applied brake, the armature plate is released. The microswitch (NO contact) is actuated and gives the signal “Spring-applied brake released”.



Note!

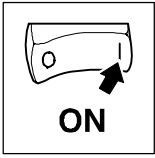
Application range recommended for the microswitch

- DC current: 10 mA to 100 mA at 12 V
- AC current: 10 mA to 5 A at 12 V / max. 250 V

Temperature sensor connection (optional)

The spring-applied brake can be delivered with PTC sensors according to DIN 44082 for temperature monitoring (reference temperature 130°C). The signal is evaluated via a PTC thermistor tripping device provided by the customer.

Connection: AWG 26 blue/blue



5 Commissioning and operation

5.1 Operating test



Warning!

The braking torque must be zero. The motor must not run!
Live connections must not be touched!

In the event of faults, see chapter 7 "Troubleshooting and fault elimination".

5.1.1 Release / voltage control

1. Remove two jumpers from the motor terminals. Do not switch off the voltage supply for the brake.
2. Measure the AC voltage at the motor terminals. It must be zero.
3. Switch on the current for the brake.
4. Measure the AC voltage at the motor terminals. It must be equal to the mains voltage.
5. Check air gap "s_{Lü}" between brake disc and friction lining. Air gap must be 0.4±0.1 mm. Brake disc must rotate freely.
6. Turn off the power supply.
7. Screw jumpers to motor terminals.

5.1.2 Manual release (optional)

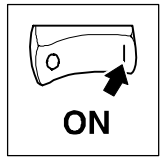
The installed manual release is designed for operation using a Bowden cable. The support at the spring-applied brake is used to suspend the Bowden cable. If no Bowden cable is being used, the lever must be extended to a total length of approx. 500 mm.



Warning!

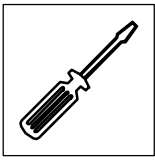
The braking torque must be zero. The motor must not run!

1. Pull lever with approx. 800 N (approx. 200 N with extension) until considerable increase in resistance is felt.
2. The rotor must be freely rotatable. A low residual torque is permissible.
3. Release lever.



5.2 During operation

- Perform regular checking during operation. Please pay particular attention to:
 - Unusual noises or temperatures
 - Loose fixing elements
 - The state of the electrical cables.
- In the event of faults and errors refer to troubleshooting table in chapter 7. If the fault cannot be eliminated, please contact the INTORQ representative.



6 Maintenance / repair

6.1 Inspection intervals

The spring-applied brake is to be checked during the prescribed inspections of the drive system in which it is installed.

The service life of the brake before replacement does not depend on the number of emergency brakings alone. The friction lining of the brake wears at varying speeds depending on the operating conditions. The total possible friction energy until replacement is required is reduced if a large quantity of switching energy is used per braking.

6.2 Inspections

1. Braking torque / delay check.



Warning!

Disconnect the drive from the load to prevent accidents. During the next inspection steps of the spring-applied brake, the motor must not run!

2. Switch on the current for the brake.
3. Check air gap " $s_{L\ddot{u}}$ " between brake disc and friction lining with a feeler gauge. It must not exceed dimension " $s_{L\ddot{u} \text{ max.}}$ " as per the table (3.2).
4. Turn off the power supply.

6.3 Maintenance

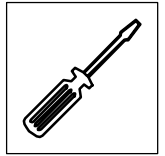
The brake does not require any maintenance when it is being used as a holding brake. The brake is replaced in the reverse order to assembly (chapter 4.2).



Warning!

Disconnect the drive from the load to prevent accidents. During the next inspection steps of the spring-applied brake, the motor must not run!

1. Switch on current for brake **or** insert transport screws (M6 x 60).
2. Undo the mounting screws at the guide sleeves (Fig. 1).
3. Remove the brake radially from the brake disc.
4. Switch off the power supply and disconnect the connecting cables.



