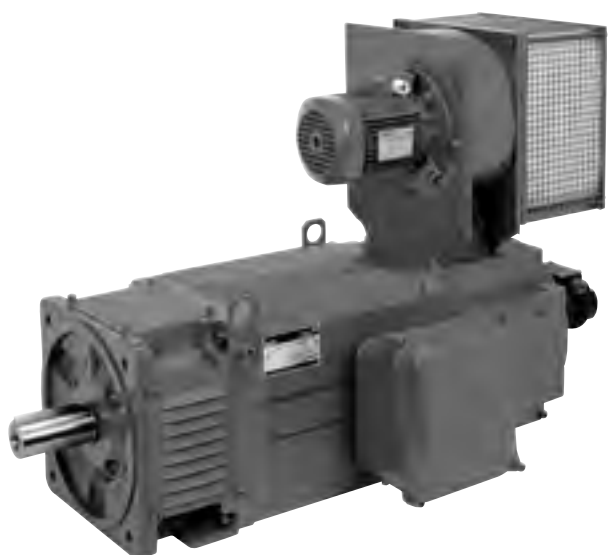


***Nidec***  
All for dreams



*Installation and  
maintenance guide*

---

***LSK***

---

*D.C. motors*

Reference: 5703 en - 2018.04 / a

***LEROY-SOMER***<sup>TM</sup>

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### IMPORTANT

Contact with any live or rotating parts may cause injury.

Installation and maintenance must only be carried out by a qualified member of staff.

Before touching the motor, you must read the UTE C18-510 standard with regard to operator protection as well as any current laws and regulations affecting the safety of personnel.

LEROY-SOMER cannot be held responsible for any problems arising from failure to comply with the instructions in this manual.

## 1 - TOOLS

In addition to standard dismantling and reassembly tools, the following tools are needed to change the brushes in the LSK range:

- reversible pawl key type R151 Facom or equivalent,
- set of male hexagonal keys,
- set of hexagonal tube keys.

## 2 - HANDLING

The motors are fitted as standard with two handling rings, which are located diagonally opposite, and are fixed on the DE and NDE motor flanges.

A lifting bar must be used to avoid damaging the forced ventilation unit on the motor: see diagram opposite.

Take care not to knock the motor against any object during handling.

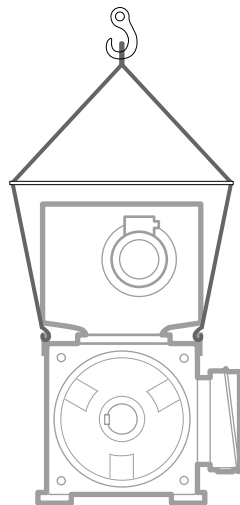


Fig. 1

## 3 - LOCATION

If the protection index on the motor identification plate is IP 23, it must be installed under cover, and not exposed to extreme weather conditions.

## 4 - ENVIRONMENT (diagrams 2 & 3)

Unless stated otherwise at the time of ordering, the motors are suitable for standard environments in accordance with IEC 34.1. That is:

- altitude 1000 m or less,

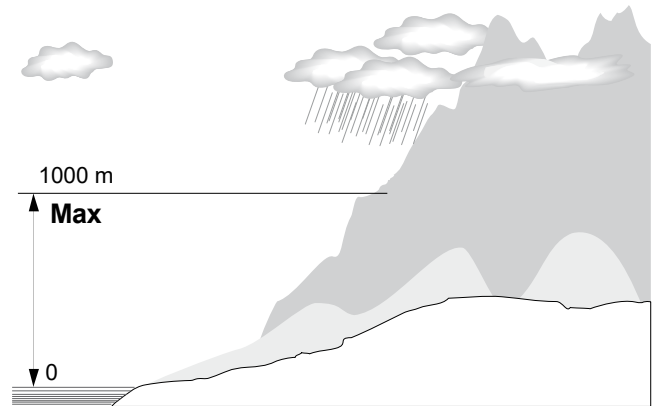


Fig. 2

- temperature between +5 and +40°C.

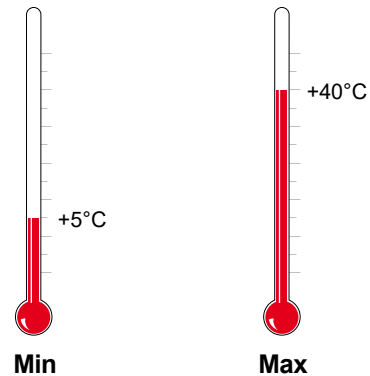


Fig. 3

The motor can be adapted if conditions are not satisfactory: see the technical catalogue ref. 3805.

## 5 - INSTALLATION (figure 4)

See section 4.1 page 3 of the general manual (réf. 5702).

The motor should be installed on a flat surface and should not be subject to vibrations.



Fig. 4

The seals should be able to withstand the forces engaged during normal motor operation, as well as a possible over-torque of 2.5 times the rated torque.

If atmospheric pollution is a problem the following solutions are available : air filter, ducting of cables, etc: see technical catalogue ref. 3805.

The motor terminals and inspection doors should be easily accessible to facilitate repairs and maintenance.

### Connection

See section 4.1 page 3 of the general manual (ref. 5702). Check the connections are correctly aligned (see figure 5). For pulley and belt installations, compatibility of the forces (radial and axial) exerted on the shaft **MUST** be compared to those listed in the relevant sections of the technical catalogue reference 3805.

For sleeve couplings a sufficient gap should be left between the two coupling halves to allow thermal expansion without axial thrust.

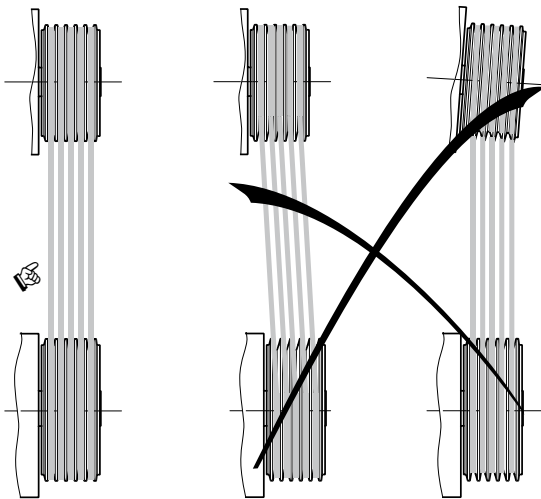


Fig. 5

Do not use tools which jolt or bang the motor as this may damage the bearings.

