

# ***Nidec***

**All for dreams**



*Installation guide  
and maintenance*

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***LSN - FLSN***



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*3-phase induction motors  
for atmospheres containing  
explosive gases and dust*

Part number: 2727 en - 2017.10 / g

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

**IMPORTANT**

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

It is essential that electric motors are installed by qualified, experienced and authorised personnel.

In accordance with the main requirements of the EC Directives, the safety of people, animals and property should be ensured when fitting the motors into machines.

Particular attention must be given to equipotential ground or earthing connections.

The noise level of the machines, measured under standard conditions, conforms to the requirements of the standard and does not exceed the maximum value of 85 dB(A) pressure at 1 metre.



**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 (jammed transmission - loss of phase - Cut-out due to thermal protection - lack of lubrication, etc)



**Electric motors are industrial products. They must therefore be installed by qualified, experienced and authorised personnel. The safety of people, animals and property must be ensured when fitting the motors into machines (please refer to current standards).**

Those persons required to work on electrical installations and equipment in zones where there is a risk of explosion must be specially trained and authorised for this type of equipment.

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

In particular, they must be informed and aware of the reasons for the specific safety instructions in order to comply with them. For example:

- Do not open when powered up
- Do not open when powered up in atmospheres containing explosive gas or dust
- Do not repair while powered up
- Do not move when on load
- Wait for a few minutes before opening
- Replace the seals tightly to ensure watertightness



**Before commissioning, ensure compatibility of the information on the motor nameplate with the actual explosive atmosphere and the operating zone.**

**NOTE:**

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 may therefore be changed without notice.

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All brands and models have been registered and patents applied for.

Dear Customer,

You have just acquired a LEROY-SOMER **safety motor**.


This motor benefits from the experience of one of the largest manufacturers in the world, using state-of-the-art technology in automation, specially selected materials and rigorous quality control. As a result, the regulatory authorities have awarded our motor factories the ISO 9001 - Edition 2008 international certificate.

We thank you for making this choice, and would ask you to read the contents of this manual.

By observing a few essential rules, you will ensure problem-free operation for many years.

LEROY-SOMER

## EC Declaration of conformity

	<p><b>EC DECLARATION OF CONFORMITY AND INCORPORATION (F)LSN motor</b></p>															
<p>We, <b>MOTEURS LEROY SOMER</b>,</p> <p>declare, under our sole responsibility, that the following products:</p>																
<p><b>LSN and FLSN series type "n" non-sparking induction motors</b></p>																
<p>bearing the following markings on their nameplates:</p>																
<table border="1"> <tr> <td>CE</td> <td>II 3G</td> <td>Ex nA IIC T3 (or T4) Gc</td> <td>or Ex nA nC IIC T3 (or T4) Gc</td> <td>(zone 2)</td> </tr> <tr> <td>or CE</td> <td>II 3GD</td> <td>Ex nA IIC T3 (or T4) Gc</td> <td>Ex tc IIC T125°C (to 200°C) Dc</td> <td>(zone 2 et 22)</td> </tr> <tr> <td>or CE</td> <td>II 3GD</td> <td>Ex nA nC II T3 (or T4) Gc</td> <td>Ex tc IIC T125°C (to 200°C) Dc</td> <td>(zone 2 et 22)</td> </tr> </table> <p>IIC motors can be marked IIA or IIB for commercial reasons.</p>		CE	II 3G	Ex nA IIC T3 (or T4) Gc	or Ex nA nC IIC T3 (or T4) Gc	(zone 2)	or CE	II 3GD	Ex nA IIC T3 (or T4) Gc	Ex tc IIC T125°C (to 200°C) Dc	(zone 2 et 22)	or CE	II 3GD	Ex nA nC II T3 (or T4) Gc	Ex tc IIC T125°C (to 200°C) Dc	(zone 2 et 22)
CE	II 3G	Ex nA IIC T3 (or T4) Gc	or Ex nA nC IIC T3 (or T4) Gc	(zone 2)												
or CE	II 3GD	Ex nA IIC T3 (or T4) Gc	Ex tc IIC T125°C (to 200°C) Dc	(zone 2 et 22)												
or CE	II 3GD	Ex nA nC II T3 (or T4) Gc	Ex tc IIC T125°C (to 200°C) Dc	(zone 2 et 22)												
<p>comply with:</p>																
<ul style="list-style-type: none"> <li>▪ European and international standards:</li> </ul>	<p><b>IEC60079-0:2007 ; EN60079-0:2009</b>  <b>IEC60079-15:2010 ; EN60079-15:2010</b>  <b>IEC60079-31:2008 ; EN60079-31:2009 (motors Ex tb)</b>  <b>IEC-EN 60034 ; IEC-EN 60072 ; IEC-EN 60529</b></p>															
<ul style="list-style-type: none"> <li>• The Low Voltage Directive:</li> </ul>	<p><b>2006/95/EC</b></p>															
<ul style="list-style-type: none"> <li>• The ATEX European Directive:</li> </ul>	<p><b>94/9 /EC (decree 96 1010 from 19/10/1996)</b></p>															
<ul style="list-style-type: none"> <li>• The type awarded an EC type-examination certificate by the notified body:</li> </ul>	<p><b>INERIS 01ATEX3004 X</b></p>															
<p>INERIS (0080) – BP 2 – Parc technologique ALATA 60550 – VERNEUIL EN HALATTE</p>																
<p>This conformity permits the use of these ranges of products in machines subject to the application of the Machinery Directive 2006/42/EC, provided that they are integrated or incorporated and/or assembled in accordance with, amongst others, the regulations of standard EN 60204 "Electrical Equipment for Machinery" and the Electromagnetic Compatibility Directive 2004/108/EC.</p>																
<p>The products defined above may not be put into service until the machines in which they are incorporated have been declared as complying with the applicable Directive.</p>																
<p>Installation of these motors must comply with the regulations, decrees, laws, orders, directives, application circulars, standards, rules or any other document relating to the installation site. LEROY-SOMER accepts no liability in the event of failure to comply with these rules and regulations.</p>																
<p>Note: When the motors are supplied via appropriate separate electronic inverters and/or controlled by electronic control or monitoring devices, they must be installed by a professional who will be responsible for ensuring that the electromagnetic compatibility regulations of the country in which the product is installed are observed.</p>																
<p>Signature of quality director :</p>	<p>Signature of technical director :</p>															
<p>P. THERY</p>	<p>C.PLASSE</p>															

Included with the manual "Specific recommendations: Installation and Maintenance" (ref. 3607) are supplied with the relevant products.

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# 1 - RECEIPT

On receipt of your motor, check that it has not suffered any damage in transit.

If there are obvious signs of knocks, contact the carrier (you may be able to claim on their insurance) and after a visual check, turn the motor by hand to detect any malfunction.

## 1.1 - Identification and marking

1.2 - As soon as you receive the motor, check that the nameplate on the machine conforms to your order.

**LEROY SOMER** LSN 3 ~ LSN132 M T **CE**  
**SOMER** N°0123456J11 001  
 F - 16015 ANGOULEME 2011 IP55 IK08  
 40 °C Ins. cl. F S1 1000m 93kg

INERIS 01ATEX3004X  
 II 3 G Ex nA IIC T3 Gc

DE: \_\_\_\_\_  
 NDE: \_\_\_\_\_ g. / h. | (A) (H)

V	Hz	min <sup>-1</sup>	kW	cos φ	A
Δ 230	50	1460	7,50	0,83	25,40
λ 400	50	1460	7,50	0,83	14,70
λ 460	60	1765	7,50	0,81	12,85

HS50A, 100-a IEC 60034-1

**LEROY SOMER** LSN 3 ~ LSN132 M T **CE**  
**SOMER** N°0123456J11 001  
 F - 16015 ANGOULEME 2011 IP65 IK08  
 40 °C Ins. cl. F S1 1000m 93kg

INERIS 01ATEX3004X  
 II 3 GD Ex nA IIC T3 Gc Ex tc IIIC T125°C Dc

DE: \_\_\_\_\_  
 NDE: \_\_\_\_\_ g. / h. | (A) (H)

V	Hz	min <sup>-1</sup>	kW	cos φ	A
Δ 230	50	1460	7,50	0,83	25,40
λ 400	50	1460	7,50	0,83	14,70
λ 460	60	1765	7,50	0,81	12,85

HS50A, 100-a IEC 60034-1

Definition of symbols used on nameplates:



Legal mark of conformity of product to the requirements of European Directives.

### Marking



II 3G or II 3GD

Ex

nA

IIC

T3

Gc

Ex tb

IIIC T 125°C

Dc

0080

INERIS 01ATEX3004 X

: Specific marking for protection against risks of explosion

: ATEX marking

: Symbol for equipment designed for potentially explosive atmospheres

: Protection type "Gas"

: Explosion group "Gas"

: Temperature class "Gas"

: EPL "Gas" level

: Protection type "Dust"

: Explosion group "Dust" and maximum surface temperature (optional)

: EPL "Dust" level

: Notified Body INERIS

: EC type-examination certificate number

	Zone	ATEX marking	Gas Protection type marking	Dust Protection type marking (optional)	Degree of protection
ATEX	2	II 3 G	Ex nA IIC T3 Gc	/	IP 55
ATEX	2 & 22	II 3 GD	Ex nA IIC T3 Gc	Ex tc IIIC T125°C Dc	IP 65

### Motor

MOT 3 ~ : Three-phase A.C. motor

LSN : LSN range

132 : Frame size

M : Frame size

kg : Weight

IP 55 : Degree of protection

IK08 : Shock resistance index

I cl.F : Insulation class F

40°C : Maximum ambient operating temperature

### Bearings

DE : Drive end

Drive end bearing

NDE : Non drive end

bearing

### Motor no.

No. : Serial number

L-M\* : Year of production

F-A\*\* : Month of production

S1 : Duty

V : Supply voltage

Hz : Supply frequency

min<sup>-1</sup> : Revolutions per minute (rpm)

kW : Rated output power

cos φ : Power factor

A : Rated current

Δ : Connection symbol

\* L = 2000, M = 2001 ... W = 2009, X = 2010

\*\* A = January, F = June

## 2 - STORAGE

Prior to commissioning, motors should be stored:

- Away from humidity: at relative humidity levels above 90%, the machine insulation can drop very rapidly, to just above zero at around 100%. The state of the anti-rust protection on unpainted parts should be monitored.

For very long storage periods the motor can be placed in a sealed enclosure (for example heat-shrunk plastic) containing sachets of desiccant:

- Away from frequent significant variations in temperature, to avoid the risk of condensation. During storage the drain plugs must be removed to allow condensation water to escape.

- If the area is subject to vibration, try to reduce the effect of this vibration by placing the motor on a damping support (rubber pad or similar) and turn the rotor a fraction of a turn once a fortnight to prevent the bearing rings from becoming marked. Remove and replace the rotor locking device if applicable.

- Do not remove the rotor locking device (where there are roller bearings).

Even if the motor has been stored in the correct conditions, certain checks must be carried out before it is started up:

### Greasing

The motors must be stored in their original packaging, in a location away from humidity (RH<90%) and vibrations.

- Motors fitted with permanently greased bearings: maximum storage period = 3 years; after this time, replace the bearings with an identical type.

- Motors fitted with grease nipples:

Storage period		
Grade 2 grease	Grade 3 grease	
< 6 months	< 1 year	No regreasing before commissioning.
6 months to 1 year	1 to 2 years	Regrease before commissioning in accordance with the instructions appearing on the nameplate (quantity and quality of grease).
1 to 5 years	2 to 5 years	Dismantle and clean the bearings. Completely replace the grease in accordance with the instructions appearing on the nameplate (quantity and quality of grease). Replace the seals on the shaftways and for IP 66 motors on the spigots before commissioning.
> 5 years	> 5 years	Change the bearings. Completely replace the grease in accordance with the instructions appearing on the nameplate (quantity and quality of grease). Replace the seals on the shaftways (lubricate them using the same grease as that on the bearings) and for IP 66 motors on the spigots before commissioning.



**Warning: Do not perform a high voltage test on the auxiliaries.**

**Should the machine need to be repainted, the coating must not be more than 2 mm thick and 0.2 mm thick for equipment in group IIC. If not, it must be antistatic.**

## 3 - COMMISSIONING

**Before starting the motor, it is advisable to check the insulation between the phases and earth, and between phases.**

This check is essential if the motor has been stored for longer than 6 months or if it has been kept in a damp atmosphere.

This measurement must be carried out using a megohmmeter at 500 V D.C. (do not use a magnetoelectric system).

It is better to carry out an initial test at 30 or 50 volts and if the insulation is greater than 1 megohm, carry out a second test at 500 volts for 60 seconds. The insulation value must be at least 10 megohms in cold state.

If this value cannot be achieved, or if the motor may have been splashed with water or salt spray, or kept for a long period in a very humid place or if it is covered with condensation, it is advisable to dry the stator for 24 hours in a drying oven at a temperature of between 110°C and 120°C.

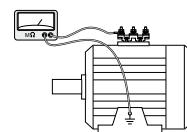
If it is not possible to place the motor in a drying oven:

- Switch on the motor, with the rotor locked, at 3-phase A.C. voltage reduced to approximately 10% of the rated voltage, for 12 hours (use an induction regulator or a reduction transformer with adjustable outlets).

- Or supply the 3 phases in series with a D.C. current, with the voltage at 1 to 2% of the rated voltage (use a D.C. generator with independent excitation or batteries for motors of less than 22 kW).

- NB: The A.C. current must be monitored using a clamp ammeter, and the D.C. current using a shunt ammeter. This current must not exceed 60% of the rated current.

It is advisable to place a thermometer on the motor housing: if the temperature exceeds 70°C, reduce the indicated voltage or current by 5% of the original value for every 10°C difference. While it is drying, all the motor orifices must be open (terminal box, drain holes). Before commissioning, all these covers must be replaced so that the motor conforms to IP 55 or 65 degree of protection. Clean or replace the orifices and plugs or breathers before reassembly.



**Warning: If the high voltage test, carried out at the factory before despatch, needs to be repeated, it should be performed at half the standard voltage, ie: 1/2 (2 U + 1000 V). Check that the capacitive effect resulting from the high voltage test is eliminated before connecting the terminals to earth.**

**Prior to commissioning for all motors:**

- Remove all dust from the machine  
 - Rotate the motor with no load (no mechanical load) for 2 to 5 minutes, checking that there is no abnormal noise. If there is any abnormal noise, see section 10.

