INTORQ spring applied brakes Type BFK458

Safety, fitting and operating instructions

Publication No. 426

Page 1 of 8

June 2006

The information contained in this leaflet is taken from INTORQ publication No. 13040625 GB, a copy of which is available on request.

- The BFK458 series of spring applied brakes is available in two models, N or E.
  N – fixed torque (non adjustable).
  E – adjustable (with torque adjuster nut).
- Nine sizes covering torques 2 to 600 Nm.
- Modular design options.
- Very robust.
- Simple, quick assembly.

Replaces the previous 14.448.series.

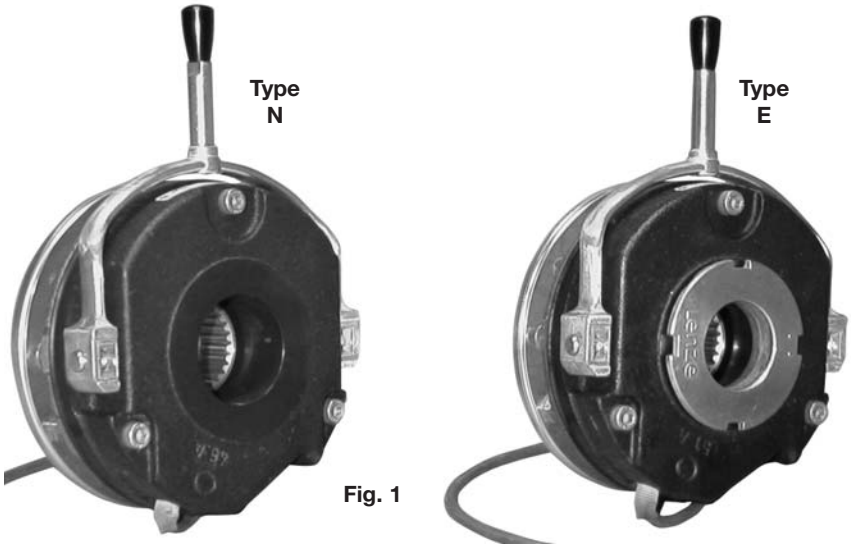


Fig. 1

1. Introduction

1.1. Description

Braking torque is created by springs (2) pushing the armature plate (1) against the double-sided rotor (3) which in turn is pressed against a mounting surface. The splined hub (4) allows axial movement of the rotor across the airgap $S_{Lü}$. (See Fig. 2).

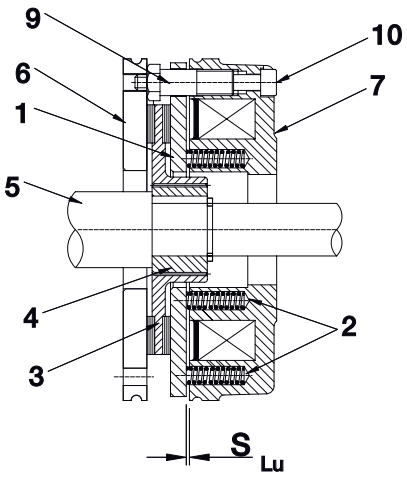
1.2. Identification

Brake stators are identified with a label as shown opposite.
Note that BFK458 is followed by size (06 to 25) and brake model:

Field	Content			Example: Size 06-16
1	Manufacturer	Brake type	Type No.	**INTORQ** BFK458-06E Nr. 519508
2	Rated voltage	Rated power	Rated brake torque/CE mark	205V DC 20W 4.0NM 80515 CE
3			Date of manufacture	

Field	Content			Example: Size 18-25
1	Manufacturer			**INTORQ** Aerzen
2	Brake type			Typ: BFK458-25E
3	Rated voltage	Rated power		205V DC 110W
4	Rated brake torque		Date of manufacture	400NM 80515
5	Type No.		CE mark	Nr. 521388 CE

Fig. 2

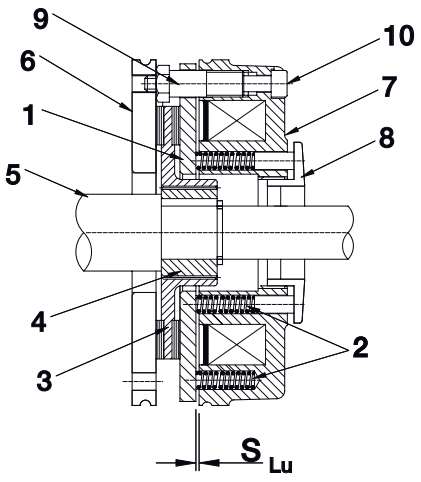


Model BFK458.N

Key to parts

1 Armature plate
2 Compression springs
3 Rotor
4 Hub
5 Shaft
6 Flange
7 Stator
8 Torque adjuster nut
9 Airgap adjustment tubes
10 Assembly bolts

$S_{Lü}$ = Air gap



Model BFK458.E

Airgap setting

Brake size	$S_{Lü}$ mm
06	0.2
08	0.2
10	0.2
12	0.3
14	0.3
16	0.3
18	0.4
20	0.4
25	0.5

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The information contained in this leaflet is taken from INTORQ publication No. 405520 GB, a copy of which is available on request.

