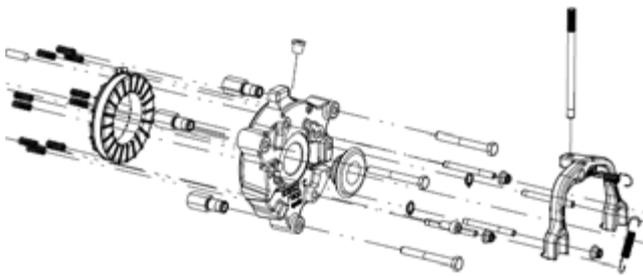


Nidec

All for dreams

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Maintenance Guide

Brake motors FFB

Reference: 5287 en - 2017.09 / c

LEROY-SOMERTM

This document is an addition to the general manual ref. 1889 (recommendations), ref. 4850 (LSES motor), ref. 4155 (LSRPM motor), and the installation manual ref. 5286.

FFB brake motors are assemblies made of an asynchronous motor and a failsafe braking system (safety brake). This brake motor benefits from the experience of a global manufacturer, using cutting edge technologies - automation, selected materials, thorough quality control - in our motor plants who have been awarded the ISO 9001 - Issue 2008 international certification.

These symbols appear in this document whenever it is important to take special precautions during installation, operation, maintenance or servicing of the brake motors.



It is prohibited to drive the extension shaft and the fan in manual rotation with the parking brake applied, or the brake released under load.



General danger



Electrical hazard
Risk of severe or lethal injury



Risk of physical injury
Risk of severe or lethal injury



These recommendations, instructions and descriptions refer to standard use. They do not take account of non-standard versions or special adaptations. Failure to comply with these recommendations can lead to premature wear and tear of the motor and can invalidate the manufacturer warranty.

Make sure that the brake motor is compatible with its environment before its installation and also throughout its life.



The following preliminary precautions must be taken before working on any stationary device:

- **Mains voltage disconnected and no residual voltage present**
- **Careful examination of the causes of the stoppage** (blocked transmission - loss of phase - cut-out due to thermal protection - lack of lubrication, etc.)



Electric brake motors are industrial products. They must therefore be installed by qualified, experienced and authorized personnel. The safety of people, animals and property must be ensured when fitting the motors into machines (please refer to current standards). Particular attention must be given to equipotential ground or earthing connections.



Safety of personnel: protect all rotating devices before power-up. If a brake motor is started up without a coupling device having been fitted, carefully immobilize the key in its location. All measures must be taken to ensure protection against the risks which arise when there are rotating parts (coupling sleeve, pulley, belt, fan, etc.). Personal protective equipment must be worn. After work is carried out, the lids of the terminal box and its cover must always be closed.



Beware of backdriving: when the brake motor is fitted with an active brake release lock off system (DLM), **it is vital to ensure safety (of people and property) in exposed areas.** Before any intervention on the brake, check that it holds no load.



After an operating period, certain parts of the brake motor may be hot and are likely to cause burns.

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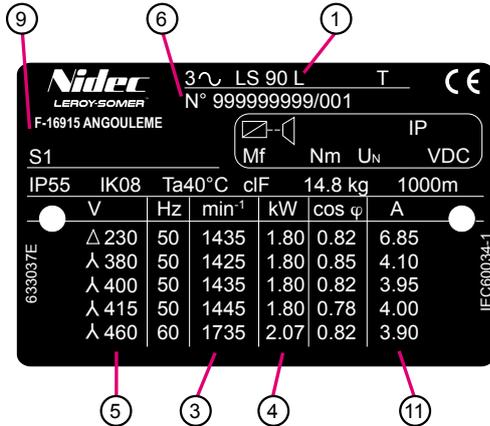
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Leroy-Somer reserves the right to modify the characteristics of its products at any time in order to incorporate the latest technological developments. The information contained in this document is therefore liable to be changed without notice.

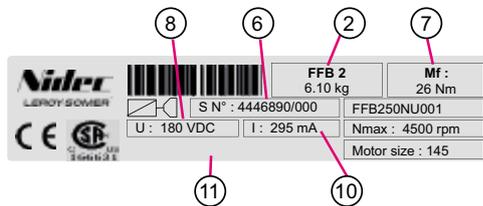
1 - IDENTIFICATION

1.1 - Standard plate

Motor nameplate (item 26a)



Brake nameplate (item 26b)



Indispensable information found on the nameplates:

①	Motor series, frame size
②	FFB brake type <input type="checkbox"/>
③	Speed of rotation (rpm)
④	Rated power (kW)
⑤	Motor voltage (V)
⑥	Motor and brake manufacturing no.
⑦	Mf: Braking torque (N.m)
⑧	U: Brake coil voltage (VDC)
⑨	Duty - Duty (operating) factor
⑩	I: Coil current (mA)
⑪	Specific (ATEX) marking (§6)
⑫	rpm: Max usage speed (3600 in ATEX)

Information to be remembered for spare part orders

Definition of symbols

T: Impregnation index

IE3: Efficiency class

IP-- IK--*: Protection indices

Ins. Cl.F: Insulation class

(Ta) 40°C: Ambient operating temperature

cos P or φ: Power factor

A: Rated current

Δ: Delta connection

λ: Star connection

*IK: Shock resistance

The motor can withstand a weak mechanical shock (IK 08 according to EN 50102). **The user must provide additional protection if there is a high risk of mechanical shock.**

Bearings

DE: Drive end bearing

NDE: Non drive end bearing

Marking

CE: Legal mark of conformity of product to the requirements of European Directives

CSA: CSA certified product, UL conformity

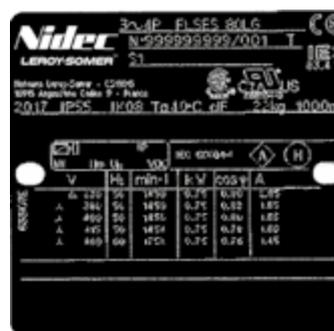
Motor plate LSES112MU 4kW, 4p, 400V λ



Brake motor plate with inverter LSES112MU 4kW, 4p, 400V λ



Motor plate FLSES 80 LG - IFT/IE3



Brake motor plate



1.2 - Special marking

Upon receiving the brake motor, check that the information nameplate complies with contractual specifications. (e.g. brake motor operating in dusty explosive atmospheres; in this case: non conductive dust.)

2 - SPARE PARTS

2.1 - Procedure

Always indicate the following when ordering spare parts:

- complete motor type, its number and the information indicated on the information plate (refer to §1);
- serial no. of the brake information plate item 26b;
- the numbers and descriptions of the parts (record the part marks in the exploded view §2.1 and their description in the parts list §2.2).

For motors with a fixing flange, specify the flange and its dimensions (IM B5 smooth holes, IM B14 tapped holes or built-in assembly MI) and the details of the coupled reduction gear if applicable.

To ensure proper operation and safety of our brake motors, always use original manufacturer parts.

Maintenance kits are available. Refer to LSAS or the following sites: www.leroy-somer.com

Otherwise, the manufacturer shall waive any liability in case of damage.

2.2 - Spare parts

Type	Polarity	Item (item)								
		30	50	39	54	1101	1107	1300	1306	1402
LS 71 L, M	2 ; 4 ; 6	6202 C3	6201 C3							
LS 80 L	2 ; 4 ; 6	6204 C3	6203 CN							
(F)LS(ES) 80 LG	4	6205 C3	6204 C3							
(F)LS(ES) 90 SL, L	2 ; 4 ; 6	6205 C3	6204 C3							
(F)LS(ES) 90 LU	4	6205 C3	6205 C3							
(F)LS(ES) 100 L	2 ; 4 ; 6	6206 C3	6205 C3							
(F)LS(ES) 100 LG	4	6206 C3	6205 C3							
(F)LS(ES) 100 LR	4	6206 C3	6205 C3							
LSES 112 M	4	6206 C3	6205 C3							
(F)LS(ES) 112 MG	2 ; 4 ; 6	6206 C3	6205 C3							
(F)LS(ES) 112 MU	4	6206 C3	6206 C3							
LS(ES) 132 S, SU	2 ; 4 ; 6	6208 C3	6206 C3							
(F)LS(ES) 132 SM, M	2 ; 4 ; 6	6308 C3	6207 C3							
LSES 160 MR	4	6309 C3	6308 C3							
LSES 160 MP	2 ; 4	6309 C3	6208 C3							
(F)LS(ES) 160 M	4 ; 6	6309 C3	6210 C3							
(F)LS(ES) 160 L, LR	4	6309 C3	6210 C3							
(F)LS(ES) 160 MU	6	6309 C3	6210 C3							
(F)LS(ES) 160 LUR	4	6210 C3	6210 C3							
(F)LS(ES) 180 MT, MR	2 ; 4	6210 C3	6210 C3							

gasket

disc¹

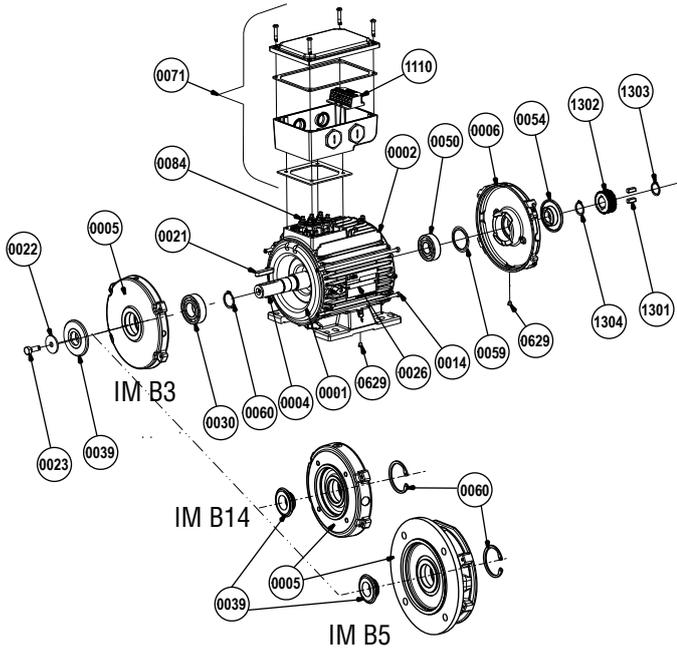
gaskets



¹ When changing the brake disc only, the braking moment is achieved only once the friction surfaces are run in