## 4 - INSTALLATION

### 4.1 - Position of the lifting rings

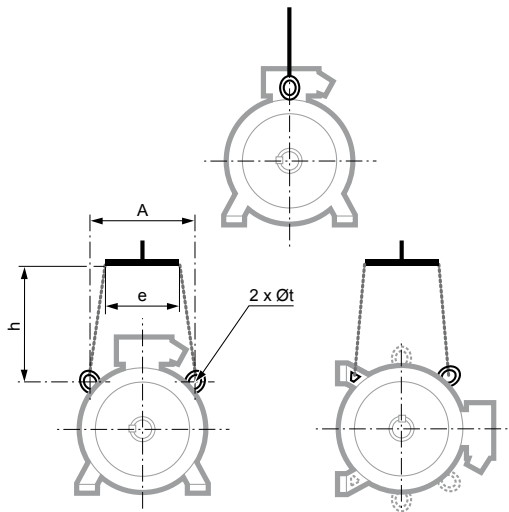
**Position of lifting rings for lifting the motor only (not connected to the machine).**

Labour regulations stipulate that all loads over 25 kg must be fitted with lifting devices to facilitate handling.

The positions of the lifting rings and the minimum dimensions of the loading bars are given below in order to help with preparation for handling the motors. If these precautions are not followed, there is a risk of warping or crushing some equipment such as the terminal box, cover or drip cover.

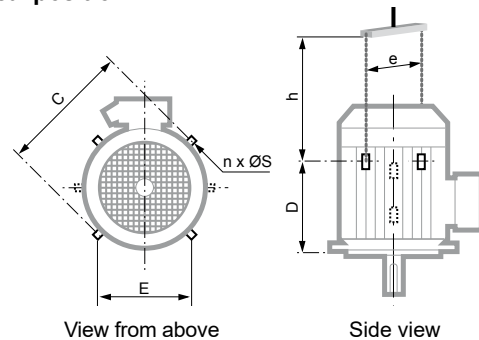
**Motors intended for use in the vertical position may be delivered in the horizontal position on a pallet. When the motor is pivoted, the shaft must under no circumstances be allowed to touch the ground, as the bearings may be irreparably damaged. Moreover, additional special precautions must be taken, as the integral motor lifting rings are not designed for pivoting the motor.**

#### • Horizontal position



Type	Horizontal position			
	A	e min.	h min.	Øt
100	120	200	150	9
112	120	200	150	9
132	160	200	150	9
160	200	160	110	14
180 MR	200	160	110	14
180 L	200	260	150	14
200	270	260	165	14
225 ST/MT	270	260	150	14
225 M	360	265	200	30
250	360	380	200	30
280	360	380	500	30
315 ST	310	380	500	17
315 M/L	360	380	500	23
355	310	380	500	23
355 LK - 400	735	710	500	30
400 LK - 450	730	710	500	30

#### • Vertical position



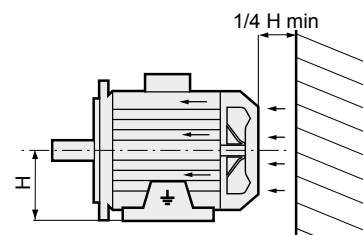
Type	Vertical position						
	C	E	D	n	ØS	e min.*	h min.
160	320	200	230	2	14	320	350
180 MR	320	200	230	2	14	320	270
180 L	390	265	290	2	14	390	320
200	410	300	295	2	14	410	450
225 ST/MT	410	300	295	2	14	410	450
225 M	480	360	405	4	30	540	350
250	480	360	405	4	30	540	350
280 S	480	360	485	4	30	590	550
280 M	480	360	585	4	30	590	550
315 ST	590	-	590	2	17	630	550
315 M/L	695	-	765	2	24	695	550
355	755	-	835	2	24	755	550
355 LK - 400	810	350	1135	4	30	810	600
400 LK - 450	960	400	1170	4	30	960	750

\* If the motor is fitted with a drip cover, allow an additional 50 to 100 mm to avoid damaging it when the load is swung.

### 4.2 - Location - ventilation

Our motors are cooled in accordance with method IC 411 (standard IEC 60034-6), ie. "machine cooled by the surface, using the ambient fluid (air) flowing along the machine".

The fan at the non drive end cools the motor. Air is sucked in through the grille of a fan cover (which provides protection against the risk of direct contact with the fan in accordance with standard IEC 60034-5) and blown along the housing fins to ensure thermal equilibrium of the motor whatever the direction of rotation.



The motor must be installed in an adequately ventilated area, with clearance for the air intake and outlet of at least one-quarter of the frame size.

Blocking the fan cover grille and the housing fins, even accidentally (clogging), is likely to adversely affect the operation and safety of the motor.

In the case of vertical operation with the shaft extension facing down, it is advisable to fit the motor with a drip cover to prevent the entry of any foreign bodies.

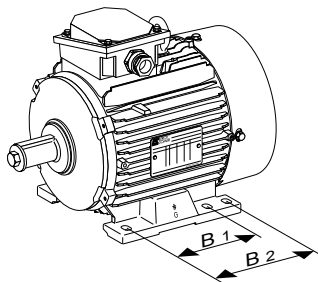
It is necessary to check that the hot air is not being recycled. If it is, pipes must be provided for the intake of cold air and discharge of hot air, in order to prevent abnormal temperature rise of the motor.

In this case, if the air is not circulated by an auxiliary fan, the dimensions of the pipes must be such that the load losses are negligible compared to those of the motor.

### Positioning

The motor must be mounted in the position specified on the order, on a base which is rigid enough to prevent distortion and vibration.

Where the motor feet have six fixing holes, it is preferable to use those which correspond to the standard dimensions for the motor power rating (refer to the technical catalogue for induction motors) or, failing that, to those shown at B2.



Provide easy access to the terminal box, the condensation drain plugs and, if appropriate, to the grease nipples. Use lifting equipment which is compatible with the weight of the motor (indicated on the nameplate).

**When the motor is fitted with lifting rings, they are for lifting the motor on its own and must not be used to lift the whole machine after the motor has been fitted to it.**

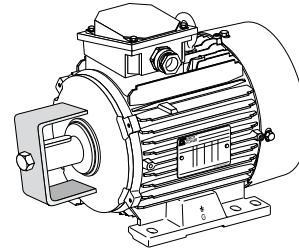
**Note 1: When installing a suspended motor, it is essential to provide protection in case the fixing breaks.**

**Note 2: Never stand on the motor.**

### Rotor locking device

For made-to-order motors with roller bearings, remove the rotor locking device.

In exceptional circumstances when the motor has to be moved after the coupling device has been fitted, the rotor must be re-immobilised.



### Balancing

Rotating machines are balanced according to standard IEC 60034-14:

- Half-key when the shaft extension is marked H

By special request the balancing can be set:

- No key when the shaft extension is marked N

- Full key when the shaft extension is marked F

Any coupling element (pulley, coupling sleeve, slip-ring, etc) must therefore be balanced accordingly.

### Motor with 2 shaft extensions:

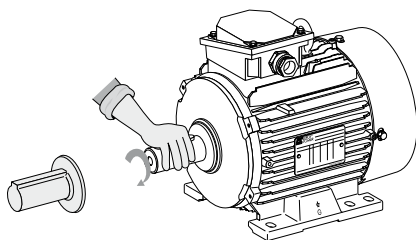
If the second shaft extension is not used, in order to comply with the balancing class, the half-key or key must be fixed firmly in the keyway so that it is not thrown out during rotation (H or F balancing) and must be protected against direct contact.

## 4.3 - Coupling

### Preparation

Turn the motor by hand before coupling to detect any possible fault due to handling.

Remove any protection from the shaft extension. Drain off any condensation water which may have formed inside the motor (see section 3).





## 5 - ELECTRICAL PARAMETERS LIMIT VALUES

### 5.1 - Limiting problems caused by motor starting

In order to protect the installation, any significant temperature rise in the cabling conduits must be prevented, while ensuring that the protection devices are not triggered during starting. Problems affecting the operation of other devices connected to the same source are due to the voltage drop caused by the current inrush on starting.

Even though mains supplies increasingly allow D.O.L. starting, the current inrush must be reduced for certain installations. Jolt-free operation and soft starting ensure greater ease of use and an increased lifespan for the machines being driven.

The two essential parameters for starting cage induction motors are:

- Starting torque
- Starting current

The starting torque and the resistive torque determine the starting time.

Depending on the load being driven, it may be necessary to adapt the torque and the current to the machine starting time and to the possibilities of the mains power supply.

The five essential modes are:

- D.O.L. starting
- Star/delta starting
- Soft starting with autotransformer
- Soft starting with resistors
- Electronic starting

The "electronic" starting modes control the voltage at the motor terminals during the entire starting phase and enable very soft, jolt-free starting.

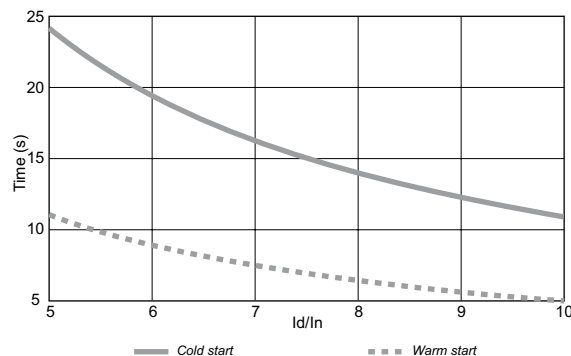
**The starting systems must be placed outside the explosive zone or be of an approved type.**

### 5.2 - Supply voltage

The rated voltage is indicated on the nameplate.

### 5.3 - Starting times

The starting times must remain within the limits shown below on condition that the number of starts per hour is 6 or less. Three successive cold starts and two consecutive warm starts are allowed.




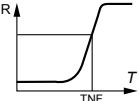
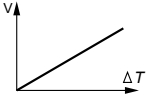
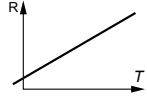
*Permissible motor starting time as a function of the ratio  $I_d/I_N$*

### 5.4 - Supply by frequency inverter

(See section 7.1).

## 6 - USE

Thermal protection (see section 8) and space heaters.

Type	Operating principle	Operating curve	Breaking capacity (A)	Protection provided	Mounting Number of devices*
Thermistor with positive temperature coefficient PTC	Non-linear variable resistor, indirectly heated 		0	General surveillance for transient overloads	Mounted with associated relay in control circuit  3 in series
Thermocouples T (T < 150°C) Copper Constantan K (T < 1000°C) Copper-nickel	Peltier effect		0	Continuous surveillance at hot spots at regular intervals	Mounting in switchboards with associated reader (or recorder)  1 per hot spot
Platinum resistance thermometer PT 100	Variable linear resistance with indirect heating		0	High accuracy continuous surveillance at key hot spots	Mounting in switchboards with associated reader (or recorder)  1 per hot spot

- NRT: nominal running temperature.

- The NRTs are chosen according to the position of the sensor in the motor and the temperature rise class.

\* The number of devices relates to the winding protection.

### Alarm and early warning

All protective equipment can be backed up by another type of protection (with different NRTs): the first device will then act as an early warning (light or sound signals given without shutting down the power circuits), and the second device will be the alarm (shutting down the power circuits).

### Protection against condensation: space heaters

Identification: 1 red label

A glass fibre flexible resistor is fixed on 1 or 2 coil end turns. This resistor heats the machines when stopped and thus prevents condensation inside the machines. The space heaters must be switched off when the machine is in use.

Power supply: 230 V single-phase unless otherwise specified by the customer.

The drain plugs at the bottom of the motor must be opened approximately every 6 months. They must be replaced with new seals to ensure IP 55 or IP 65 protection of the motor.

### Thermal magnetic protection

The motors must be protected by a thermal magnetic device located between the isolating switch and the motor. These protection devices provide total protection of the motor against non-transient overloads.

This device can be accompanied by fused circuit-breakers.

### Built-in indirect thermal protection


The motors can be equipped with optional heat sensors. These sensors can be used to monitor temperature changes at "hot spots":


- Overload detection


- Cooling check

- Monitoring strategic points for maintenance of the installation

**- Ensuring the temperature of the hot spots is monitored**

 **So that the maximum surface temperature is never reached, the internal thermal sensors with the material, when they are obligatory, must be connected to a device (in addition to and functionally independent of any system which could be required for operational reasons in normal conditions), which switches off the motor.**

 **Under no circumstances can these sensors be used for direct control of the motor operating cycles.**

 **Control and breaking devices must be installed in cabinets placed outside the danger zone or must be of an approved type.**

### Temperature sensor operating thresholds:

- Maximum surface temperature: 125°C (GD)

• winding sensor: 120°C ± 5°C

• DE shield sensor: 120°C ± 5°C

- Maximum surface temperature: 195°C (class T3)

• winding sensor: 150°C ± 6°C

• DE shield sensor: 120°C ± 5°C

## 7 - SPECIAL OPERATING CONDITIONS

### - Thermal protection (see sections 6 & 8)

#### - Space heaters (see section 6)

#### - Temperatures: storage and ambient

Note:  $T_a$  = ambient temperature

If it has been stored at a temperature lower than

- 10°C, heat the motor (see section 3) and turn the shaft manually before starting up the machine.

If it is to be used at a temperature lower than

- 20°C, the motor may be equipped with space heaters.

Our standard motors are designed to operate at an ambient temperature  $T_a$  of between

-20°C and 40°C.

If  $T_a < -25^\circ\text{C}$ , the shaftway seals must be made of silicon and the fan must be metal. The flat seals of the terminal box must be silicon.

#### - Surface temperature

As standard, the maximum surface temperature of our motors is 200°C for T3 with an ambient temperature of  $\leq 40^\circ\text{C}$ .

If the motors are also to be used in atmospheres which may contain explosive dust, the maximum surface temperature will be 125°C.

#### - Installation zones

Motors marked as group III equipment can be installed in atmospheres containing explosive dust (zone 21).

#### - Connection

Particular attention must be paid to the information on the nameplate in order to choose the correct type of connection for the supply voltage.

#### - Earthing

It is compulsory to earth the motor, and earthing must be performed in accordance with current regulations (protection of workers).

#### - Seals

If the drain plugs or breathers are removed, they must be replaced in order to ensure that the motor conforms to IP 55 or IP 65 protection. Replace the seals which have been removed with new seals of the same type. Clean the holes and plugs before reassembly.

Each time the motor is dismantled, and during planned maintenance, replace the seals on the shaftways, the shield spigots and the terminal box cover with new seals of the same type after cleaning all parts. The seals on the shaftways must be fitted using the same type of grease as on the bearings.