## 6 - ELECTRICAL CONNECTION

See section 4.2 page 4 of the general manual (ref. 5702). Refer to the diagrams for details on how to connect the motor.

- In the motor power circuit we recommend that there is:
- thermal protection by integration of overload (100% of supply current);
  - instantaneous protection (200% of supply current);
  - protection against ground faults;
  - protection against field overvoltages: if there is a short-circuit in the field coil supply, place a resistor  $R_p$  in parallel with the field coil. For example:

$$R_p = 800 \times U_{exc} / P_{exc}$$

where:

$R_p$  parallel resistance in  $\Omega$ ,

$U_{exc}$  field voltage in V,

$P_{exc}$  field power supply in W.

Do not forget to connect the earth terminal to earth.

### 6.1 - Thermal detection

If a shorter protection reaction time is required, or if you want to detect transient overloads and monitor temperature rises at "hot spots" in the motor or at strategic measured points in the installation for maintenance purposes, installation of heat sensors at "sensitive" points is recommended. The various types are described below.

**N.B:** Heat sensors do not themselves protect the motor.

Motors can be fitted with the following types of thermal detector :

- thermistor (PTC probe : diag. 6)

These are thermovisible resistors with positive temperature coefficients (marked with black flagtype labels -trip- or blue -alarm-). When there is an increase in temperature, the probe resistance increases slowly then very quickly within a range of  $\pm 5^\circ\text{C}$  of the nominal running temperature (NRT).

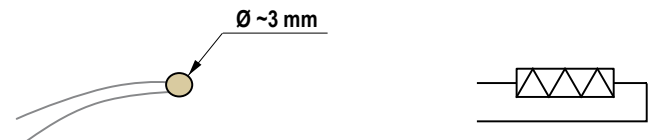
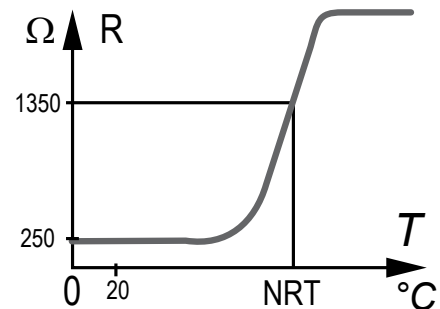


Fig. 6

The resistance value measured at R terminals must be less than 250  $\Omega$  at the ambient temperature.

Max. voltage : 2.5 V per probe.



They are used together with a relay which is not supplied by LEROY-SOMER (type LT1 SA... Telemecanique or similar); LEROY-SOMER MENTOR MP speed controllers include direct connection for probes.

- thermostatic (PTO or PTF : diag. 7 & 8)

These are bimetallic strips, either opening type (PTO, normally closed, white flag-type labels) or closing type (PTF, normally open, yellow flag-type label).

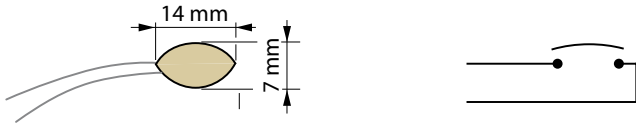


Fig. 7

**Operating principle**

**Thermal detection on opening**

**Thermal detection on closing**



They are connected in the motor protection circuit.

**Thermal detection on opening**

**Thermal detection on closing**



Fig. 8

Characteristics	PTO	PTF
rms current	1 A - cosφ 0.6	1 A - cosφ 0.6
shutdown current	2.5 A - cosφ 0.4	2.5 A - cosφ 0.4
rms voltage	250 V	250 V

**6.2 - Space heaters**

These are in the form of fibre glass insulated ribbon on the end windings, which maintain the the average temperature of the motor, provide trouble-free starting and eliminate problems caused by condensation (loss of insulation). The heaters must be switched on when the machine stops and switched off while the machine is in operation.

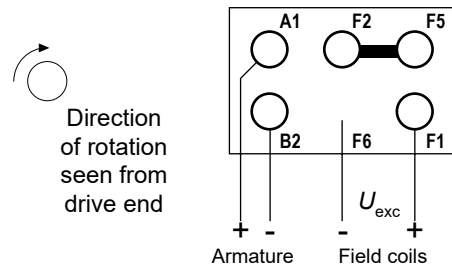
LSK motors have 2 space heaters, with a 25 W (for size 1124 to 1604) or 50 W (for larger models) unit power supply, and a supply voltage of 230 V at 50 or 60 Hz. They are marked with a red flag-type label.

**6.3 - Connection diagrams**

The motors are connected at the factory when the field voltage is specified in the order.

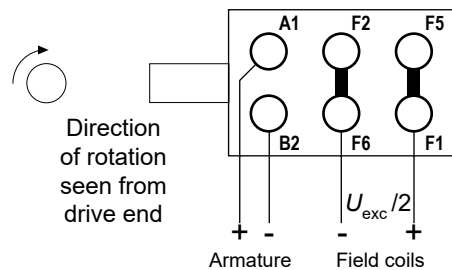
- Field coils with 4 output terminals, and series connection (clockwise rotation seen from the drive end (DE)):

*Example:* For a motor plate indicating 180 - 360: the field voltage will be 360 V.



- Field coils with 4 output terminals, and parallel connection (clockwise rotation seen from the drive end):

*Example:* For a motor plate indicating 180 - 360 : the field voltage will be 180 V.



**6.4 - Marking the terminal box**

All accessory outputs are marked with a "flag-type" label (colours indicated in the corresponding paragraphs). It is connected in the terminal box, as show in the terminal connection diagram supplied with the motor.

**6.5 - Accessoires**

(see technical catalogue ref. 3805, section G)

For motors equipped with option(s) check that the correct parts are used for the various connections (brake, tacho detector, etc).

For the brake, check the power supply voltage conforms with that of the winding, indicated on the brake plate.

Refer to the detailed manual on brakes enclosed.

Do not forget to connect the air flow detector if necessary.

If motors fitted with a pulse generator (PG or encoder) have a connecting cable longer than 20 m, the cable should be of the shielded twisted pair type and should be no longer than 500 m to the opto-coupler input.

If necessary, the connection of the detection probes to the relay (brush wear detection probes are optional) can control an audible or flashing alarm, or a circuit-breaker.