2. Safety information


Warning of hazardous electrical voltage


Warning of a general danger

Warning of potential damage to material

2.1. General notes

- These safety notes do not claim to be complete. In cases of questions or problems please contact Lenze.
- At the time of supply the spring operated brake is state-of-the-art and ensures basically safe operation.
- The spring operated brake may be a source of danger for persons, the brake itself and other material assets of the operator if it is improperly modified or used by unqualified personnel.
- Only operate the spring applied brake in a perfect condition.

Operator

An operator is any qualified person who uses the drive system or on behalf of whom the spring operated brake is used.

The operator or his safety officer are obliged:

- to check whether all relevant regulations, notes, and laws are observed.
- to make sure that only qualified personnel work on and with the drive system.
- to ensure that the personnel have the operating instructions available for all corresponding operations.
- to prohibit non-qualified personnel from working with and on the spring-operated brake.

Qualified personnel

Qualified personnel are persons who – because of their education, experience, instructions, and knowledge about the corresponding standards and regulations, rules for the prevention of accidents, and operating conditions – are authorized by the persons responsible for the safety of the plant to perform the required actions and who are able to recognise the potential hazards.

2.2. Environmental restrictions

- No explosive or aggressive atmosphere.
- Normal ambient temperature –20° to +40°C. Outside this range, refer to Lenze Ltd.
- With high humidity and low temperature, care must be taken to protect armature plate and rotor from freezing.
- Electrical connections must be protected.
- Cooling airflow must not be impeded.

3. Technical data

3.1 Standard settings

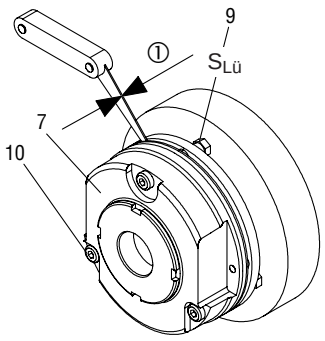

Fig. 3

1. Armature plate
7. Stator body
9. Airgap adjustment tube
10. Assembly bolt
11. Hand release (handle)
14. Hand release bolt

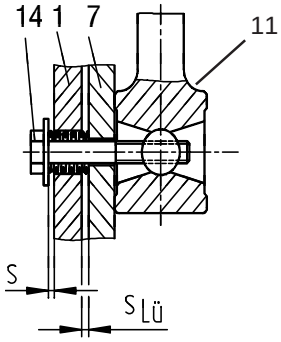

Fig. 4

– Rated airgap, $S_{Lü}$
Check the airgap with a feeler gauge near the bolts.If adjustment is needed,refer to Section 6.3.

– Hand release gap, S
Where a hand release is fitted, make sure that the gap S iscorrectly set.

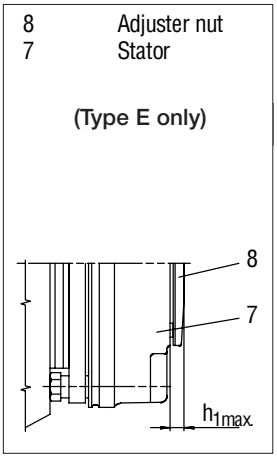

Fig. 5

Size	06	08	10	12	14	16	18	20	25
Rotor diameter, mm	60	77	95	115	124	149	174	206	254
Rotor thickness (new), mm	6.0	7.0	9.0	10.0	10.0	11.5	13.0	16.0	20.0
Minimum rotor thickness, mm	4.5	5.5	7.5	8.0	7.5	8.0	10.0	12.0	15.5
Rated airgap, $S_{Lü}$, mm	**0.2**			**0.3**			**0.4**		**0.5**
OPERATING Max torque, Nm	4	8	16	32	60	80	150	260	400
BRAKE Max airgap, mm	0.5			0.75			1.0		1.25
HOLDING Max torque, Nm	6	12	23	46	95	125	235	400	600
BRAKE Max airgap, mm	0.3			0.45			0.6		0.75
Hand release clearance $S^{+0.1}$	1.0			1.5			2.0		2.5
Hand rel. adj. setting $S + S_{Lü}$	1.2			1.8			2.4		3.0
Torque reduction per detent position (Type E only) Nm	0.2	0.35	0.8	1.3	1.7	1.6	3.6	5.6	6.2
Adjuster nut projection h_1 max mm	4.5	4.5	7.5	9.5	11.0	10.0	15.0	17.0	19.5

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3.2. Coil values

Size		06	08	10	12	14	16	18	20	25
Coil power (20ºC), W		20	25	32	40	53	55	85	100	110
Nominal coil	24V	20	23	19.2	14.4	11.5	10.5	6.8	5.8	5.2
Resistance, Ω) (at 20ºC)	103V	531	424	332	265	200	190	125	106	97
	180V	1620	1296	1013	810	611	589	387	324	295
Values may vary ±8%	205V	2101	1681	1273	1051	793	751	494	420	382

3.3. Switching times

Size	Operating time [ms] for $S_{Lü}$ rated			
	Engaging DC-switching			Disengaging
	t_{11}	t_{12}	t_1	t_2
06	15	13	28	45
08	15	16	31	57
10	28	19	47	76
12	28	25	53	115
14	17	25	42	210
16	27	30	57	220
18	33	45	78	270
20	65	100	165	340
25	110	120	230	390