#### - Workforce safety

Protect all rotating devices before power-up.

If a motor is started up without a coupling device having been fitted, carefully immobilise 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, etc).

Beware of backdriving when the motor is switched off. The appropriate precautions must be taken:

- For example, for pumps a non-return valve must be installed.

#### - LEROY-SOMER "Digistart" electronic starter

This is a multi-function electronic system with a microcontroller, which is used with all 3-phase cage induction motors.

It provides soft starting of the motor with:

- Reduction of the starting current

- Gradual, jolt-free acceleration, achieved by controlling the current absorbed by the motor.

After starting, the DIGISTART performs additional motor control functions in its other operating phases: steady state and deceleration.

- 18 to 1600 A models

- Supply: 220 to 700 V - 50/60 Hz

DIGISTART is economical to install, as a fused switch is the only additional device needed.

**The "Digistart" electronic starter used with the motor must be installed outside danger zones.**

#### - Contactors - Isolators

**In all cases, contactors, isolators, etc, must be installed and connected in an enclosure outside the dangerous zones or be of an approved type.**

#### - 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.

## 7.1 - Use with a variable speed drive

When a drive is used, any special instructions detailed in the specific drive manual must be observed. In particular, the following minimum steps must be taken:

- Check that the drive switching frequency is at least 3 kHz.
- Check that the motor has a second nameplate indicating the motor characteristics and the motor performance when used with a variable speed drive.
- The reference voltage, usually 400 V at 50 Hz, is indicated on the motor nameplate. The drive must deliver a constant voltage/frequency signal to the motor.
- Program in the drive the maximum current value and also the min. and max. frequency values indicated on the second motor nameplate.
- Each type of motor should have been tested first on load with a drive of the same type as the one it will be controlled with.

**Drives and sensor connection devices must be placed outside danger zones (outside zones 0, 1, 2, 20, 21 and 22).**

- The space heaters should only be supplied with power when the motor is switched off and cold; their use is recommended in ambient temperatures less than -20°C.

- The supply voltage and frequency must conform to those indicated on the motor nameplate.

- The frequency range specified on the motor nameplate must be strictly observed.

- When several motors are supplied by the same drive, individual protection must be provided on each motor starter (thermal relay for example), for safety reasons.

- When a frequency inverter is used, any special instructions detailed in its specific manual must be complied with.

- The cable glands should be compatible with the protection method used for the connection part. On variants with an integral cable(s), the motor must be connected outside the potentially explosive atmosphere, or inside a box protected by a suitable recognised protection method.

- When the motor is fitted with one or more auxiliary junction boxes (protected with increased safety for "de", "e" or "n" motors), it can only tolerate a low risk of mechanical danger, and the user will need to provide additional protection if there is a high level of risk. (In other words, when an auxiliary terminal box is attached to the main terminal box).

### 7.1.1 - Special conditions for safe operation

- As standard, the motor shock resistance corresponds to a "low" risk of mechanical danger, and they should therefore be installed in an environment with a low risk of shocks.

- The motor must be fitted with thermal sensors in the winding (all frame sizes) and on the DE bearing (frame size 160 and above) in the following cases:

- Motor supplied by a frequency inverter
- Motor in a good air-flow (IC418) and not self-cooled
- Motor adapted so as to no longer be self-cooled (IC410)
- Motor fitted with a backstop

- The thermal sensors fitted on the motor must be connected to a device placed outside the zone, which switches off the motor when the operating thresholds are reached, so that the maximum surface temperature is never reached. This device must operate in normal conditions and must be in addition to and functionally independent of any system which could be required for operational reasons in normal conditions.

- When the motor is fitted with auxiliary or forced ventilation (IC416), a device must be present to prevent the main motor from operating when there is no ventilation.

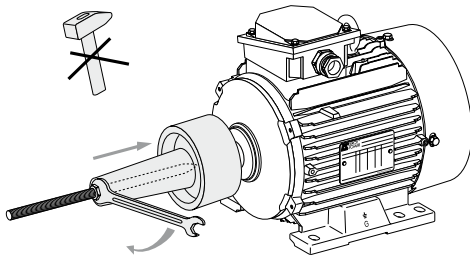
## 8 - MECHANICAL ADJUSTMENTS

### Tolerances and adjustments

The standard tolerances are applicable to the mechanical characteristics given in our catalogues. They comply fully with the requirements of IEC standard 60072-1.

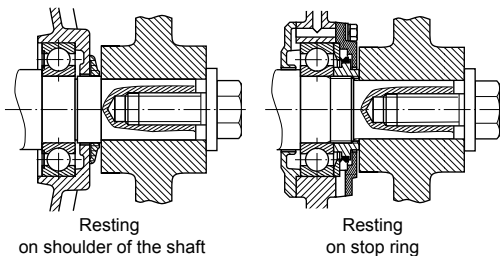
- Users must adhere strictly to the instructions provided by the transmission device supplier.
- Avoid impacts which could damage the bearings.

Use a spanner and the tapped hole of the shaft extension with a special lubricant (e.g. molykote grease) to make it easier to fit the coupling.



The hub of the transmission device must be:

- Fully in contact with the shoulder of the shaft or, if this is missing, against the metal stop ring which forms a labyrinth seal and thus locks the bearing in place (do not crush the seal).
- Longer than the shaft extension (2 to 3 mm) so that it can be tightened using a screw and washer. If it is not, a spacer ring must be inserted without cutting the key (if this ring is large, it must be balanced).



If there is a second shaft extension, it must only be used for direct coupling and the same recommendations must be followed.

**The 2nd shaft extension may also be smaller than the main shaft extension, and under no circumstances can it deliver torques greater than half the rated torque.**

**Inertia flywheels** must not be mounted directly onto the shaft extension, but installed between end shields and connected by a coupling device.

### Direct connection onto the machine

When mounted directly on the motor shaft extension of the moving device (pump or fan turbine), check that this device is perfectly balanced and that the radial force and the axial thrust are within the limits indicated in the catalogue for bearing performance.

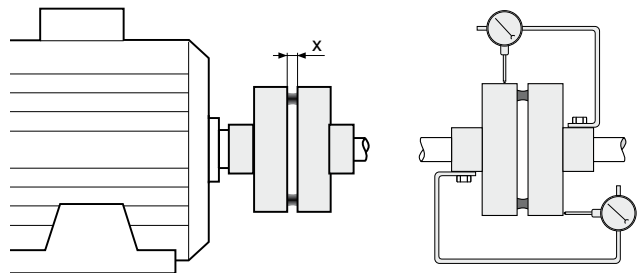
### Direct connection using a flexible coupling

Selection of the coupling sleeve should take account of the rated torque to be transmitted and the safety factor dependent on the starting conditions for the electric motor.

The machines must be carefully aligned, so that any lack of concentricity and parallelism in the two parts of the coupling sleeve is compatible with the recommendations of the coupling sleeve manufacturer.

Both coupling halves should be provisionally assembled to assist moving them in relation to one another.

Adjust the parallel plane of both shafts using a gauge. Measure the distance between the two coupling surfaces at one point on the circumference. Rotate them 90°, 180° and 270° in relation to this initial position, and measure each time. The difference between the two extreme values of dimension "x" must not exceed 0.05 mm for standard couplings.



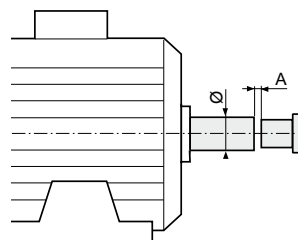
To perfect this adjustment and at the same time check the concentricity of the two shafts, fit 2 gauges as shown in the diagram and slowly turn both shafts.

The differences registered by either shaft will indicate the need for an axial or radial adjustment if the difference exceeds 0.05 mm.

### Direct connection using a rigid coupling

The two shafts must be aligned so as to adhere to the tolerances of the coupling sleeve manufacturer.

Maintain the minimum distance between the two shaft extensions to allow for expansion of the motor shaft and the load shaft.



Ø (mm)	A (mm) min.
9 to 55	1
60	1.5
65	1.5
75	2
80	2

**Transmission via belt pulleys**

**With a belt/pulley assembly, check that the motor can cope with radial loads.**

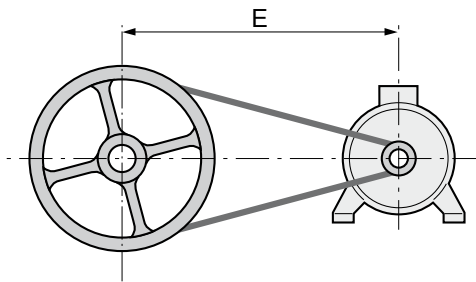
The user can choose the diameter of the pulleys.  
 Cast iron pulleys with a diameter over 315 are not recommended for rotation speeds of 3000 min<sup>-1</sup>.  
 Flat belts cannot be used for rotation speeds of 3000 min<sup>-1</sup> or more.

**Positioning the belts**

**The belts must be antistatic and flame-resistant.**

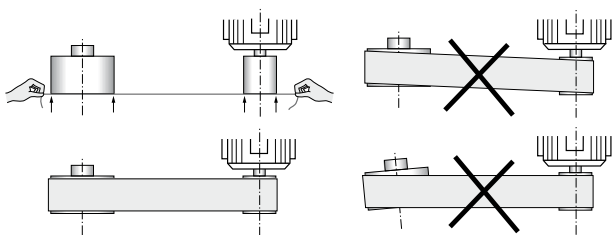
So that the belts can be correctly positioned, allow for possible adjustment of approximately 3% with respect to the calculated distance E.

Force must never be used when fitting the belts.  
 For notched belts, position the notches in the pulley grooves.



**Aligning the pulleys**

Check that the motor shaft is totally parallel to that of the receiving pulley.



Protect all rotating devices before power-up.

**Adjusting the tension of the belts**

The tension of the belts must be adjusted very carefully in accordance with the recommendations of the belt supplier and the calculations made when the product was specified.

**Reminder:**

- Too much tension = unnecessary force on the end shields which could lead to an abnormal temperature, premature wear of the bearing unit (end shield-bearings), and eventually break the shaft.
- Too little tension = vibration (wearing of the bearing unit).

**Fixed distance between centres:**

Place a belt tensioning pulley on the slack side of the belts:

- Smooth pulley on the outside of the belt
- Grooved pulley on the inside of the belts when using V-belts

**Adjustable distance between centres:**

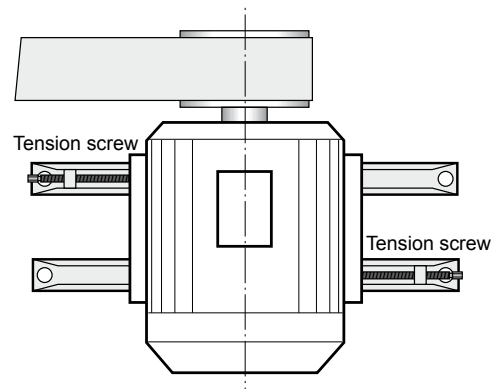
The motor is usually mounted on slide rails, which enables optimum adjustment of the pulley alignment and the belt tension.

Place the slide rails on a completely horizontal baseplate.

The lengthways position of the slide rails is determined by the length of the belt, and the crossways position by the pulley of the machine being driven.

Mount the slide rails firmly with the tension screws in the direction shown in the diagram (slide rail screw on the belt side between the motor and the machine being driven).

Fix the slide rails onto the baseplate and adjust the belt tension as before.



**Thermal protection**

**On-line protection**

**Setting the thermal protection (see section 6)**

This should be adjusted to the value of the current read on the motor nameplate for the connected mains voltage and frequency.

## 9 - SUPPLY CONNECTION

### 9.1 - Terminal box

This is placed as standard on the top of the motor near the drive end. It has IP 55 (G) or IP 65 (GD) protection and is fitted with a cable gland according to the table below.

Warning: The position of the terminal box cannot be easily modified, even with flanged motors, as the condensation drain holes (if appropriate) must be at the bottom.

### Cable gland

If the thread(s) on the orifice(s) designed to take one or more cable glands or conduits is (are) metric, there will be no particular marking on the motor; if the thread type is different or mixed, the type(s) will be marked on the equipment.

The standard position of the cable gland (1) is on the right, seen from the motor drive end.

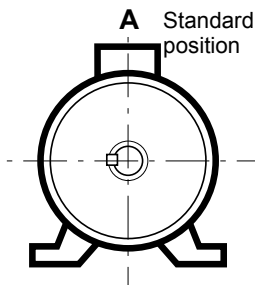
Due to the symmetrical construction of the terminal box, it can be placed in any of the four directions, except position 2 on flange-mounted motors (B5), apart from on 355 LK - 400 - 500. A cable gland must never open upwards.

Check that the incoming bend radius of the cables prevents water entering via the cable gland.

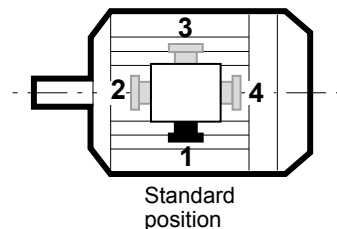
**The installer is responsible for the IP sealing of the cable path (see the motor nameplate and the instructions for assembling the cable gland).**

**All accessories must be of a type approved or certified by the group, the application (gas and/or dust) and the temperature class correspond at minimum to those for the device location.**

Terminal box positions



Cable gland positions



### Cable size

**Adapt the cable gland and its reducer or amplifier, if fitted, to the diameter of the cable being used, in accordance with the manual specific to the cable gland. To maintain the original stated IP protection of the motor, it is essential to make a watertight seal between the rubber ring and the cable, by tightening the cable gland correctly (it should not be possible to unscrew it without a tool).**

**Unused cable glands must be replaced with threaded plugs.**

**Unused orifices must also be closed off using threaded plugs. When fitting cable glands or blocking holes, a seal of perbunan, or silicon or polyurethane mastic, must be inserted between the cable glands, the plugs, the reducers or (and) the amplifiers and the support or the terminal box.**

**For connections using screwed conduit entries, the thread seal can be reinforced with grease. These threads must be rendered watertight by using polyurethane or silicon mastic, or anti-vibration adhesive.**

**AVERTISSEMENT**



**WARNING**

NE PAS OUVRIR SOUS TENSION  
NE PAS OUVRIR SI UNE ATMOSPHERE  
EXPLOSIVE PEUT ETRE PRESENTE

DO NOT OPEN WHEN ENERGIZED  
DO NOT OPEN WHEN AN EXPLOSIVE  
ATMOSPHERE MAY BE PRESENTE

ref. HS51A 31  
PSI070EA050



The motors are factory-fitted with guidance labels which must be kept clean and legible.