3 - EXPLODED VIEW AND PARTS LIST OF FFB BRAKE MOTORS

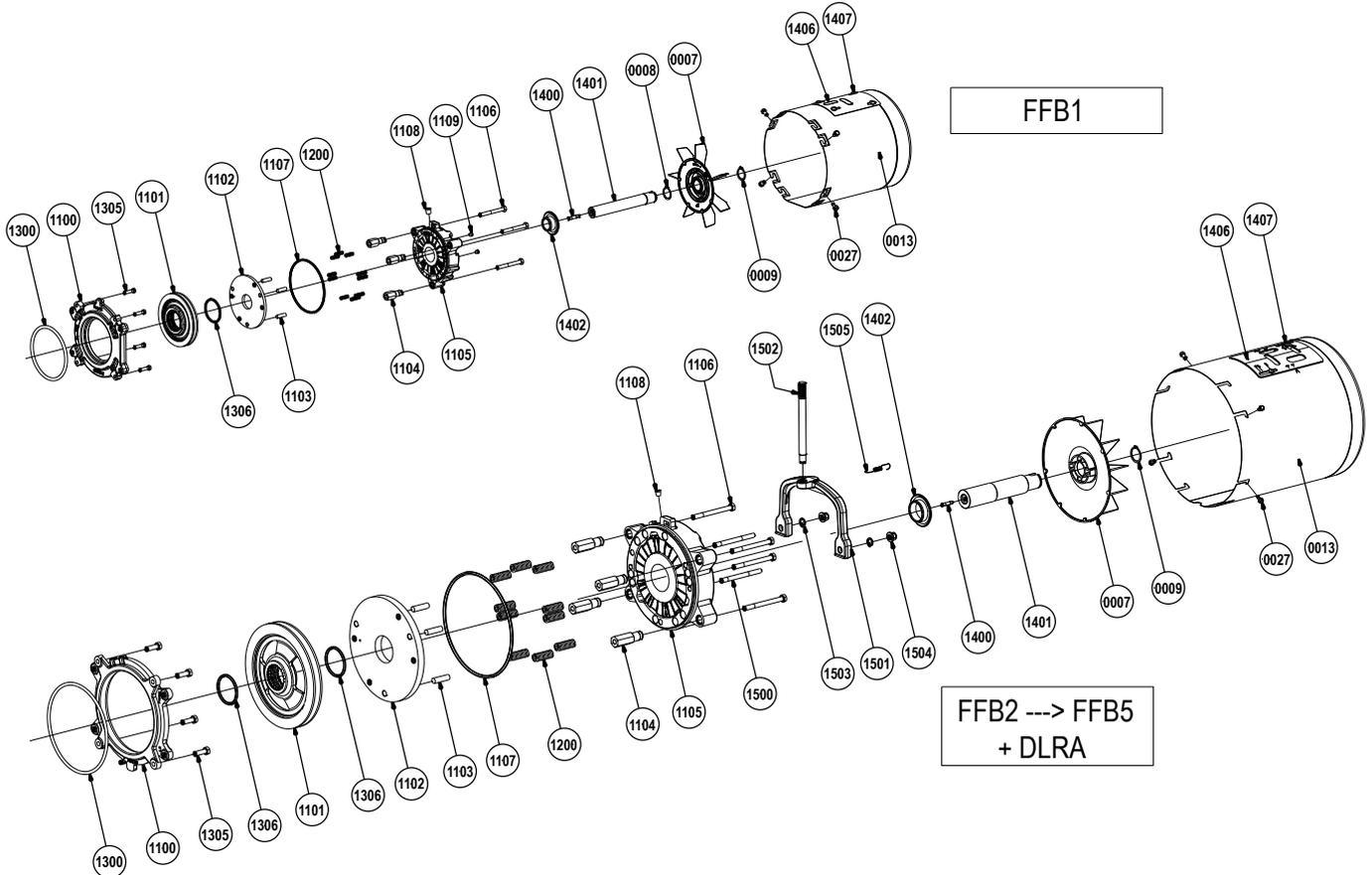
3.1 - Exploded view and parts list for (F)LS(ES) FFB brake motor



Item	Description	Qty
1	Stator	1
2	Housing	1
4	Rotor	1
5	Front shield (DE)	1
6	Back shield (NDE)	2
7	Fan	1
8	Fan spacer (item 7)	0 or 1
9	Locking circlips (item 7)	1 or 2
13	Fan cover	1
14	Assembly rods	3 or 4
21	Shaft end key (DE)	1
22	Shaft end spacer	1
23	Tightening screw (item 22)	1
25	Lifting eye (H.A. ≥ 100)	2
26a	Motor nameplate	1
26b	Brake nameplate	1
27	Cover fixing screw (item 13)	4
30	Front bearing (DE)	1
39	Front sealing gasket (DE)	1
50	Bearing brake side (NDE)	1
54	Sealing gasket on brake side (NDE)	1
59	Preload washer	1
60	Internal circlips (DE)	1
71	Terminal box	1
84	Terminal board	1
629	Drain hole plug	1 or 2

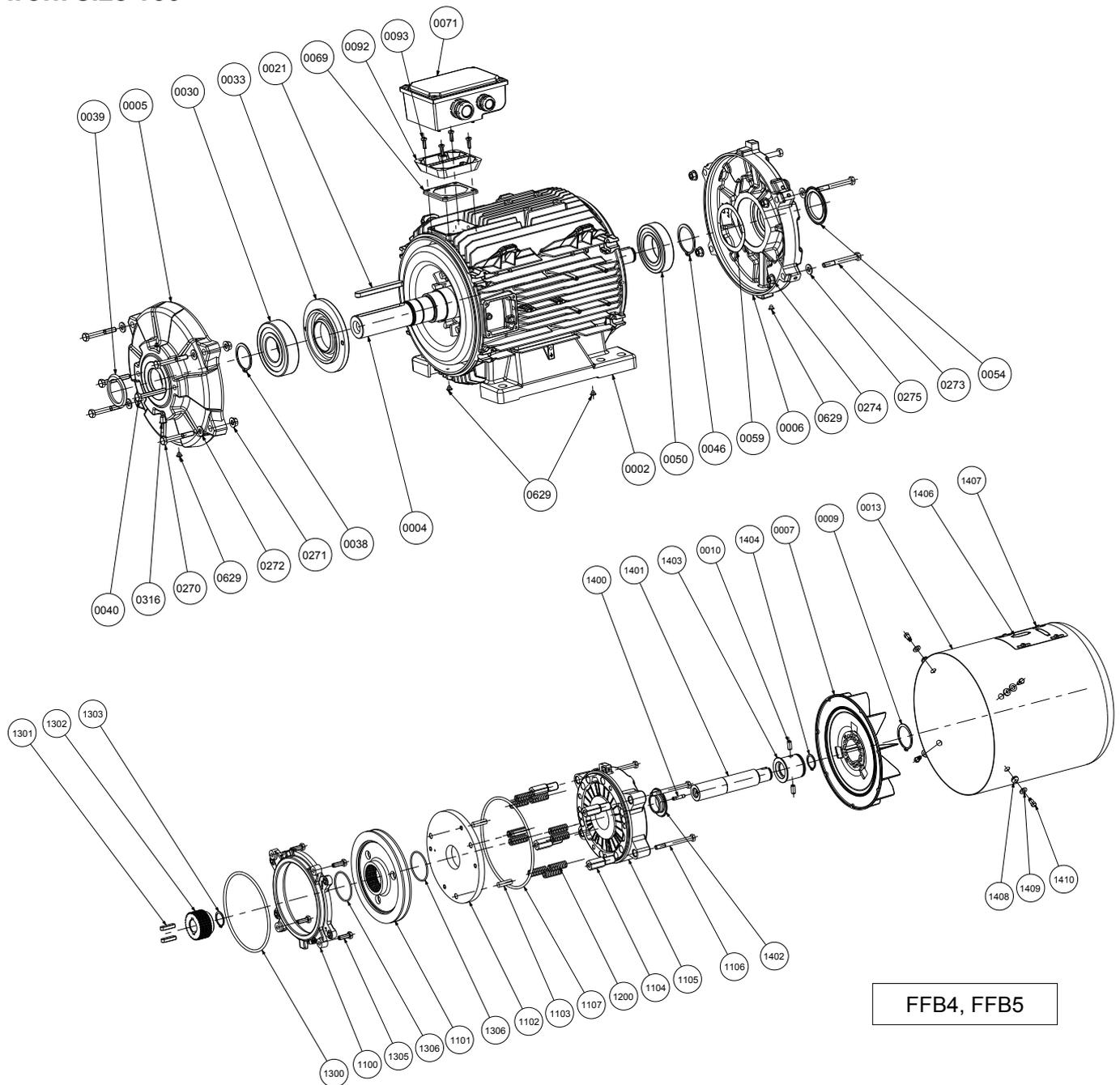
xx Spare part

3.2 - FFB brake - Aluminium: size 71 to 132, or Cast iron: size 80 to 132



Item	Description	Qty	Item	Description	Qty	Item	Description	Qty
1100	Friction face plate	1	1109	Obturator cap	2	1306	O-ring (item 1101)	2
1101	Brake disc	1	1110	Brake supply unit	1	1400	Extension/shaft link screw (item 1401/4)	1
1102	Armature	1	1200	Compression spring	3 to 10	1401	Extension shaft	1
1103	Safety pins	3 or 4	1300	O-ring (between item 6 and item 1100)	1	1402	VLS gasket (item 1105)	1
1104	Adjustment spacer	3 or 4	1301	Splined ring key (item 1302)	2	1406	Cover closing hatch	1
1105	Brake yoke	1	1302	Splined ring	1	1407	Fixing screw (item 1406)	4
1106	Fixing screw (item 1105/1100)	3 or 4	1303	Locking circlips (item 1302)	1	1500 to 1505:	DLRA option (see § 6.1)	
1107	O-ring	1	1304	Spacer	0 or 1			
1108	Wire guide (item 1105)	1	1305	Fixing screw (item 1100)	3 or 4			

xx Spare part

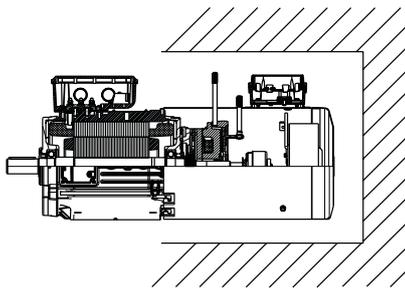
3.3 - Exploded view, parts list Aluminium FFB brake motor: size 160 and 180 or Cast iron: size 160