## 6.6 - Before start-up

Do a global check reviewing the whole drive chain to ensure nothing has been forgotten (tightening of various screws and bolts, installation of various components).

**! WARNING:** *the ventilation unit should be installed, then the field powered at the rated voltage before the motor is started. The power supply must include protection against field faults (risk motor racing : taken into account by LEROY-SOMER speed controllers).*

### Changing the direction of rotation

This should be done when the motor is powered down; to change the direction of motor rotation reverse the field polarity.

## 7 - MAINTENANCE

See section 5 of the general manual reference 5702 to ensure the motor lasts as long as possible.

**! Brushes**  
**WARNING:** *the following operations must only be performed when the motor is at a standstill and powered down.*

*The brushes should be checked (state of the brushes, freedom of movement, pressure exerted by the springs) 200 hours after first use. They should be checked again after a further 500 hours of operation. The results of these two checks should be used to determine the interval at which periodic checks are made. Replace the brushes before they reach the wear limit indicated on the label.*

### IP 55 IC 416 motors only:

*each time the motor is checked or at most every 500 hours, completely clean (armature and commutator: inside and outside, stator) by blowing with compressed air, with the inspection doors open.*

## 8 - RECOMMENDED SPARE PARTS

We recommend the following emergency spare parts:

- set of brushes,
- set of bearings.

Other main parts:

- brush-holders,
- set of armature windings,
- set of main pole windings,
- set of pole switching windings,
- wound armature (balanced),
- ventilation induction motor.

## 9 - DISMANTLING

**! During the guarantee period this operation should only be performed in a LEROY-SOMER approved workshop or at one of our factories, otherwise the guarantee may no longer be valid. When the guarantee period is over any dismantling operations should either be done by an approved workshop or at one of our factories. Day-to-day maintenance may be performed by staff trained in electrical rotating machines.**

See exploded view (p.9 to 13) for how to configure parts.

### 9.1 - Procedure

- Switch off the motor and disconnect it from the machine.
- Label the cables and connections in the terminal box. Disconnect them.
- Loosen the 4 baseplate screws in the terminal box (92) and remove the cables from the brushholder (149).
- Remove the inspection doors (140) and the forced ventilation unit if necessary (118).
- Label the NDE flange (6) in relation to the stator (1).
- Label and disconnect the stator from the brushholder (149).
- Remove the brushes (150) from their housing; wrap the commutator in a piece of cardboard.
- Remove the cover (53) of the NDE bearing (50).
- Loosen the 4 NDE flange screws (6).
- Extract the NDE flange, the armature remains in the stator.  
*Be careful to bring the cables out together.*
- Loosen the 4 DE flange screws (5).
- Extract the flange and retrieve the Borelly washer, the armature remains in the stator.
- Remove the armature without knocking the commutator.
- Complete dismantling by removing any parts which need to be changed.

### 9.2 - Dismantling the armature only

Dismantle the DE flange (5) as described above.

- Remove the inspection doors (140) on the NDE flange (6), remove the brushes (150) from their housing and wrap the commutator in a piece of cardboard.
- Loosen the 4 NDE flange cover screws (53).
- Extract the armature (3) from the front end : take care not to knock the commutator against the stator poles (1).
- Remove the DE (46) and NDE (60) circlips.
- Remove the bearings (30 & 50) using a bearing extractor.
- Retrieve the two supporting washers and the bearing cover on the commutator side (53 LSK 1122 to 1604, or brushholder support 160 for larger models).

**N.B:** *it is recommended that bearings should be replaced whenever the motor is dismantled.*

## 10 - CLEANING

**⚠ Do not use solvents as they can damage the varnish and protection of windings as well as the commutator.**

Clean the parts carefully, with dry compressed air (maximum 2 bars) for electric parts, with white spirit or similar for mechanical parts. See section 5 of the general manual for necessary precautions. The flanges should be coated with a thin layer of grease.

## 11 - REASSEMBLY

### 11.1 - Armature reassembly

- Replace the cover (53) or the brush-holder (160) on the commutator side, and the two supporting washers.
- Reassemble the two bearings on the shaft, do not use heavy tools; replace the two circlips (46 & 60).
- First replace the commutator armature (3) in the stator (1) taking care not to knock the commutator against the stator poles.
- Fix the NDE bearing cover (53) or the brushholder (160) in place.
- Reassemble the DE flange (5), replace the DE cover (33).

### 11.2 - Complete reassembly

- Perform the dismantling operations in reverse order.
- Once assembly is complete, ensure that the shaft rotates freely when turned by hand.
- Replace the brush-holder (149) on the labels (see figure 10). If the armature is being replaced the adjustment to neutral position must be checked (see section 6 of manual 5702).
- Reconnect the motor to the power terminals as labelled before dismantling.
- Switch on the motor and test operation.
- Connect the motor to the machine according to the instructions in the commissioning section.

Contact LEROY-SOMER with any problems.

## 12 - CHANGING THE BRUSHES

See figure 9 for the position of inspection doors.

1. **Switch the motor off** before performing any operation.

▼ **Position of inspection doors, motor seen from opposite side of drive (NDE flange)**

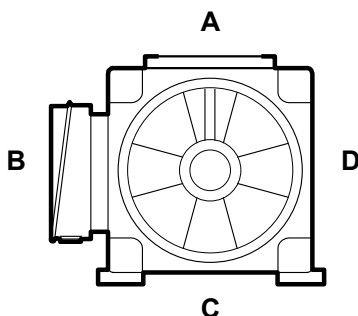


Fig. 9

2. If the motor is force cooled (FV) on the commutator side, dismantle the FV (LSK 1124 to 1604) and the inspection doors B, D or A.

3. Two labels (counter-sunk on the brush-holder) locate the brush-holder in relation to the flange (see fig. 10). These two labels should be set opposite an inspection door B, D or A.

4. Loosen cables 1 & 2 for connection to the brushholder, inspection doors A and D.

5. Loosen screws 3 & 4 which hold the brushholder:

- CHC 6\*16 for LSK1124 & 1324,
- CHC 8\*20 for LSK 1604,
- CHC 8\*60 for LSK 1804.

6. Replace the brushes located opposite inspection doors B, D and A.

7. Rotate the brush-holder by 90 degrees so that brush C is accessible via inspection door B.

8. Change these brushes.

9. Reposition the brush-holder in its original position and check the position of labels 1 and 2.

10. Tighten screws 3 & 4 to hold the brush-holder in position.

11. Tighten the connection, cable screws 1 & 2.

12. Run the brushes in following the running-in procedure described in section 5.2 page 4 of the general manual (ref. 5702).