Under no circumstances should the power supply cable be used for handling the motor.

## 9.2 - Wiring diagram for terminal block or isolators

All motors are supplied with a wiring diagram in the terminal box. If required, this diagram should be obtained from the supplier, specifying the motor type and number (shown on the motor nameplate).

The connector links required for coupling can be found inside the terminal box.

Single speed motors have a block with 6 Ex safety terminals, whose marking complies with IEC 60034-8 (or NFC 51-118).

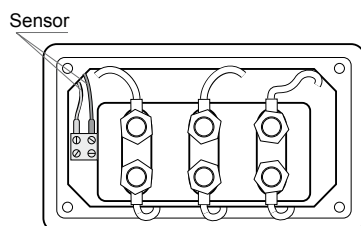
## 9.3 - Direction of rotation

When the motor is powered by U1, V1, W1 or 1U, 1V, 1W from a direct mains supply L1, L2, L3, it turns clockwise when seen from the drive shaft end.

If 2 phases of the power supply are changed over, the motor will rotate anti-clockwise (the motor should be checked to ensure that it has been designed to rotate in both directions).

If the motor is fitted with accessories (thermal protection or space heater), these must be connected on mini-terminals.

### Motor fitted with a terminal block



## 9.4 - Earth terminal

**It is compulsory to earth the motor, and earthing must be performed in accordance with current regulations (protection of workers).**

One earth terminal is located inside the terminal box, and another is outside the enclosure. They are marked:  $\perp$ . They must be protected against self-release by a jumper, lock washer, screw or locknut, or anti-vibration adhesive. The sizing of the cables must comply with the specifications of standard 60079-0.

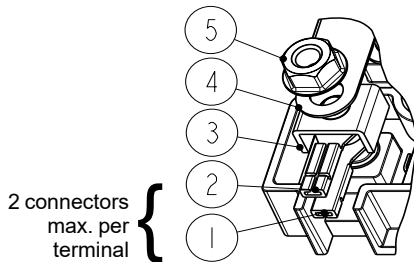


## 9.5 - Connecting the power supply cables to the terminal block

The cables must be fitted with connectors suitable for the cable cross-section and the terminal diameter (diagrams 1 and 3). They must be crimped in accordance with the connector supplier's instructions.

### 9.5.1 - Terminal block with round connectors Ex e M5 and M6 (LSN/FLSN 80 to 160)

These terminal blocks, mounted on the housing and held in place by 2 locked screws, make it possible to use standard round connectors.



- Each terminal consists of the following items, positioned in order:
- 1: motor cable connector, shank locked
  - 2: power supply cable connector, shank locked
  - 3: terminal washer
  - 4: Y or Δ connector link
  - 5: "Serpress" brake nut

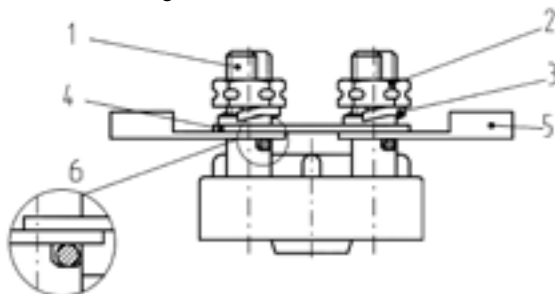
### Tightening torque (N.m) for the nuts on LSE terminal blocks

Terminal	M4	M5	M6
Steel	2	3.2	5
Brass	1	2	3

### 9.5.2 - Terminal block with slotted terminals (LSN 180 to 280)

The motor winding connecting cable is attached to the connector for a slotted terminal, either tinned brass KA type (open shank) for soldering, or tinned copper QUCA type (closed shank) for crimping with a suitable tool.

The cable connecting the electrical mains supply is laid in the terminal slot, under the connector, and tightened to the recommended tightening torque, as are the connector and the connector link, using the nut.



- 1: slotted terminal
- 2: clamping nut
- 3: lock washer
- 4: connector link
- 5: winding connector
- 6: slot for power supply cable

### Tightening torque (N.m) for the nuts on slotted terminal blocks

Terminal	KS7A	KS8A	KS10A	KS14A	KS18A
Steel	5	6	6	10	16

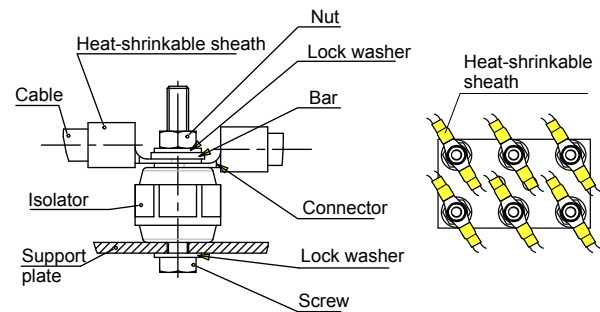
### Max. connection cross-section on slotted terminal blocks

Terminal		KS7A	KS8A	KS10A	KS14A	KS18A
Solid or stranded cable	mm <sup>2</sup>	2.5	4	6	10	-
Solid cable	mm <sup>2</sup>	4	6	10	16	-
Max. current (solid cable)	A	35	46	63	85	-

### 9.5.3 - Isolator and support plate (FLSN 180 to 355)

Where anti-rotation is not ensured by the joining element, insulate the shank of each power supply cable connector using a heat-shrinkable sheath; this insulation must extend at least 15 mm down the cable. As they exit each terminal, place the cables (fitted with their connectors) parallel to one another, so as to maintain the maximum air distances and leakage lines.

#### - Isolator and support plate



### Tightening torque (N.m) for the nuts on the isolators

Terminal	M8	M10	M12
Steel	10	20	35

**As a general rule, check that no nut, washer or other foreign body has fallen into the terminal box and/or come into contact with the winding.**

**- Earth terminal:**

This is situated inside the terminal box; in some cases, the earth terminal may be situated on one of the feet or on one of the cooling fins (round motors). It is indicated by the symbol:



**It is compulsory to earth the motor. Earthing must be performed in accordance with current regulations (protection of workers).**

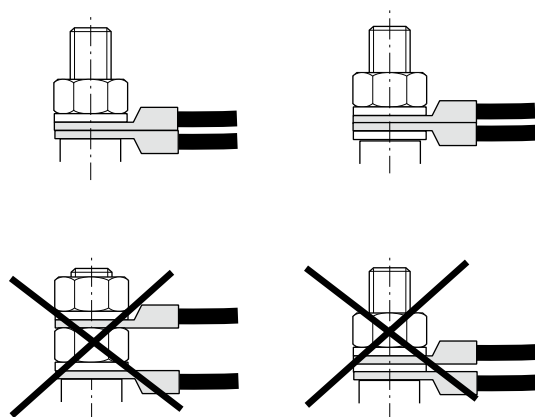
\* If required, ask the supplier for this diagram, specifying the motor type and number (shown on the motor nameplate).

**- Connecting the power supply cables to the terminal block:**

The cables must be fitted with connectors suitable for the cable cross-section and the terminal diameter.

They must be crimped in accordance with the connector supplier's instructions.

Connection must be carried out with connector resting on connector (see the diagrams below):



## 10 - MAINTENANCE

### 10.1 - General information

#### 10.1.1 - Frequent monitoring

This monitoring, generally carried out by operators, is intended to:

- Monitor, as a preventive measure, the state of the equipment (cables, cable glands, etc) bearing in mind the environmental conditions (temperature, humidity, etc).
- Detect as early as possible any potentially dangerous problems, such as damage to the cable ducts by abrasion.
- Ensure that staff are fully trained on the risks and means of prevention.

**If there is an accumulation of dust between the fins and/or on the fan cover grille, leading to a rise in the surface temperature, the motor should be cleaned frequently.**

#### 10.1.2 - Repairs

Repairs to and/or rewinding of an electric motor for use in potentially explosive zones must be carried out by qualified staff, using identical equipment, in compliance with the specifications of standard 60079-19. It is essential that the motor is returned to its original state, adhering scrupulously to the original motor construction. Disregarding this may affect the safety of the equipment (for example, protection index not conforming to IP 55 or IP 65) or the surface temperature (for example, rewinding the motor). Services Centres (CDS) are trained and approved by "Saqr - ATEX" to guarantee the maintenance and repair of these motors in complete safety.

**WARNING:**

**Modification is strictly prohibited without the manufacturer's approval in writing.**

**Service Centres (CDS) are trained and approved by "Saqr - ATEX" to guarantee the maintenance and repair of these motors in complete safety.**

### 10.1.3 - Spare parts

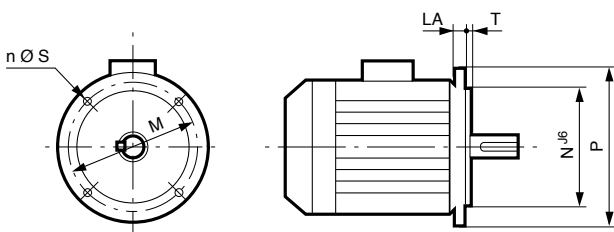
When ordering spare parts, you must indicate the complete motor type, its serial number and the information given on the nameplate (see section 1).

Part numbers can be found on the exploded views and their descriptions in the parts list (section 11).

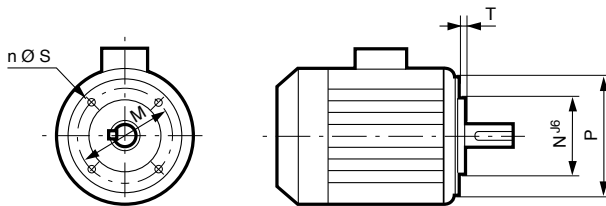
Routine maintenance kits can be obtained from our After Sales Service.

In the case of flange mounted motors, indicate the type of flange and its dimensions (see below).

Flange mounted motor



Face mounted motor



To ensure that our motors operate correctly and safely, it is imperative to use of original manufacturer spare parts.

In the event of failure to comply with this advice, the manufacturer cannot be held responsible for any damage.

## 10.2 - Corrective maintenance: general information

### CAUTION:

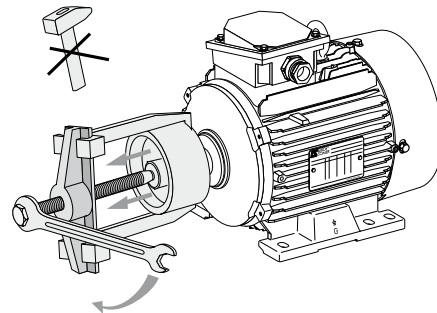
**Corrective maintenance can only be performed by a Service Centre that has been trained and approved in the repair of ATEX products.**

### 10.2.1 - Dismantling the motor

**First switch off and lock the power supply and ensure there is no potentially explosive atmosphere.**

- Open the terminal box, mark the wires and their positions,
- Disconnect the power supply wires,
- Uncouple the motor from the equipment being driven.

Always use an extractor to remove any devices mounted on the motor shaft extension.



### 10.2.2 - Checks before reassembly

#### Stator:

- Remove all dust from the stator: if the winding needs to be cleaned, a suitable liquid must be used: dielectric and inert on the insulating components and the external finish.
- Check the insulation (see section 3) and if necessary, dry it in an oven.
- Clean the spigots thoroughly, and remove all traces of knocks and mastic sealant on the mating surfaces if necessary.

#### Rotor:

**Replace the seals on the shaftways and on the shield spigots with new seals of the same type, after cleaning the parts. The seals on the shaftways must be fitted using the same type of grease as on the bearings.**

- Clean and check the bearing running surfaces. If they are damaged, renew the running surfaces or change the rotor;
- check the condition of the threads, and keys and their housings.

#### End shields:

- Clean off any traces of dirt (old grease, accumulated dust, mastic sealant, etc).
- Clean the bearing housings and the spigot.
- If necessary, apply some antifeash varnish to the insides of the end shields.
- Carefully clean the bearing retainers and the grease valves (if these are fitted on the motor).

### 10.2.3 - Mounting the bearings on the shaft

This operation is extremely important, as the slightest indentation of a ball on the bearing tracks would cause noise and vibration.

Lightly lubricate the running surfaces of the shaft.

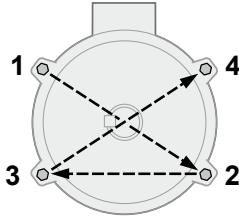
There are a number of ways of mounting the bearings correctly:

- Cold state: The bearings must be mounted without any impact, using a spanner (do not use a hammer). The force applied must not be transferred to the bearing track. You should therefore use the internal cage for support (taking care not to press on the seal shield for sealed bearings).

- Hot state: Heat the bearing to between 80 and 100°C: using a bearing heater, in a drying cabinet, an oven or on a heating plate. (A blowtorch or an oil bath must never be used).

After dismantling and reassembling a bearing, all the spaces between the seals and labyrinth seals must be filled with grease in order to prevent the entry of dust and the rusting of machined parts.

### 10.2.4 - Reassembling the motor



Tie rod tightening torque		
Type	Rod/screw Ø	Tightening torque N.m ± 5%
56	M4	2.5
63	M4	2.5
71	M4	2.5
80	M5	4
90	M5	4
100	M5 or M6	4
112	M5 or M6	4
132	M7	10
160	M8	18
180 MT/LR	M8	18
180 L	M10	25
200	M10	25
225 ST/MR	M10	25
225 MK	M12	44
250	M12	44
280	M12	44
315	M12	44
315 LK/355	M16	100
355 LK/400	M16	100
450	M16	100

**Care must be taken to ensure that the stator is replaced in its original position** so that the stack of laminations is centred correctly (generally with the terminal box facing forward) and the water drain holes are positioned correctly if they are on the housing.

#### Tightening the tie rods

These must be tightened diagonally, to the torque indicated (see above).

### 10.2.5 - Reassembling the terminal box

Reconnect all the power supply wires in accordance with the diagram or the markings made before dismantling, and check that the seals are correctly positioned before closing. Check that the terminal box components are tightened correctly.

**Note: It is advisable to test the motor at no load.**

- If necessary, repaint the motor.
- Mount the transmission device on the motor shaft extension and reinstall the motor on the machine to be driven (see section 4.3).