Item	Description	Qty	Item	Description	Qty	Item	Description	Qty
2	Housing	1	71	Terminal box	1	1107	O-ring	1
4	Rotor	1	92	TB base	1	1200	Compression spring	3 to 10
5	Front shield (DE)	1	93	Screw (item. 92)	4	1300	O-ring (between item 6 and item 1100)	1
6	Back shield (NDE)	2	270	Fixing screws (item 5)	5	1301	Splined ring key (item 1302)	2
7	Fan	1	271	Fixing nut (item 270)	5	1302	Splined ring	1
9	Locking circlips (item 7)	1 or 2	272	Washer under screw (item 270)	5	1303	Locking circlips (item 1302)	1
10	Pin (item 7)	2	273	Fixing screws (item 6)	4	1305	Fixing screw (item 1100)	3 or 4
13	Fan cover	1	274	Fixing nut (item 273)	4	1306	O-ring (item 1101)	2
21	Shaft end key (DE)	1	275	Washer under screw (item 273)	4	1400	Extension/shaft link screw (item 1401/4)	1
30	Front bearing (DE)	1	316	Plug	1	1401	Extension shaft	1
33	Bearing cap (item. 30)	1	629	Drain hole plug	1 ou 2	1402	VLS gasket (item 1105)	1
38	Ext. circlips (item 30)	1	1100	Friction face plate	1	1403	Fan adaptation socket	1
39	Front sealing gasket (DE)	1	1101	Brake disc	1	1404	Socket/extension fixing	1
40	Cap fixing screws (item 33)	1	1102	Armature	1	1406	Cover closing hatch	1
46	Ext. circlips (item 50)	1	1103	Safety pins	3 or 4	1407	Fixing screw (item 1406)	4
50	Bearing brake side (NDE)	1	1104	Adjustment spacer	3 or 4	1408	Grommet	4
54	Sealing gasket on brake side (NDE)	1	1105	Brake yoke	1	1409	Washer under screw	4
59	Preload washer	1	1106	Fixing screw (item 1105/1100)	3 or 4	1410	Shouldered screw	4
69	Joint d'embase BaB	1						
xx	Spare part							

4 - CORRECTIVE MAINTENANCE



Before any operation on the brake, always disconnect the brake motor from its power supply (Putting in writing).



Include sufficient distance around the brake for access and intervention.

4.1 - Tooling (not supplied)

Tools	Function
Adjustment shims	Air gap adjustment
Torque wrench	Tightening for assembly of brake parts
Open end, handle, box wrench (M8/10/16, etc.)	Removal of the face plate, extension, yoke, DLRA, DLM, DMD
Special socket	Screw and unscrew the shaft end extensions
Hub puller	Splined ring removal
Bearing puller	Bearing change: refer to manual §3.2
Mallet (leather or plastic)	Lift the keys from the splined ring
Multimeter	Voltage check
Ohmmeter (indicator lamp)	Coil resistance measurement, micro-contact adjustment
Circlip pliers	Circlip removal
VLS assembly jet	Gasket fitting
Large flat blade screwdriver	Fan removal
2 threaded rods: M5 (FFB1), M6 (FFB2 and 3) and M8 (FFB4 and 5) and corresponding nuts	Refitting the armature on yoke
2 large flat blade screwdrivers	Fan removal



Always record the connections of the supply wires and options before disconnection.

Similarly, record the position of flanges with respect to the stator and the fan's direction on the rotor.

4.2 - Removing the FFB brake motor

- Remove the brake motor using appropriate tools.
- Disconnect the brake motor from its supply.
- Open the terminal box, record the wires and their position (supply of the brake motor, encoder, probes, etc.). Always record the connections of the supply wires and options before disconnection.
- Disconnect the supply wires from the motor and brake supply terminal strips (+ and - terminals).
- Disconnect the rectifier bridge and check the stator isolation (> 10 MOhms).
- If the brake is fitted with a DLRA, DLM or DMD system, unscrew the lever rod(s) (item **1502**, **1605**).
- Unscrew the cover screws **27**, remove the metal cover **13**.
- Remove the fan **7** by removing the axial locking circlips **9**.
- Extract the fan **7** using two screwdrivers as levers.
- Remove the VLS gasket **1402**.
- Unscrew the fixing screws from the yoke **1106**.
- Remove the yoke **1105** from the brake, remove the O-ring **1107**, extract the armature **1102** while recording its angular position.

- Remove the brake disc **1101** while recording the assembly direction (large hub shoulder on motor side).
- Unscrew the fixing screws **1305** from the face plate, then remove the face plate **1100**.
- Unscrew the extension **1401** while blocking the drive shaft.
- Remove the circlips **1303**.
- Extract the splined ring **1302** using a puller.
- Remove the keys **1301** from the ring.
- Find all the faulty parts to order spare parts. Refer to §3.

• Clean the parts:

- with a blow gun only for electrical parts and the lined disc item **1101** (no solvents, no humid products);
- using a non greasy degreasing product for mechanical parts
- using a scraper for joints.
- Change the gaskets and bearings. Refer to §2 and 3.

4.3 - Refitting the FFB brake motor



Clean the bleeding ports and plugs before refitting.

Verify that no pollution distorts item 1105.

Tightening screw according to NF E 25030-1 or VDI2230. Reverse the removal procedure. Refit the extension **1401** and tighten to the following torque:

Motor type	Brake type	Fastening torque
71to 80 L	FFB1	3,9 N.m ±10%
80 LG to 132 S	FFB2, FFB3	9,1 N.m ±10%
132 SM to 180	FFB4, FFB5	16,3 N.m ±10%

Check eccentricity (≤ 0.05 mm) in the case of a version with coder § 6.6

- Refitting: the keys **1301**, socket **1302**, circlips **1303**, face plate **1100** (with locating pin: position the outer spigot opposite the coil cable), brake disc **1101**.
- Position the armature **1102** (non through drill hole on one face located at 9 o'clock with respect to the yoke cable) on the yoke **1105** fitted with its springs (§5.2 Spring positions). Screw the two threaded screws through the yoke into the armature while ensuring it does not protrude the braking face (slight recess). Press the armature onto the yoke using two nuts mounted onto the rods (tighten each rod gradually).
- Install the O-ring **1107** inside its groove between the armature **1102** and the yoke **1105**.
- Mount the yoke and armature onto the face plate using the fixing screws **1106** (tighten to torque).
- Check that the brake disc turns freely.
- Remove the two threaded rods: the brake disc is blocked.
- Refit the fan **7** and its holding washers **8** and **9**.
- Refit the cover **13**.
- Refit the control rod of the DLRA, DLM lever(s) if necessary.

If Encoder option: see §6.6

If Forced Ventilation option (VF) + Encoder: refer to §6.7 and 6.6.

4.4 - Air gap adjustment

The air gap requires adjusting when it reaches 0.9 mm.. Lining wear must be checked when the air gap is adjusted, by checking the disc thickness (R). The dimension R must never be below the following values, as this would result in damage including total loss of braking torque, without any warning signs.

Disc thickness must be measured with an accuracy of at least 0.5 mm.



Always change the disc when the R dimension reaches the following values:

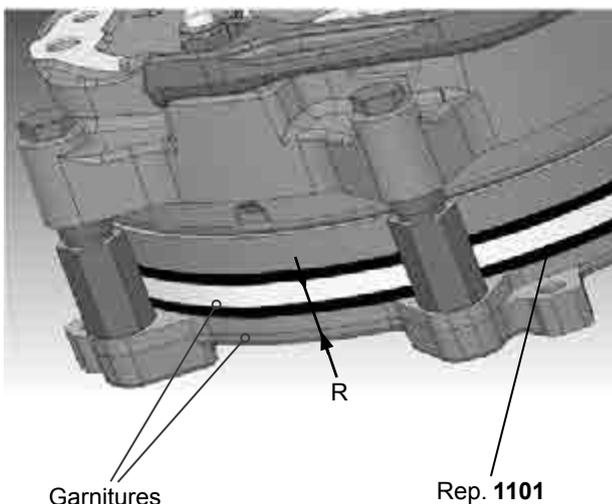
Brake size	Minimum R dimension
FFB1, FFB2, FFB3	10 mm
FFB4, FFB5	16,5 mm



Exceeding R dimension can cause security problems (quick decrease of braking torque M_p).

Procedure:

- Unscrew the screws **27** holding the metal cover **13**.
- Remove the metal cover **13**.
- Clear the O-ring **1107** to gain access to the air gap.
- Check the air gap between the yoke **1105** and armature **1102** in 3 points at 120°.



- Release spacers **1104**, move them closer to the yoke **1105**.
- Screw (to narrow the air gap) or unscrew (to increase the air gap) the screws **1106** while measuring the air gap between the yoke and the armature to obtain a dimension as specified in the table below:

Brake size	Release option		
	Without option	with DLRA lever (§6.1)	with DLM or DMD Lever (§6.2, 6.3)
FFB1, FFB2, FFB3	0,3 - 0,4 mm	0,6 - 0,7 mm	
FFB4, FFB5	0,4 - 0,5 mm		

- Screw the spacers **1104** in abutment on friction face-plate (tighten to 2 Nm \pm 10% torque).
- Tighten fixing screws **1106** brake yoke on face-plate to the torque as follows:

Brake size	
FFB1	4,9 Nm \pm 10%.
FFB2, FFB3	8,5 Nm \pm 10%.
FFB4, FFB5	21 Nm \pm 10%.

- Check the value of the air-gap again.
 - Reposition the O-ring **1107** into its groove.
 - Fasten the cover **13** with its screws **27**.
- When DLRA or DLM mounted, refer to §6.1, 6.2.



After 3 air gap adjustments, always check the value of the R dimension frequently and changing the brake disc item 1101 is recommended (according to dynamic brake use).

Atex zone 22

If the brake is not equipped with an opening/closing detector, check the clearance periodically according to the rates and the energy to be dissipated on each braking operation (see technical catalogue ref 5329 § Brake energy capacity).

4.5 - Maintenance

Control after commissioning (about 50h).

Check tightening of fastening screws and belt tensioning if applicable.

Preventive maintenance visit.

- Check regularly that the recommendations concerning mechanical and electrical installation are still complied with.
- Inspect the seals.
- Remove any dust or foreign bodies which might clog the cover grille and the housing fins.
- Lubricate the bearings of the motors fitted with grease nipples.