Once running-in is complete, check that:

- the brushes move freely in the brushholder casing;
- the brushes are 100% run in (the whole surface coming into contact with the brush should shine);
- check all the brushes in the line located above the grindstone depending on the direction of rotation.
- clean properly: blow through dry greasfree compressed air.

13. Reassemble the forced ventilation unit and the inspection doors.

▼ Position of inspection doors, motor seen from opposite side of drive (NDE flange)

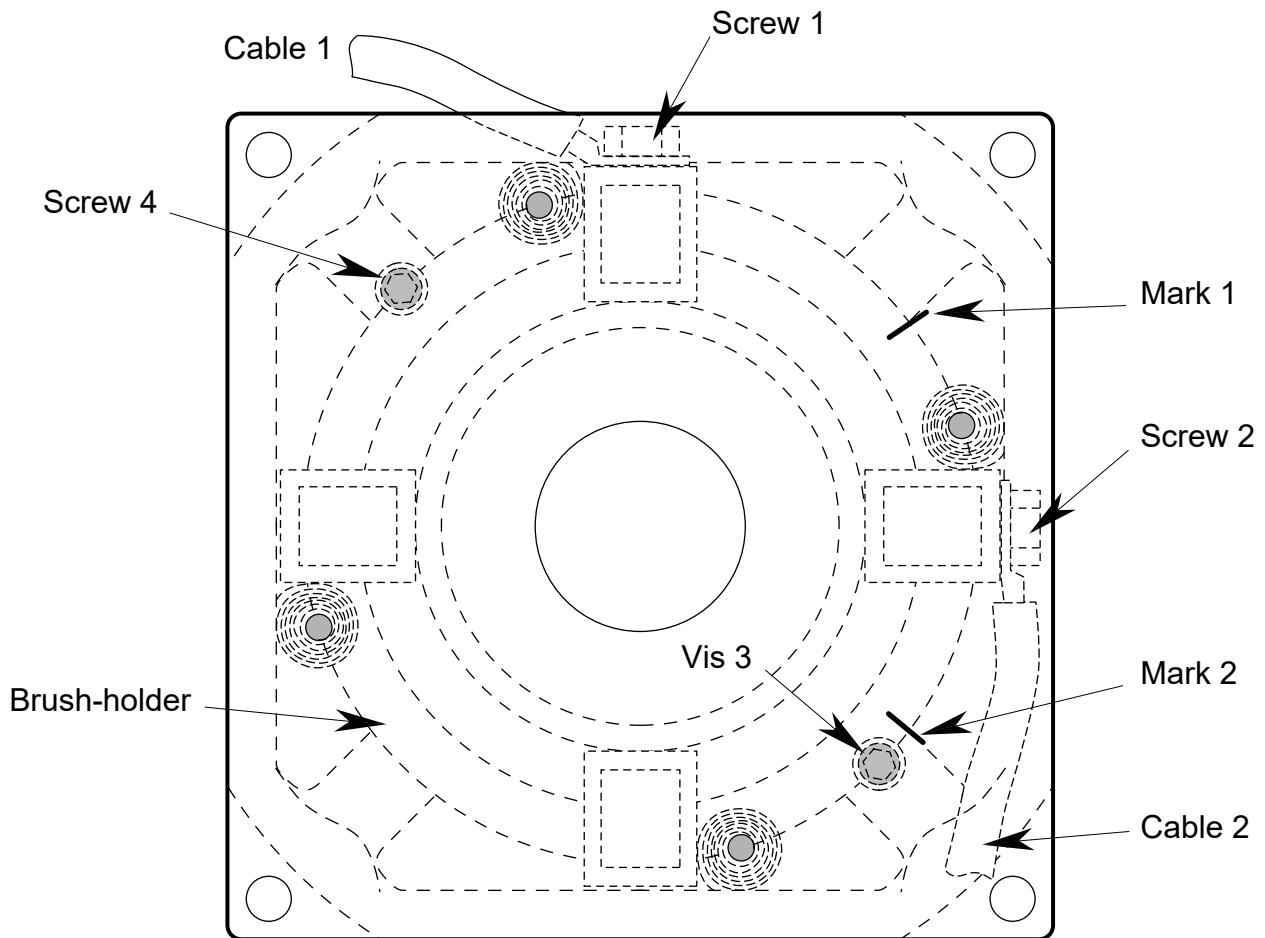


Fig. 10

### 13 - OPERATIONAL MALFUNCTIONS

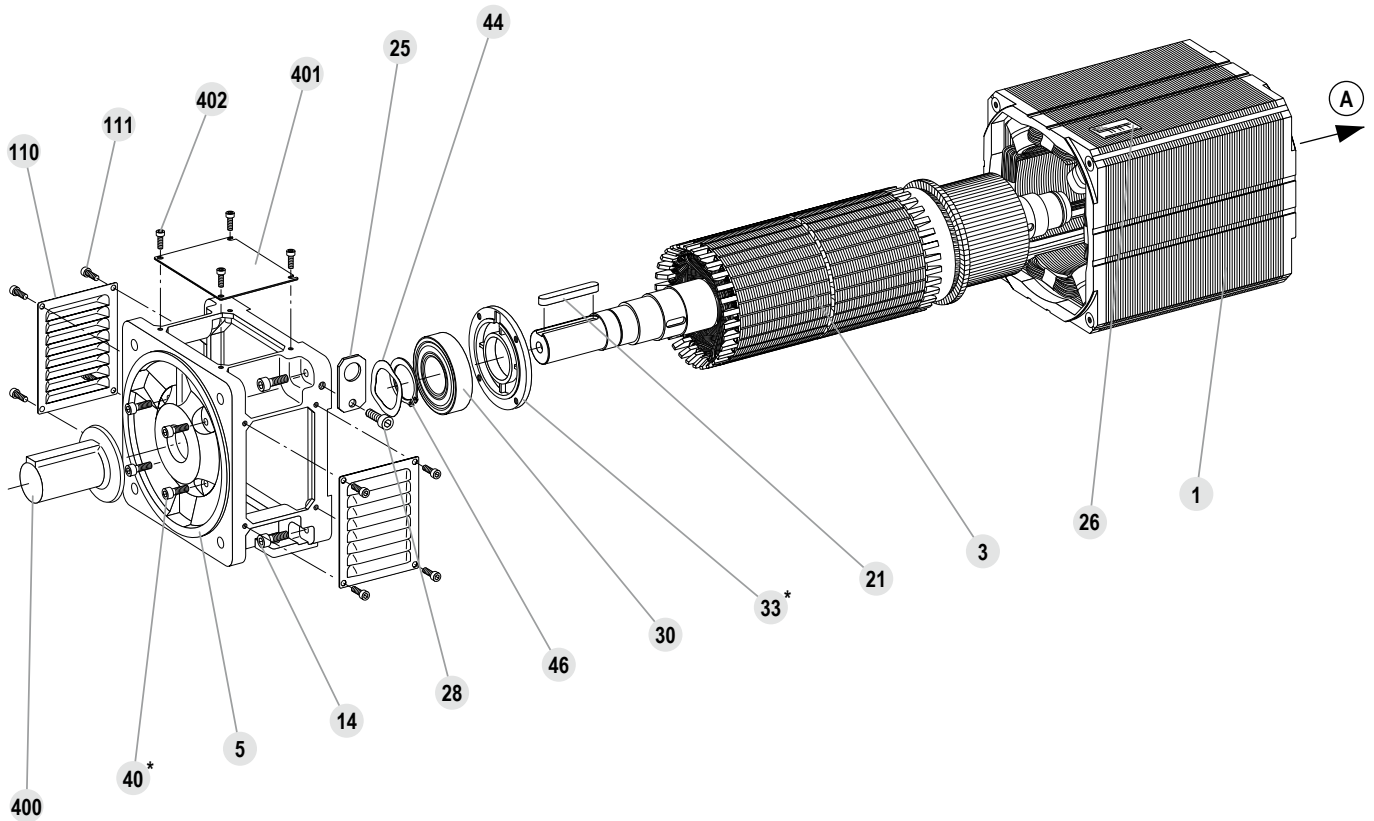
FAULT	CAUSE	REMEDY
Loss of field current	<ul style="list-style-type: none"> <li>• Power supply fault</li> <li>• Field coils disconnected</li> <li>• Field coils short-circuited</li> </ul>	<ul style="list-style-type: none"> <li>• Check speed controller</li> <li>• Replace wound stator</li> </ul>
Commutator: traces of flashover damage to metal scratches, out-of-round	<ul style="list-style-type: none"> <li>• Power supply fault</li> <li>• Used in non-recommended way</li> <li>• Vibration</li> <li>• Harsh environment</li> <li>• Locking of armature</li> </ul>	<ul style="list-style-type: none"> <li>• Check power supply</li> <li>• Check type of use</li> <li>• Check environment</li> <li>• Repair commutator *</li> <li>• Anti-locking device</li> </ul>
Different speed in one direction compared with the other	On reassembly incorrect indexing of stator in relation to NDE flange and/or adjustment of brush-holder	Readjust the motor according to the procedure given in the general manual
Probes tripped	<ul style="list-style-type: none"> <li>• Ventilation</li> <li>• Overload</li> </ul>	<ul style="list-style-type: none"> <li>• Check the cooling circuit, forced ventilation unit and its direction of rotation</li> <li>• Check operation of the machine being driven</li> </ul>
Premature wear of brushes	<ul style="list-style-type: none"> <li>• Operating underload</li> <li>• Vibration</li> </ul>	<ul style="list-style-type: none"> <li>• Possible reduction in ventilation by the FV moving to the front (consult LEROY-SOMER)</li> <li>• Examine balance of driven parts</li> <li>• Check motor support</li> </ul>

\* Repair of the commutator should be undertaken by a qualified repairer, particularly the remilling of the mica : see general manual.