## 10.3 - Safety regulations

**Before any work is carried out on the motor or in the cabinet, ensure that there is no potentially explosive atmosphere and that all the components of the equipment are powered down.**

**Before any work is carried out on the motor or in the cabinet, check that the cosine  $\varphi$  compensation capacitors are isolated and/or discharged (read the voltage at the terminals).**

**Before any work is carried out in the terminal box or in the cabinet, check that the space heaters are switched off.**

**Depending on the type of thermal protection, the motor may remain powered up. Ensure that the mains supply is disconnected before any work is carried out in the terminal box or in the cabinet.**

## 10.4 - Routine maintenance

### Inspection after commissioning

After approximately 50 hours' operation, check the tightness of the screws fixing the motor and the coupling device. In the case of chain or belt transmission, check that the tension is correctly adjusted.

### Cleaning

To ensure the motor operates correctly, remove any dust or foreign bodies which may clog the air intake and the housing fins.

Precaution: Check that the motor is completely sealed (terminal box, drain holes, etc) before carrying out any cleaning operation.

Dry cleaning (vacuuming) is always preferable to wet cleaning. When cleaning the motor, be careful to avoid any build-up of static.

**Cleaning must always be carried out at a pressure of less than 10 bars, from the centre of the motor outwards to avoid dust and particles getting under the seals.**

### Draining condensation water

Variations in temperature cause condensation to form inside the motor. This must be removed before it affects the operation of the motor.

Condensation drain holes, located at the bottom of the motors (bearing in mind their operating position) are sealed with plugs or breathers which must be removed and then replaced every six months.

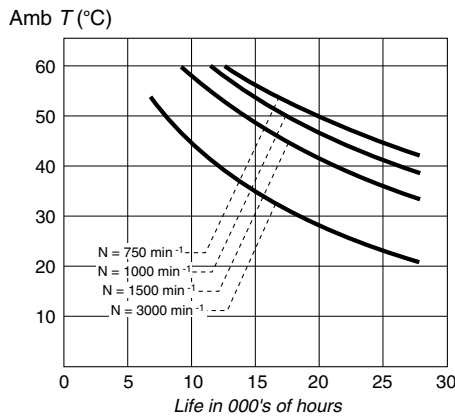
Note: If there is high humidity and significant variations in temperature, or a prolonged stoppage, a shorter period is recommended.

**Replace the drain hole covers to ensure IP55 or IP65 protection of the motor. Replace the seals which have been removed with new seals of the same type. Clean the orifices and plugs or breathers before reassembling them.**

### 10.4.1 - Greasing

#### 10.4.1.1 - Permanently greased bearings

For all (F)LSPX motors of type 180 or below, the specified bearings provide a long grease life and therefore greasing for the lifetime of the machines. The grease life according to speed of rotation and ambient temperature is shown on the chart below.



### 10.5 - Reconditioning the bearings

#### Bearings without grease nipples

Dismantle the motor; remove the old grease and clean the bearings and accessories with degreasing agent.

Fill with new grease: the correct amount of new grease for the bearing is 50% of the free space.

#### Bearings with grease nipples

##### Always begin by cleaning the waste grease channel

When using the type of grease indicated on the nameplate, remove the covers and clean the grease nipple heads.

If a different grease from that on the nameplate is being used, the motor must be dismantled and the bearings and accessories cleaned with degreasing agent (carefully clean the grease inlet and outlet passages) to remove the old grease before relubrication.

To ensure correct lubrication, fill the inner free spaces of the bearing retainers, flanges and grease pipes and 30% of the bearing free space.

Then rotate the motor shaft to distribute the grease.

#### Warning:

Too much grease causes the bearing to overheat (statistics show that more bearings are damaged through too much grease than too little grease).

#### Important note:

The new grease must be recently manufactured, of an equivalent performance level and must not contain any impurities (dust, water, etc).

### 10.6 - IP 55 or IP 65 protection for the motor

Each time the motor is dismantled and during planned site maintenance, replace the seals on the shaftways, the shield spigots and the terminal box cover (if mastic) with new seals of the same type after cleaning all parts. The seals on the shaftways must be fitted using the same type of grease as on the bearings.

If the drain plugs or breathers are removed, they must be replaced in order to ensure that the motor conforms to IP 55 or IP 65 protection. Replace the seals which have been removed with new seals of the same type. Clean the holes and plugs before reassembly.

If the terminal box cover is removed, clean all the parts and replace the seal with a new seal of the same type, if its condition no longer provides the required degree of protection.

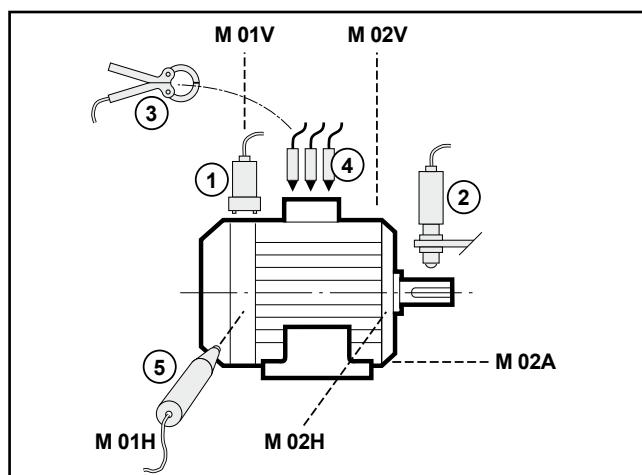
### 10.7 - Troubleshooting guide (in addition to standard IEC 79-17)

Incident	Possible cause	Remedy
Abnormal noise	Originating in motor or machine being driven?	Uncouple the motor from the equipment being driven and test the motor on its own
Noisy motor	<b>Mechanical cause:</b> if the noise persists after switching off the power supply	
	- Vibration	- Check that the key conforms to the type of balancing (see section 10.3)
	- Damaged bearings	- Change the bearings
	- Mechanical friction: ventilation, coupling	- Check
	<b>Electrical cause:</b> if the noise stops after switching off the power supply	- Check the power supply at the motor terminals
	- Normal voltage and 3 phases balanced	- Check the connection of the terminal block and the tightening of the connectors
Motor heats up abnormally	- Abnormal voltage	- Check the power supply line
	- Phase imbalance (current)	- Check the winding resistance and the balancing of the mains supply (voltage)
	- Faulty ventilation	- Check the environment - Clean the fan cover and the cooling fins - Check that the fan is correctly mounted on the shaft
	- Faulty supply voltage	- Check
	- Terminal connection fault	- Check
	- Overload	- Check the current consumption in relation to that indicated on the motor nameplate
Motor does not start	- Partial short-circuit	- Check the electrical continuity of the windings and/or the installation
	- Phase imbalance	- Check the winding resistance
	<b>No load</b>	When switched off:
	- Mechanical seizing	- Check by hand that the shaft rotates freely
	- Broken power supply line	- Check the fuses, electrical protection, starting device, electrical continuity
	<b>On load</b>	When switched off:
	- Phase imbalance	- Check the direction of rotation (phase order) - Check the resistance and continuity of the windings - Check the electrical protection

### 10.8 - Preventive maintenance

Please consult LEROY-SOMER who, in its continuous search for ways to help customers, has evaluated numerous methods of preventive maintenance.

The diagram and table below give the recommended equipment to use and the ideal positions to take measurements of all parameters which can affect the operation of the machine, such as eccentricity, vibration, state of the bearings, structural problems, electrical problems, etc.



Detector	Measurement	Measurement points								
		M 01V	M 01H	M 02V	M 02H	M 02A	Shaft	E01	E02	E03
① Accelerometer	For measuring vibrations	•	•	•	•	•				
② Photo-electric cell	For measuring speed and phase (balancing)						•			
③ Clamp ammeter	For measuring current (D.C. and 3-phase A.C.)							•	•	•
④ Voltage probe	For measuring voltages							•	•	•
⑤ Infra-red probe	For measuring temperature	•		•						





## 11 - DISMANTLING AND REASSEMBLY PROCEDURE

### 11.1 - LSN 80 to LSN 160 MP/LR - FLSN 80 to 132 motors

#### 11.1.1 - Dismantling

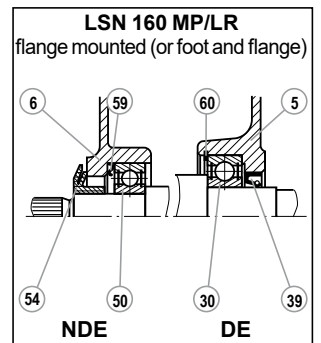
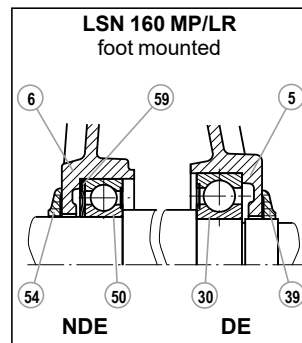
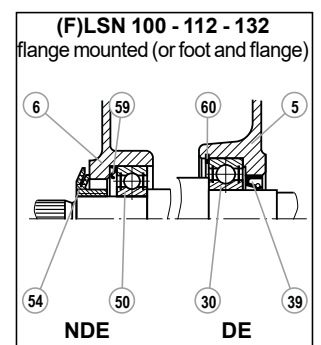
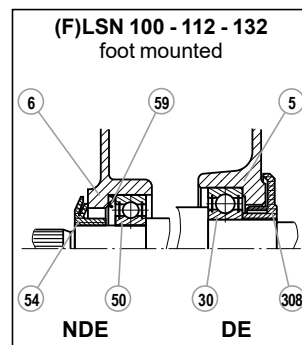
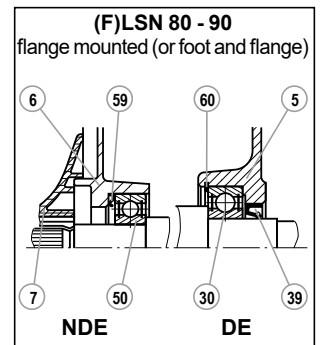
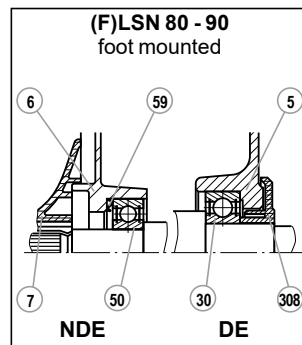
- Remove the screws (27) and then take off the cover (13).
  - Pull out the fan (7) using a hub remover or 2 levers (for example, 2 screwdrivers) diametrically opposed to one another, using the shield (6) for support.
  - Remove the tie rods (14).
  - Remove the key (21).
  - Using a wooden mallet, tap the shaft on the fan side in order to loosen the drive end shield (5).
  - Remove the rotor shaft (3) and the DE shield (5) taking care not to knock the winding.
  - Remove the shield on the fan side (6).
  - Take out the preloading washer (59) and the seal of the NDE shield (54) for LSN 100, 112 and 132 motors.
  - Remove the circlip (60) from flanged motors using angled circlip pliers.
  - Separate the DE shield from the rotor shaft.
  - The shaft can then be seen with its 2 bearings and, if appropriate, the circlip.
- Use a bearing remover to take out the bearings, taking care not to knock the running surfaces of the shaft.

#### 11.1.2 - Reassembling motors without circlip

- Mount the bearings on the rotor shaft.
- Insert the rotor into the stator taking all possible precautions not to knock the winding.
- Mount the DE shield (5).
- Place the preloading washer (59) in the bearing housing, then mount the NDE shield (6).
- Place the tie rods (14) in position and tighten the nuts diagonally to the recommended torque (see section 10.2.4).
- Mount the shield seals (39, 54, 308) with grease.
- Mount the fan (7) using a drift to bed it into position.
- Check that the motor turns freely by hand and that there is no radial play.
- Replace the cover (13) and fix it with the screws (27).

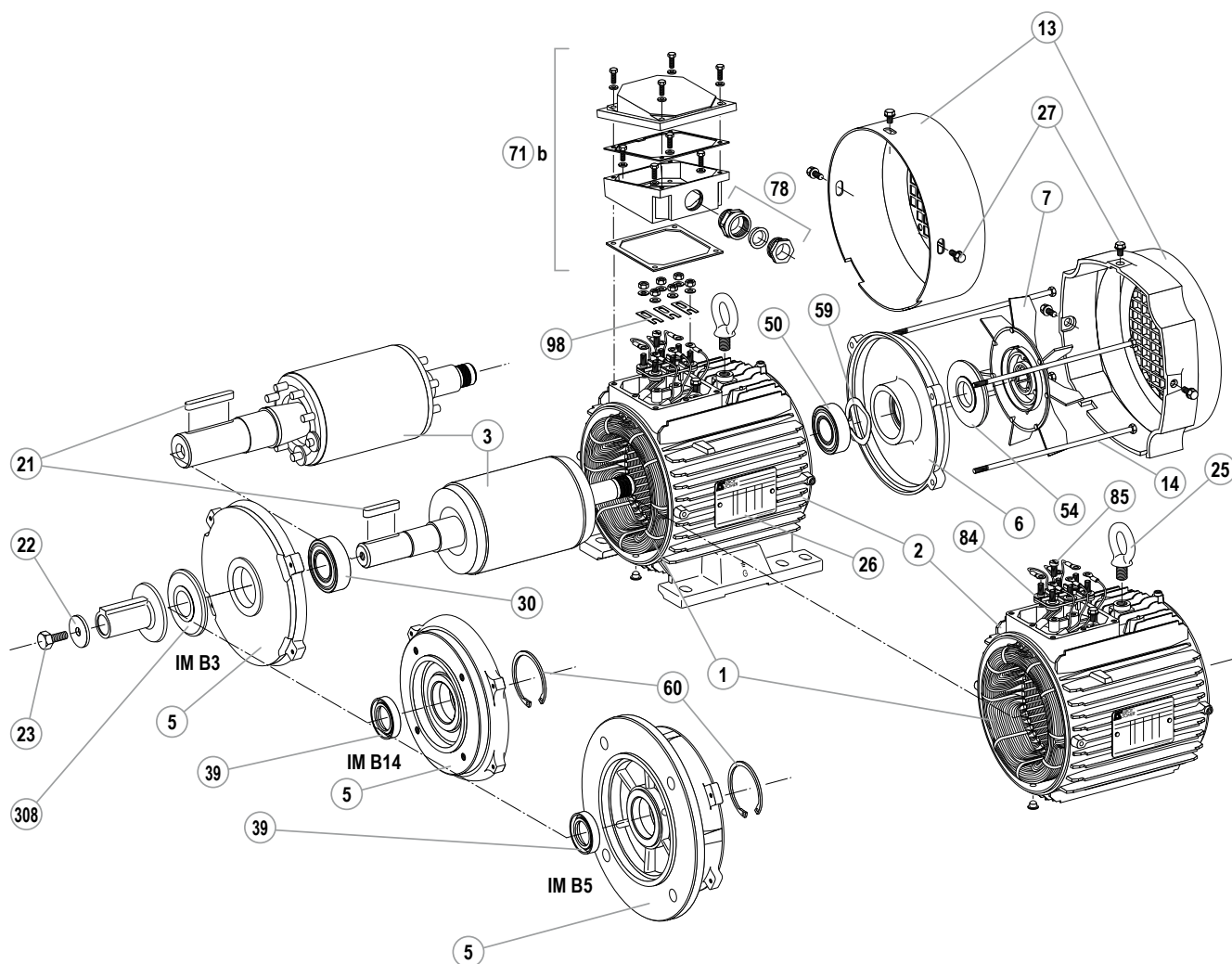
#### 11.1.3 - Reassembling motors with flange and circlip

- Mount the DE bearing (30) in the flange (5) using the outer slip-ring for support.
- Fit the circlip (60).
- Mount this assembly on the rotor (3) using the inner slip-ring for support.
- Mount the NDE bearing on the rotor.
- Insert the rotor (3) and shield (5) assembly in the stator taking care not to knock the winding.
- Place the preloading washer (59) in the bearing housing, then mount the NDE shield (6).
- Place the tie rods (14) in position and tighten the nuts diagonally to the recommended torque (see section 10.2.4).
- Mount the shield seals (39, 54, 308) with grease.
- Mount the fan (7) using a drift to bed it into position.
- Check that the motor turns freely by hand and that there is no axial play.
- Replace the cover (13) and fix it with the screws (27).
- Replace the key (21).