In the absence of a wear detector (highly recommended for lifting - UL applications):

- Beyond the 3rd air gap measurement, the user must check disc thickness at sufficient interval (according to the braking cycle and energy to dissipate to avoid exceeding the R dimension see § Operation in the technical catalogue ref. 5329) .

In the absence of opening/close detector (highly recommended for applications in Atex zone):

- The user will check the air gap at a sufficient interval (according to the braking cycle and energy to dissipate, for information refer to § Operation in the technical catalogue ref 5329) to prevent disc locking (risk of overheating and early lining wear).

- Gaskets, bearings:

1 an	Inspect the condition of the gaskets and bearings at the shaft passage (item. 39, 54, 1402).
-------------	--

5 - CHARACTERISTICS

5.1 - Braking moments

The braking torque is defined according to the number, position of the springs and their colour, according to the values indicated in the following table.

Running-in: all brake linings (complete brake, disc only: see § 2.2) are run-in in the plant before assembly onto the motor. The stated dynamic braking torque is optimum (tolerance from -10 to +40%).

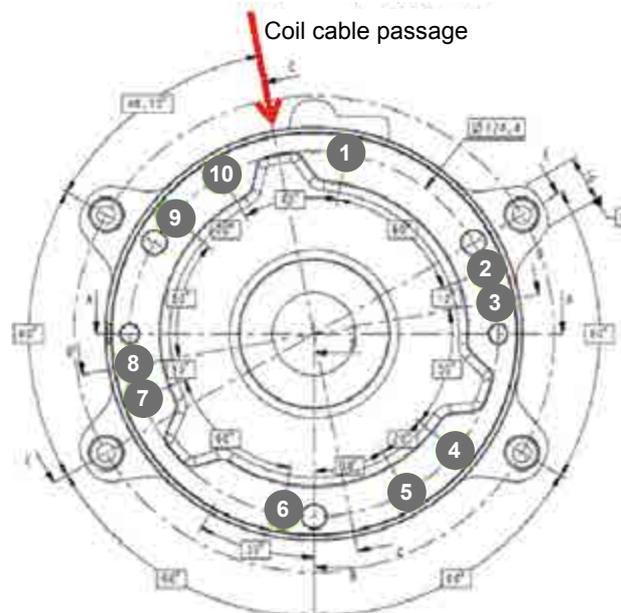
Braking moments (N.m) specified for information; in case of normative restriction, please consult us.

Nbr of springs	FFB ¹		FFB2		FFB3		FFB4		FFB5	
	Colour	M_f (N.m)	Colour	M_f (N.m)	Colour	M_f (N.m)	Colour	M_f (N.m)	Colour	M_f (N.m)
3		4.5		11	-	-		41	-	-
4		6		15	-	-		55	-	-
5	Purple (RAL 4008)	7.5	White (RAL 1013)	19	Orange yellow (RAL 2000)	37	Brown (RAL 8017)	69	-	-
6		9		23		45		83		
7		10.5		26		52		96		140
8		12		30		59		110	Black (RAL 9005)	160
9	-	-	-	-		67	-	-	-	180
10	-	-	-	-		-	-	-	-	200

¹ 7,5 N.m maximum braking torque on size 71

5.2 - Spring position

Brake type	Qty	Positions										
		①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	
FFB1 FFB2 FFB4	3	✓				✓				✓		
	4		✓				✓		✓			✓
	5		✓				✓				✓	✓
	6	✓	✓			✓		✓			✓	✓
	7		✓	✓			✓	✓			✓	✓
8	✓	✓	✓			✓	✓	✓	✓		✓	✓
FFB3	9	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
FFB5	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓



5.3 - Electromagnets

As certain direct current coils are difficult to differentiate by their dimension, measure the coil's resistance using an Ohmmeter on an appropriate calibre and compare with the value indicated in the table below.

These values are theoretical, calculated for an ambient temperature of +20°C.

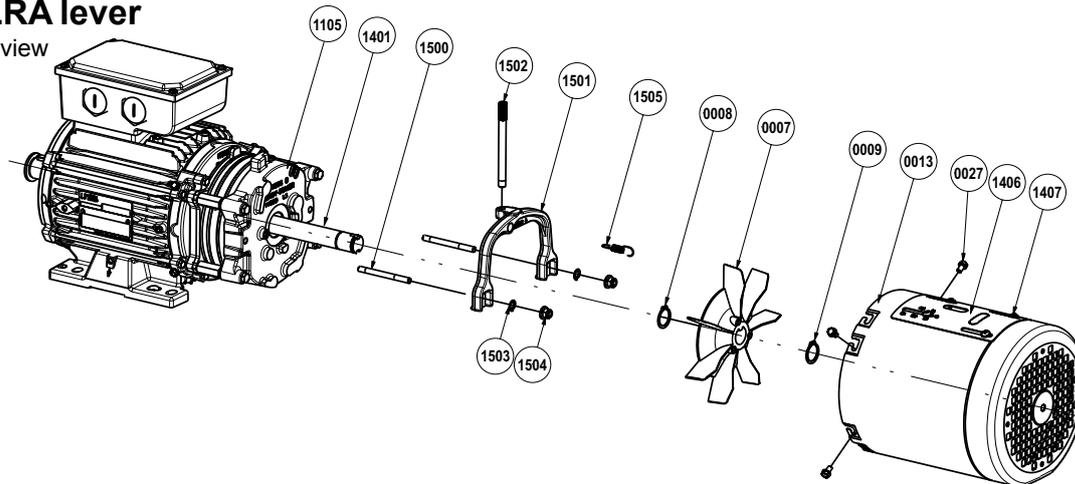
Characteristics of the electromagnets ±5 %, at +20°C

Brake type	180V coil ID300/302 brake control option - ESFR VMA 31 to 34			20V coil		
	Intensity A	Resistance Ω	Power W	Intensity A	Resistance Ω	Power W
FFB1	0.232	776	42	1.974	10.1	39
FFB2	0.295	610	53	2.633	7.6	53
FFB3	0.345	522	62	2.793	7.2	56
FFB4	0.339	530	61	3.602	5.6	72
FFB5	0.547	329	98	4.211	4.8	84

6 - OPTIONS

6.1 - DLRA lever

- Exploded view



- Parts list

Item	Description	Qty
7	Fan	1
8	Fan thrust washer	0 or 1
9	Locking circlips	1
13	Fan cover	1
27	Cover fixing screw	3 or 4
1105	Yoke	1
1401	Extension shaft	1
1406	Cover closing hatch	1

Item	Description	Qty
1407	Fixing screw	4
1500	Stud	2
1501	DLRA calliper	1
1502	DLRA control rod	1
1503	Spiral spring under nut	2
1504	Locknut	2
1505	Return spring (item 1501)	1

• Disassembly:

- Unscrew the rod from the lever **1502** (if mounted on the lever).
- Unscrew the fixing screws **27** from the cover, remove the metal cover **13**.
- Remove the fan **7** by removing the axial locking circlips **9**.
- Extract the fan **7** using two screwdrivers as levers.
- Unscrew the two locknuts **1504**, remove the spiral springs **1503**.
- Remove the return spring **1505**.
- Remove the calliper **1501**.
- Unscrew the two studs **1500**.

• (Re)Fitting:

- Proceed the other way round of dismantling. Screw studs at the following torque: FFB1: 5.75 Nm; FFB2 and 3: 9.9 Nm; FFB4 and 5: 24 N.m ±10%.
- Insert a thickness shim **j** on either side (see diagram opposite) between the caliper **1501** and the yoke **1105**. Tighten the nuts **1504** into contact with the caliper (springs fully compressed).
 - Remove the 2 shims, the brake should now be in the fully braked position.
 - Operate the caliper **1501** using the lever **1502**; the lever should have a slight angular deflection to feel actual resistance due to brake release.
 - While holding the lever **1502**, check that the drive shaft's rotation (without load).



It is prohibited to drive the extension shaft and the fan in manual rotation with the parking brake applied, or the brake released under load.

Shim thickness (mm)

FFB1	FFB2	FFB3	FFB4	FFB5
1,9	1,6	1,6	2	2

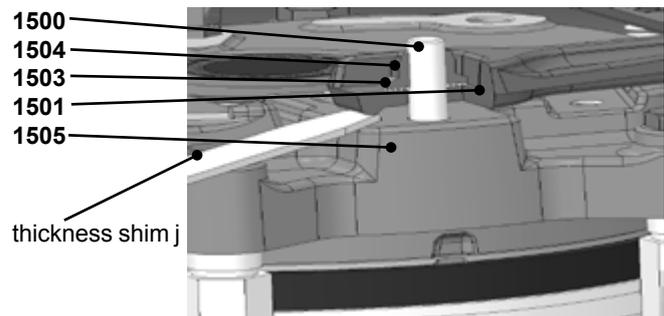


Non-compliance with the *j* dimension may cause safety issues (rapid degradation of the braking torque).

Check the air gap as described in procedure § 4.4.

- When the manoeuvring load is too important, the use of an element extending the lever **1502** requires compliance with the following values:

Brake size	Max load to supply	Maximum limit
FFB1	60 N	100 N
FFB2, FFB3	200 N	400 N
FFB4, FFB5	200 N	600 N



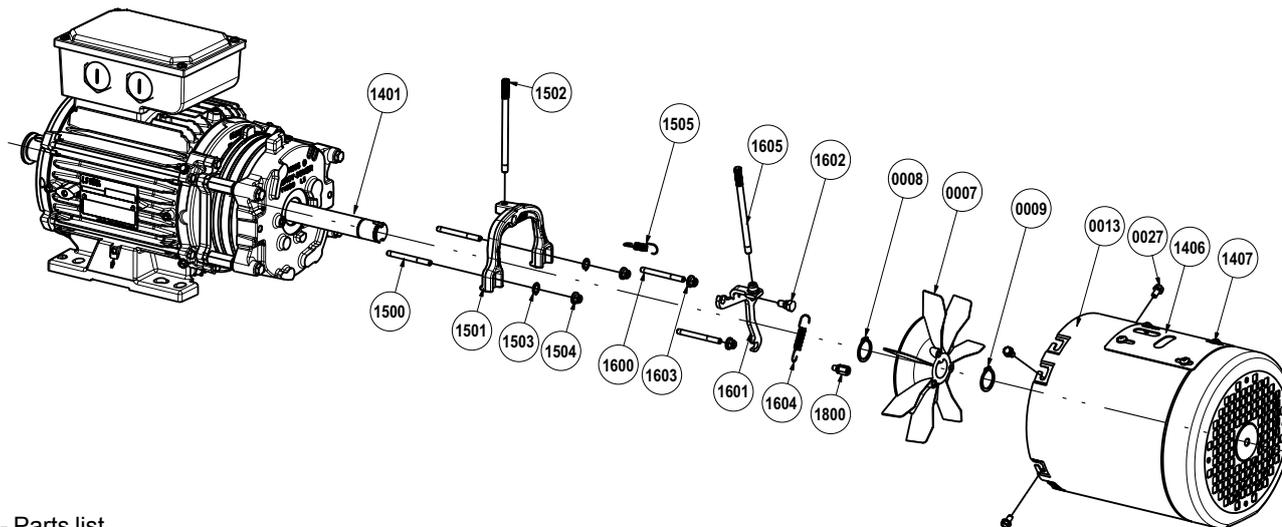
- After fitting the cover, loosen the fixing screws **1407**, fully screw the control rod **1502** onto the calliper **1501**.
- **Position the cover closing hatch **1406** while checking that the lever's travel is effective (in brake release position).**
- Tighten the fixing screws **1407**.