## 14 - PARTS LIST

## 14.1 - LSK 1124, 1324 &amp; 1604

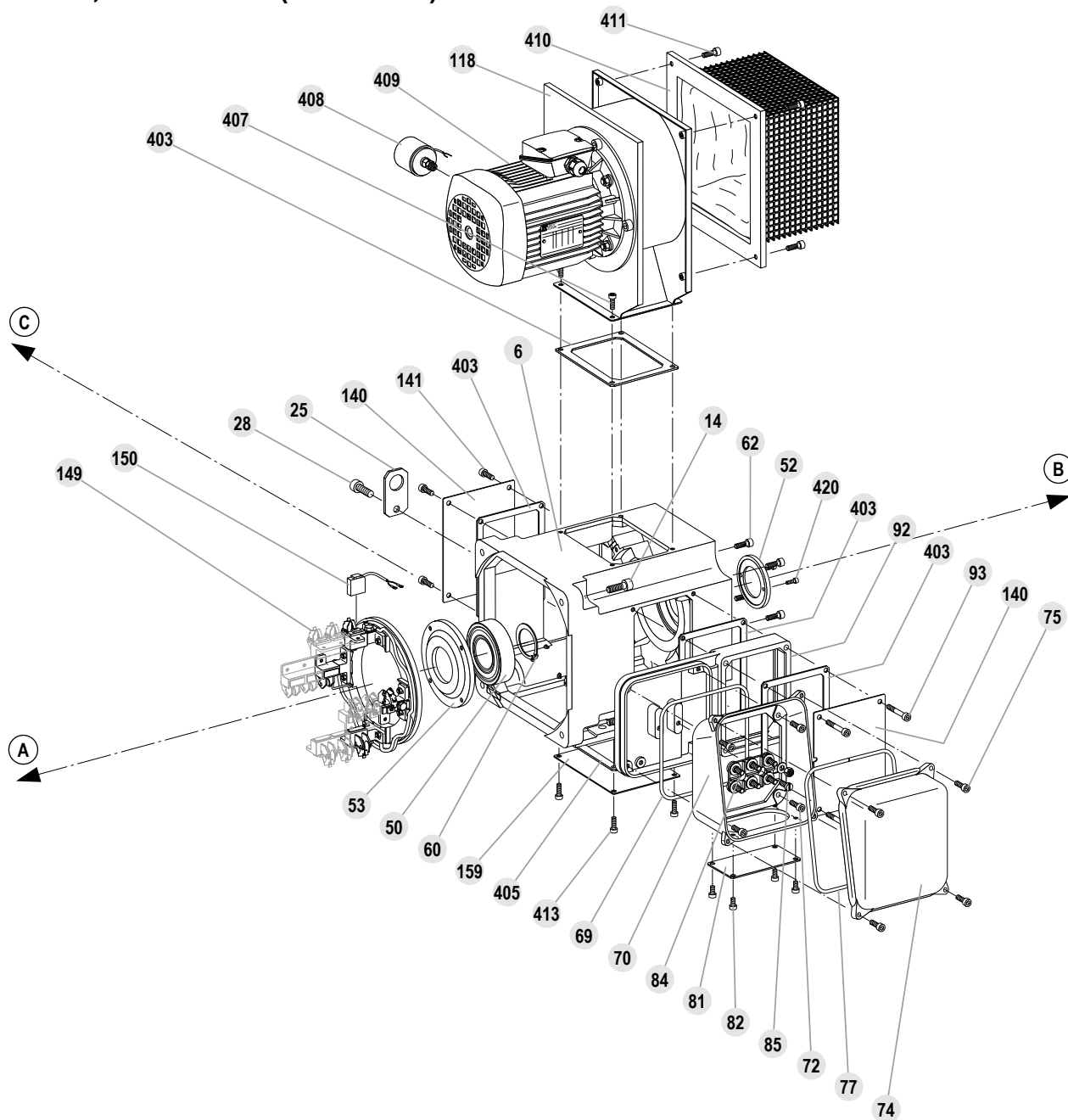


## LSK motor models 1124 to 1604

No.	Description	No.	Description	No.	Description
1	Wound stator	33	DE bearing retaining plate (lubrication option for ZZ bearing or roller bearing)	70	Terminal box
3	Wound armature	40	Fixing screw for retaining plate no. 33	72	Fixing screw for no. 70
5	Drive end shield (DE)	44	DE bearing preloading (wavy) washer	74	Terminal box lid
6	Non drive end shield (NDE)	46	DE bearing circlip	75	Screw for lid no. 74
14	DE shield fixing screw	50	Non drive end bearing	77	Seal for lid no. 74
21	Shaft extension key	52	Retaining plate (for motor with no option fitted on rear end shield)	81	Cable gland support plate
25	Lifting ring	53	NDE bearing retaining plate (lubrication option for ZZ bearing or roller bearing)	82	Fixing screw for plate no. 81
26	Identification plate	60	NDE bearing circlip	84	Terminal block
28	Lifting ring fixing screw	62	Fixing screw for retaining plate no. 52	85	Set screw
30	Drive end bearing	69	Terminal box seal	92	Terminal box base plate

\*: number linked to an option.

## LSK 1124, 1324 &amp; 1604 (continued)

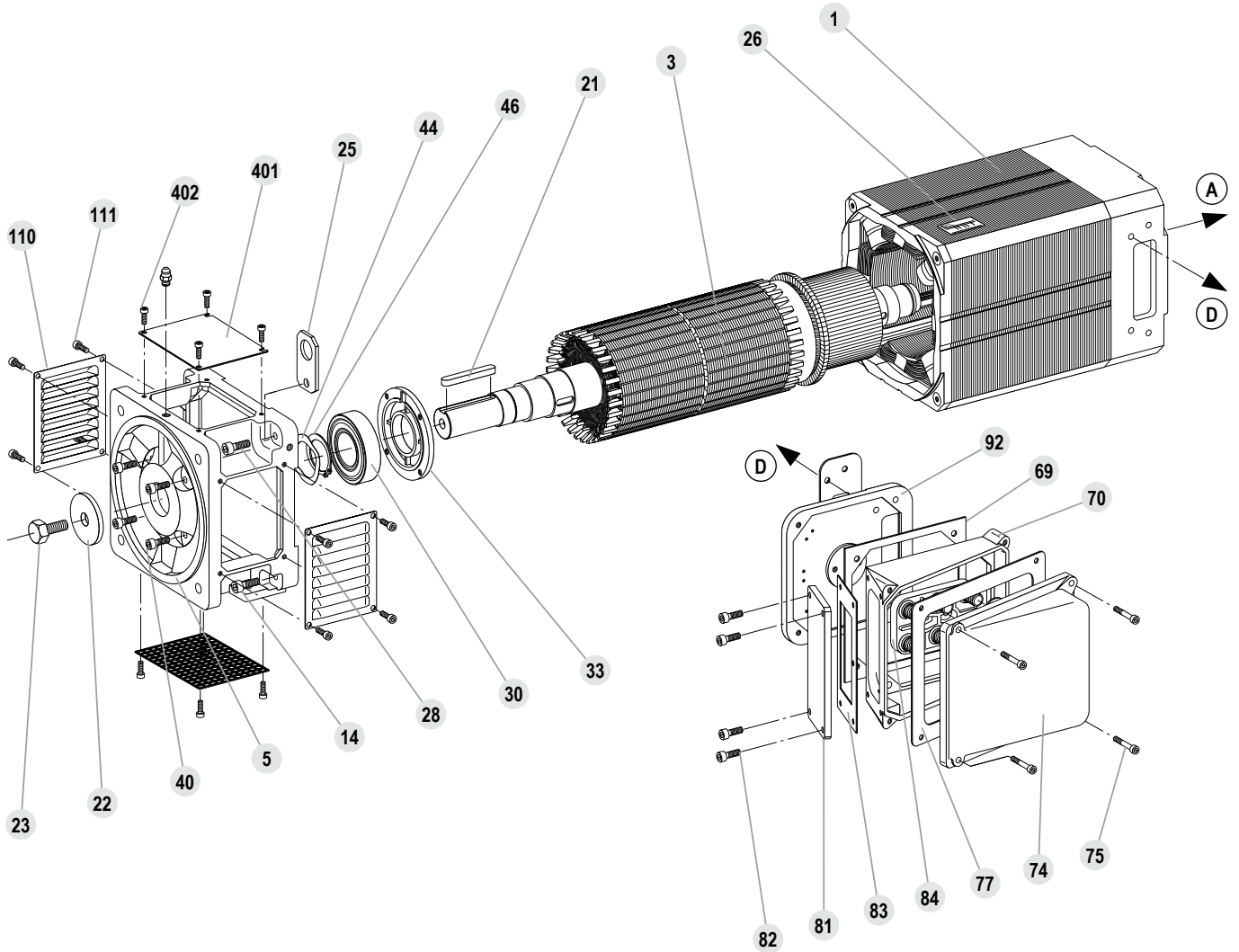


## Moteurs LSK taille 1124 à 1604

No.	Description	No.	Description	No.	Description
93	Fixing screw for nos 92 + 140	150	Brush	407	Fixing screw for fan housing
110	Fan grille	159	Lower inspection door	408	Air flow detector
111	Fixing screw for grille no. 110	400	Drive end cover	409	Fan motor
118	Fan housing	401	DE bearing inspection door	410	Filter (optional)
140	NDE shield inspection door	402	Fixing screw for inspection door no. 401	411	Fixing screw for filter
141	Fixing screw for no. 140 (opp. terminal box)	403	Seal for inspection door no. 140	413	Fixing screw for inspection door no. 159
149	Brush holder	405	Seal for door no. 159	420	Fixing screw for retaining plate no. 52

\*: number linked to an option.

