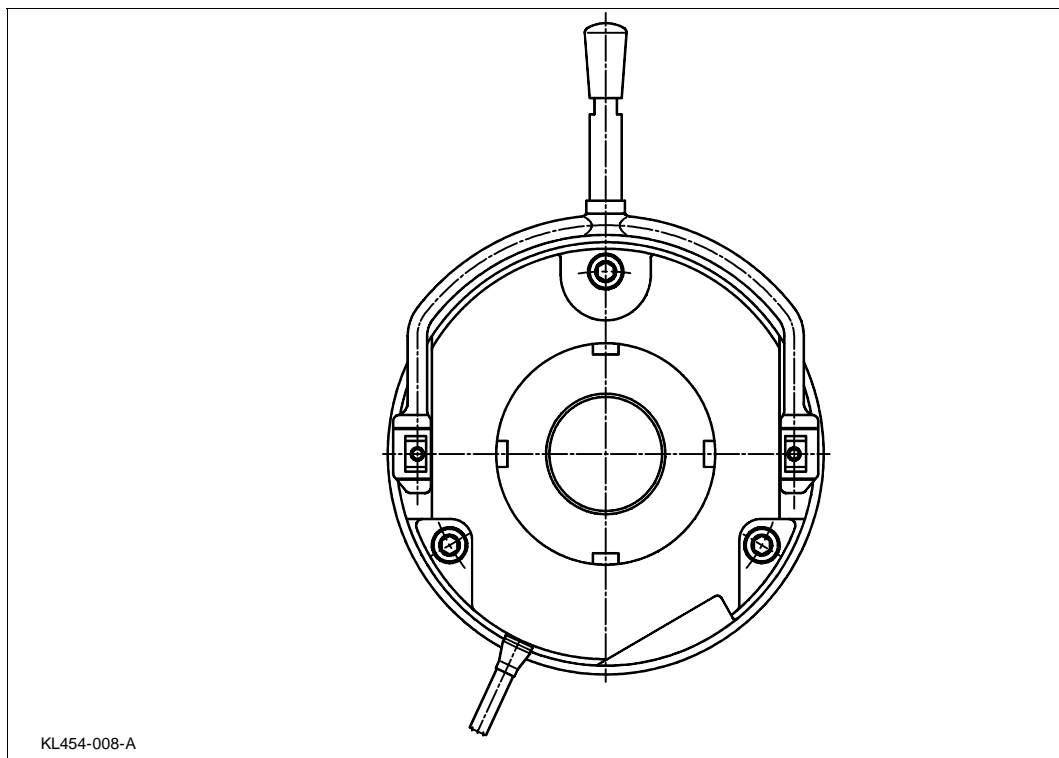


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Lenze

Operating Instructions

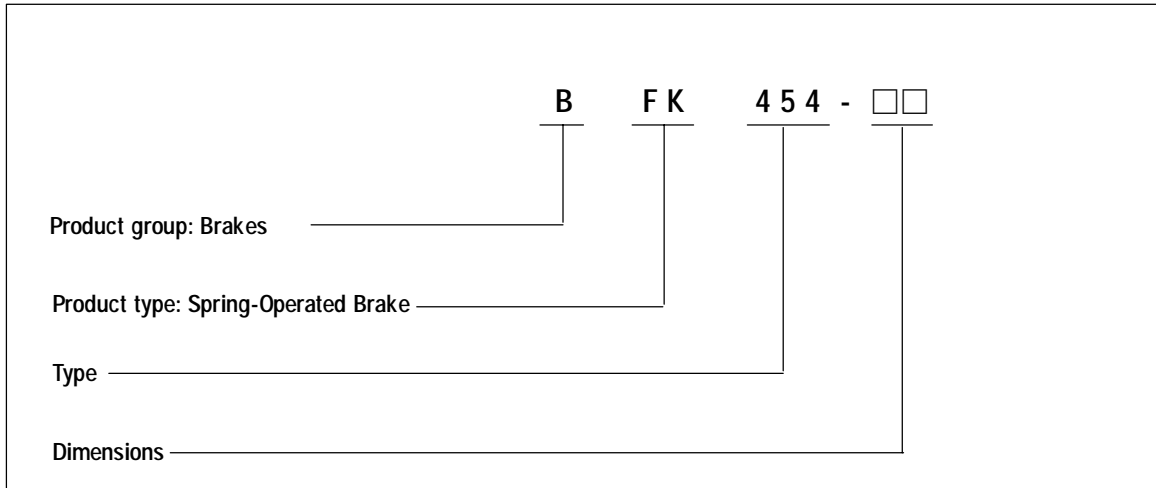


***Electromagnetically
released twin-circuit
spring-operated brake***

Type BFK454-



Product Key



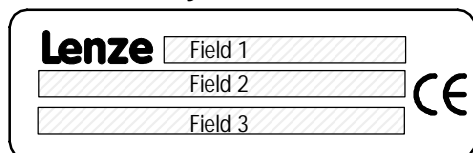
- The information given in the product key, on the nameplate and on packaging labelling applies to spring-operated brakes of the BFK454 series.

These Operating Instructions are valid for the following spring-operated brake models/types:

BFK454-10
BFK454-12
BFK454-14
BFK454-16
BFK454-18
BFK454-20
BFK454-25

Nameplate

Layout

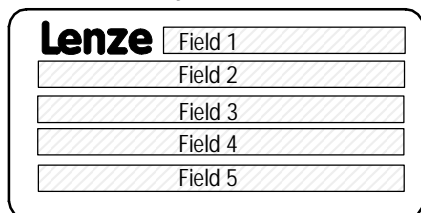


Layout for sizes 10 -16 and 18 - 25

Field	Contents				Example: size 10-16
1	Manufacturer	Brake type	Type no.		
2	Rated voltage	Rated power	Rated braking torque	CE labelling	
3	Date of manufacture				
Field	Contents				Example: size 18-25
1	Manufacturer				
2	Brake type				
3	Rated voltage	Rated power			
4	Rated braking torque		Date of manufacture		
5	Type no.	CE labelling			

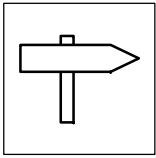
Packaging sticker

Layout



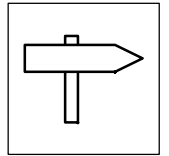
Assembly

Field	Contents				Example
1	Manufacturer	Barcode no.			
2	Name				Type no.
3	Type: see product key	Rated braking torque	Qty. per carton		
4	Rated voltage and power		Packaging date		
5	Supplement		CE labelling		



Contents

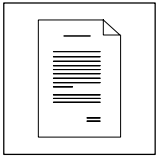
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Declaration of Conformity / Manufacturer's Certification

Service addresses



1 Preface and General Information

1.1 How to use these Operating Instructions

- These Operating Instructions are intended to ensure safe operation on and with the spring-operated brake with electromagnetic release. They include safety instructions that must be adhered to.
- All persons working on and/or with the spring-operated brake with electromagnetic release must have these Operating Instructions available to them at all times when so doing and must adhere to the information and notes relevant to their activities.
- The Operating Instructions must always be complete and wholly legible.

1.1.1 Terminology used

Brake

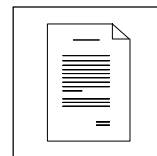
The term "spring-operated brake" is used to mean " spring-operated brake with electromagnetic release" throughout the text that follows.

Drive system

The term "drive system" is used throughout the text that follows to mean drive systems with spring-operated brake with electromagnetic release.

1.2 Scope of Delivery

- The drive systems are individually assembled on the modular principle. Scope of delivery is stated in the accompanying paperwork.
- Check immediately on receipt whether the goods delivered comply entirely with the accompanying documentation. Lenze cannot accept liability for any defects notified at a later date. Please immediately submit a claim for
 - visible transport damage to the forwarder;
 - and to the Lenze subsidiary/agency responsible in case of incomplete delivery or visible defects.



1.3 Lenze drive systems

1.3.1 Labelling

- Lenze drive systems and components are uniquely designated by the content of their nameplate/s.
- **Manufacturer:**
Lenze GmbH & Co KG Bremsen
POB 10 13 52
D-31763 Hameln
- **Location:**
Wülmser Weg 5
D-31855 Aerzen

1.3.2 Application as directed

- Lenze drive systems
 - are intended for use in machinery and plant;
 - may only be used for their designed purpose/s as ordered;
 - may only be operated under the conditions given in the Operating Instructions, and
 - may not be operated outside their applicable performance/capacity limits.

Any and all other use/s is/are improper.

1.3.3 Legal rules

Liability

- The information, data and notes in these Operating Instructions were current at the time of printing. No right to make claim/s concerning drive systems already supplied can be made on the basis of the details, illustrations and descriptions contained herein.
- We accept no liability for damage or operational malfunction due to:
 - improper use;
 - unauthorised modification/s to drive system/s;
 - improper operation of/with the drive system/s;
 - control/operation errors, or
 - disregarding these Operating Instructions.

Warranty

- Please refer to Lenze GmbH & Co. KG's Terms and Conditions of Sale for our warranty conditions.& Co KG.
- Warranty claims must be advised Lenze immediately on the defect/fault/malfunction concerned being detected to be effective.
- The warranty is null and void should any claim/s of liability not be effective in law.



2 Safety Information

2.1 Persons responsible for safety

Operator

- An operator is any legal or natural person using the spring-operated brake or on whose behalf same is used.
- The operator or his designated safety officer must ensure
 - that all relevant rules, notes and laws are adhered to;
 - that only properly qualified personnel work on or with the spring-operated brake;
 - that such personnel have the Operating Instructions available to them during all relevant work/s, and
 - that personnel not properly qualified are prohibited from working on and/or with the spring-operated brake.

Properly qualified staff

Properly qualified staff are persons authorised by those responsible for plant safety to carry out such activities as may be required and who are able to recognise and avoid all potential risks. Such persons are so authorised on the basis of their training, experience and equipment familiarisation and their knowledge of applicable standards, rules, accident prevention regulation and operating conditions. (Definition of specialist personnel according to IEC 364)
(Definition of specialist personnel according to IEC 364)

2.2 General Safety Information

- No claim is made for this safety information being comprehensive. In the event of queries and/or problems, please refer to your Lenze agent/representative.
- The spring-operated brake is state-of-the-art when supplied and is considered fundamentally safe to operate.
- Risks to persons, the spring-operated brake itself and/or to the operator's assets may arise in operating the brake if
 - personnel who are not properly qualified work on/with the brake, and/or
 - the spring-operated brake is improperly used.
- The spring-operated brakes must be so designed that, if correctly installed and if used for their designed purpose in fault-free operation, their function is fulfilled and no risk to persons arises. This also applies to their interaction with the entire plant..
- Only use the spring-operated brake when it is in a fault-free condition.
- Retrofitting, modification and/or any change/s to the spring-operated brake/s are prohibited as a matter of principle. Prior reference to Lenze is essential in ALL cases.
- Friction linings and/or surfaces must never come into contact with oil or grease; even minor quantities of either/both greatly reduce braking torque.
- Given operating conditions compliant with Protection Type IP54, no changes in braking torque need normally be anticipated. However, proper functioning of the mechanical components needs to be tested under the particular operating conditions applicable as such conditions can vary so greatly.