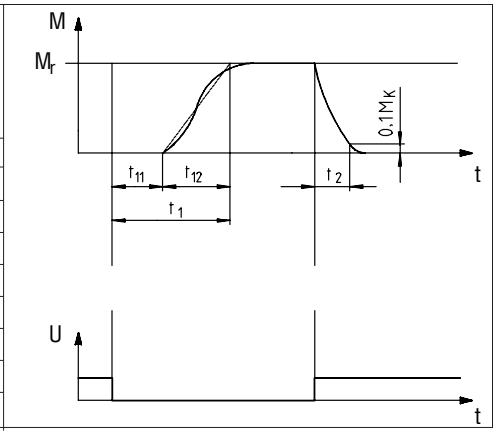

Fig. 6

NOTE! Engagement times are valid for DC switching at nominal airgap.
AC switching times are extended by 3-6 times – see section 4.8.
Disengagement times are not affected by AC or DC switching.

t_1 Engagement time
t_2 Disengagement time (up to M=0.1 M_r)
t_{11} Reaction delay during engagement
t_{12} Torque rise time of the brake torque

3.4. Operating frequency/friction work

The permissible operating frequency depends on the friction work. With high speed and friction work, the wear increases strongly, because very high temperatures occur at the friction faces for a short time.
Values for operating frequencies dependent on friction work per operation are given in INTORQ publication 405520 GB.

3.5. Mounting requirements

- The shaft should be toleranced to k6. Provide axial location for securing the hub.
- Provide a key in the shaft equal to the length of the hub. For up to standard torques, a rounded key may be used, above these values a square-ended key across the full width of the hub is preferred on brakes size 16 and above.

The mounting surface should be square to the shaft with 5-8 µm or fine turned finish over the rubbing area, made of steel or cast iron. If a flat ferrous surface is not available use the friction plate or mounting flange.

Recommended shaft tolerances. Dimensions µm

Shaft tolerance Over	Up to	Tolerance	Lower limit	Upper limit
6	10		+1	+10
10	18	k6	+1	+12
18	30		+2	+15
30	50	m6	+2	+18

3.6 Emission

Electromagnetic compatibility

For normal circuits with unsmoothed d.c. voltage via bridge connection, the spring applied brake series BFK458 complies with EN50081 Part 1.
The entire circuit only complies when it is configured according to one of the eight options listed in the table below.

Circuit:		Options	With a rectifier that: complies with standard	With a rectifier that: does not comply with standard	Spark suppressor in parallel to AC voltage	Mains filters
DC switching	< = 5 Switching operations/minute	1	●			
		2		●	●	
	> 5 Switching operations/minute	3	●			●
		4		●		●
AC switching	< = 5 Switching operations/minute	5	●			
		6		●	●	
	> 5 Switching operations/minute	7	●			
		8		●	●	

Caution!

A spark suppressor may also be required for DC switching in order to protect coil and contact points.

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Heat
Since the brake converts kinetic energy into heat, the surface temperature depends on operating conditions. This can reach 130ºC under unfavourable conditions.

Noise
Switching noise is dependent on airgap. Some resonance (squeal) may be possible during dynamic braking.

4. Installation

4.1 Tools required

Size	Torque wrench Range [Nm]	Hexagon key A/F [mm]	Adjuster tubes A/F	Open-ended spanner Hand release Screws	Stud	'C' spanner for torque adjustment (Type E)	Notes here (for your reference)
06	1 to 12	3	8	5.5	7	45-55	
08		4	9	7.0		52-55	
10		5	12			68-75	
12		5				80-90	
14	24 to 100	6	15	8.0	9		
16		6				95-100	
18		6		10	10	110-115	
20		8	17		12	135-145	
25		8			14	155-165	

4.2 Fixing screw dimensions

Size	06	08	10	12	14	16	18	20	25
For direct mounting or with friction plate	M4x40	M5x45	M6x55	M6x60	M8x70	M8x80	M8x90	M10x100	M10x110
For use with mounting flange	M4x35	M5x40	M6x50	M6x55	M8x65	M8x70	M8x80	M10x90	M10x100
Minimum clearance required behind flange, mm	0.5	1.0	2.0	3.0	1.5	0.5	0.8	2.1	5.0
For mounting through flange	M4x45	M5x50	M6x65	M6x70	M8x80	M8x90	M8x100	M10x110	M10x120
Flange fixing screws DIN 6912	3xM4	3xM5	3xM6	3xM6	3xM8	3xM8	4xM8	4xM10	6xM10
Assembly bolts tightening torque, Nm	2.8	5.5	9.5		23.0			46.0	

4.3 Assembly of mounting flange

Check there is the minimum clearance behind the flange as given in Section 4.2. Without this clearance the minimum rotor thickness cannot be reached. It is not allowed for screws to "bottom" onto the mounting surface.

NOTE! For sizes 18 and 20 brakes only 4 mounting holes are present, in order to provide clearance for the hand release bolts. Align the mounting flange accordingly before assembling the brake.

4.4 Assembly of friction plate

Check the clearance holes align with the threads in the mounting surface.