After loosening, check that the brake is in the applied position once the maintenance operations are performed.

6.2 - DLM lever

- Exploded view



- Parts list

Item	Description	Qty
7	Fan	1
8	Fan thrust washer	0 or 1
9	Locking circlips (item 7)	1
13	Fan cover	1
27	Cover fixing screw (item 13)	3 or 4
1401	Extension shaft	1
1406	Cover closing hatch	1
1407	Fixing screw (item 1406)	4
1500	Stud (item 1501)	2
1501	DLRA calliper	1
1502	DLRA control rod	1

Item	Description	Qty
1503	Spiral spring under nut	2
1504	Locknut	2
1505	Return spring (item 1501)	1
1600	Stud (item 1601)	2
1601	Latch	1
1602	Rotation axis (item 1601)	1
1603	Locknut	2
1604	Return spring (item 1601)	1
1605	Control rod (item 1601)	1
1800	Spacer	1

• Operation

Releasing the brake and maintaining it in position: push the control rod DLRA **1502** by applying a force towards the rear of the brake motor, then swivel the rod of the DLM **1605** clockwise. Release the DLRA rod **1502** to lock the brake in the released position.

• Disassembly

- Unscrew the control rods of the levers **1502** and **1605** (if mounted on their base).
- Unscrew the screws **27** from the cover, remove the metal cover **13**.
- Remove the fan **7** by removing the axial locking circlips **9**.
- Extract the fan **7** using two screwdrivers as levers.
- Remove the return spring **1604**.
- If applicable, unscrew the latch stop **1606**.
- Unscrew the hexagonal spacer (catcher springs) DLM **1800**.
- Unscrew the rotation axis of the latch **1602** then remove the latch **1601**.
- Unscrew locknuts **1603**.
- Unscrew studs **1600**.
- Remove the DLRA according to the procedure in section 6.1.

• Reassembly

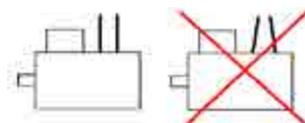
- Proceed the other way round of dismantling. Screw the rotation axis of the bolt **1602** at the following torque: FFB1, 2 and 3: 5.75 Nm; FFB4 and 5: 9.9 Nm, $\pm 10\%$. Screw the hexagonal spacer DLM **1800** to the torque of 5.75 Nm $\pm 10\%$ for FFB1 in 5. Screw the studs at the following torque: FFB1 : 5.75 Nm; FFB2 and 3: 9.9 Nm; FFB4 and 5: 24 Nm, $\pm 10\%$.
- Put the latch 1601 in touch with studs 1600 then screw the locknuts 1603. Insert a thickness shim of 0,3mm in the air-gap between the armature 1102 and the yoke 1105 then squeeze nuts 1603 until block the shim. Unscrew slightly (1/8 of turn) nuts to get the shim free.
 - Fit the spring 1604.
 - Make sure of motor shaft rotation.



It is prohibited to drive the extension shaft 1401 in manual rotation and the fan 7 with the parking brake applied, or the brake released under load.

- Operate the lever DLRA 1502, under the action of spring 1604, the latch **1601** should return to its idle position (rotor locked).
- Check the air gap between the armature **1102** and the yoke **1105** next to the spacers **1104**. The dimensions shall comply with the following table:

Brake size	With DLM lever
FFB1, FFB2, FFB3	0,6-0,7 mm
FFB4, FFB5	0,6-0,7 mm

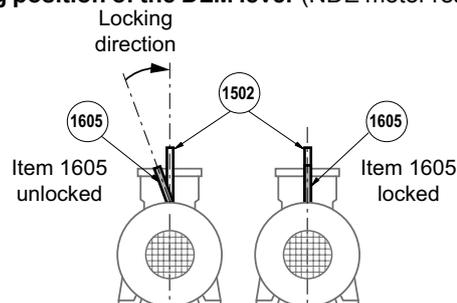


- Check visually that the levers **1502** and **1605** are on 2 parallel planes and perpendicular to the motor shaft.



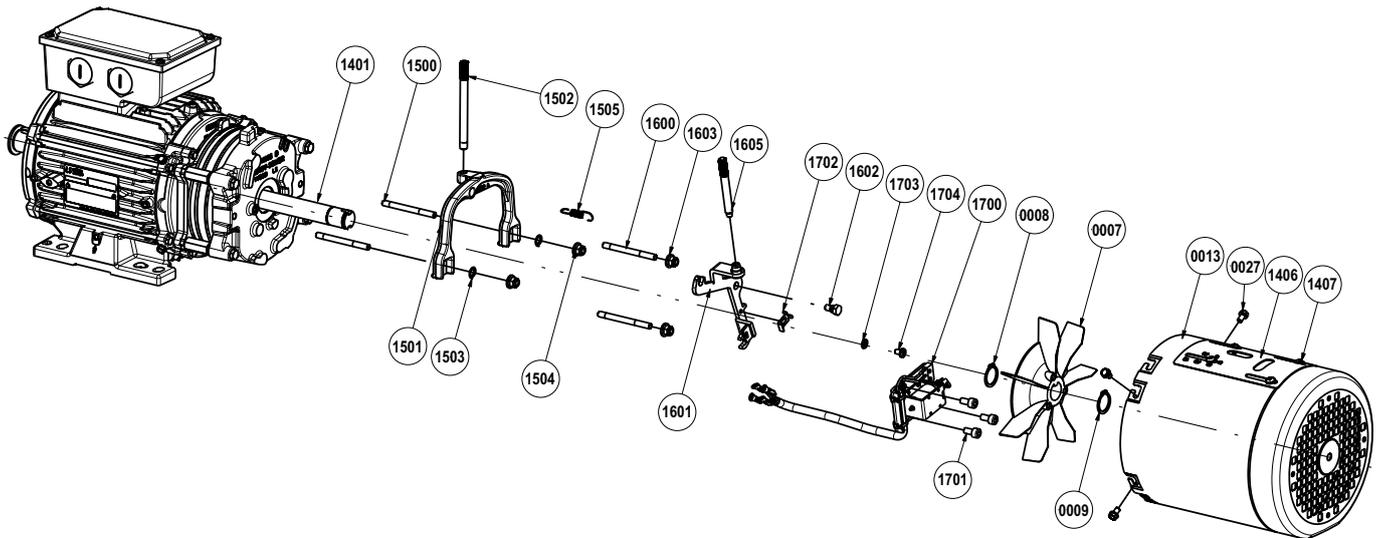
After any loosening operation, check that the brake is in the applied position once the maintenance operations are performed.

Working position of the DLM lever (NDE motor rear view):



6.3 - DMD lever

- Exploded view



- Parts list

Item	Description	Qty	Item	Description	Qty
7	Fan	1	1505	Return spring (item 1501)	1
8	Fan thrust washer (item 7)	0 or 1	1600	Stud (item 1601)	1
9	Locking circlips (item 7)	1	1601	Latch mechanism	1
13	Fan cover	1	1602	Rotation axis (item 1601)	1
27	Cover fixing screw (item 13)	3 or 4	1603	Locknut	1
1406	Cover closing hatch	1	1605	Control rod (item 1601)	1
1407	Fixing screw (item 1406)	4	1700	Electromagnet plate assembly	1
1500	Stud (rep.1501)	2	1701	Plate fixing screw (item 1700)	3
1501	DLRA calliper	1	1702	Contact pallet	1
1502	DLRA control rod	1	1703	Washer under screw (item 1704)	1
1503	Spiral spring under nut	2	1704	Pallet fixing screw (item 1702)	1
1504	Locknut	2			

• Operation

For brakes fitted with a DMD, supply the brake coil separately from the motor. Once the brake is released, supply the electromagnet on the latch control plate. Once the latch contact is triggered, power off the brake coil then the control plate. The brake is maintained in the released position. When brake power is restored, locking drops automatically and the brake is operational.

• Disassembly:

- Disconnect the electromagnet plate **1700**.
- Unscrew the control rods of the levers **1502** and **1605** (if mounted on their base).
- Unscrew the screws **27** from the cover, remove the metal cover **13**.

- Remove the fan **7** by removing the axial holding circlips **9**.
- Extract the fan **7** using two screwdrivers as levers.
- Unscrew the screws **1701** from the electromagnet plate **1700**, then remove the plate.

To remove the latch (DLM) refer to § 6.2 and the (DLRA) refer to § 6.1.

• Reassembly:

Reverse the removal procedure.

- When refitting the mechanical link between the latch and the plate, adjust the contact pallet **1702** using the screw and washer **1703**, **1704**.

Adjusting must be done with the rod in; check that the pallet **1702** actually activates the microcontact of the electromagnet plate **1700**. Lock the fixing screws **1703**.

- Operate the DLRA control rod **1502**, then the DLM **1605** one. Release the DLRA, then the DLM, rotor must be free.



It is prohibited to drive the extension shaft **1401 and the fan **7** in manual rotation with the parking brake applied, or the brake released under load.**

- Actuate the DLRA **1502**, under the action of the electromagnet plate **1700**, the DLM lever **1605** should return to its 'unlocked' position.
- Check the air gap between the armature **1102** and the yoke **1105** next to the spacers **1104**. The values shall comply with the following table:

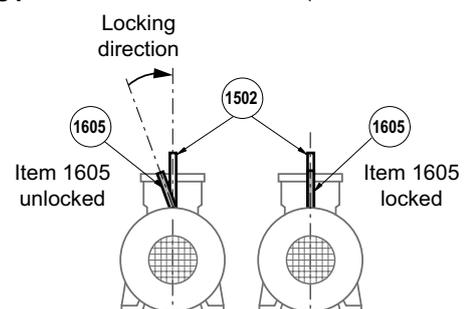
Brake size	With DMD lever
FFB1, FFB2, FFB3	0,6-0,7 mm
FFB4, FFB5	0,6-0,7 mm

- Refit the fan...