Spring-operated BFK454 brake operating range and limitations□□:

- Not to be used in explosion-endangered or corrosive atmospheres.
- There are no humidity limitations.
- Ambient temperatures from -20°C to $+40^{\circ}\text{C}$ are permissible.
- Where humidity is high and temperature low, measures must be taken to ensure the armature plate and rotor do not freeze solid.
- Electrical connections must be protected against short-circuits/contact.
- The flow of cooling air must not be impeded in any way whatsoever.
- In reverse operation, we recommend the hub be additionally affixed to the shaft with adhesive..

2.3 Testing and expertise evaluation

- In an expertise dated 29.06.1998 BT BY-FAS/re-id, adherence to the requirements of the TRA 200 (TRA 227, 228.1 (1), 228.2), DIN EN 81 Part 1 [section 12.4.2.1 (para. 2), 12.4.2.4, 12.4.2.5, 12.4.2.6] and pr EN 81 - 1, issue of March 1997 [section 12.4.2.1 (section 2.), 12.4.2.4, 12.4.2.5] was confirmed by the TÜV Süddeutschland (= German Technical Monitoring Association, South Germany).
- The brakes must be supplied complete with testing instructions..



Safety information

2.4 Layout of the Safety Information

- All Safety Information in these Operating Instructions is laid out uniformly as below.



Signal word!

Informational text

- The pictograph identifies the type of risk.
- The signal word identifies the risk degree of severity.
- The informational text describes the risk and advises on how it might be avoided.

Warning of danger to persons

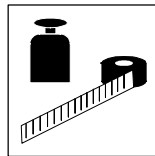
Icons used	Signal words	
 Warning of dangerous electric current	Danger!	Warns of immediately impending danger . Consequences if disregarded: death or very severe injury.
 Warning of a general danger	Warning!	Warns of a potentially very dangerous situation . Possible consequences if disregarded: death or serious injury.
	Caution!	Warning of a potentially hazardous situation . Possible consequences if disregarded: light or minor injury.

Warning of danger to material/s

Icons used	Signal words	
 Warning of danger to material/s	Stop!	Warns of potential danger to material/s . Possible consequences if disregarded: damage to the drive system/device or its environment.

Other information

Icons used	Signal words	
 Other information	Tip!	Denotes a general useful tip. Following it eases handling/operating/controlling the drive system/device.



3 Technical Data

3.1 Product description

3.1.1 General

The twin-circuit spring-operated brake

The twin-circuit system of the BFK454 brakes is created by splitting the armature plate into

- the front armature plate and
- the rear armature plate.

The twin-circuit spring-operated BFK454-□□ brake is designed to convert mechanical force and kinetic energy into heat at operating speeds up to 400 min^{-1} . Loads can be maintained without differential speed due to the static initial breakaway torque. Emergency braking from a differential speed of 3000 min^{-1} is possible.

The stator is designed to be of thermal class F. Limiting winding temperature is $155 \text{ }^\circ\text{C}$.

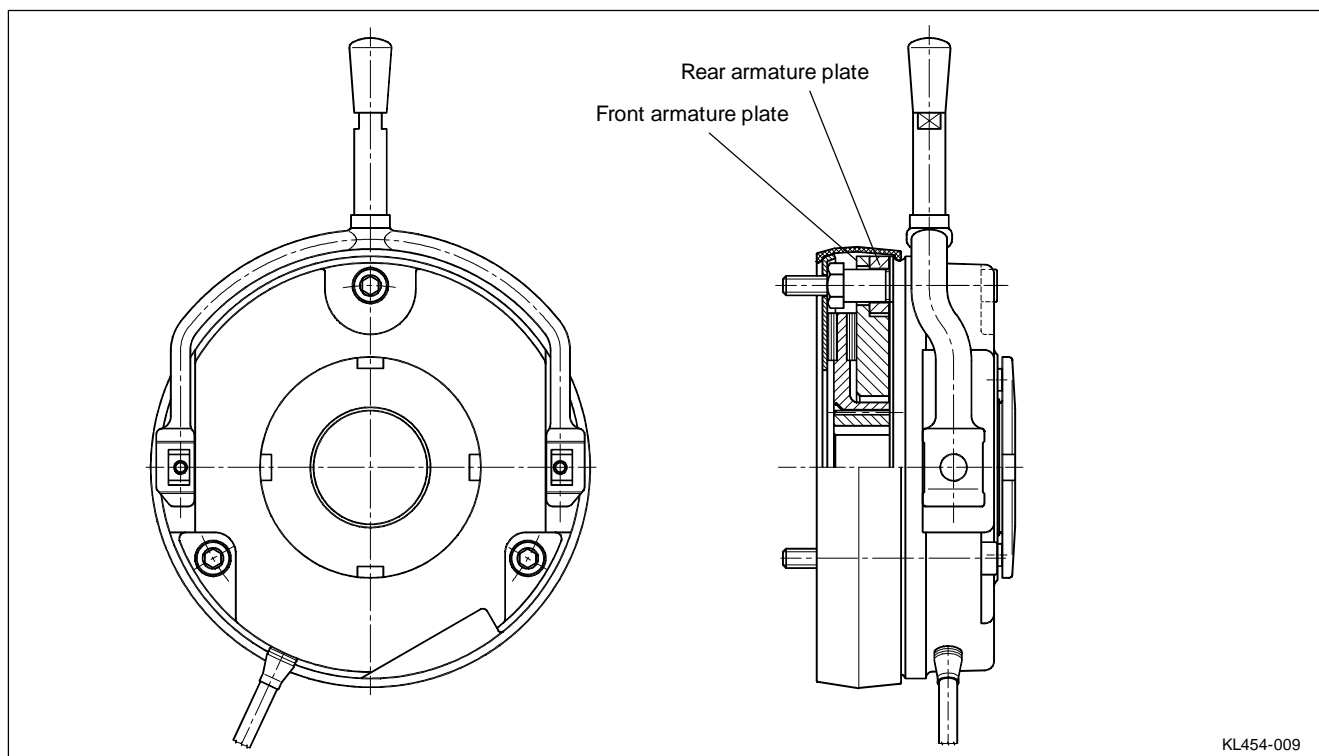
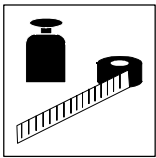


FIG 1



Technical data

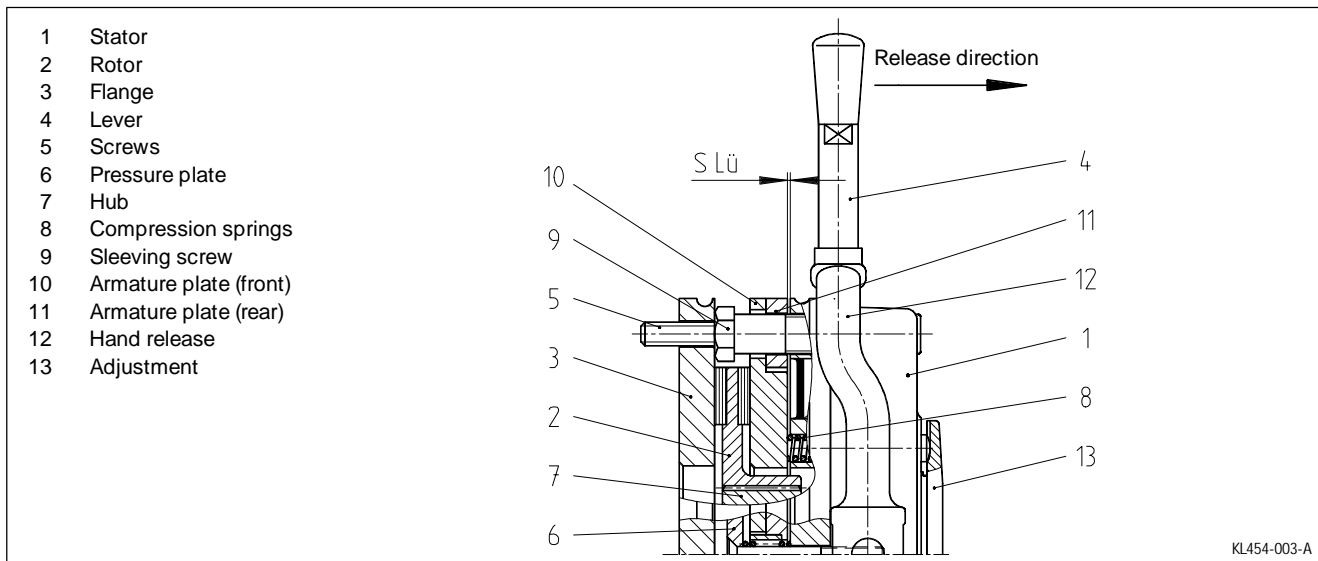


FIG 2 Twin-circuit spring-operated brake type BFK454-□□

Functional principle

The braking torque is created by the pressure of several compression springs (8) via friction between the friction linings of the rotor (2), flange (3) and front armature plate (10). The brake is released electromagnetically.

The front armature plate (10) is secured against torsion by two or more drill-holes in cylindrical rear armature plate (11) retainers. That part of braking torque created on the front armature plate (10) is born via the rear armature plate (11) by the sleeving screws (9). The compression force of the outer pole springs (8) affects the front armature plate via the rear armature plate (11), whereas the inner pole compression springs (8) directly affect the front armature plate (10).

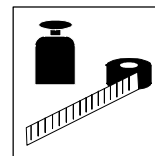
The thickness of the armature plates is so attuned to one another that the front plate (10) cannot be separated from the friction lining without the rear one (11). The rear plate (11) can on its part not fall from the stator (1) without its front mate (10).

Armature plate separation hence does not occur in the friction surface area. Switching behaviour similar to that in one-piece armature plates is achieved. If the rear plate (11) clamps to the sleeving screw (9), then the front plate (10) can still fall from the stator (1) and at least 50% of braking torque is achieved.

No relative axial motion between the armature plates (10+11) when they fall from the stator (1) occurs in view of this design and in accordance with the above description. This means that the the front plate (10) cannot clamp on the sleeving screws (9) with simultaneous movement of the rear plate (11) as a matter of design principle.

3.1.2 Brakes

During braking, the rotor mounted axially movably on the toothed hub is pressed against the flange by the inner and outer compression springs via the front armature plate. The asbestos-free friction linings ensure a high braking torque with low wear. The braking torque is transmitted between flange, front armature plate and rotor by friction coupling. This torque is transmitted from rotor to shaft and from the front via the rear armature plate to the sleeving screws in the stator by positive engagement.



3.1.3 Brake release

When the brake is applied, there is an air gap between stator and armature plates of $s_{L\ddot{u}}$ (FIG 2). To release the brake, the DC current provided is fed to the stator coil. The magnetic force generated attracts the armature plates toward the stator against the force of the springs. The rotor is then relieved of the spring compression force and can rotate freely.

3.1.4 Hand release

Manual release is designed for short-term release in dead condition (i.e. without current). This permits lowering the cabin to floor height even when the power fails. Manual release can be used to simulate loss of a braking circuit for brake testing purposes.

3.1.5 Wear display / monitoring option

The optionally available microswitch (changeover contact) monitors the air gap $s_{L\ddot{u}}$. Shortly before the max. permissible air gap $s_{L\ddot{u}max.}$ is reached, the microswitch trips. Motor and brake operation is inhibited. In addition, a signal can be transmitted if desired.