NOTE! The lip edge **must** be away from the mounting surface.

4.5 Assembly of hand release (if fitted)

Note that the cranked yoke 14.1 (Fig. 7) can be assembled either with the crank pointing towards the mounting surface or away from it.

1. Insert the compression springs (14.2) into the bore holes of the armature plate.
2. Push the bolts (14.4) through the washers (14.3).
3. Push the screws and washers (14.4 and 14.3) through the compression springs (14.2), armature plate (1) and stator (7).
4. Locate the trunnions (14.5) in the yoke (14.1).
5. Screw the hexagon screws (14.4) into the trunnions (14.5) in the yoke (14.1)

1 Armature plate
3 Rotor
4 Hub
7 Stator
14.1 Manual release
14.2 Spring
14.3 Washer
14.4 Hexagon screw

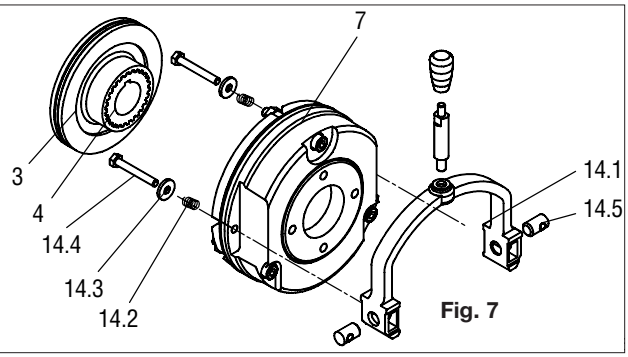


Fig. 7

The information contained in this leaflet is taken from INTORQ publication No. 405520 GB, a copy of which is available on request.

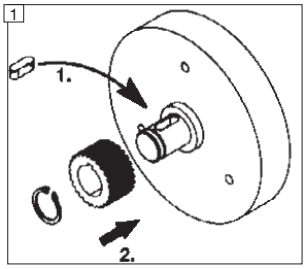
6. Tighten hexagon screws (14.4) until armature plate (1) moves towards stator (7).
7. Remove and discard plastic transit clips.
8. Adjust the gap between the armature plate (1) and the stator (7) using the hexagon screws (14.4) to achieve dimension S + $S_{Lü}$ (Section 3.1).
9. Assemble brake as per following section
10. Check and re-adjust (if necessary) gaps S and $S_{Lü}$.
11. After assembly of the seal (if fitted) screw the lever and knob into yoke (14.1) and tighten.

4.6 Assembly of brake

1. HUB

Fit the hub to the shaft using a key. The hub should be a transition fit.
DO NOT hammer the hub onto the shaft! Secure it axially, i.e. with a circlip.

1



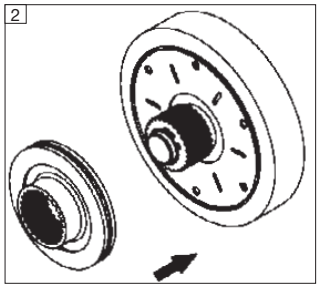
2. ROTOR

Mount the rotor onto the hub and check it will slide axially.

STOP

For reversing applications, it is recommended to additionally secure the hub with a suitable adhesive.

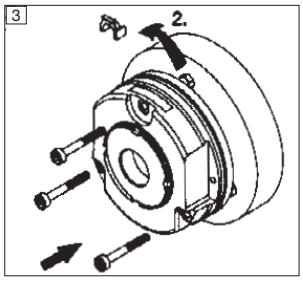
2



3. STATOR-ARMATURE

Mount the stator armature onto the wall surface using the assembly bolts. Tighten the bolts to the rated torque (Section 4.2), then remove the plastic transit clips.

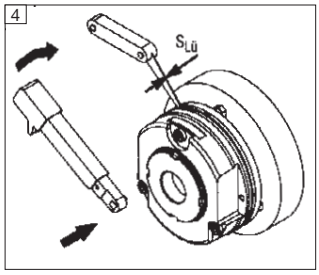
3



4. AIR GAP

The airgap is preset at manufacture but should be checked on assembly.
Check the airgap ($S_{Lü}$ rated) using a feeler gauge (Section 3.1). If adjustment is required, refer to maintenance (Section 6.3).

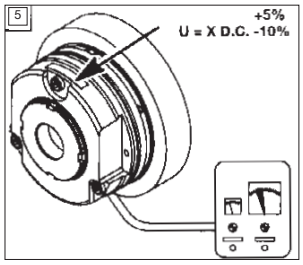
4



5. VOLTAGE

The brake is now ready for operation. Check that the voltage supplied to the coil is within –10% to +5% of the rated DC voltage.

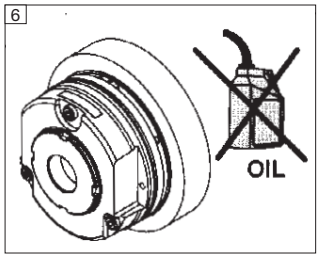
5



6. CAUTION!

Keep rubbing surfaces free from grease, oil or any other contaminating material.

6



4.7 Assembly of cover seal

Pull the cable through the seal.
Assemble over the stator pressing the lips of the seal into the groove of the stator and flange, or over the lip of the friction plate.
See figure 9.