After any loosening operation, check that the brake is in the applied position once the maintenance operations are performed.

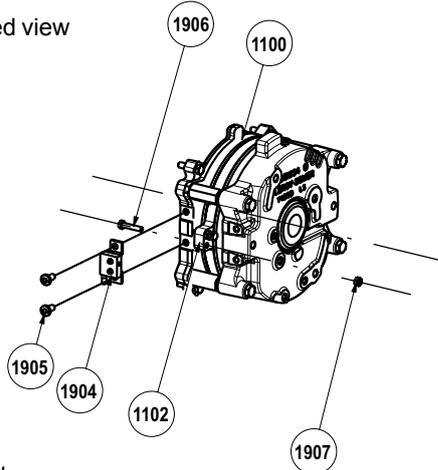
Working position of the DLM lever (NDE motor rear view):



6.4 - Marks (Loosening-Wear)

6.4.1 - Wear mark

- Exploded view



- Parts list

Item	Description	Qty
1100	Face plate	1
1102	Armature	1
1904	Wear indicator microcontact	1
1905	Fixing screw on item 1904	2
1906	Contact screw on item 1904	1
1907	Lock nut (item 1906)	1

• **Operation:**

For brakes fitted with a wear indicator, if the brake pad is worn (+ 0.6 mm) the armature actuates the microcontact fastened on the back plate, indicating that the air gap requires adjustment or the pad changed, when the latter is thinner than the minimum required (see procedure "Air gap adjustment" §2.5).

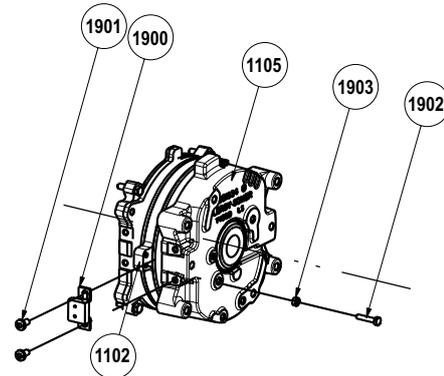
• **Adjustment and removal:**

To adjust the microcontact **1904**, engage the screw **1906** into the armature **1102**, position a 0.5 mm shim between the screw head and the microcontact sensor **1904**. Unscrew the screw **1906** until hearing the "click" of switching. Block the screw **1906** with the lock nut **1907** then remove the shim.

For disassembly, return to the beginning of the cover removal procedure. Unscrew the screws **1905** then remove the microcontact **1904**. Unscrew the locknut **1907** then unscrew the contact screw **1906**.

6.4.2 - Loosening indicator

- Exploded view



- Parts list

Item	Description	Qty
1105	Yoke	1
1102	Armature	1
1900	Loosening indicator microcontact	1
1901	Fixing screw (item 1900)	2
1902	Contact screw on item 1900	1
1903	Lock nut (item 1902)	1

• **Operation:**

For brakes fitted with a loosening indicator, when the brake is supplied, the armature actuates a microcontact (on-off) fastened to the yoke, indicating brake opening. Upon a power failure, the microcontact changes state to confirm brake closing.

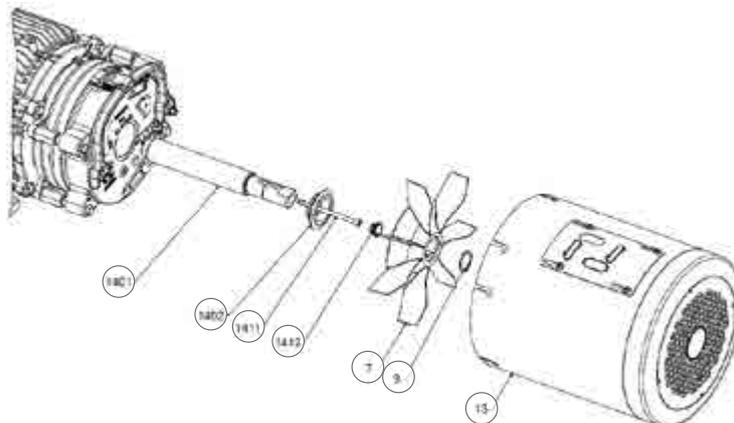
• **Adjustment and removal:**

To adjust the microcontact **1900**, engage the screw **1902** into the armature **1102**, position a 0.2 mm shim between the screw head and the microcontact sensor **1900**. Unscrew the screw **1902** until hearing the "click" switching. Block the screw **1902** with the lock nut **1903** then remove the shim.

For disassembly, return to the beginning of the cover removal procedure. Unscrew the screws **1901** then remove the microcontact **1900**. Unscrew the locknut **1903** then unscrew the contact screw **1902**.

6.5 - Second shaft end (crankshaft socket)

- Exploded view



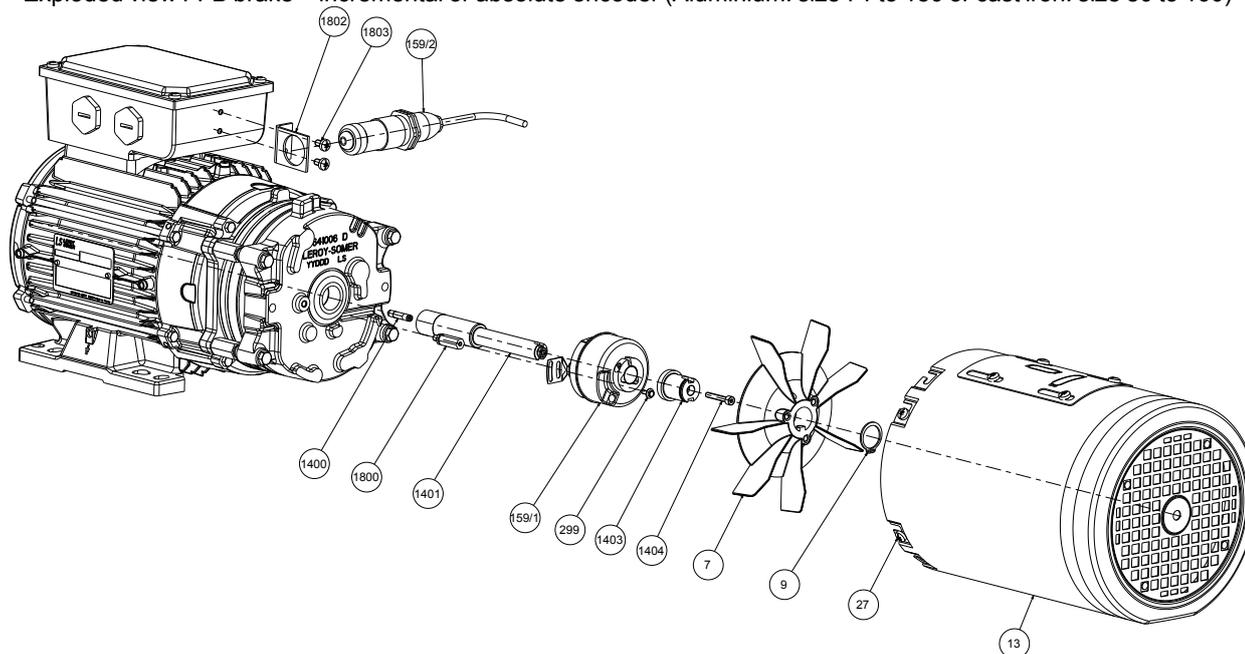
- Parts List

Item	Name	Qty	Item	Name	Qty
7	Fan	1	1402	VLS seal (item 1105)	1
9	Locking circlips (item 7)	1	1411	Link screw	1
13	Fan cover	1	1412	Crankshaft socket plug	1
1401	Extension shaft	1			

xx Wear part

6.6 - Speed and position feedback devices

- Exploded view FFB brake + incremental or absolute encoder (Aluminium: size 71 to 180 or cast iron: size 80 to 160)



- Parts list

Item	Description	Qty	Item	Description	Qty
7	Fan	1	1400	Extension/shaft link screw	1
9	Locking circlips (item 7)	1	1401	Extension	1
13	Ventilation cover	1	1403	Fan adapter socket	1
27	Cover fixing screw (item 13)	3 or 4	1404	Socket fixing screw	1
159/1	Encoder	1	1800/1801	Spacer (and extension)	1 to 3
159/1	Connector		1802	Fixing bracket	2
299	Fixing screw	2	1803	Fixing screws	1

• Disassembly, Replacement:

- Disconnect the connector **159/2** fastened to the terminal box body.
- Unscrew the screws **27** from the cover, remove the metal cover **13**.
- Unscrew the screw **1404** and remove the fan with its socket **1403** and the circlips **9**.
- Unscrew the screw **299**, unscrew the encoder hooping ring (radial screw) from the extension **1401**; remove the encoder.

• Reassembly:

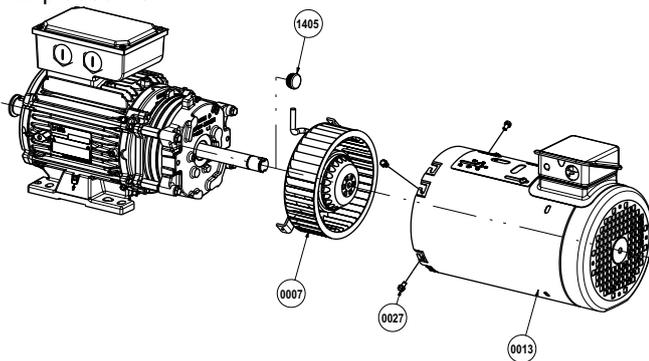
- Replace the spacer **1800** tightened to the torque of 5.75 Nm. Check the beating $\leq 0,05$ mm. Replace the spacer extension **1801** and tighten to the torque of 5.75 Nm $\pm 10\%$ for FFB1 up to 5.
- Fit the (new) encoder on the shaft extension **1401**.
- Block the encoder by screwing to the torque of 0.8 Nm $\pm 10\%$ the screw **299** on the spacer extension **1800**.
- Tighten the encoder fixing screw to the torque, according to supplier instruction (Heidenhain: 1.1 Nm $\pm 0,1$ N.m; Hengstler: 0.6 Nm $\pm 5\%$; Ideacod: 1.5 Nm $\pm 10\%$).
- Fit the fan adapter socket **1403**, screw **1404** to the torque of 3 Nm $\pm 10\%$. Insert the fan **7** on the socket **1403** then block on the axis with fan lock washer **9**.