3.1.6 Decrease braking torque

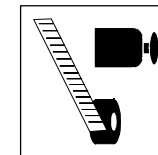
Please refer to chapter 5.2 for further information on this.

The twin-circuit spring-operated type BFK454 brake is equipped with a centrally installed adjustment ring. This affects only the compression springs of the inner pole and hence the front armature plate (front brake circuit).

The brake is supplied with the rated value of rated torque pre-set ex works. Undoing the adjustment ring permits the braking torque to be reduced by a max. 60% and hence optimally tailored to individual use. Compression spring force distribution between the two braking circuits is so selected that, after the adjustment ring (13) has been unscrewed, 50% of the braking torque is provided in each circuit. Twin-circuit brake operation is thus retained.

Braking torque may only be reduced to the point at which the torque from the front circuit suffices alone to adhere to the required stopping distance.

3.2 Rated data



Type	Power	Voltage	Coil resistance (Ω) $R_{20} \pm 3\%$	Rotor thickness		Max. adjustment, permissible wear (mm)	Max. projection of adjustment ring (mm) O_{max}	Pitch circle		Screws for flange mounting (DIN6912) 1)	Minimum depth of clearing holes (installation flange) (mm)	Weight of complete stator (kg)
	(W) P_{20}	(V) V		(mm) Rated	(mm) min.			(mm) \varnothing	Thread			
BFK454-10	33	205	1273	9	7	1.5	7.5	112	3 x M6	3 x M6	3	2.6
BFK454-12	40	205	1051	10	8	2	9.5	132	3 x M6	3 x M6	4	4.3
BFK454-14	53	205	793	10	7.5	2.5	11	145	3 x M8	3 x M8	3	6
BFK454-16	56	205	751	11,5	8	3.5	10	170	3 x M8	3 x M8	6	9.2
BFK454-18	85	205	494	13	10	3	15	196	6 x M8	4 x M8 ²⁾	6	14
BFK454-20	100	205	420	16	12	4	16.5	230	6 x M10	4 x M10 ²⁾	7.5	21.9
BFK454-25	110	205	382	20	15.5	4.5	18.5	278	6 x M10	6 x M10	9	32.5

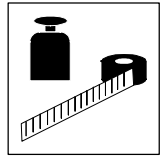
Type	Braking torque Rated value at $\Delta n = 100 \text{ min}^{-1}$ $M_f(\text{Nm}) \pm 20\%$		Max. speed Δn_{Omax} (min^{-1})		Air gap s_{Lu} (mm)		Braking torque at $\Delta n_0 (\text{min}^{-1})$ (%)			Braking torque derating per detent position (Nm)	Tightening torque (Nm)	
	Rated 3)	min. 3)	Normal braking	Emergency braking	Rated +0,1 -0,05	max. 4)	1000	1500	3000		Screws	Lever
	BFK454-10	15 (12/3)	6 (3/3)	400	3000	0.3	0.7 (0.45)	87	83	76	0.8	9.5
BFK454-12	30 (24/6)	12 (6/6)	400	3000	0.3	0.8 (0.45)	85	81	74	1.3	9.5	4.8
BFK454-14	60 (48/12)	24 (12/12)	400	3000	0.3	0.8 (0.45)	84	80	73	1.7	23	12
BFK454-16	90 (72/18)	36 (18/18)	400	3000	0.3	0.8 (0.45)	83	79	72	1.6	23	12
BFK454-18	150 (120/30)	60 (30/30)	400	3000	0.4	1.0 (0.6)	81	77	70	3.6	23	23
BFK454-20	200 (160/40)	80 (40/40)	400	3000	0.4	1.3 (0.6)	79	75	68	5.6	46	23
BFK454-25	400 (320/80)	160 (80/80)	400	3000	0.5	1.3 (0.75)	77	73	66	6.2	46	40

1) Screw length depends on material/s and thickness of the client's mounting surface.

2) Thread in mounting surface 30 degrees inclined to centre axis of manual release lever

3) () Distribution of the preset brake torque to the front/back brake circuit (delivery).

4) () Max. permissible air gap for brake torques $M_{k rated}$.



3.3 Switching times

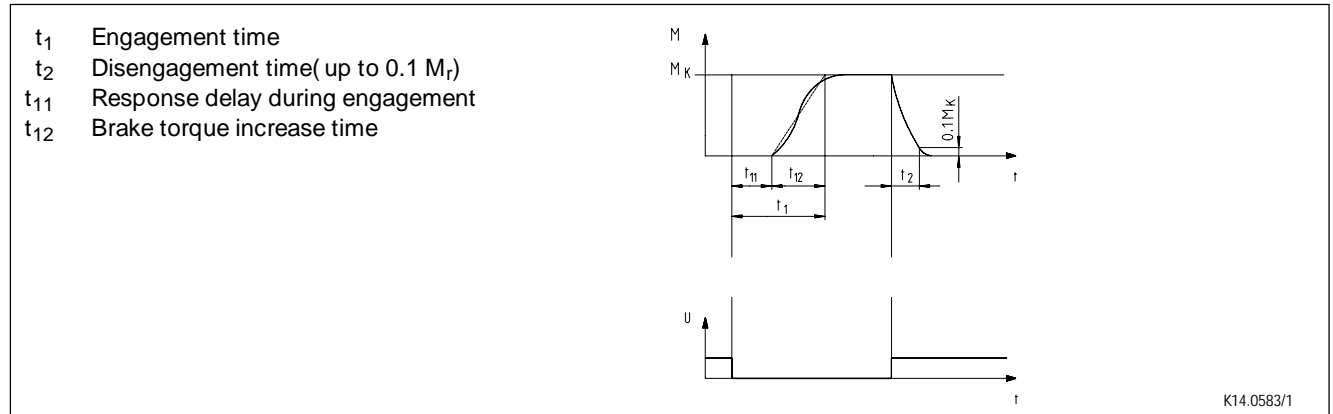


FIG 3 Switching times diagram

Type	Braking torque at $n_n=100 \text{ min}^{-1}$		Max. switching per individual switching procedure (J) Q_E	Transition switching frequency (h^{-1}) $S_{\text{hü}}$	Switching times (s) at $S_{\text{Lürated}}$ and $M_r \text{ rated}$			
	M_r (Nm) $\pm 20\%$ rated	min.			Engage		Disengage	
					t_{11}	t_{12}	t_1	t_2
BFK454-10	15 (12/3)	6 (3/3)	12000	40	0.02	0.02	0.04	0.08
BFK454-12	30 (24/6)	12 (6/6)	24000	30	0.03	0.03	0.06	0.12
BFK454-14	60 (48/12)	24 (12/12)	30000	28	0.03	0.03	0.06	0.18
BFK454-16	90 (72/18)	36 (18/18)	36000	27	0.04	0.04	0.08	0.22
BFK454-18	150 (120/30)	60 (30/30)	60000	20	0.05	0.05	0.10	0.27
BFK454-20	200 (160/40)	80 (40/40)	80000	19	0.06	0.08	0.14	0.35
BFK454-25	400 (320/80)	160 (80/80)	120000	15	0.08	0.12	0.20	0.45

Transition from a condition free of braking torque to one of steady braking torque is not immediate. The engagement times apply to DC switching with induction voltages of about 5 to 10 times rated voltage. The diagram (FIG 3) shows the engagement delay t_{11} , the time the braking torque takes to increase t_{12} and the engagement time $t_1=t_{11}+t_{12}$, as well as the disengagement time t_2 . Reducing the braking torque changes switching times.

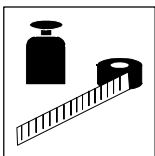
Disengagement

The disengagement time is not affected by AC or DC switching. It can be shortened using special devices that operate on the basis of rapid excitation or overexcitation.

Engagement time

DC wiring with spark suppression is absolutely essential to ensure brief engagement times in emergency braking. The engagement time response delay in particular is extended when braking torque is reduced.

If the drive system is operated with a frequency converter, so that the cabin is positioned by the AC motor and the brake is first switched dead (i.e. without current) when the motor stops, then AC switching can also be used (this does not apply to emergency braking). In such cases, the engagement times are greatly extended. The change is by about a factor of 10.



3.4 Switching frequency / switching

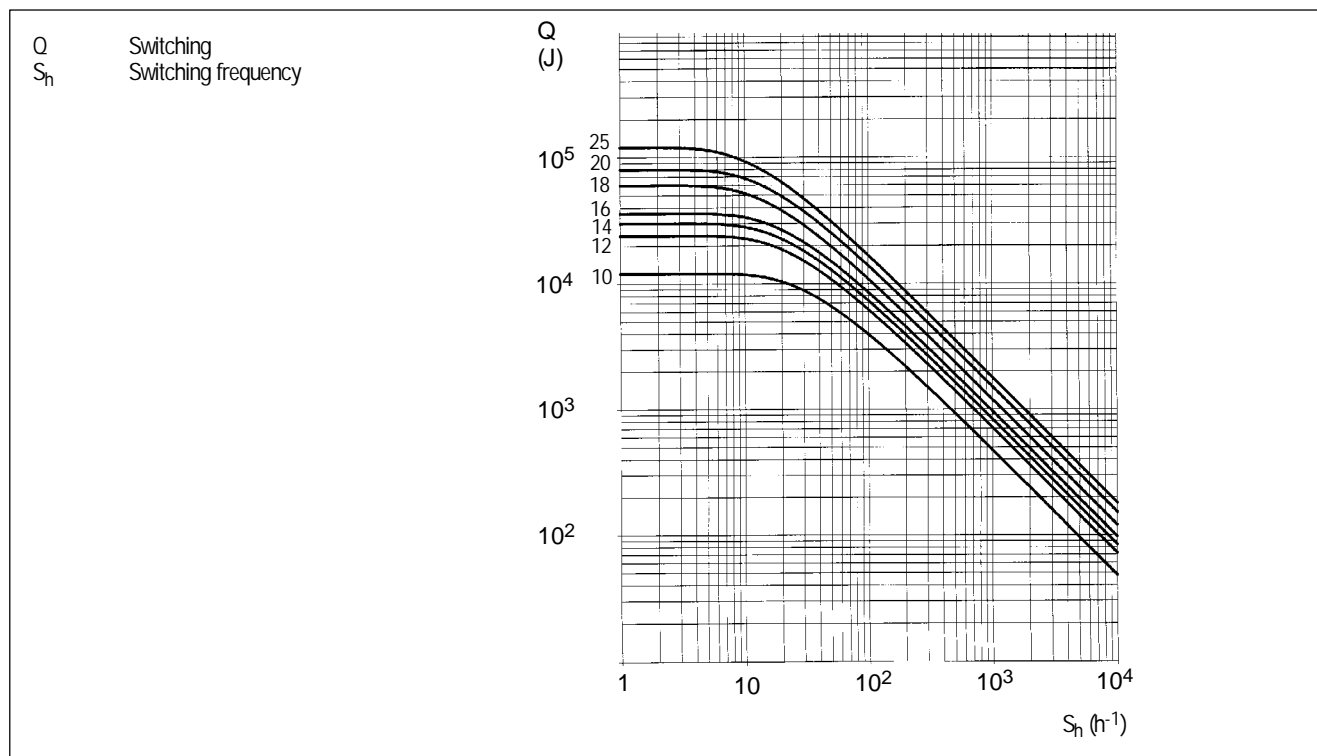
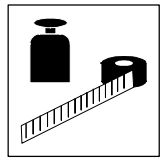


FIG 4 Switching as a function of switching frequency; sizes 10 to 25

$$S_{hperm} = \frac{-S_{h\ddot{u}}}{\ln\left(1 - \frac{a}{a_E}\right)} \quad Q_{perm} = Q_E \left(1 - e^{-\frac{S_{h\ddot{u}}}{S_h}}\right)$$

Permissible switching frequency S_{hperm} is dependant on switching Q (see FIG 4). At a pre-determined switching frequency of S_h , permissible switching is Q_{perm} .