LSN 80 to LSN 160 MP/LR - FLSN 80 to FLSN 132



LSN 80 to LSN 160 MP/LR - FLSN 80 to FLSN 132

Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	22	Shaft extension washer	59	Preloading (wavy) washer
2	Housing	23	Shaft extension screw	60	Circlip
3	Rotor	25	Lifting ring	71 b	Metal terminal box
5	DE shield	26	Nameplate	78	Cable gland
6	NDE shield	27	Fan cover screw	84	Terminal block
7	Fan	30	DE bearing	85	Set screw
13	Fan cover	39	Drive end seal	98	Connectors
14	Tie rods	50	Non drive end bearing	308	Labyrinth seal
21	Shaft extension key	54	NDE seal		

## 11.2 - LSN 160 M/L, LSN 180 MT/LR motors

### 11.2.1 - Dismantling

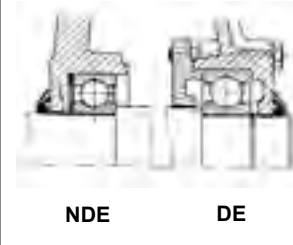
- Remove the screws (27) and then take off the cover (13).
- Pull out the fan (7) using a hub remover or 2 levers diametrically opposite one another, using the shield (6) for support.
- Take out the key (21) and remove the seals (39 and 54 for foot mounted motors, 54 for flange mounted motors).
- Unscrew the tie rods (14) then remove them.
- Unscrew the fixing screws (40) on the inner bearing retainer (33).
- Using a bronze drift, remove the shields (5 and 6) by tapping gently on the shield bosses. Take out the preloading washer (59).
- Remove the circlip (38) if necessary (flange mounted motor).
- Remove the rotor (3) from the stator (1) taking care not to touch the winding.
- Take out the bearings (30) and (50) using a bearing remover, while protecting the end of the shaft extension with a washer. Avoid knocking the running surfaces of the shaft.

### 11.2.2 - Reassembly

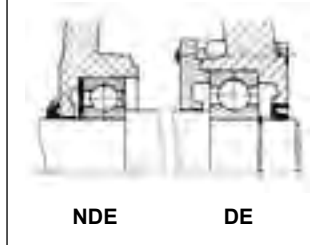
- See section 10.2.4 before reassembly.
- Insert the inner bearing retainer (33) at the drive end of the rotor then fit new bearings on the shaft.
- Mount the circlip (38) for flange mounted motors.
- Insert the rotor (3) in the stator (1) taking care not to knock the winding.
- Position the preloading washer (59) with a small amount of grease in the back of the bearing cage of the NDE shield (6), then remount the NDE shield (6), positioning it on the stator.
- To fit the bearing retainer (33), screw a threaded rod with the same diameter as the screws (40) into one of the tapped holes of the bearing retainer to maintain its angular position when refitting the DE shield (5). When there is a flange, mount a new seal (39) with the spring facing outwards.
- Remount the DE shield (5) taking care to allow for the positioning of a bearing retainer if used.
- Place the tie rods (14) in position and tighten the nuts diagonally to the recommended torque (see section 10.2.4).
- Fix the bearing retainer with its screws (33).
- Mount the shield seals with grease (54 at the non drive end, 39 at the drive end for foot mounted motors).
- Mount the fan (7) using a drift to bed it into position.
- Check that the rotor turns freely by hand (that there is no axial play if there is a locked end shield).
- Replace the cover (13) and fix it with the screws (27).
- Replace the key (21).

The shields must be fitted with a DE inner bearing retainer.

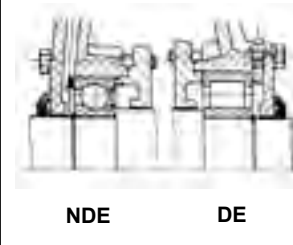
LSN 160 M/L - LSN 180 MT/LR  
foot mounted  
standard bearings



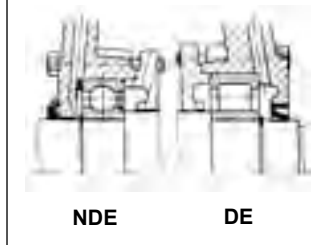
LSN 160 M/L - LSN 180 MT/LR  
flange mounted (or foot and flange)  
standard bearings



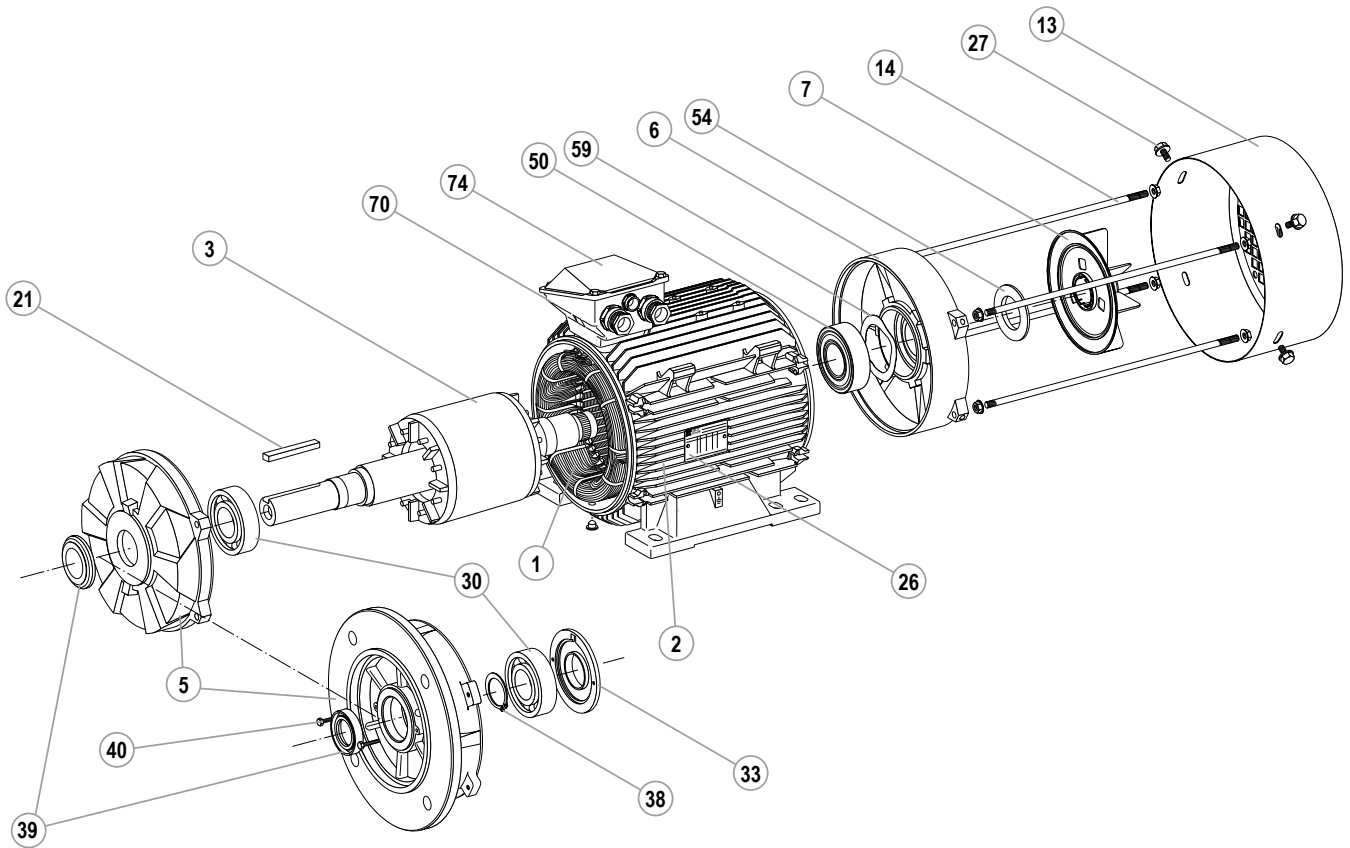
LSN 160 M/L - LSN 180 MT/LR  
foot mounted  
drive end roller bearings



LSN 160 M/L - LSN 180 MT/LR  
flange mounted (or foot and flange)  
drive end roller bearings



LSN 160 M/L, LSN 180 MT/LR



LSN 160 M/L, LSN 180 MT/LR

Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	14	Tie rods	39	Drive end seal
2	Housing	21	Key	40	Cover fixing screw
3	Rotor	26	Nameplate	50	Non drive end bearing
5	DE shield	27	Fan cover screw	54	NDE seal
6	NDE shield	30	DE bearing	59	Preloading (wavy) washer
7	Fan	33	Inner DE bearing retainer	70	Terminal box
13	Fan cover	38	Drive end bearing circlip	74	Terminal box cover

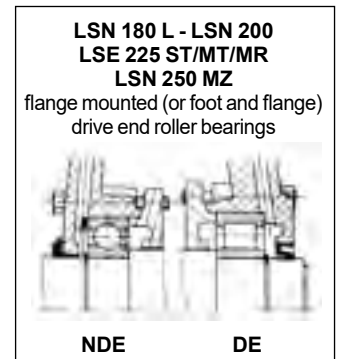
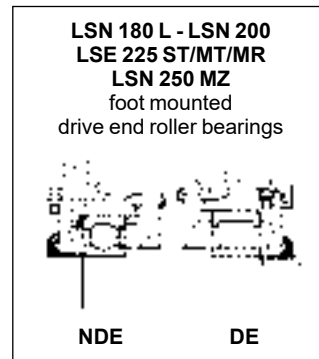
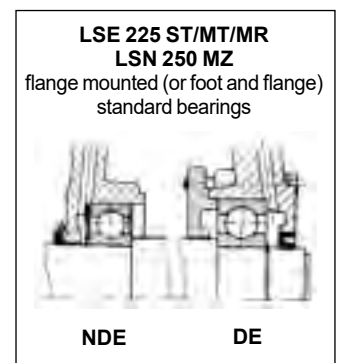
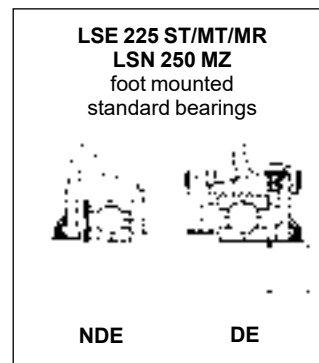
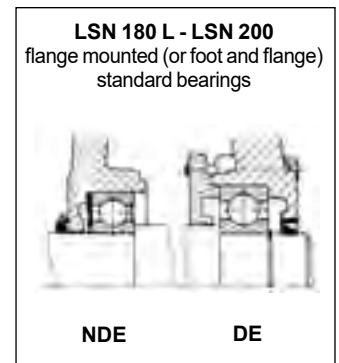
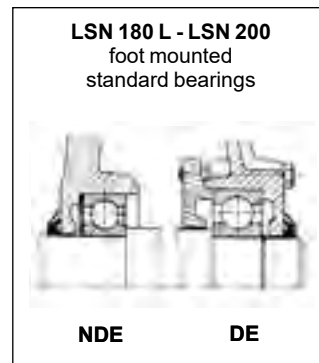
## 11.3 - LSN 180 L, LSN 200, LSN 225 ST/MT/MR, LSN 250 MZ motors