1	Armature plate
6	Flange
7	Stator
10	Socket head screw
12	Friction plate
13	Cover seal
15	Endshield

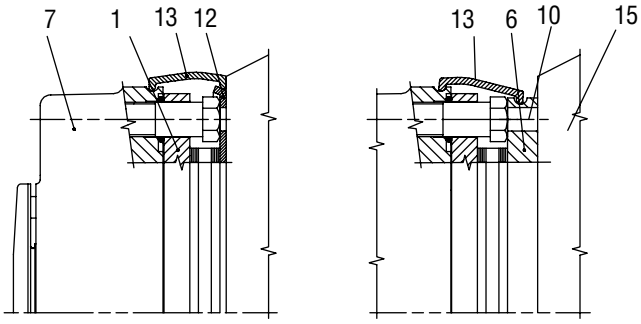


Fig. 9

4.8 Electrical Connections

All electrical connections should be made under voltage-free conditions.

24V coils

INTORQ spring applied brakes operate best with an unsmoothed d.c. supply.Where a 24V coil is fitted, the Lenze Simplavolt power supply units can be used.

103V, 180V, 205V coils

A rectifier should be selected to match the coil voltage to the supply voltage, based on:

$$\text{Full wave rectified coil voltage (d.c.)} = \frac{\text{Supply voltage (a.c.)}}{1.1}$$

$$\text{Half wave rectified coil voltage (d.c.)} = \frac{\text{Supply voltage (a.c.)}}{2.2}$$

Deviations at 10% are permissible.

Supply volts (a.c.)	Rectifier type	Coil voltage d.c.
110	Full wave	103
220	Full wave	205
240	Full wave	205
220	Half wave	103
240	Half wave	103
380	Half wave	180
415	Half wave	180/205

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Engagement time
When switching a brake on the a.c. side of the supply engagement times are extended by 3-6 times those shown under paragraph 3.4. The simplest form of connection to a motor in parallel with the rectifier and brake coil further extends the engagement time. This is because the motor which is already switched off but still running, continues to excite the brake. With falling loads such as hoists, lifts and cranes, it is ESSENTIAL to switch the brake coil on the d.c. side of the supply. A spark suppressor is required to prevent inductive voltages from damaging the brake coil or rectifier. Reducing the brake torque also prolongs brake engagement times.

Disengagement time
The disengagement time is not influenced by a.c. or d.c. switching. It can only be shortened by over-excitation of the coil, for example by using a force voltage rectifier.