At high speed and rapid switching, wear increases steeply as very high temperatures arise on the friction surfaces for brief periods.



3.5 Emissions

Under normal switching conditions with unfiltered DC voltage via bridging, the twin-circuit spring-operated brake type BFK454-□□ fulfils the electromagnetic compatibility requirements of EN50081 Part 1.

Please note that the entire wiring only fulfils this EN 50081 Part 1 standard, if one of the following configuration alternatives is applied.

Wiring/circuitry		Rectifier		Spark suppression in parallel with AC voltage	Mains filter
		Fulfils standard	Does not fulfil standard		
DC switching	< = 5 Switching operations per minute	●			
			●	●	
	> 5 Switching operations per minute	●			●
			●		●
AC switching	< = 5 Switching operations per minute	●			
			●	●	
	> 5 Switching operations per minute	●			
			●	●	

Spark suppression equipment on request (dependant on coil voltage).

Heat

As the brake converts kinetic, mechanical and electrical energy into heat, the surface heats up to an extent dependant on operating conditions and possible heat dissipation. Under unfavourable operating conditions, a surface temperature of 130°C can be reached.

Noise

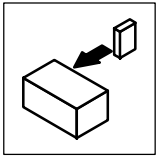
Switching noise during engagement and disengagement varies dependant on the air gap $s_{Lü}$ and the brake size.

Squeaking sounds may occur during braking dependant on inherent oscillation in the installed state, operating conditions and the condition of the friction surfaces.

Miscellaneous emission information

Friction surface abrasion produces dust.

At high loads, the friction surfaces heat up to such an extent that odours may be given off.



Installation







4 Installation






Warning!

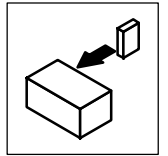
Do not lubricate the toothed hub or the screws with oil or grease.

4.1 Required tools

Type	Torque wrench Measurement range [Nm] 	Insert for hexagonal socket (Allen) screws Width [mm]  *	Open-jawed spanner Jaw span [mm] 			Sickle spanner DIN1810 A-design for Diameter [mm] 	Socket spanner for outer flange mounting Size [mm] 
			Sleeving screws	Nuts / bolts	2kt lever 		
BFK454-10	1 to 12	5x ¹ / ₄ " square	12	10 / 7	7	68 - 75	10x ¹ / ₄ " square
BFK454-12						80 - 90	
BFK454-14	20 to 100	6x ¹ / ₂ " square	15	12 / 8	9	95 - 100	13x ¹ / ₂ " square
BFK454-16						110 - 115	
BFK454-18						135 - 145	
BFK454-20						155 - 165	
BFK454-25		8x ¹ / ₂ " square	17	- / 10	14		17x ¹ / ₂ " square

* for flange mounting insertion with journal guidance

Feeler gauge	Caliper gauge	Multimeter
		



4.2 Assembly

4.2.1 Preparation

1. Unpack the spring-operated brake.
2. Check that it is complete.
3. Check nameplate information, especially rated voltage.

4.3 Installation procedure

- First install friction plate and/or flange if these extras have been supplied.

4.3.1 Mounting the hub on the shaft

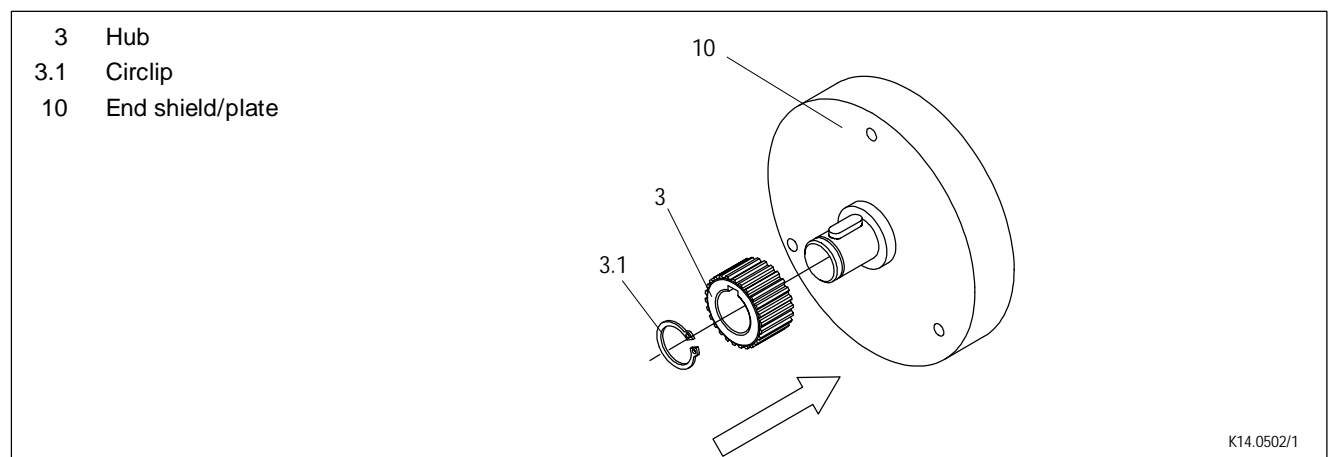


FIG 5 Mounting the hub on the shaft

1. Press the hub (3) on the shaft.
2. Secure the hub against axial displacement, e.g. with a circlip (3.1).



Stop!

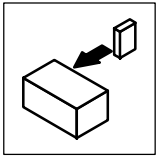
In reverse operation, we recommend additionally affixing the hub to the shaft with adhesive.

4.3.2 Mounting the brake



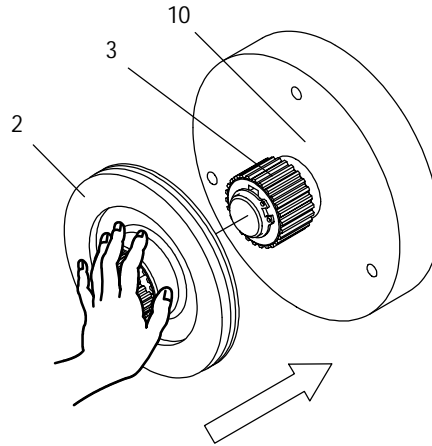
Stop!

Allow for permissible wear (chapter 3.2 refers) when sizing the thread depth in the end shield (10). Check the condition of the end shield. It must be free of oil and grease.



Installation

- 2 Rotor
- 3 Hub
- 10 End shield/plate

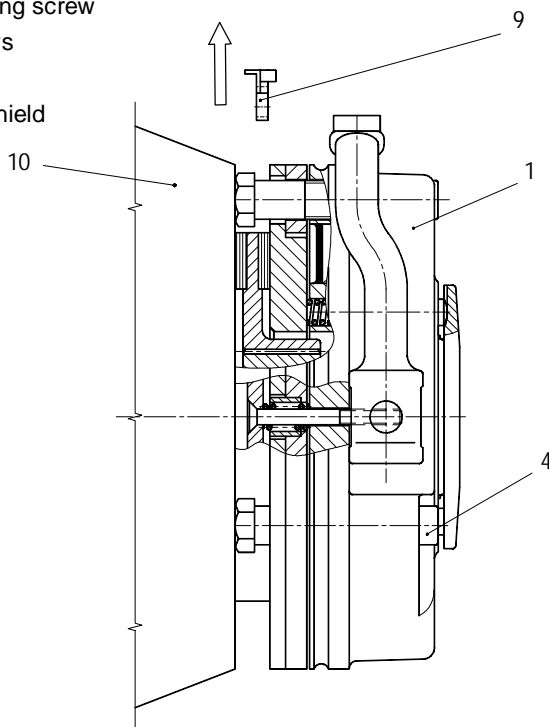


K14.0502/8

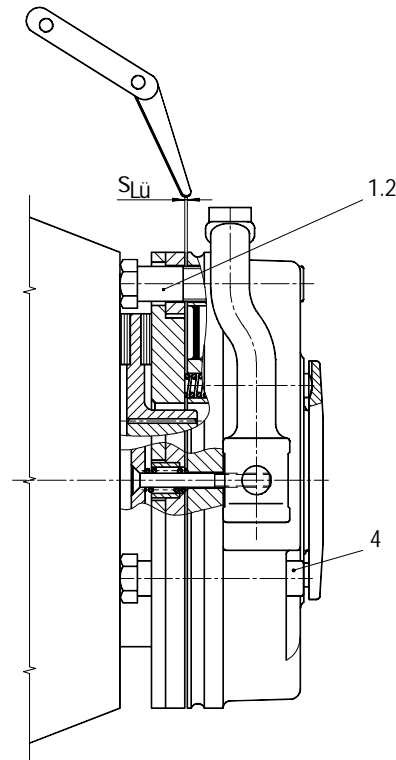
FIG 6 Installing the brake

1. Push the rotor (2) on the hub (3) and check whether it can be moved manually (FIG 6).

- 1 Stator
- 1.2 Sleeving screw
- 4 Screws
- 9 Clip
- 10 End shield



KL454-001-A



KL454-002-A

FIG 7 Affixing the stator

FIG 8 Setting the air gap

2. Screw the entire stator (1) onto the end shield (10) using the screws (4) (FIG 7).
3. Remove the clips (9) (dispose; FIG 7).
4. Evenly tighten the screws (4). (check the table of tightening torques in chapter 3.2 and FIG 7) for the correct applicable torque/s.
5. Check the air gap $s_{L\ddot{u}rated}$ near the screws (4) using the feeler gauge ($s_{L\ddot{u}rated}$ see chapter 3.2 and FIG 7).