### 11.3.1 - Dismantling

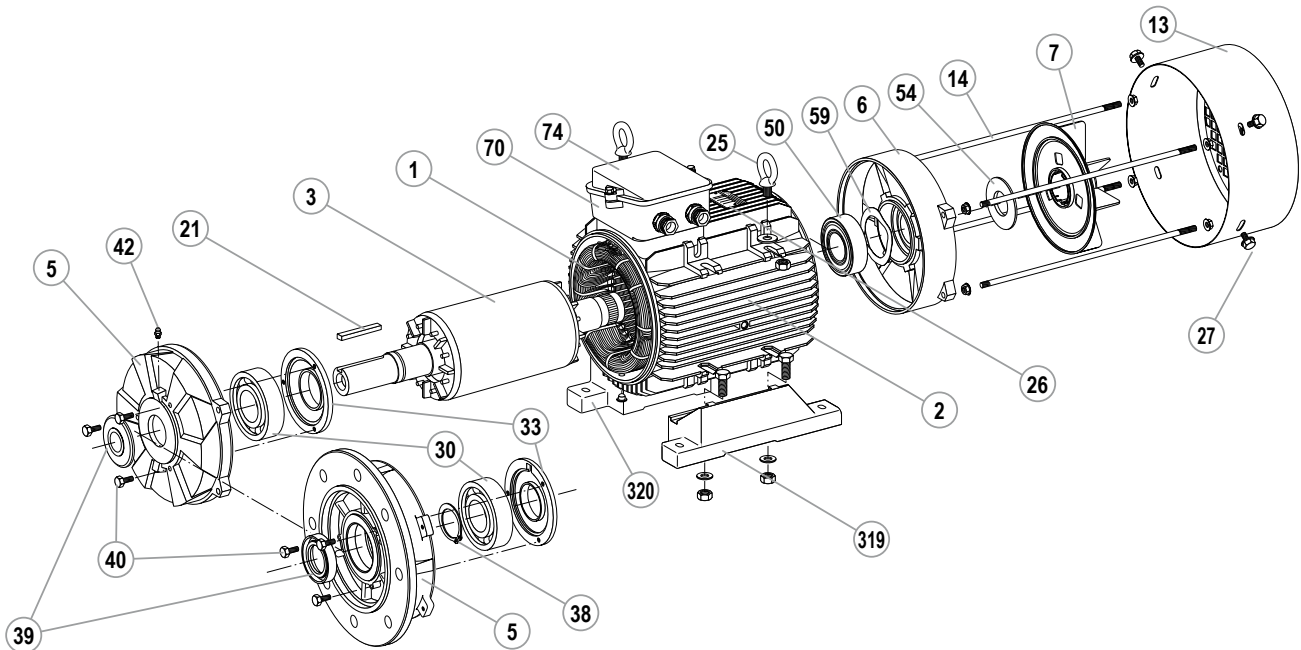
- Remove the screws (27) and then take off the cover (13).
- Pull out the fan (7) using a hub remover or 2 levers diametrically opposite one another, using the shield (6) for support.
- Take out the key (21) and remove the seals (39 and 54 for foot mounted motors, 54 for flange mounted motors).
- Unscrew the tie rods (14) then remove them.
- Unscrew the fixing screws (40) on the inner bearing retainer (33).
- Using a bronze drift, remove the shields (5 and 6) tapping lightly on the shield bosses. Recover the preloading washer (59).
- Remove the circlip (38) if appropriate.
- Remove the rotor (3) from the stator (1) taking care not to touch the winding.
- Take out the bearings (30) and (50) using a bearing remover, while protecting the end of the shaft extension with a washer. Avoid knocking the running surfaces of the shaft.

### 11.3.2 - Reassembly

- See section 10.2.4 before reassembly.
  - Insert the inner bearing retainer (33) at the drive end of the rotor then fit new bearings on the shaft.
  - Fit the circlip (38) if necessary.
  - Insert the rotor (3) in the stator (1) taking care not to knock the winding.
  - Position the preloading washer (59) with a small amount of grease in the back of the bearing cage of the NDE shield (6), then remount the NDE shield (6), positioning it on the stator.
  - To fit the bearing retainer (33), screw a threaded rod with the same diameter as the screws (40) into one of the tapped holes of the bearing retainer to maintain its angular position when refitting the DE shield (5). When there is a flange, mount a new seal (39) with the spring facing outwards.
  - Remount the DE shield (5) taking care to allow for the positioning of a bearing retainer if used.
  - Place the tie rods (14) in position and tighten the nuts diagonally to the recommended torque (see section 10.2.4).
  - Fix the bearing retainer (33) with the screws (40).
  - Mount the shield seals with grease (54 at the non drive end, 39 at the drive end for foot mounted motors).
  - Mount the fan (7) using a drift to bed it into position.
  - Check that the rotor turns freely by hand (that there is no axial play if there is a locked end shield).
  - Replace the cover (13) and fix it with the screws (27).
  - Replace the key (21).
- The shields must be fitted with a DE inner bearing retainer.



LSN 180 L, LSN 200, LSN 225 ST/MT/MR, LSN 250 MZ



LSN 180 L, LSN 200, LSN 225 ST/MT/MR, LSN 250 MZ

Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	25	Lifting ring	50	Non drive end bearing
2	Housing	26	Nameplate	54	NDE seal
3	Rotor	27	Fan cover screw	59	Preloading (wavy) washer
5	DE shield	30	DE bearing	70	Terminal box
6	NDE shield	33	Inner DE bearing retainer	74	Terminal box cover
7	Fan	38	Drive end bearing circlip	319	Right foot
13	Fan cover	39	Drive end seal	320	Left foot
14	Tie rods	40	Cover fixing screw		
21	Key	42	Grease nipples (optional for LSN 180 L, LSN 200)		

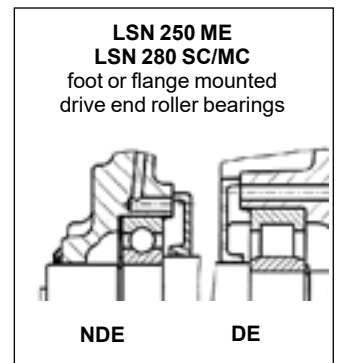
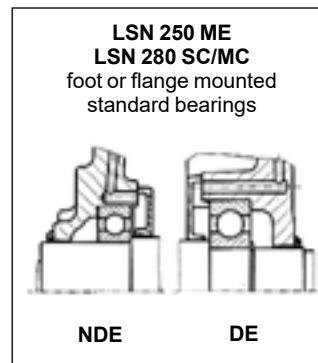
## 11.4 - LSN 250 ME, LSN 280 SC/MC motors

### 11.4.1 - Dismantling

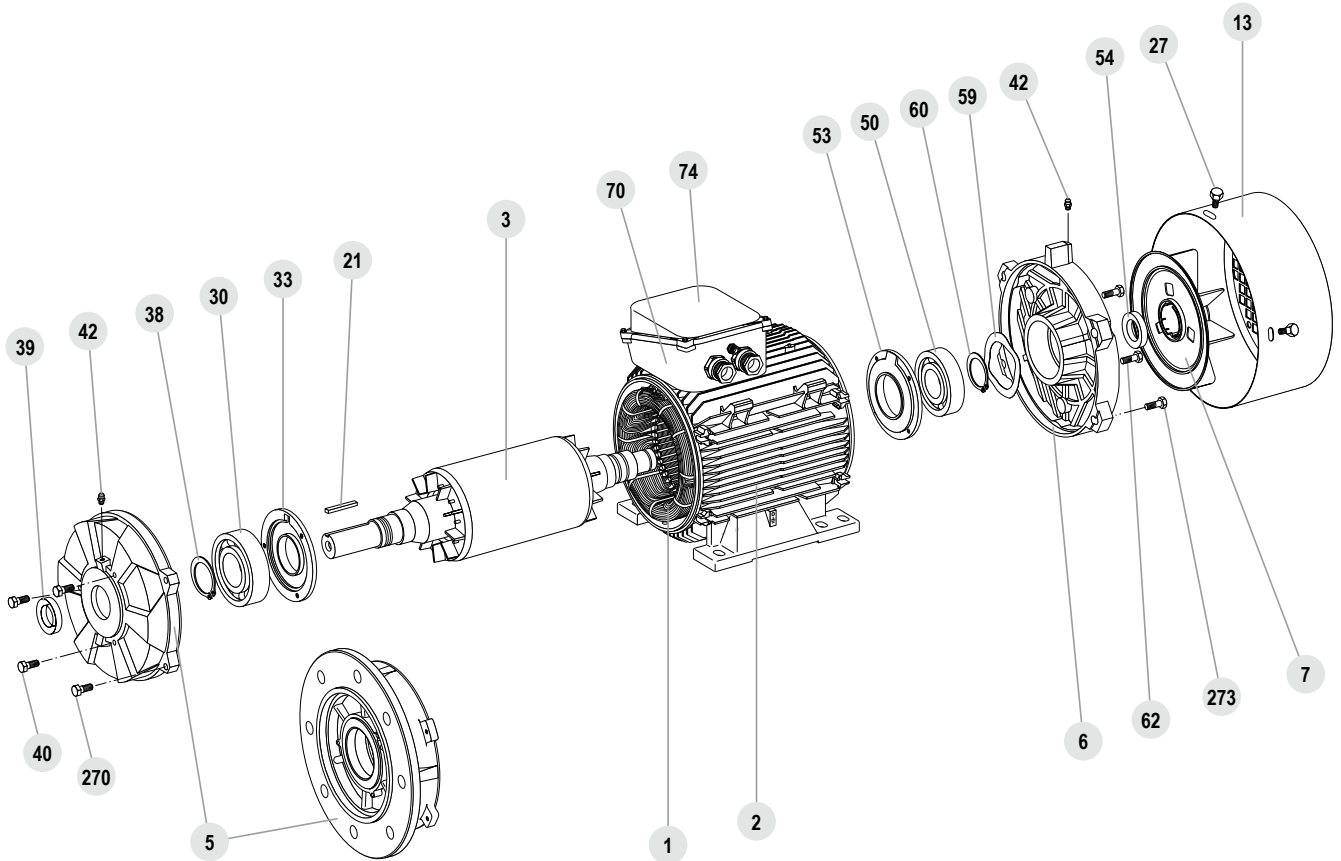
- Remove the screws (27) and then take off the cover (13).
- Pull out the fan (7) using a hub remover or 2 levers diametrically opposite one another, using the shield (6) for support.
- Take out the key (21) and remove the seals (39) and (54).
- Unscrew the DE shield fixing screws (270) and (273).
- Unscrew the fixing screws (40) on the inner bearing retainer (33).
- Using a bronze drift, remove the shields (5 and 6) by tapping gently on the shield bosses. Take out the preloading washer (59).
- Remove the circlip (38).
- Remove the rotor (3) from the stator (1) taking care not to touch the winding.
- Take out the bearings (30) and (50) using a bearing remover, while protecting the end of the shaft extension with a washer. Avoid knocking the running surfaces of the shaft.

### 11.4.2 - Reassembly

- See section 10.2.4 before reassembly.
  - Insert the inner bearing retainer (33) at the drive end of the rotor then fit new bearings on the shaft.
  - Fit the circlip (38).
  - Insert the rotor (3) in the stator (1) taking care not to knock the winding.
  - When fitting the bearing retainer (53), screw a threaded rod with the same diameter as the screws (62) into one of the tapped holes of the bearing retainer to maintain its angular position when refitting the NDE shield (6).
  - Position the preloading washer (59) with a small amount of grease in the back of the bearing cage of the NDE shield (6), then remount the NDE shield (6), positioning it on the stator.
  - Fix the bearing retainer (53) with the screws (62).
  - When fitting the bearing retainer (33), screw a threaded rod with the same diameter as the screws (40) into one of the tapped holes of the bearing retainer to maintain its angular position when refitting the DE shield (5). Mount a new seal (39).
  - Remount the shield (5) taking care to allow for the positioning of the bearing retainer.
  - Place the fixing screws (270) and (273) in position and tighten them diagonally up to the recommended torque (see section 10.2.4).
  - When fitting the bearing retainer (53), screw a threaded rod with the same diameter as the screws (62) into one of the tapped holes of the bearing retainer to maintain its angular position when refitting the NDE shield (6).
  - Fix the bearing retainer (33) with the screws (40).
  - Mount the shield seals with grease (54 at the non drive end, 39 at the drive end for foot mounted motors).
  - Mount the fan (7) using a drift to bed it into position.
  - Check that the rotor turns freely by hand (that there is no axial play if there is a locked end shield).
  - Replace the cover (13) and fix it with the screws (27).
  - Replace the key (21).
- The shields must be fitted with a DE inner bearing retainer.



LSN 250 ME, LSN 280 SC/MC



LSN 250 ME, LSN 280 SC/MC

Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	30	DE bearing	59	Preloading (wavy) washer
2	Housing	33	Inner DE bearing retainer	60	Non drive end bearing circlip
3	Rotor	38	Drive end bearing circlip	62	Cover fixing screw
5	DE shield	39	Drive end seal	70	Terminal box
6	NDE shield	40	Cover fixing screw	74	Terminal box cover
7	Fan	42	Grease nipples	270	DE shield fixing screw
13	Fan cover	50	Non drive end bearing	273	NDE shield fixing screw
21	Shaft extension key	53	Inner NDE bearing retainer		
27	Fan cover screw	54	NDE seal		

## 11.5 - LSN 280 SK/MK, LSN 315 motors

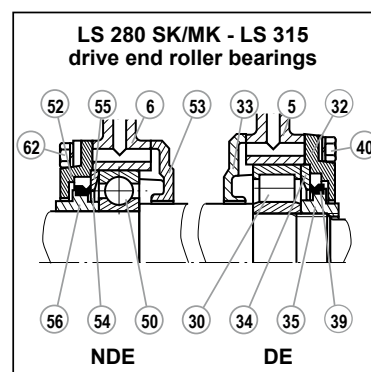
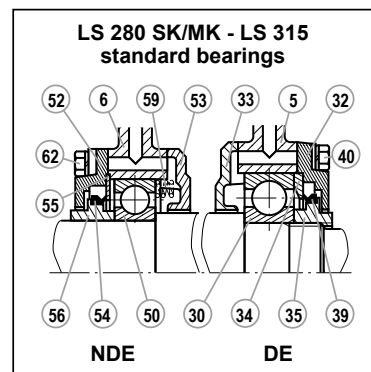
### 11.5.1 - Dismantling

- Remove the screws (27), the grease nipple (42) and its extension, then take off the cover (13).
  - Pull out the fan (7) using a hub remover or 2 diametrically opposed levers, using the shield (6) for support; for an aluminium fan, heat the hub to approximately 100°C before removing it.
  - Take out the key (21).
  - Unscrew the tie rods (14) then remove them.
  - Unscrew the DE bearing retainer (33) fixing screws (40) and NDE bearing retainer (32) and (52) fixing screws (62), and remove the bearing retainers.
  - Unscrew the "CHc" screws of the mobile valves (35 and 56) then unscrew the valves using a hook spanner or a conical bronze drift; unscrew the valves by hand and remove them. The valves hold the seals (39 and 54) in place.
  - Remove the fixed valves (34 and 35) from the bearing housings.
  - Using a bronze drift, remove the shields (5 and 6) by tapping gently on the shield bosses.
- Check that the bearing retainer (53) is smaller in diameter than the stator, otherwise remove the bearing (50) as per the following instructions.
- Remove the rotor (3) from the stator (1) at the drive end, taking care not to touch the winding with the inner bearing retainer if there is no internal turbine. Take out the bearings (30) and (50) using a bearing remover, while protecting the end of the shaft extension with a washer. Avoid knocking the running surfaces of the shaft.
  - The bearings are removed either separately or with the bearing retainers (33 and 53). To avoid damaging the bearing retainers, heat the outer bearing ring (the bearing should be discarded).
  - Recover the preloading washer or springs (59) from the bearing retainer (53).