After intervention, always close the cover(s) of terminal boxes and the caps.

6.7 - Forced ventilation kit

- Exploded view



- Parts list

Item	Description	Qty
7	Forced ventilation	1
13	Forced ventilation cover	1
27	Cover fixing screw (item 13)	3 or 4
1405	Yoke borehole plug	1

• Disassembly, Replacement:

- Unscrew the screws **27** from the cover, remove the cover **13** fitted with forced ventilation.

When replacing the standard auto-ventilation with forced ventilation, remove the fan **7** by removing the axial holding circlips **9** (see §2.1), remove the extension **1401** and stop with plug **1405**.

• Reassembly:

- Reverse the removal procedure.

6.8 - IP65 10 pin 16A connector kit

The LSES 71 to 132 4-pole motors can be fitted with a connector compliant with UL and CSA standards as per the following two versions:

- WMS or male version, closed with lead cover



- WMFS or full version, with female extension cover on the side, docking brass PE ISO 25 for cable entry (not supplied) between 12.5 and 18 mm.



See connection diagram § 8.

6.9 - Particular conditions of use

- Thermal protections (§8)

- Heating resistors (§8)

- Surface temperatures:

As standard, the maximum temperature of our brake motors is +125°C with a maximum ambient temperature $\leq +40^\circ\text{C}$. Without derating the brake motor, the maximum surface temperature shall be:

- +135°C if $40^\circ\text{C} \leq 50^\circ\text{C}$
- +145°C if $50^\circ\text{C} \leq 60^\circ\text{C}$



Caution: The motor's surface temperature during operation requires wearing PPEs when handling parts and during maintenance operations.

- Maintenance of main bearings:

When detecting the following on the brake motor:

- abnormal noise or vibrations,
 - abnormal heating on the bearing, check their condition.
- Change damaged bearings as soon as possible to prevent additional damage to the brake motor and driven devices. When one bearing requires to be changed, also change the other bearing. The floating bearing shall ensure expansion of the rotor shaft (check its identification upon disassembly). Always change the sealing gaskets when changing the bearings.

- Sealing

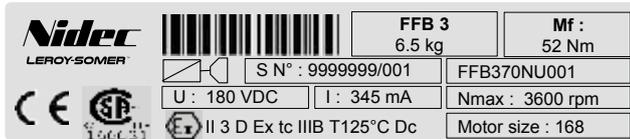
After removing the bleeding plugs, refit them to ensure the brake motor achieves the IP55 protection rating.

Non-ventilated brake (IC410): using the brake exclusively as a parking brake. Service braking is forbidden. Dust must be removed regularly to prevent it from building up.

For motors with voltages other than the catalogue standard, with low voltage starting or running under variable voltage or frequency: separate brake supply is required. (Also in the case of a 20V DC coil).

6.10 - Use in Atex zone 22

Specific ATEX 11 marking (§1.1):



II 3D Ex tc IIIB: Group II, category 3, non-conductive dusts.

T125°C: Maximum surface temperature

Dc: Equipment protection level

Nmax 3600 rpm: maximum rotation speed in Atex.

The brake must be assembled with a motor which respects the same EXAT level requirements at least.

If the brake is not equipped with a release/application indicator, check the clearance periodically according to the rates and the energy to be dissipated on each braking operation (see technical catalogue ref 5329 § Operation). Those persons required to work on electrical installations and equipment in zones where there is a risk of explosion must be specially trained in the necessary skills.

In effect, they must be familiar not only with the electrical risks, but also with those that are due to the chemical properties and physical characteristics of products used in the installation (gas, vapour, dust), as well as the environment in which the equipment operates. These elements dictate the risk of fire and explosion.

In particular, they must be informed and aware of the specific safety reasons and requirements in order to adhere to them.

For example:

- do not open when powered up,
- do not open when powered up in atmospheres D21 containing explosive dust,
- do not repair when powered up,
- do not manoeuvre when on load,
- wait several minutes before opening,
- replace the seals tightly to ensure watertightness.

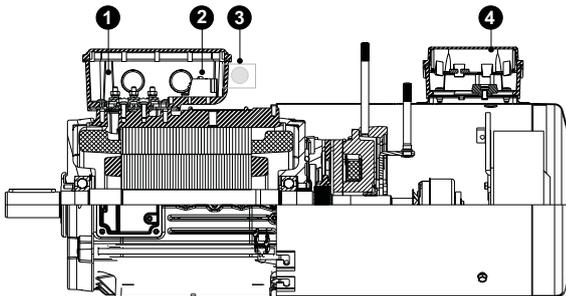
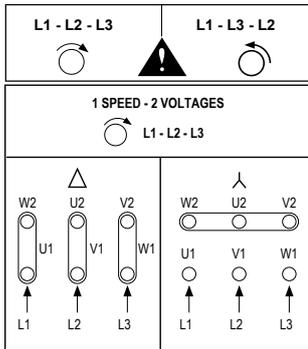
7 - REPAIR GUIDE

Incident	Possible cause	Remedy
Abnormal noise	From motor or driven machine?	Disconnect the motor from the driven device and test the motor alone
Noisy brake motor	Mechanical cause: if the noise persists after powering off - Vibrations - Faulty bearing - Sensor extension (item 1401) fitted improperly - Mechanical friction: ventilation, coupling Electrical cause: if the noise stops after power drops - Normal voltage and 3 phases balanced - Abnormal voltage - Unbalance of phases Other possible causes: - bad drive setting - drive malfunction	Check that the key complies with the type of balancing - Check the condition of the bearings - Change the bearings as soon as possible - See adjustment § 6.6 - Check and change the faulty part - Check the supply at the motor terminals - Check the drive setting - Check the plate connection and strip tightening - Check the supply line - Check the resistance of windings Refer to the drive manual
Abnormal motor heating	- Faulty ventilation - Faulty supply voltage - Strip coupling error - Overload - Partial short circuit - Phase unbalance Other possible causes: - bad drive setting	- Check the environment - Clean the ventilation cover and the cooling fins - Check the fitting of the fan onto the shaft - Check - Check - Check the intensity absorbed with respect to that indicated in the motor information plate - Check electrical continuity of the windings and/or the installation - Check the resistance of windings Refer to the drive manual
Motor does not start	Empty: - Mechanical blocking - Power supply line interrupted - Position return (drive message) - Thermal protection In charge: - Unbalance of phases - Drive - Position return (drive message) - Thermal protection	- Release the brake and motor powered off: check by hand that the shaft turns freely - Check the fuses, electric protection, starting device - Check the wiring, drive setting, operation of the position sensor - Check Powered off: - Check the rotation direction (order of the phases) - Check the resistance and continuity of the windings - Check the electric protection - Check the setting, dimensioning (Max current delivered by the speed drive) - Check the wiring, drive setting, operation of the position sensor - Check
The brake does not release	- The voltage is present at the coil's terminals - The lever rod is in abutment on the cover - Mobile parts are stuck - No more voltage at the coil terminals - Drive	The air gap is too big, the yoke does not attract the armature - Adjust and check disc wear The voltage is too low $U < 0.8U_n$ - Restore the voltage to its nominal value The coil is off, its resistance is infinite - Change the complete brake unit or the coil - See adjustment section 6.1 ref. 1406 - Remove, clean, and look for the cause of sticking The cell is inoperative - Test it - Check that the brake supply is separate from the motor's
The call time is too long	- Check the voltage at the coil terminals - The air gap is too wide - The braking moment has increased	The voltage is too low $U < 0.8U_n$ (U_n : according nominal power supply) - Restore the voltage to its nominal value - Readjust - Return to the initial setting or consult - Connect the cell as per the mark (A) power off on the direct
The drop time is too long	- Check that the power off is performed on the direct	- Connect the cell as per the mark (A) power off on the direct
The brake is noisy when released	- Irregular or excessive air gap - Foreign material in the air gap - Extension shaft 1401 fitted incorrectly - Drive	- Remove if necessary and clean (see §4) - Clean - See encoder reassembly section 6.6 - Check that the brake supply is separate from the motor's
The braking moment is insufficient	- The friction faces are not clean and dry - Pollution due to environment - The disc is worn	- Clean the friction faces - Redefine the braking moment - Clean friction faces. If disc is marked, replace it - Change the disc
The brake is applied (drops) but braking is weak	- Insufficient spring pressure - Correct spring pressure	- Check pad wear. Increase the number of springs - Check the surface wear of the armature - Use a blower to clean dust due to friction
Permanent pad friction	- The air gap is insufficient	- Adjust the air gap

8 - CONNECTION DIAGRAMS

8.1 - Motor: reminder

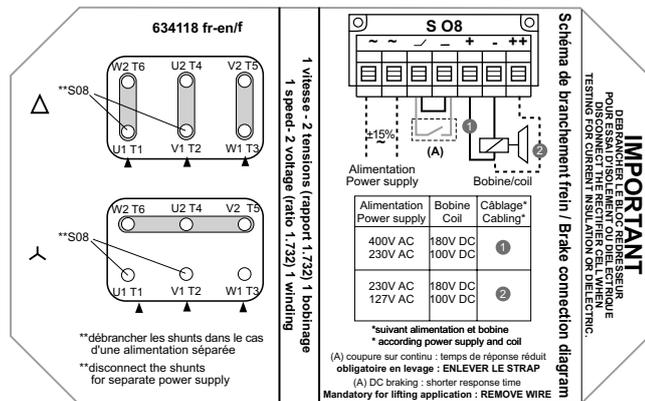
❶ Check the rotation direction of the drive shaft.



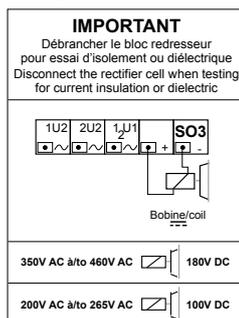
❷ Check the brake wiring according to the power supply.