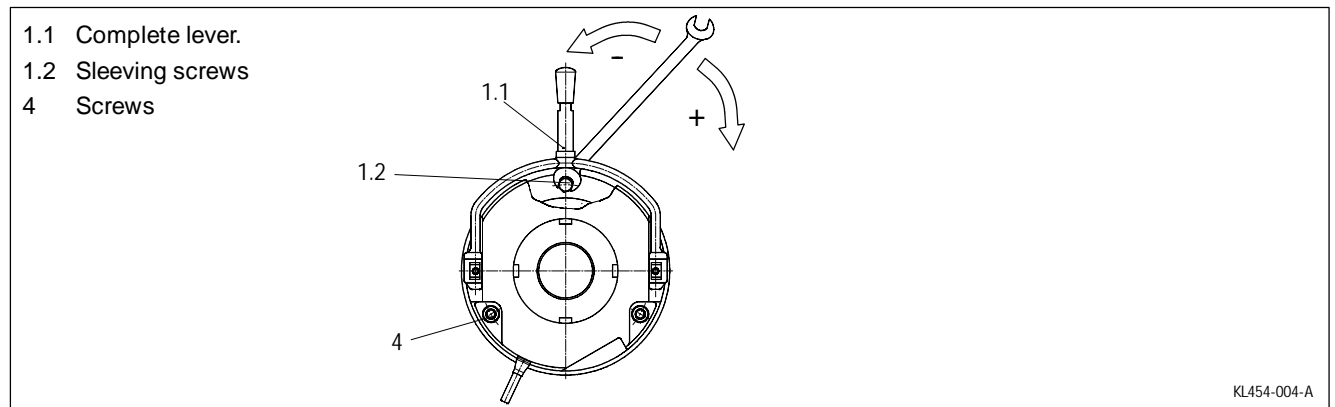
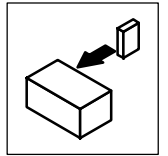


FIG 9 Setting the air gap

- Adjust as below if the deviation $s_{L\ddot{u}rated}$ is too great:
6. Undo the screws (4).
 7. Turn the sleeving screws (1.2) lightly using an open-jawed spanner
 - into the stator if the air gap is too large (1), and
 - out of it (1) if too small.
 - $\frac{1}{6}$ of a turn alters the air gap by about 0.15 mm.
 8. Tighten the screws (4) (refer to chapter 3.2 for the correct tightening torques).
 9. Check the air gap again and, if necessary, re-adjust it.
 10. After installing the protective hood or seal ring, screw the pre-assembled lever (1.1) in the retainer and tighten it in place (check chapter 3.2 for tightening torques).

4.3.3 Assembly of the friction plate, size 10 to 16

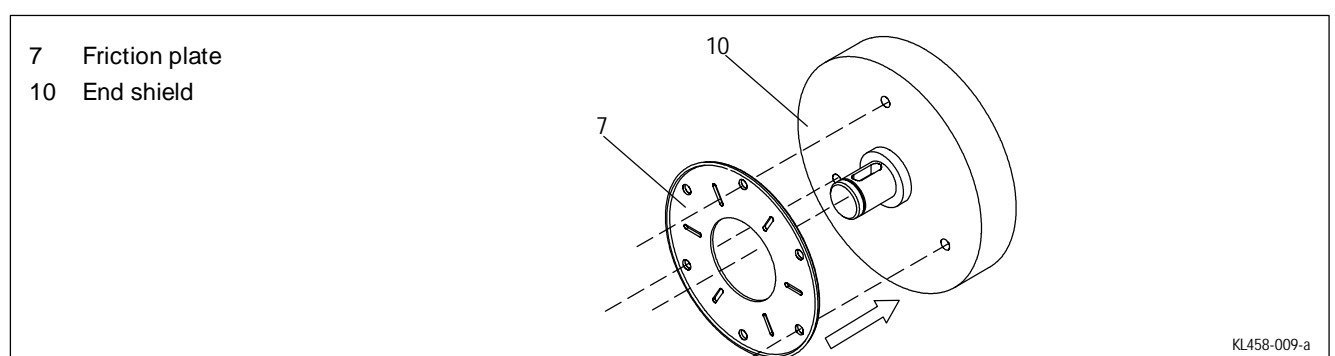
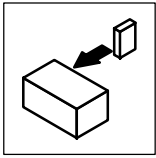


FIG 10 Friction plate assembly

1. Hold the friction plate (7) against the end shield.
2. Check pitch circle and fastening bore hole threads.

The lip edging must remain visible.



Installation

4.3.4 Mounting the flange

- The flange (6) can be screwed to the end shield (10) on the outer pitch circle (screw dimensioning is given in chapter 3.2).

Flange mounting with additional screws



Stop!

- Clearing holes in the end shield must be behind the threaded screw drill-holes in the flange (see chapter 3.2). Without them, minimal rotor thickness cannot be utilised. The screws must not press against the end shield.
- For sizes 18 and 20, the fastening surface threading must be angled at 30 degrees to the centre axis of the manual release lever.

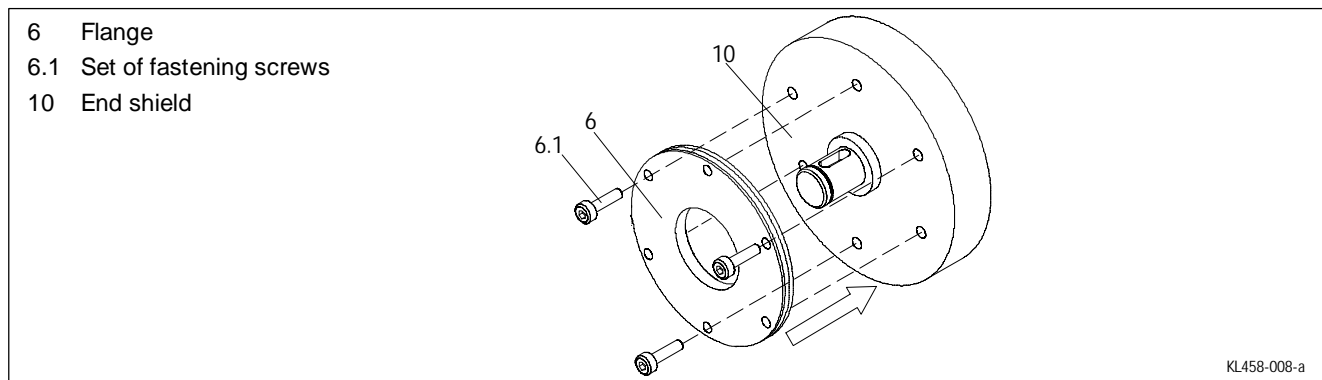


FIG 11 Mounting the flange

1. Hold the flange (6) against the end shield (10) and check the pitch circle and retaining screw drill hole threading.
2. Fasten the flange (6) with the screws (6.1) to the end shield (10).
3. Tighten the screws (6.1) evenly (check chapter 3.2 for the correct tightening torques).
4. Check screw head height. They may not be higher than the minimal rotor thickness. We recommend using DIN6912 screws (dimensions are given in chapter 3.2).

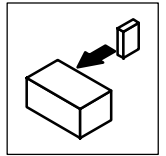
Mounting the flange without additional screws



Stop!

Allow for permissible wear in sizing end shield thread depth (see chapter 3.2).

1. Hold the flange (6) against the end shield (10) and check the pitch circle and fastening screw drill hole threading.
2. Install the brake using the set of screws supplied (see chapter 4.3.2).



4.3.5 Mounting the seal ring

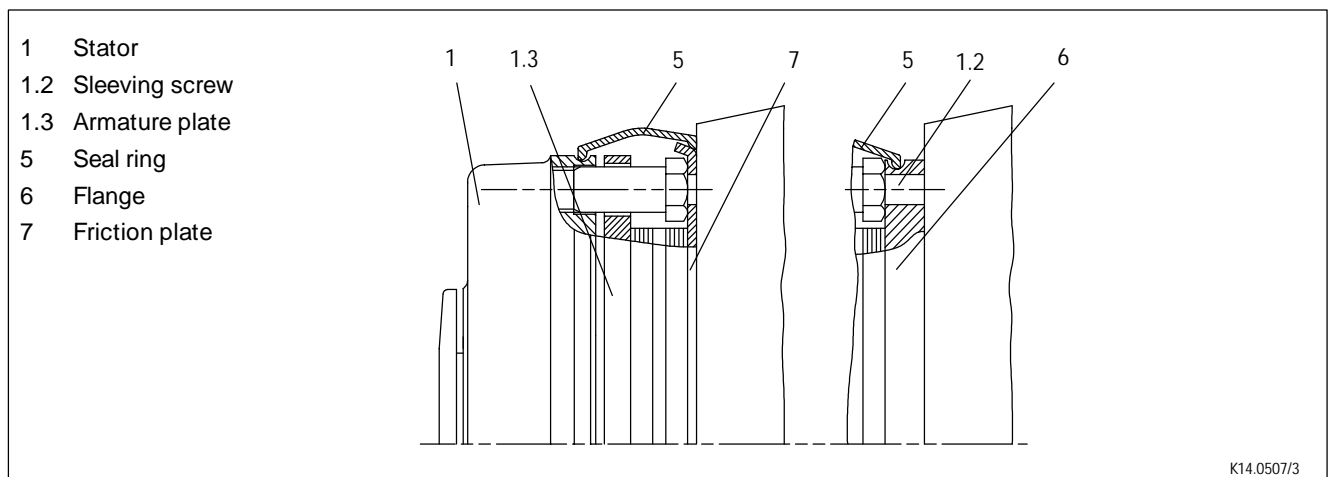
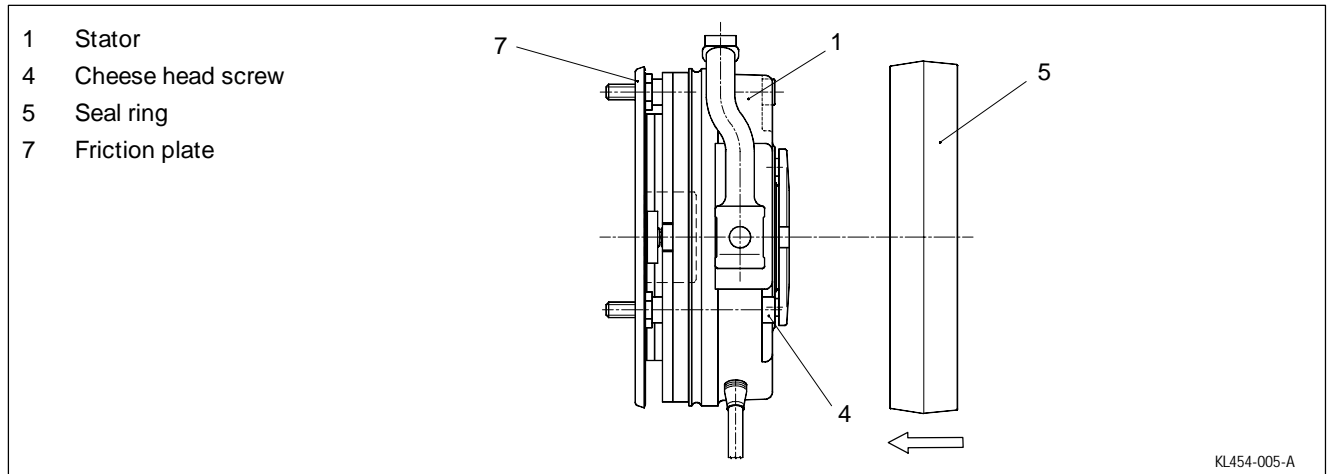
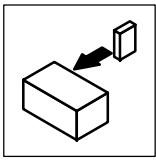


FIG 12 Seal ring assembly

1. Pull the cable through the seal ring (5).
2. Then push the seal ring (5) over the stator (1).
3. Press the lips of the seal ring (5) into the groove on the stator (1) and flange (6)
 - If a friction plate (7) is used, the lip must be pulled over the edging.



Installation

4.4 Electrical connection



Warning!

Work on electrical connection should only be carried out when no voltage is applied.