14.2 - LSK 1804, 1804C, 2004, 2254, 2504C & 2804C

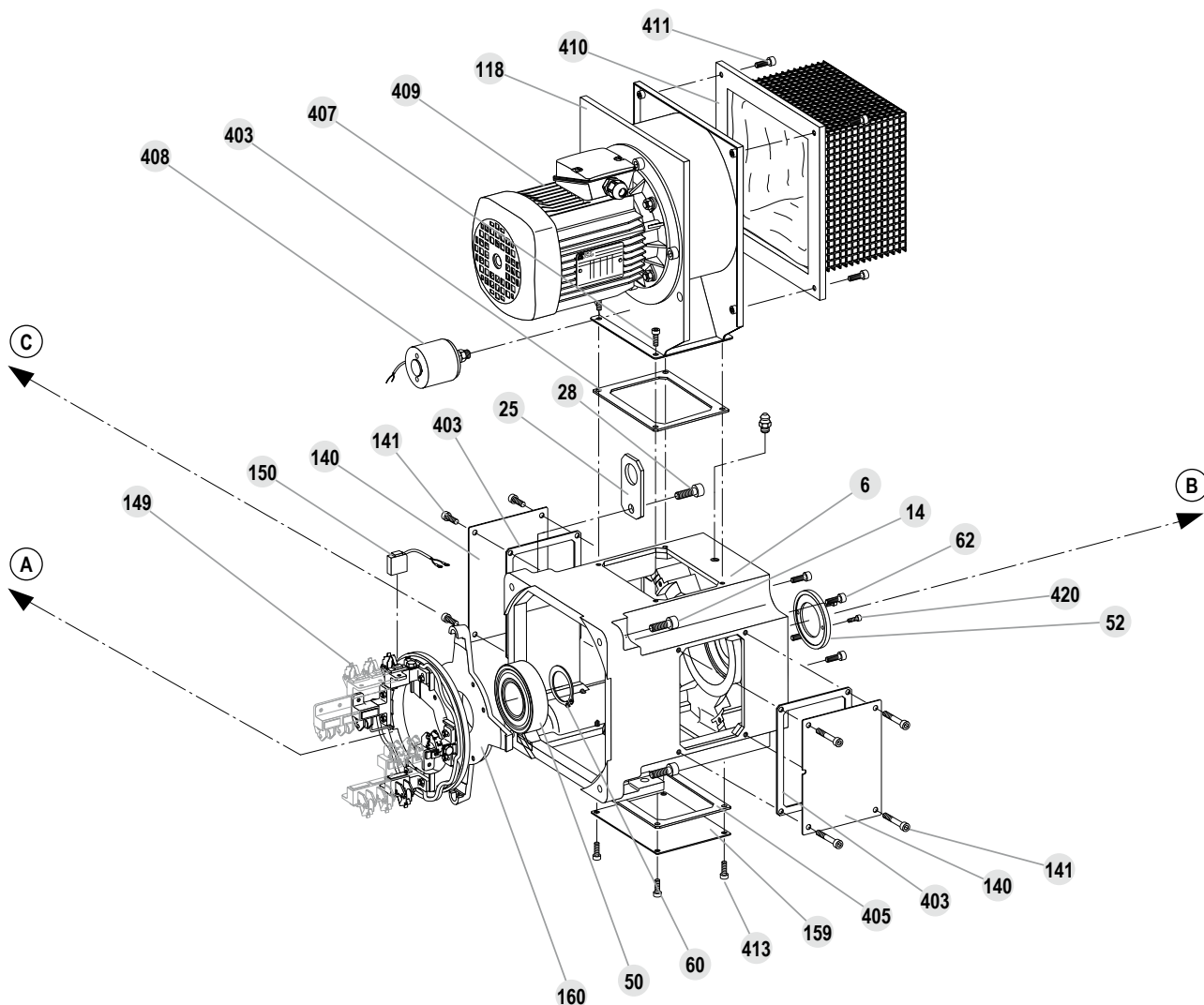


LSK motor model 1804 to 2804C

No.	Description	No.	Description	No.	Description
1	Wound stator	30	DE bearing	72	Fixing screw for no. 70
3	Wound armature	33	DE bearing retainer	74	Terminal box lid
5	Drive end shield (DE)	40	Fixing screw for retainer no. 33	75	Screw for lid no. 74
6	Non drive end shield (NDE)	44	DE bearing preloading (wavy) washer	77	Seal for lid no. 74
14	DE shield fixing screw	46	DE bearing circlip	81	Cable gland support plate
21	Shaft extension key	50	NDE bearing	82	Seal for plate no. 81
22	Shaft extension washer	52	Retainer (for motor with no options fitted)	83	Fixing screw for plate no. 81
23	Shaft extension screw	60	NDE bearing circlip	84	Terminal block
25	Lifting ring	62	Fixing screw for retainer no. 52 and/or 160	92	Terminal box base plate
26	Identification plate	69	Terminal box seal	110	Fan grille
28	Fixing screw	70	Terminal box	111	Fixing screw for grille no. 110

\*: number linked to an option.