Fig. 10 – BRAKES ONLY

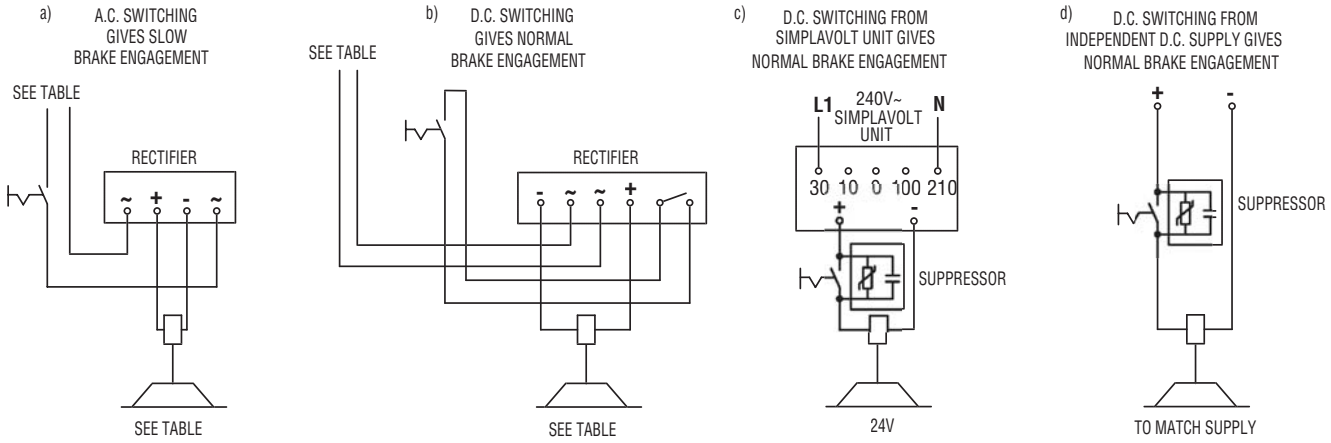
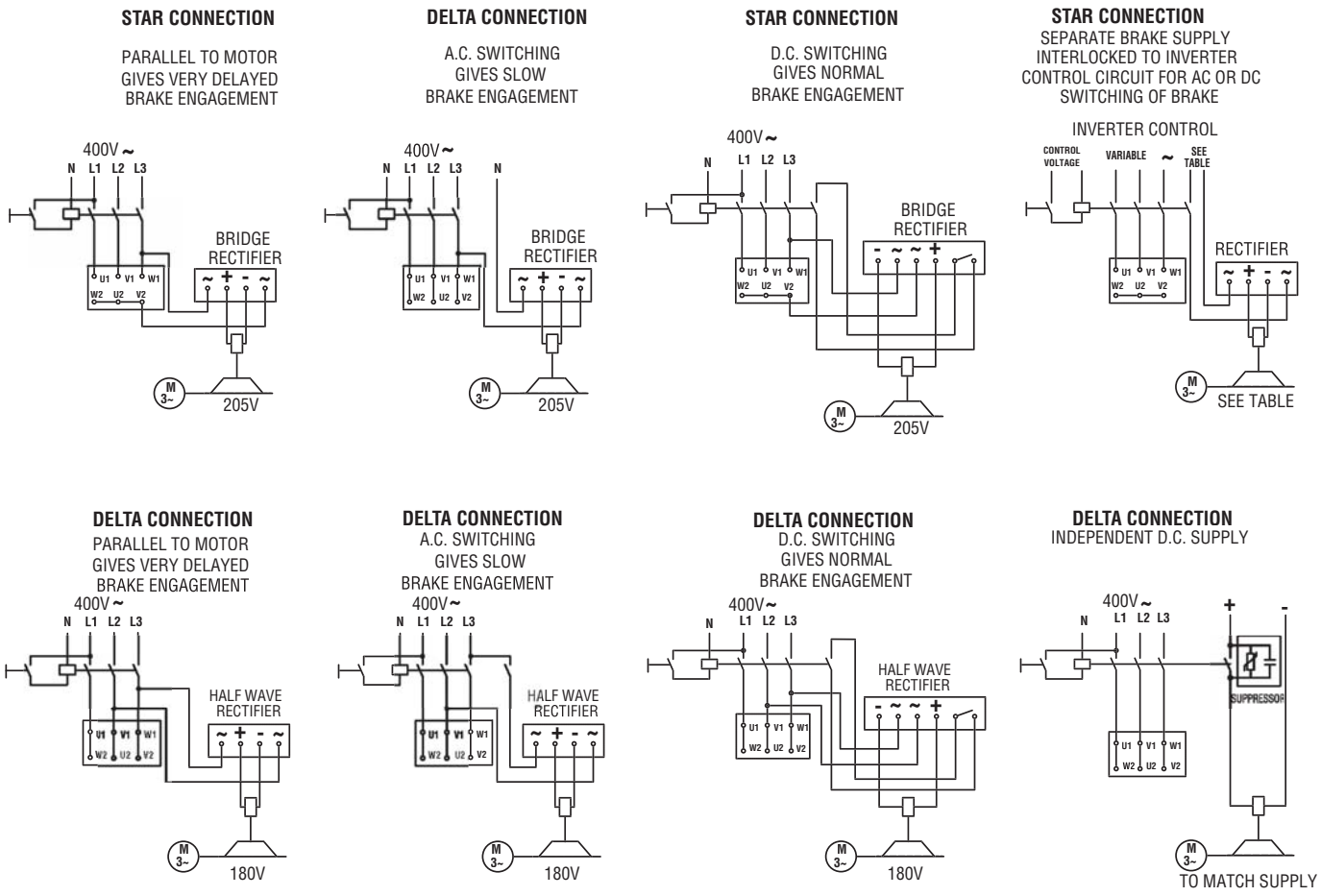


Fig. 11 – BRAKE MOTORS



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5. Commissioning and Operation

For brake motors disconnect the links from the motor terminals when checking the release function of the brake. The motor must be free from residual torque and must not rotate. If the rectifier is connected to the star point of the motor, the earth must also be connected to this point.

- Check the brake regularly for: unusual noise – excessive temperatures – loose assembly bolts – damage to cables

6. Maintenance

6.1 Inspection intervals

To maintain safety and efficient brake action, regular inspections are essential. The wear on the friction lining on the rotor depends on the operating conditions. High energy braking and frequent operation reduce the time until re-adjustment becomes necessary. The inspection intervals must be adapted to the operating conditions and can be prolonged if the wear is small.

6.2 Inspection

Warning! The motor must be at standstill when checking rotor thickness and airgap.

1. For brake motors, remove motor fan cowl and seal (if fitted).
2. Measure rotor thickness. Replace if below minimum permitted value (see Rated Data Section 3.1).
3. Check the airgap $S_{Lü}$ between armature plate and stator using a feeler gauge and compare with maximum allowed depending on torque (Section 3.1).