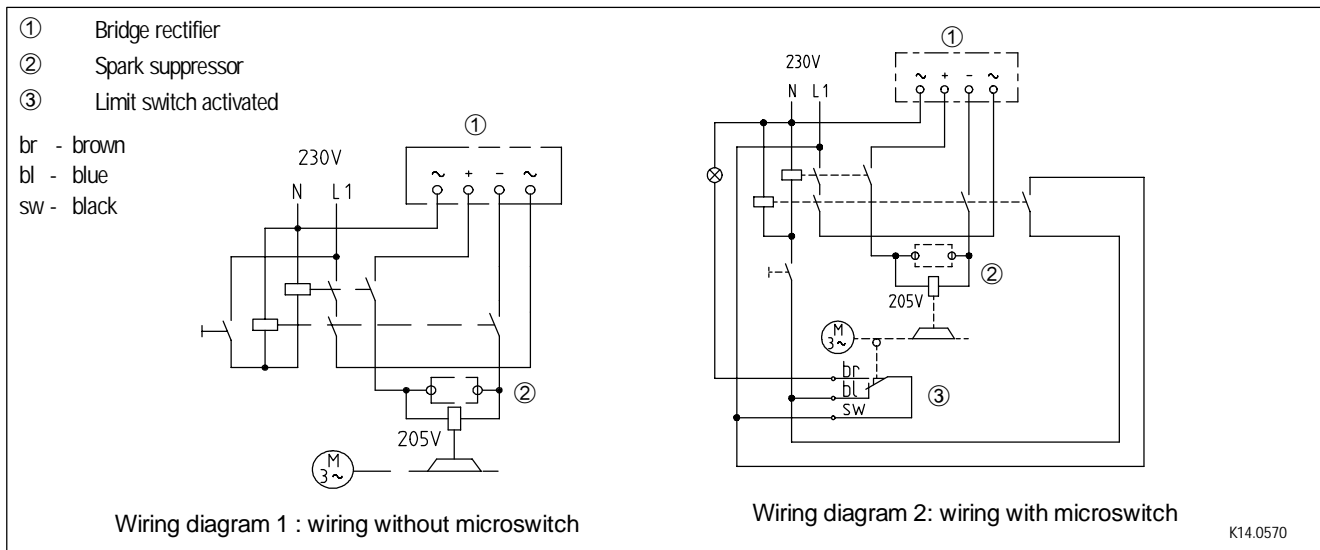


FIG 13 Electrical wiring of a 205V brake

Note on wiring per diagram 2:

If wiring diagram 2 is applied, the air gap is only monitored when the brake is in electrically dead condition. This makes sense, since the armature plate may be affected on only one side when current is fed to the brake. Such imbalanced positioning may simulate the maximal air gap and open the microswitch. If there is no closed contact parallel to the microswitch contact, motor and brake will then be switched off. The microswitch contact closes again when the armature plate is completely released due to the small differential contact distance of the microswitch and the above process is then repeated.



Tip!

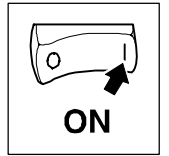
To exclude any mis-interpretation of microswitch signals, processing of same should only take place when the brake is electrically dead.

1. Install the rectifier in the terminal box. Mount it in the control cabinet if the motor is of insulation class H. Rectifier permissible ambient temperatures are from -25°C to $+80^{\circ}\text{C}$.
2. Compare stator (7) coil voltage with the DC voltage of the rectifier installed.
3. Select an applicable wiring diagram (FIG 13). Convert deviant AC voltage, e.g. in a 380 V bridge rectifier, as below.

$$380/400 \times 205 = 195\text{V}$$

Deviations of up to $\pm 3\%$ are permissible.

4. Motor and brake are to be wired up in accordance with wiring diagram 1 or 2.



5 Commissioning and operation



Warning!

Do not touch live connections and/or the moving rotor.
The motor must be turned off whilst brake function is being tested.

5.1 Function test

Refer to chapter 7 Troubleshooting and fault elimination.

5.1.1 Release / voltage check

Applies only to brakes without microswitches.



Warning!

The brake must be torque-free and the motor not running.



Warnung!

Do not touch live connections.

1. Remove two bridges from the motor terminals. Do not turn off brake DC power supply. The neutral conductor must also be connected to the motor neutral point when the rectifier is connected to that point.
2. Turn on the current.
3. Measure the DC brake voltage.
4. Compare the result with the nameplate voltage rating. Deviations of up to $\pm 10\%$ are acceptable.
5. Check the air gap $s_{Lü}$. It must be zero and the rotor freely rotatable.
6. Turn the power supply off.
7. Screw bridges to the motor terminals. Remove the additional neutral conductor.

5.1.2 Microswitch - wear check



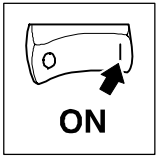
Warning!

The brake must be torque-free and the motor not running.



Warnung!

Do not touch live connections.



Commissioning

1. Remove two bridges from the motor terminals. Do not turn off the power supply to the brake. The neutral conductor must also be connected to the motor neutral point when the rectifier is wired to that point.
2. Adjust the air gap to $s_{L\ddot{u}max}$. Refer to chapter 4.3.2 steps 5-6 for more information.
3. Turn the power supply on.
4. Measure motor terminal AC voltage and brake DC voltage. Both must be zero.
5. Turn the power supply off.
6. Adjust the air gap to $s_{L\ddot{u}rated}$. See chapter 4.3.2 steps 5-6 for more information.
7. Turn the power supply on.
8. Measure the motor terminal DC voltage. It must be the same as the mains voltage.
9. Measure the brake DC voltage.
10. Compare it to that on the nameplate. Deviations up to $\pm 10\%$ are permissible.
11. Check the air gap $s_{L\ddot{u}}$. It must be zero and the rotor freely rotatable.
12. Turn the brake power supply off.
13. Screw the bridges onto the motor terminals and remove the additional neutral conductor.

5.1.3 Twin-circuit function

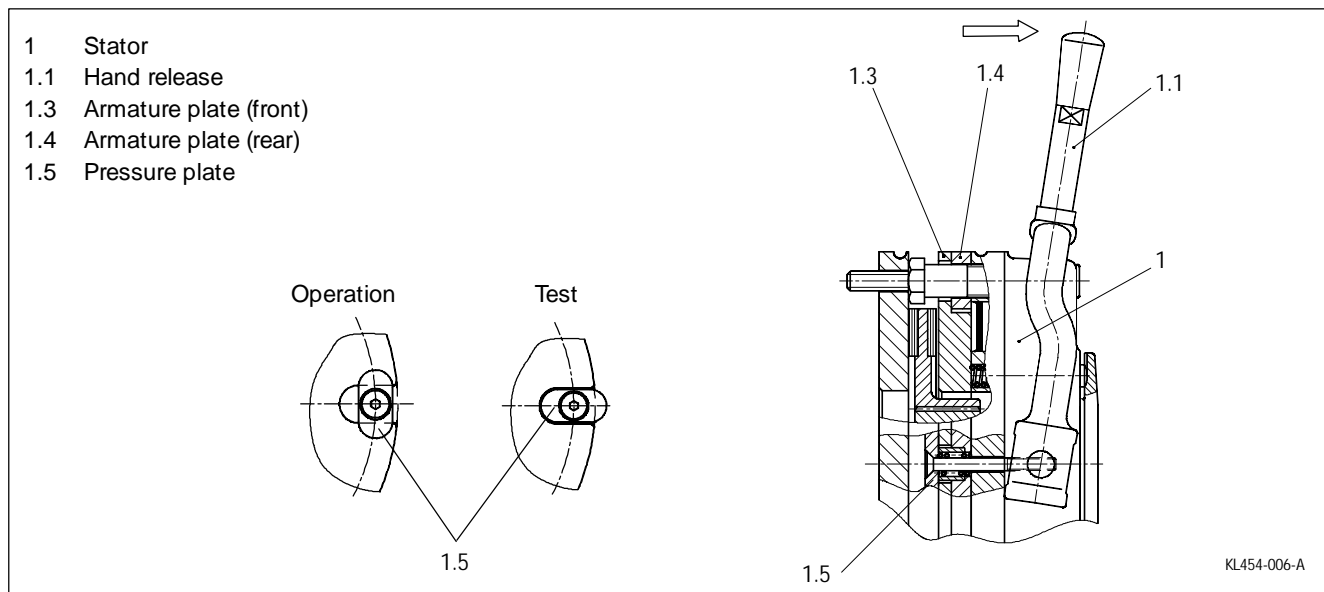
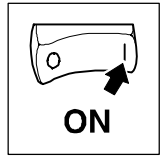


FIG 14 Test of inner circuit

Testing the twin-circuit function is done by simulating jamming of the rear armature plate (1.4). The rear armature plate (1.4) is pulled against the stator using the manual release (1.1) for the purpose. Only the inner compression springs then affect the front armature plate (1.3) and exert at least 50% of the brake torque.

Test procedure

1. Remove any dust protection.
2. Use a spanner to turn the pressure plates (1.5) on both sides of the brake into their test position (FIG 14) parallel to the slats of the front armature plate (1.3).



- Exert pressure on the lever towards the handwheel and/or flywheel of about 50 N until the resistance increases sharply and then hold the lever in that position. The rear armature plate is now released.



Stop!

Do not use additional tools, such as extension piping to ease release.

- Initiate emergency braking at maximal load and speed and measure the stopping distance.
- Release the lever (1.1).
- Use a spanner to turn the pressure plates 90° (1.5) into their operating position (FIG 14).
- Re-install any dust protection means removed.

5.1.4 Hand release

The function test described below is also to be carried out.



Warning!

The brake must be torque-free and the motor not running.

The pressure plates must be in their operating position (FIG 14).

- Pull the lever (FIG 14) with 150 N to 300 N in the indicated direction until the resistance increases considerably.



Stop!

Additional tools to ease manual release, such as piping extensions may not be used.

- The rotor must rotate freely, whereby minor residual torque is permissible.
- Release the lever.

5.2 Reducing brake torque

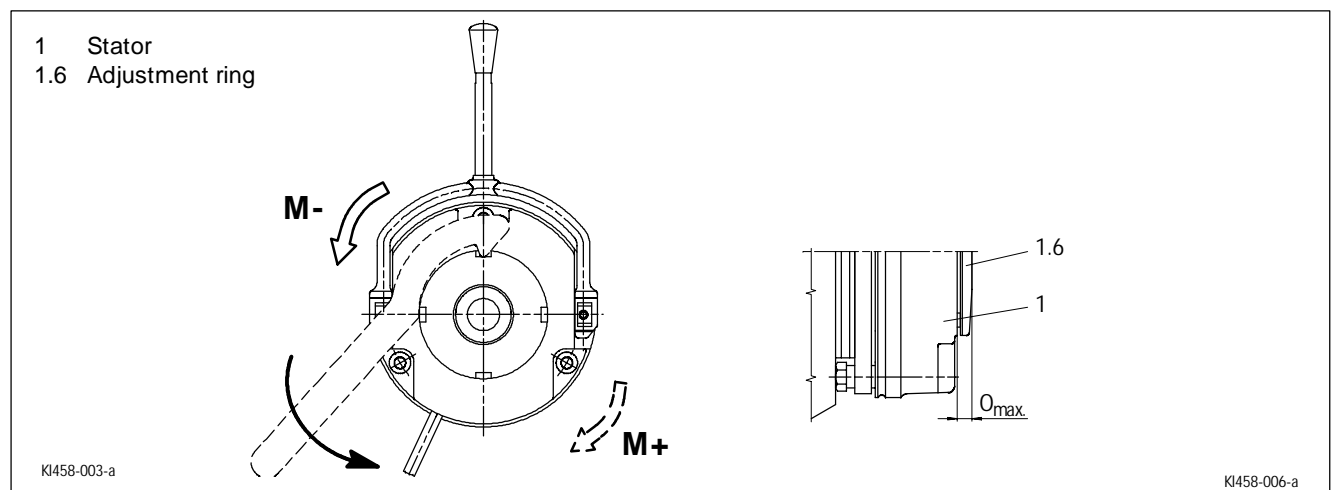
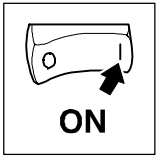


FIG 15



Commissioning

1. Turn the adjustment ring (1.6) counter-clockwise with a sickle spanner.
 - Adhere to the detent positions. Do not use settings between them (values for brake torque reduction are given in chapter 3.2).
 - Adhere to the given max. permissible projection O_{\max} of the adjustment ring (1.6) relative to the stator (1) (these values are given in chapter 3.2 for O_{\max}).