## LSK 1804, 1804C, 2004, 2254, 2504C &amp; 2804C (continued)



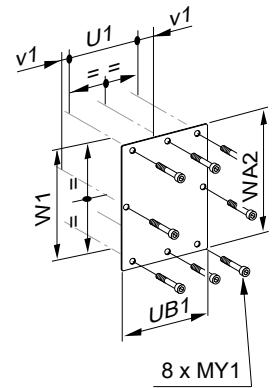
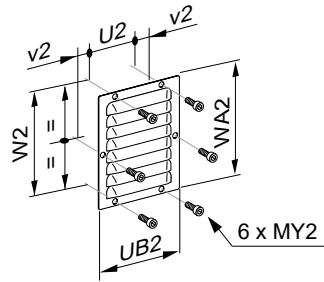
## LSK motor models 1804 to 2804C

No.	Description	No.	Description	No.	Description
118	Fan housing	160	Housing for holder no. 149	408	Air flow detector
140	NDE shield inspection door	401	DE shield inspection door	409	Fan motor
141	Fixing screw for no. 140	402	Fixing screw for inspection door no. 401	410	Filter (optional)
149	Brush holder	403	Seal for inspection door no. 140	411	Fixing screw for filter
150	Brush	405	Seal for door no. 159	413	Fixing screw for inspection door no. 159
159	Lower inspection door	407	Fixing screw for fan housing	420	Fixing screw for retaining plate no. 52

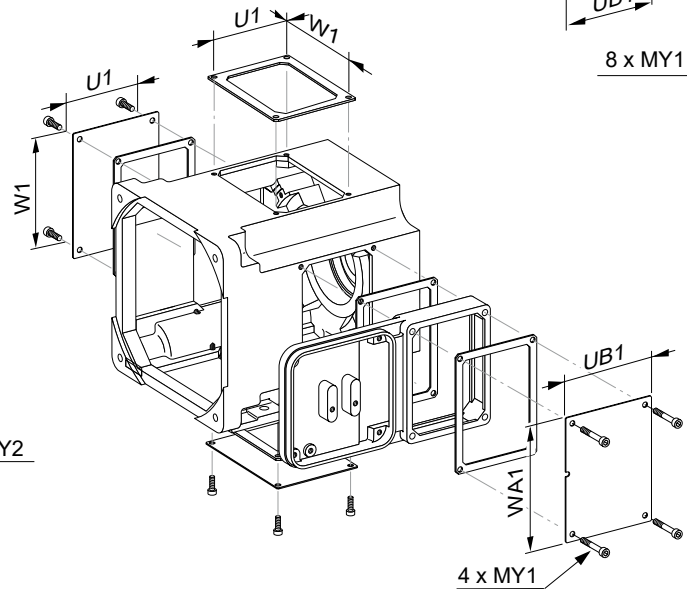
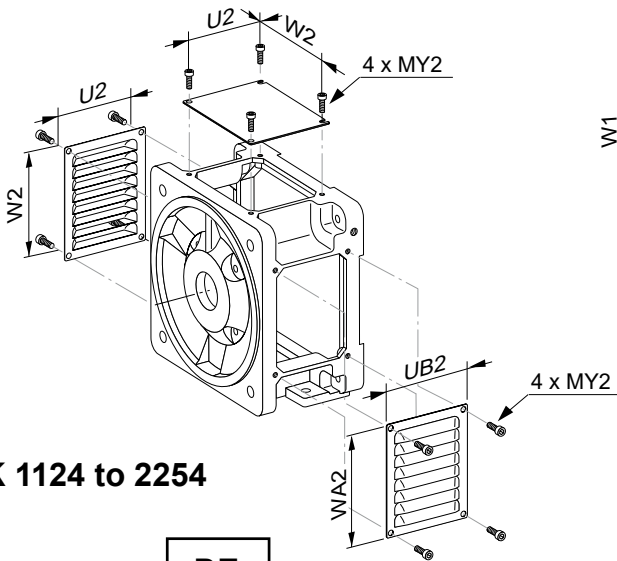
\*: number linked to an option.

## 15 - CONNECTING THE AIR OUTLETS

### LSK 2504C & 2804C



### LSK 1124 to 2254



DE

NDE

DE: drive end flange. NDE: non-drive end flange

### Dimensions of connections for air outlets: IC 17 - IC 26 - IC 27 - IC 37

Type	Main dimensions													
	U1	U2	UB1	UB2	V1	V2	v1	v2	W1	W2	WA1	WA2	Y1	Y2
LSK 1124	114	114	130	130	130	130	-	-	114	114	130	130	6	6
LSK 1324	140	140	160	160	160	160	-	-	140	140	160	160	8	8
LSK 1604	135	135	150	150	150	150	-	-	175	175	190	190	8	8
LSK 1804	140	140	180	180	180	180	-	-	200	200	215	215	8	8
LSK 1804C	140	140	180	180	180	180	-	-	200	200	215	215	8	8
LSK 2004	165	165	205	205	205	205	-	-	205	205	225	225	8	8
LSK 2254	170	170	210	210	210	210	-	-	230	230	250	250	8	8
LSK 2504C	180	190	320	260	320	260	56	29	280	280	300	300	6	6
LSK 2804C SM & SL	187	187	277	277	277	277	30	30	320	320	350	350	8	8
LSK 2804C M & L	289	187	380	277	380	277	30	30	320	320	350	350	8	8

**16 - MAINTENANCE FORM**

**MACHINE**

**MOTOR**

TYPE: ..... TYPE: **LSK** .....

Serial n°: ..... Serial n°: .....

Commissioning date: .....

Date of maintenance visit: .....

Number of operating hours: .....

- Shut down the installation
- Mechanical checks
- Remove inspection doors
- Clean inside and blow air through the motor (maximum of 2 bars pressure)
- Check the state of wear of the brushes
- Check the state of the commutator
- Measure the length of the brushes (monitoring for wear): ..... mm
- Replace the brushes if required
- Power up the machine being used
- Check the commutator is not sparking
- Stop the motor, switch off and replace inspection doors
- Check that the cooling air has clear passage
- Start up the installation .....

• ELECTRICAL VALUES

- \* motor supply voltage (Forced ventilation): ..... V
- \* current absorbed by the motor (Forced ventilation): ..... A
- \* input voltage of the field coils (at constant speed): ..... V
- \* current provided by the armature: ..... A

Compare these values with those on the identification plate.

OBSERVATIONS : .....

.....

.....





***Nidec***  
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**LEROY-SOMER<sup>TM</sup>**



Moteurs Leroy-Somer  
Headquarter: Boulevard Marcellin Leroy - CS 10015  
16915 ANGOULÈME Cedex 9

Limited company with capital of 65,800,512 €  
RCS Angoulême 338 567 258

[www.leroy-somer.com](http://www.leroy-somer.com)