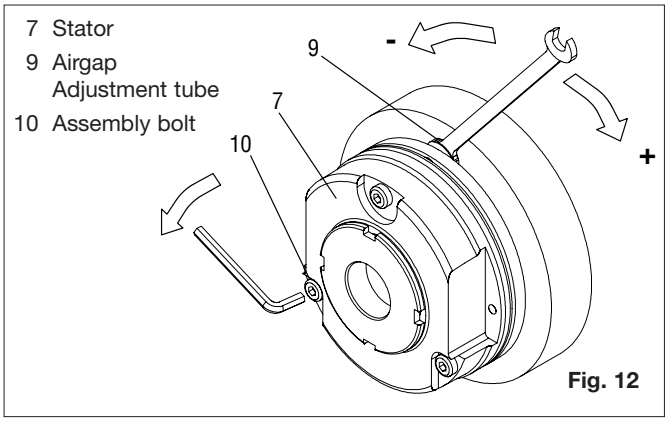

Fig. 12

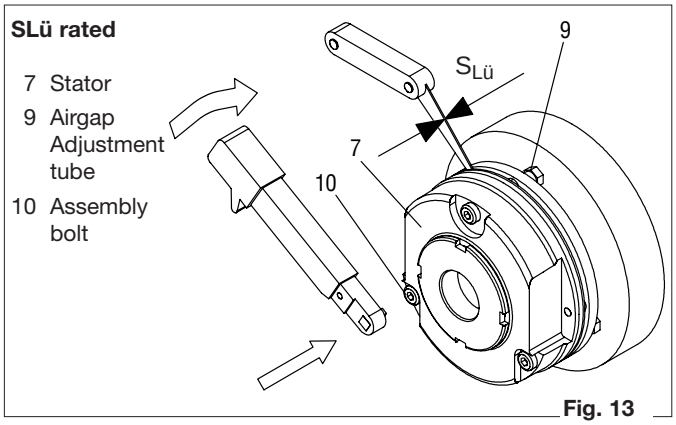

Fig. 13

6.3 Re-adjustment

If adjustment is necessary, proceed as follows:
1. Loosen assembly bolts (10) (See Fig. 12). **2**. Turn the airgap adjustment tubes (9) into or out of the stator to reduce or increase the airgap (Note – 1/6 turn corresponds to approx 0.15mm). **3**. Re-tighten the bolts to torque Fig. 13 (see Section 4.2). **4**. Check the airgap. If necessary repeat the adjustment. **Note:** If fitted, the clearance S for the hand release is set on assembly and should not require re-adjustment.

Brake size	06	08	10	12	14	16	18	20	25
Airgap setting SLü		**0.2**			**0.3**			**0.4**	**0.5**
Assembly bolts tightening torque, Nm	2.8	5.5	9.5		23.0			46.0	

7. Troubleshooting

7.1 Brake does not release

Possible cause	Remedy
Airgap too small	Reset airgap
Incorrect adjustment of hand release	Reset clearance S + $S_{Lü}$ with current applied
Coil resistance too high	Replace stator
Coil resistance too low or contact to ground	Replace stator
Supply voltage too low	Adapt supply or replace stator for correct voltage
Wiring incorrect or defective	Check for continuity and correct
Rectifier defective	Replace. If rectifier defect occurs several times, replace stator
Rectifier incorrect	Measure ac and dc voltages. Replace with correct type
Airgap too large	Re-adjust
Supply voltage too high	Adapt voltage supply to coil voltage
Rotor thickness too small	Replace rotor
Voltage too low	Check ac supply and rectifier

The information contained in this leaflet is taken from INTORQ publication No. 405520 GB, a copy of which is available on request.

8. Spares

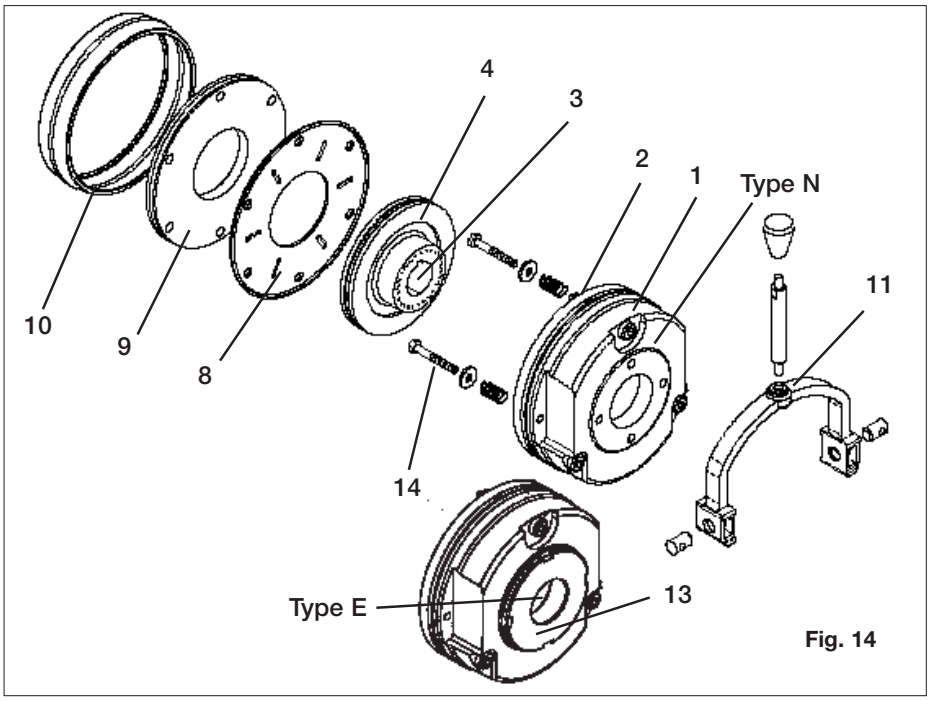

Fig. 14

Key to parts and accessories

1 Stator assembly
2 Armature plate
3 Hub
4 Rotor
5 Stator springs (not shown)
6 Assembly kit bolts (not shown)
7 Wear adjustment tubes (not shown)
8 Friction plate
9 Mounting flange
10 Seal
11 & 14 Hand release kit

} Optional extras

12 Spring and tappet kit
13 Torque adjuster nut

NOTE: Stator-armature assembly (item1) comprises psrts 1, 2, 5 and 7.