Warning!

Max. permissible air gap $s_{L\max}$ may not be increased.

Manual release setting may not be altered.

Brake torque may not be reduced beyond the point at which the max. permissible braking distance can be achieved with the front braking circuit alone.

5.3 During operation

- Check the brake regularly during operation. Pay special attention to the following:
 - unusual noises or temperatures;
 - lose fixing elements, and
 - the condition of the cables.
- In the event of malfunction, please first go through chapter 7 Troubleshooting. If the problem still cannot be solved, please then contact Lenze Customer Service.



6 Maintenance / repair

6.1 Inspection intervals

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

Rotor friction lining wear is dependant on operating conditions. Service life until adjustment is not solely dependant on the amount of switching involving friction performed. The total possible friction work becomes smaller, the higher the friction work per switching operation. Major differential speed additionally reduces service life until adjustment is required. Inspection intervals may need to be adapted to operating conditions.

6.2 Inspections

6.2.1 Rotor thickness



Warnung!

The motor must not be running when checking rotor thickness.

1. Remove the motor cover and seal ring (if mounted).
2. Measure the rotor thickness with a caliper gauge. On brakes with friction plates, note edging on outer diameter of friction plate.
3. Compare measured rotor thickness with minimum permissible rotor thickness (see chapter 3.2 for the applicable values).
4. Replace the rotor if necessary. See chapter 6.3.2. for details on how to do so.

6.2.2 Air gap



Warnung!

When checking the air gap, the motor must be turned off (not running).

1. Measure the air gap $s_{L\ddot{u}}$ between the rear armature plate and the stator with a feeler gauge (FIG 7).
2. Compare the air gap measured with the max. permissible air gap $s_{L\ddot{u}max}$ (values are given in chapter 3.2).
3. If necessary, adjust the air gap to $s_{L\ddot{u}rated}$. See chapter 6.3.1 for details on this.



Maintenance

6.2.3 Release / voltage



Warning!

Do not touch the moving rotor.



Warning!

Do not touch any live electrical connection.

1. Observe the air gap $s_{L\ddot{u}}$ during drive operation. It should be zero.
2. Measure brake DC voltage during drive operation. It must be equal to that given on the nameplate. Deviations up to $\pm 10\%$ are permissible.

6.2.4 Twin-circuit function

Please refer to chapter 5.1.3 for details.

6.3 Maintenance

6.3.1 Adjusting the air gap



Warning!

Turn power supply off. The brake must be torque-free.



Stop!

In types with a flange, please note the following where the flange is secured with additional screws. There must be clearance holes in the end shield behind the threaded drill holes in the flange for securing the brake in place. Without such clearance holes, minimal rotor thickness cannot be utilised. Screws must not press against the end shield (please refer to chapter 3.2 for information on clearance hole depth).

1. Undo the screws.
2. Tighten the sleeving screws in the stator with an open-jaw spanner. $1/6$ turn reduces the air gap by about 0.15 mm.
3. Tighten the screws (see chapter 3.2 for tightening torques).
4. Check the air gap $s_{L\ddot{u}}$ near the screws with a feeler gauge ($s_{L\ddot{u}rated}$, chapter 3.2 refers).
5. Repeat the adjustment procedure in the event of excessive deviation - $s_{L\ddot{u}rated}$.



6.3.2 Replacing the rotor



Warning!

Turn the power supply off. The brake must be torque-free.

1. Disconnect the power supply cable.
2. Undo the screws evenly and remove them completely.
3. Remove the entire stator from the end shield. Observe the power supply cable.
4. Pull the rotor off the hub.
5. Check hub teeth.
6. Replace the hub as well if worn.
7. Check the end shield friction surface. If it and/or the flange is heavily scored, replace either or both. If the end shield is heavily scored, rework the friction lining or install a friction plate.
8. Measure rotor thickness (new rotor) and sleeving screw head height with a caliper gauge.
9. Calculate the gap between the stator and the armature plate as below.

$$\text{Gap} = \text{rotor thickness} + s_{\text{Lürated}} - \text{head height}$$

($s_{\text{Lürated}}$, see chapter 3.2)

10. Undo the sleeving screws evenly until the calculated gap between stator and armature plate is reached.
11. Mount the new rotor and brake and adjust them (see chapter. 4.3.2).
12. Re-connect the power supply cable.

6.3.3 Replacing the entire stator



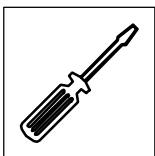
Warning!

Turn the power off. The brake must be torque-free.

1. Disconnect the power supply cable.
2. Undo the screws evenly and remove them.
3. Take the entire stator off the end shield. Observe the power supply cable.
4. Install the new stator and adjust it (see chapter 4.3.2)
5. Re-connect the power supply cable.

6.4 Spare parts lists

Only parts with order numbers can be supplied.
Order numbers apply only to the standard design.



Maintenance

6.4.1 Spare parts list for size 10 to 16

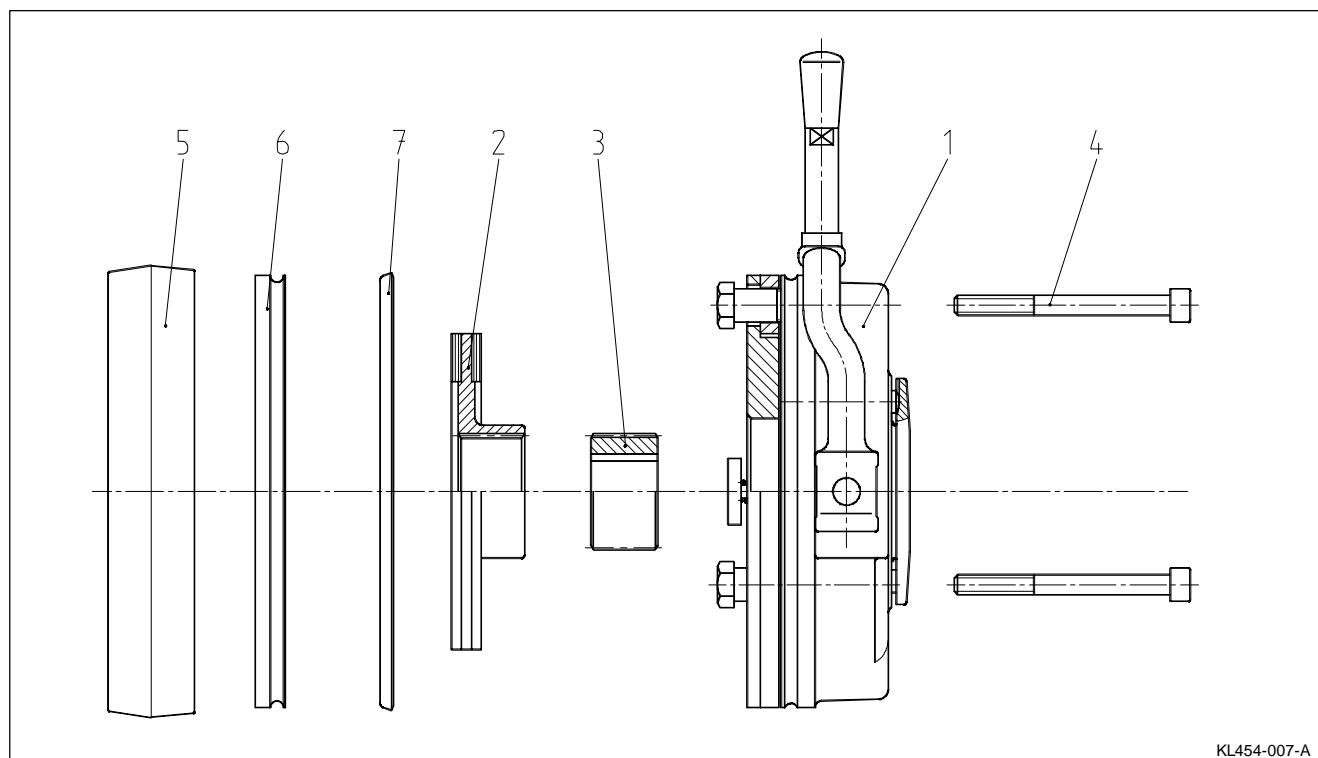


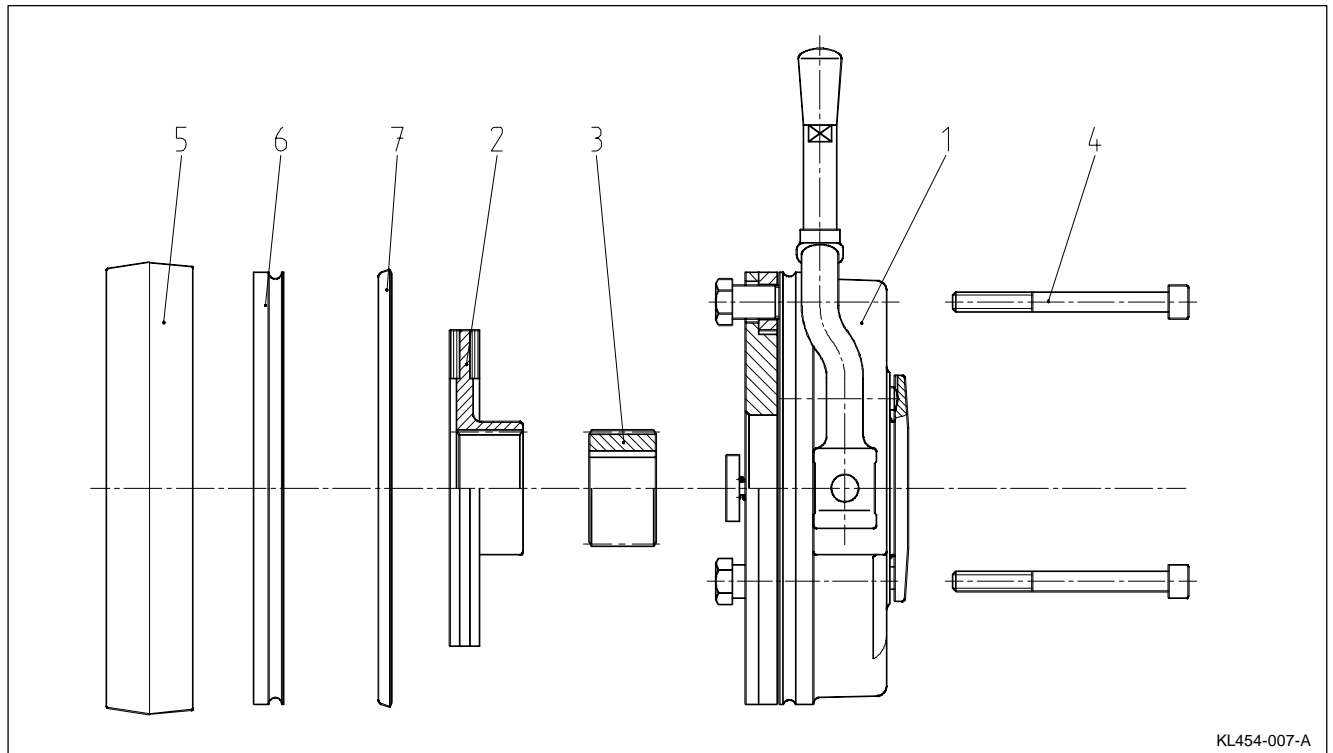
Fig. 1 Spring-operated brake type BFK454-10 to 16