8.2 - Brake: diagram under the TB cover

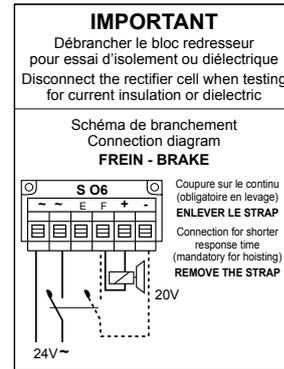
8.2.1 - 180VDC brake coil for standard 1-speed brake motor (Max power supply 500V)



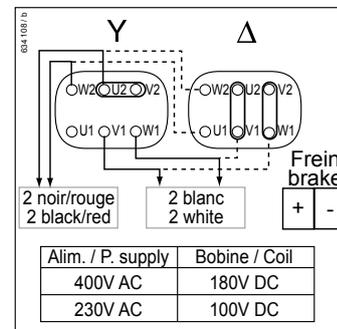
❷ **8.2.2 - 180VDC brake coil for 2-speed motor with 2 windings, 1 voltage, built-in supply**



❷ **8.2.3 - 20VDC brake coil, separate power supply 24V - (F)LS(ES) 71 to 160**



❷ **8.2.4 - Connection for reduced response time TRR: built-in power supply mandatory**



8.3 - Options

8.3.1 - Standard thermal protections, class F, 150°C

Thermal protections	Double PTO	Triple CTP
Cut-off current	1.6A - cosφ 0.6	-
RMS voltage	250V	2.5V max
Fixing	on clamp terminal + flag (purple/white)	on board (except HA71: on clamp terminal) + flag (black/black)

8.3.2 - Standard thermal probes

Thermal probes	PT100	KTY
Measurement current	10mA max	10mA max
RMS voltage	-	-
Fixing	on clamp terminal (3 wires black/red/black)	on clamp terminal (brown/white)

8.3.3 - Indicators

Indicators	Loosening indicator (Open/Close)	Wear mark
Current	6A	6A
Voltage	250V	250V
Fixing	on clamp terminal (3 wires blue/black/grey) Black/Blue = NO Black/Grey = NC	on clamp terminal (3 wires blue/black/grey) Black/Blue = NO Black/Grey = NC

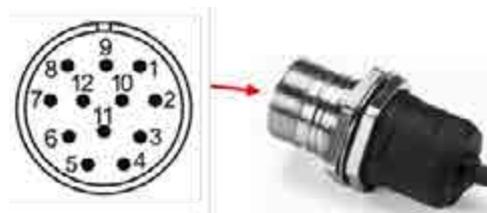
NO: normally open; NC: normally closed

8.3.4 - Speed and position encoders ③

Standard incremental encoder: 5VDC 1024 pts/tr or 4096 pts/tr

Separate supply brake

Terminal No.	Connection	Colour
1	0V	White
2	+VCC	Brown
3	A	Green
4	B	Yellow
5	0	Grey
6	A	Pink
7	B	Blue
8	0	Red
9	Mass	-
10	Mass	-
11	Mass	-
12	Mass	-



View of M23 male connector base at the encoder end

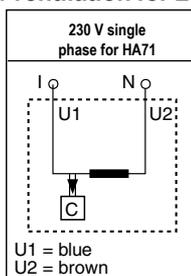
View of M23 male connector base at the encoder end

Standard absolute encoder: 10/30 VDC, SinCos SSI multi-turn - Brake with separate power supply

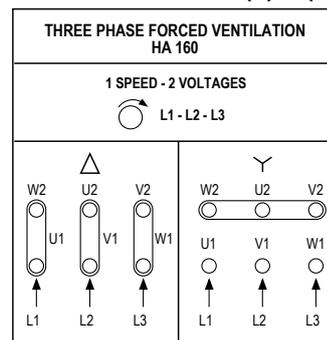
Terminal No.	Connection	Function
1	0V	Coder mass
2	+VCC	Supply voltage
3	Clock+	Clock signal
4	Clock-	Clock signal
5	Data+	Data signal
6	Data-	Data signal
7	SET	Current position defined at 0 (reset)
8	DIR	Clockwise or anti-clockwise counting direction
9	A	Sine output (incremental)
10	A	Sine output (incremental)
11	B	Cosine output (incremental)
12	B	Cosine output (incremental)

8.3.5 - Forced ventilation ④

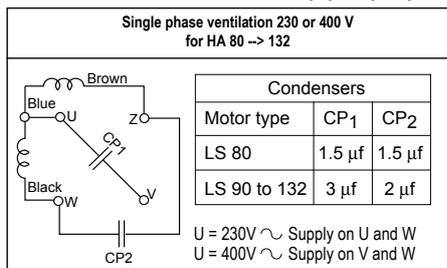
Single phase forced ventilation for LS 71



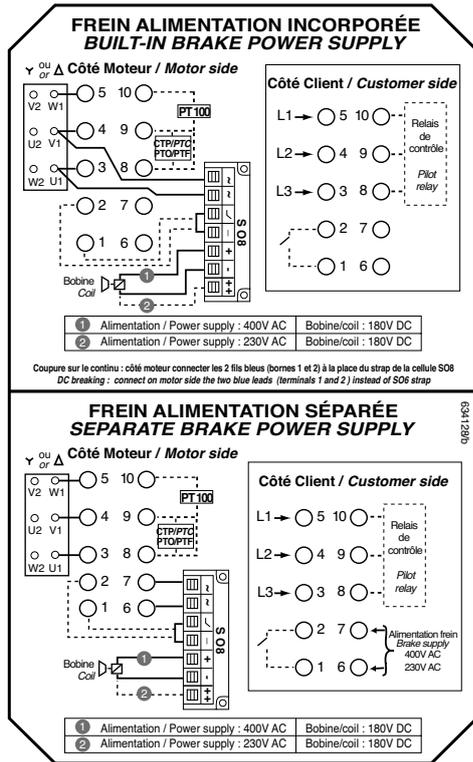
Three phase forced ventilation for (F)LS(ES) 160



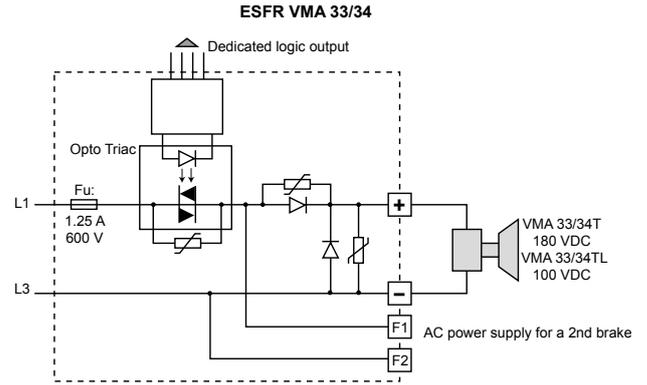
Single phase forced ventilation for (F)LS(ES) 80 to 132



8.3.6 - Plug-in connector

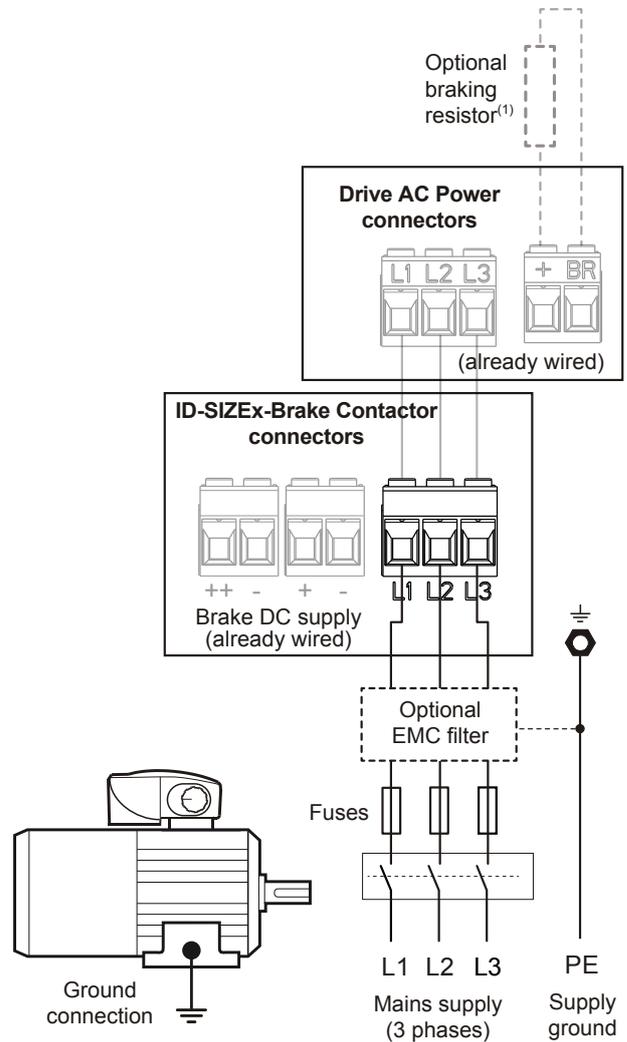
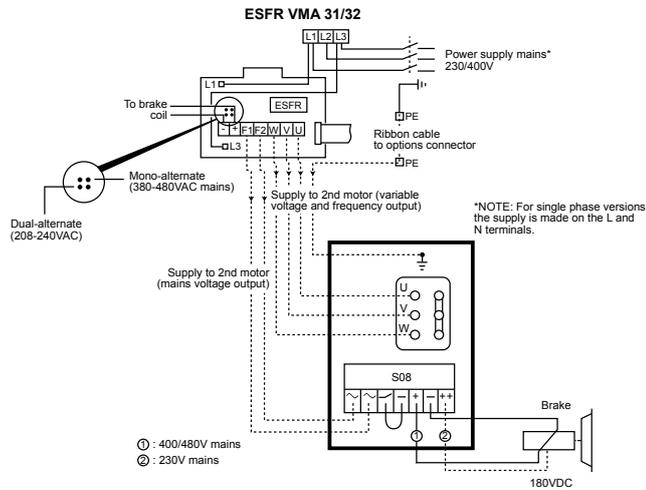


8.3.8 - VARMECA 33 / 34 option



8.3.9 - ID 300/302 Brake control option

8.3.7 - VARMECA 31 / 32



9 - RECYCLING

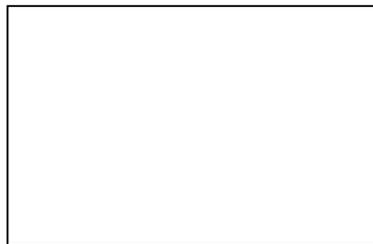
At end of life, call upon a material disposal company to dispose of the different brake motor components.

NOTES

NOTES

Nidec
All for dreams

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