Item	Brake size	06	08	10	12	14	16	18	20	25
1	Brake Diameter (mm)	87	105	130	150	165	190	217	254	302
Type N	Stator and armature assembly 24V	519 497	519 514	520 879	520 882	521 369	520 174	520 230	521 423	521 379
	103V	519 498	519 516	521 304	521 343	521 370	520 176	520 274	587 609	703 811
	180V	519 499	519 517	521 305	521 344	521 371	520 177	565 681	1510 1354	1502 9781
	205V	519 500	519 518	520 878	520 884	521 372	520 178	520 245	521 426	521 382
Type E	Stator and armature assembly 24V	519 501	519 521	520 872	520 880	521 373	520 179	520 246	521 427	521 385
	103V	519 504	519 522	521 306	521 348	398 363	520 181	520 247	521 428	521 386
	180V	519 506	519 523	521 307	521 349	521 375	520 182	520 249	521 429	521 387
	205V	519 508	519 524	520 874	520 881	521 376	520 183	520 250	521 430	521 388
2	Armature plate	396 198	401 189	047 569	047 571	398 023	398 024	398 025	398 026	398 027
3	Diameter / Width / No. of teeth	25 x 18 x 14T	35 x 20 x 26T		40 x 25 x 30T	45x 30 x 34T	55 x 30 x 26T	65 x 35 x 31T	70 x 40 x 34T	95 x 50 x 46T
	Hub (bores available) (Bore/Stock number)	PB/376 078			PB/035 596	PB/027 938	PB/024 105	PB/034 587	PB/034 593	PB/034 599
		ø10/376 077	PB/024 043	ø15/011 294	ø20/011 296	ø20/027 939	ø25/024 106	ø35/034 589	ø35/034 595	ø40/034 600
		ø11/376 076	ø11/025 552	ø20/011 295		ø25/025 353	ø30/011 298	ø40/034 591	ø40/034 596	ø50/034 602
		ø14/376 074	ø12/083 038	ø24/033 625	ø25/011 297	ø30/395 995	ø35/011 299	ø45/034 592	ø45/034 597	ø60/034 604
		ø15/181 062	ø14/078 826							
4	Diameter / Width / No. of teeth	60 x 25 x 15T	77 X 25 X 26T	95 X 35 X 26T	115 X 40 X 30T	124 X 45 X 34T	149 X 55 X 26T	174 X 65 X 31T	206 X 70 X 34T	254 X 95 X 46T
	Rotor, standard	384 705	387 475	–	–	–	–	–	–	–
	Rotor, metal-based	396 186	396 200	396 202	396 214	396 215	396 252	396 253	396 280	396 288
5	Wire dia x o/dia. x length	0.8 x 4.4 x 21.6	0.9 x 4.8 x 23.8	1.3 x 6.6 x 25.8	1.5 x 7 x 30.8	1.7 x 7.8 x 36.7	1.9 x 9.6 x 40.6	2.4 x 10.6 x 48	3 x 14 x 54.5	3 x 14.6 x 65.
	Spring (single)	397 281	400 600	397 282	397 283	404 853	397 286	397 288	404 843	397 290
	(Qty per std. torque setting)	(7)	(7)	(7)	(7)	(9)	(9)	(9)	(9)	(9)
6	Assembly kit (short)	399 492	399 502	399 506	399 507	399 511	399 512	399 515	399 517	399 518
	Thread / short / long length	M4 x 35/40	M5 x 40/45	M6 x 50/55	M6 x 55/60	M8 x 65/70	M8 x 70/80	M8 x 80/90	M10 x 90/100	M10 x 100/110
	Assembly kit (long)	399 500	399 504	399 507	399 509	399 512	399 513	399 516	399 518	399 520
7	Wear adjustment tube (not shown)	077 754	046 892	397 881	397 881	078 438	078 438	078 427	078 428	078 428
8	Friction plate	397 383	397 514	076 260	367 734	397 755	076 264	–	–	–
9	Mounting flange	397 398	397 513	397 683	397 747	397 878	398 426	398 427	398 428	398 430
10	Seal	405 194	405 197	405 198	405 199	405 201	405 202	120 591	120 592	120 593
11 & 14	Hand release kit	401 229	401 233	401 232	401 235	401 236	401 238	401 239	401 240	401 241
12a	Diameter x length	4.5 x 10.4	5.0 x 13.6	6.8 x 15	7 x 15.5	8 x 19	9.6 x 24	10.6 x 23	14 x 28	14.6 x 26
	Tappet	076 774	397 682	397 699	397 742	398 437	398 438	398 439	398 453	398 454
	(Qty per std. torque setting <E>)	(4)	(4)	(4)	(4)	(6)	(6)	(6)	(6)	(6)
12	Spring and tappet kit <E>	1311 2163	1303 7418	1303 7419	1303 7428	1303 7427	1305 5794	1303 7426	1303 7425	1305 6880
13	Torque adjuster nut <E>	046 891	363 603	046 907	045 086	387 752	387 755	387 756	178 651	398 615

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