Item	Name	Variant	Order no. for size			
			10	12	14	16
1	Complete stator	Voltage / brake torque	413408	412905	412911	412914
2	Rotor Rotor (reduced noise)		396202	396214	396215	396252
			401279	401280	401281	401282
3	Hub	Bore	015350	015351	028147	015352
4	Set of screws Cheese-head screw DIN 912	- for installation on flange	399507	399509	399512	399513
		- for installation on motor / friction plate	399507	399509	399512	399513
		- for flange with through hole	399508	399510	399513	399514
5	Seal ring		116736	116145	120589	120590
6	Flange		397683	397747	397878	398426
7	Friction plate		076260	397734	397755	076264

* on request



6.4.2 Spare parts list for size 18 to 25



KL454-007-A

Fig. 2 Spring-operated brake type BFK454-18 to 25

Item	Name	Variant	Order no. for size		
			18	20	25
1	Complete stator	Voltage / brake torque	415031	*	*
2	Rotor		396253	396280	396288
	Rotor (reduced noise)		401283	401284	401285
3	Hub	Bore	015345	015346	015347
4	Set of screws Cheese head screw DIN 912	- for installation on flange	399516	399518	399520
		- for installation on motor / friction plate	399516	399518	399520
		- for flange with through hole	---	---	---
5	Seal ring		120591	120592	120593
6	Flange		398427	398428	398430
7	Friction plate		---	---	---

* on request



Maintenance

6.5 Spare parts order

Consignee: **Lenze GmbH & Co. KG Bremsen**
 Postfach 10 13 52
 D-31763 Hameln
 Fax 0049 - 51 54 - 82 11 07

Spring-operated brake type BFK454 with accessories

Consignor

Company	_____	Customer no.	_____
Street / POB	_____	Order no.	_____
Postcode / town	_____	Issued by	_____
Delivery address*	_____	Telephone no.	_____
	_____	Telefax no.	_____
Invoice recipient*	_____		
Delivery date	_____		
Date	_____	Signature	_____

*Please state if different to consignee

BFK 454-□□ / Complete stator

Order qty. _____ pcs.

Size 10 12 14 16 18 20 25

Voltage 205V

Brake torque _____ Nm

Cable length Standard

_____ mm (from 100 mm - 1000 mm in 100 mm steps,
from 1000 mm - 2500 mm in 250 mm steps)

Armature plate Standard
 noise-insulated (O-ring type)

Microswitch (from size 12) Wear monitoring



Accessories

Rotor Aluminium Reduced noise
(Rotor with sleeving)

Hub _____mm (drill hole diameter - see dimensions)

Fastening screw set for installation on flange
 for installation on motor / friction plate
 for flange with through hole/s (up to size 16 inclusive)

Flange Friction plate (up to size 16 inclusive)
 Flange

Seal Seal ring

Electrical accessories

Bridge rectifier 4-pole w/out stud
 4-pole with stud

Half-wave rectifier 4-pole w/out stud
 4-pole with stud

Spark suppressor

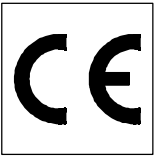


7 Troubleshooting

Fault	Cause	Remedy
Brake doesn't release, air gap isn't zero	Coil interruption	<ul style="list-style-type: none"> Check coil resistance using a multimeter <ul style="list-style-type: none"> – if resistance is too high, replace the complete stator.
	Coil has contact to earth or between windings	<ul style="list-style-type: none"> Check coil resistance with a multimeter <ul style="list-style-type: none"> – Compare result to rated resistance (see chapter 3.2 for the applicable figures). If it is too low, replace the complete stator. Check coil for earthing with a multimeter <ul style="list-style-type: none"> – Replace the entire stator if contact to earth is determined. Check brake voltage (see "defective rectifier, voltage too low").
	Wiring incorrect or defective	<ul style="list-style-type: none"> Check and correct. Check cable continuity with a multimeter <ul style="list-style-type: none"> – replace defective cable/wiring
	Rectifier defective or wrong	<ul style="list-style-type: none"> Measure rectifier DC voltage with a multimeter. <p>If DC voltage is zero:</p> <ul style="list-style-type: none"> check AC rectifier voltage. <p>If AC voltage is zero:</p> <ul style="list-style-type: none"> – turn on the power supply, – check the fusing, – and the wiring <p>If AC voltage is OK:</p> <ul style="list-style-type: none"> – check the rectifier, – replace defective half-wave rectifier. <p>If DC voltage is too low:</p> <ul style="list-style-type: none"> – check the rectifier – half-wave rectifier used instead of bridge rectifier - install bridge rectifier – diode defective - install an undamaged rectifier <ul style="list-style-type: none"> Check coil for contact to earth or coil short-circuiting Replace the entire stator if the rectifier defect re-occurs even if no contact to earth or short-circuiting can be determined. The malfunction may only occur when warm.
	Microswitch incorrectly wired	Check microswitch wiring and correct.
	Microswitch incorrectly set	Replace the entire stator and advise the maker of incorrect microswitch setting
	Air gap too large	Adjust air gap (chapter 6.3.1)
	Air gap $s_{L\underline{u}}$ too small	Check air gap $s_{L\underline{u}}$ and adjust if necessary (chapter 6.3.1).
Rotor is not freely rotatable	Manual release incorrectly set	Check s_L with the brake power supply on. Value must be the same both ends. If necessary, correct.
	Air gap $s_{L\underline{u}}$ too small	Check air gap $s_{L\underline{u}}$ and adjust if necessary (chapter 6.3.1).
Rotor too thin	Rotor wasn't replaced in good time	Replace rotor (chapter 6.3.2)
Voltage isn't zero during function test item 6.2.2 or 6.2.3	Microswitch incorrectly wired	Check and correct microswitch wiring.
	Microswitch defective or wrongly set	Replace entire stator and return the unit to the maker.
Voltage too high	Brake voltage unsuitable to rectifier	Adapt rectifier and brake voltage to one another.
Voltage too low	Brake voltage unsuitable for rectifier	Adapt rectifier and brake voltage to one another.
	Diode in rectifier defective	Replace defective rectifier with a suitable undamaged one.



Fault	Cause	Remedy
AC and mains voltage do not tally	Missing or defective fusing	Choose a terminal post that has fusing and is OK.
	Microswitch incorrectly wired	Check and correct microswitch wiring.
	Microswitch defective or incorrectly set	Replace entire stator and return defective unit to the maker.
Signal "wear limit reached" at $s_{Lu} < s_{Lu \max}$.	Microswitch incorrectly wired	Check and correct microswitch wiring.
	Microswitch incorrectly set.	Replace the entire stator and return the defective unit to the maker.
Signal "wear limit reached" not transmitted at $s_{Lu} > s_{Lu \max}$.	Microswitch incorrectly wired	Check and correct microswitch wiring.
	Microswitch incorrectly set or defective	Replace the entire stator and return the defective unit to the maker.
	Power supply cable broken	Replace defective cable
Brake distance too great	switching time too long	Turn the DC power off (see wiring diagram).
	Friction surface dirty	Replace brake. Return defective unit to maker for repair.
	Brake torque too low	Adjust brake torque.
Brake distance too short	Brake torque too high	Adjust brake torque, check twin-circuit function (chapter 5.1.3)



Declaration of Conformity/Manufacturer's Certification

Lenze

Brakes and clutches

Lenze GmbH & Co KG Bremsen
Postfach 10 13 52
D-31763 Hameln

Site:
Wülmsen Weg 5
D-31855 Aerzen
Telephone (05154) 82-0
Telefax (05154) 82-11 07

Manufacturer's Certification

for the purpose of the EC Machinery Directive (98/37/EG)

We herewith certify that the below listed products are intended for assembly into a machine or for assembly with other elements to form a machine. Commissioning of the machine is prohibited before it is proven that it corresponds to the EC regulation 98/37/EC.

Product:	Type:		
Electromagnetically released spring-operated brakes	BFK454-□□	BFK457-□□	BFK458-□□
	14.442.□□	14.444.□□	14.448.□□
	14.449.□□	14.450.□□	
Electromagnetic clutches	14.101.□□	14.105.□□	
Electromagnetic brakes	14.111.□□	14.115.□□	
Clutch-brake units	14.137.□□	14.138.□□	14.800.□□
	14.810.□□	14.820.□□	14.830.□□
	14.852.□□	14.853.□□	14.855.□□
	14.856.□□	14.857.□□	14.862.□□
	14.863.□□	14.865.□□	14.866.□□
	14.867.□□		

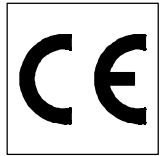
Applied standards and regulations:

VDE 0470 (EN 60529) Rotating electrical machines

VDE 0580 Electromagnetic devices

Aerzen, June 15, 1999

(ppa. Brendler)
Head of Sales and R & D



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Brakes and clutches

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EG-Declaration of Conformity

for the purpose of the EC Low-Voltage Directive(73/23/EEC)

amended by: CE-mark Directive (93/68/EEC)

The following products were developed, designed, and manufactured in compliance with the above-mentioned EC Directive under the sole responsibility of

Lenze GmbH & Co KG Bremsen, Postfach 10 13 52, D-31763 Hameln

Product:	Type:		
Electromagnetically released spring-operated brakes	BFK454-□□	BFK457-□□	BFK458-□□
	14.442.□□	14.444.□□	14.448.□□
	14.449.□□	14.450.□□	
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	14.863.□□	14.865.□□	14.866.□□
	14.867.□□		

Applied standards and regulations:

VDE 0470 (EN 60529) Rotating electrical machines
VDE 0580 Electromagnetic devices

Product:	Type:		
Rectifiers	14.630.13.□□	14.630.14.□□	14.630.32.□□
	14.630.33.□□	14.630.21.□□□	14.630.22.□□□
Spark suppressors	14.198.00.02	14.198.00.03	
SEGC-Contaxt	14.611.30.□□□	14.611.38.□□□	
SFast excitation devices	14.611.12.□□	14.611.14.□□	14.611.16.□□
	14.621.13.□□	14.621.14.□□	
Electronic switch devices	14.610.11.048	14.640.10.048	

Applied standards and regulations:

VDE 0411, Teil 1 (EN 61010-1) Safety requirements for electrical equipment for measurement, control and laboratory use

Aerzen, June 15, 1999

(ppa. Brendler)
Head of Sales and R & D