6.4 Spare part ordering

Recipient: **INTORQ GmbH & Co. KG**
Postfach 1103
D-31849 Aerzen
Fax: 0 51 54 / 95 39-10

Spring-applied brake INTORQ BFK466-43/1

Sender

Company	_____	Customer no.	_____
Street / PO Box	_____	Order no.	_____
Post code / Town	_____	Issued by	_____
Delivery address *	_____	Telephone no.	_____
	_____	Fax no.	_____
Invoice to*	_____		
Delivery date	_____		

*Please state if different from sender Date _____ Signature _____

Order quantity _____ pcs.

Size 43

Voltage 48 V 103 V 205 V

Cable length Standard
_____ mm (from 100 mm - 1000 mm in steps of 100 mm,
from 1000 mm - 2500 mm in steps of 250 mm)

Manual release mounted

Terminal box mounted

PTC sensor

Electrical accessories

Rectifier with overexcitation

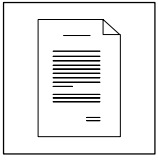


7 Troubleshooting and fault elimination

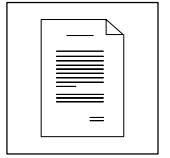
Error	Cause	Remedy
Brake cannot be released, air gap is not zero	Coil is interrupted	<ul style="list-style-type: none"> Measure coil resistance using multimeter: <ul style="list-style-type: none"> – Replace the brake when the resistance is too high.
	Coil has interturn fault or short circuit to ground	<ul style="list-style-type: none"> Measure coil resistance using multimeter: <ul style="list-style-type: none"> – Compare the measured resistance with the rated resistance. The rated data is given in chapter 3.2. Replace the brake when the resistance is too low. Test the coil for short circuit to ground using a multimeter: <ul style="list-style-type: none"> – Replace the brake in case of short circuit to ground. Check the brake voltage (see defective rectifier, voltage too low).
	Defective or wrong wiring	<ul style="list-style-type: none"> Check and correct the wiring. Check the cable using a multimeter: <ul style="list-style-type: none"> – Replace the defective cable.
	Defective or wrong rectifier	<ul style="list-style-type: none"> Measure the DC voltage at the rectifier using a multimeter. <ul style="list-style-type: none"> When the DC voltage is zero: <ul style="list-style-type: none"> • Measure the AC voltage at the rectifier. When the AC voltage is zero: <ul style="list-style-type: none"> – Switch on the voltage, – Check the fusing, – Check the wiring When the AC voltage is OK: <ul style="list-style-type: none"> – Check the rectifier – Replace defective rectifier When the DC voltage is too low: <ul style="list-style-type: none"> – Check the rectifier – Defective diode, use an appropriate rectifier Check the coil for fault between turns and short circuit to ground. If the rectifier defect occurs again, replace the brake even if you cannot find any fault between turns or short circuit to ground. The defect may occur later during heating-up.
	Microswitch miswired	Check and correct the microswitch wiring.
	Microswitchimproperly adjusted	Replace the brake and complain about the microswitch quality to the manufacturer.
	Air gap too big	Replace the brake (chapter 6.3).
Brake disc cannot rotate freely	Wrong setting of manual release	Check dimension $s+s_{L\underline{u}}$ with energised brake. The dimension must be identical at both sides. Correct if necessary.
	Air gap “ $s_{L\underline{u}}$ “ too small	<ul style="list-style-type: none"> Check air gap “$s_{L\underline{u}}$“ and replace brake if necessary (chapter 6.3). Check thickness of brake disc and replace if necessary. Check movability on guide sleeves and replace guide sleeves if necessary.
Voltage not zero during functional test, chapter 5.1	Microswitch miswired	Check and correct the microswitch wiring.
	Microswitch defective or improperly adjusted	Replace the brake and send the defective brake to the manufacturer



Voltage too high	Brake voltage does not match the rectifier	Adapt the rectifier to the brake voltage or the brake voltage to the rectifier.
Voltage too low	Brake voltage does not match the rectifier	Adapt the rectifier to the brake voltage or the brake voltage to the rectifier.
	Diode in the rectifier defective	Replace the defective rectifier.
AC voltage is not mains voltage	Defective or missing fuse	Select a connection with proper fusing.
	Microswitch miswired	Check and correct the microswitch wiring.
	Microswitch defective or improperly adjusted	Replace the brake and send the defective brake to the manufacturer



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