### 11.5.2 - Reassembly

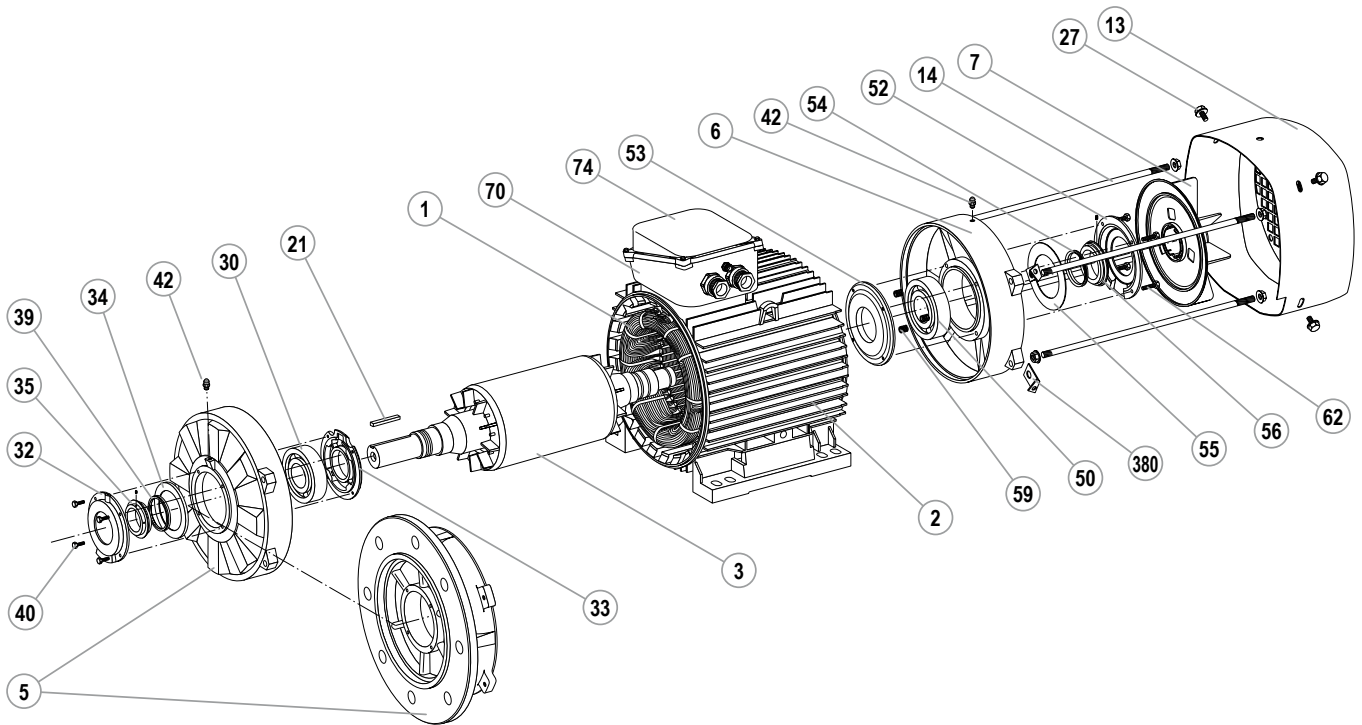
- See section 5.1 before reassembly.
- Insert the inner bearing retainer (33) at the rotor drive end and the inner bearing retainer (53) at the non drive end, not forgetting to insert the preloading springs (59).
- Fill with new grease: the correct amount of new grease for the bearing is 50% of the free space.
- Mount the new bearings (30 and 50) on the shaft, see section 5.3 on mounting bearings.
- Insert the rotor (3) in the stator (1) taking care not to knock the winding.
- Screw a rod with the same thread diameter as the screws (40) and (62) into one of the tapped holes of the bearing retainers (33) and (53) to maintain the position of the grease nipple when remounting the shields (5 and 6).
- Check that the preloading springs are properly installed.
- Mount the shield (6) at the non drive end, positioning it on the stator, then mount the fixed valve (55) in the shield bearing housing.
- Mount the mobile valve (56) by either screwing it or locking it, having carefully installed the seal (54) on the valve.

- Mount the outer bearing retainer (52) with the bearing retainer locking screws (62), making sure that the grease drain hole is at the bottom.
- Mount the shield (5) at the drive end, positioning it on the stator, then mount the fixed valve (34) in the shield bearing housing.
- Mount the mobile valve (35) by either screwing it or locking it, having carefully installed the seal (39) on the valve.
- Mount the outer bearing retainer (32) with the bearing retainer locking screws (40), making sure that the grease drain hole is at the bottom.
- Place the tie rods (14) in position, not forgetting the feet of the cover (380), tighten the nuts diagonally without locking them so that the feet of the cover can be positioned when it is mounted.
- Mount the fan (7) using a drift to bed it in position or by heating the hub of the aluminium fan to approximately 100°C.
- Check that the motor turns freely by hand and that there is no axial play.
- Replace the protective cover (13) and fix it with the screws (27), replace the grease nipple (42) and its extension.
- Tighten the rod nuts (14), always diagonally, up to the torque recommended in section 5.1.
- Replace the key (21).





LSN 280 SK/MK, LSN 315



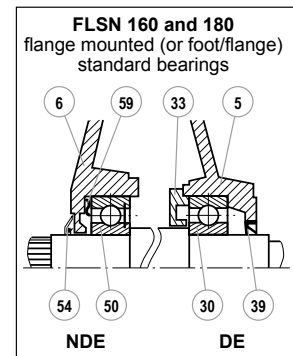
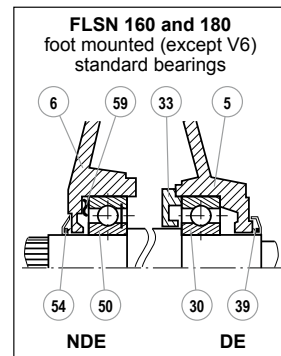
LSN 280 SK/MK, LSN 315

Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	30	DE bearing	53	Inner NDE bearing retainer
2	Housing	32	Outer DE bearing retainer	54	NDE seal
3	Rotor	33	Inner DE bearing retainer	55	NDE fixed grease valve
5	DE shield	34	DE fixed grease valve	56	NDE mobile grease valve
6	NDE shield	35	DE mobile grease valve	59	Preloading washer or spring
7	Fan	39	Drive end seal	62	Cover fixing screw
13	Fan cover	40	Cover fixing screw	70	Terminal box
14	Tie rods	42	Grease nipples	74	Terminal box cover
21	Key	50	Non drive end bearing	380	Cover feet
27	Fan cover screw	52	Outer NDE bearing retainer		

## 11.6 - FLSN 160 and 180 motors

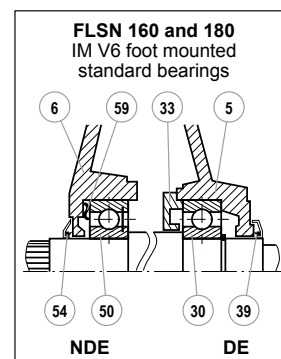
### 11.6.1 - Dismantling the NDE shield

- Remove the fixing screws (27) and then take off the cover (13).
- Take out the fan (7).
- Remove the fixing screws (273) from the NDE shield (6).
- Using two levers or a flexible hammer, disengage the NDE shield (6) taking care not to place it aslant. Remove the shield by sliding it along the shaft. The seal (54) follows behind and is no longer usable.
- Recover the preloading washer (59) which should be replaced in its housing.



### 11.6.2 - Dismantling the DE shield

- Remove the fixing screws (270) from the DE shield.
- Using an appropriate lifting tool, take out the rotor (3) + DE shield (5) assembly, without knocking the winding.
- Remove the fixing screws (40) from the inner DE bearing retainer (33).
- Take out the key (21).
- Using two levers or a flexible hammer, disengage the DE shield (5) from the rotor (3) taking care not to place it aslant.
- Remove the shield by sliding it along the shaft. The seal (39) follows behind and is no longer usable.

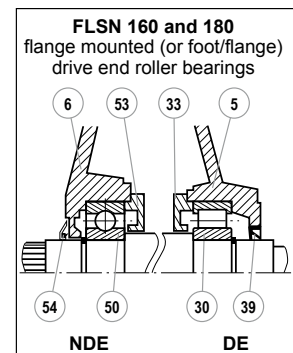
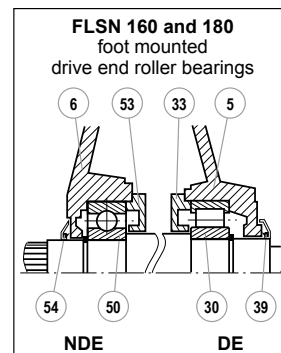


### 11.6.3 - Changing the antifriction bearings

- Remove the bearings (30) and (50) with an appropriate tool, protecting the end of the shaft extension. Avoid knocking the running surfaces of the shaft.
- Change the bearings (shrink-fitting only).

### 11.6.4 - Reassembly

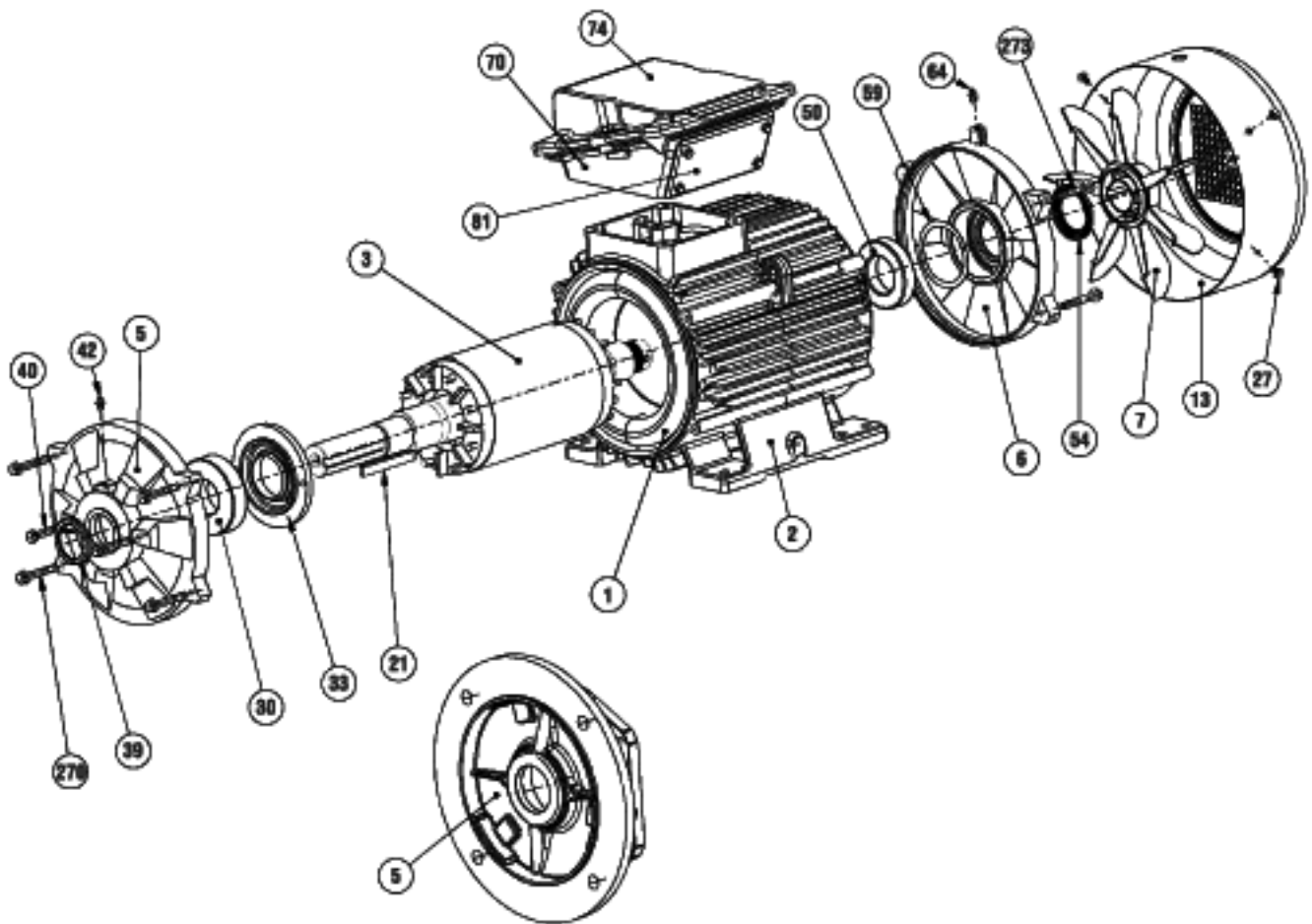
- Mount the bearings on the rotor shaft (not forgetting the inner DE bearing retainer (33)).
- Slide the DE shield (5) onto the bearing (30).
- Replace the fixing screws (40) on the inner bearing retainer (33).
- Insert the rotor + shield assembly in the stator without knocking the winding.
- Present the shields, grease nipples facing upwards, not forgetting the preloading washer (59) at the non drive end. Slide them into position.
- Fit the shields firmly in place.
- Check that the rotor turns freely by hand.



**From now on, we recommend checking at every step that the rotor turns freely by hand before continuing to the next instruction.**

- Replace the shield fixing screws (270) and (273).
- Use a drift to fit a new seal (54).
- Replace the fan (7).
- Replace the cover (13) and reinsert the fixing screws (27).
- Use a drift to fit the new seal (39).
- Lubricate the DE and NDE antifriction bearings, turning the shaft by hand.

FLSN 160 and 180



FLSN 160 and 180

Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	27	Fan cover screw	59	NDE preloading (wavy) washer
2	Housing	30	DE bearing	64	NDE grease nipple
3	Rotor	33	Inner DE bearing retainer	70	Stator terminal box
5	DE shield	39	DE seal	74	Terminal box cover
6	NDE shield	40	Cover fixing screw	81	Cable gland support plate
7	Fan	42	DE grease nipple	270	DE shield fixing screw
13	Fan cover	50	Non drive end bearing	273	NDE shield fixing screw
21	Shaft extension key	54	NDE seal		

## 11.7 - FLSN 200 to 225 ST motors

### 11.7.1 - Dismantling the NDE shield

- Remove the fixing screws (27) and then take off the cover (13).
- Take out the fan (7).
- Remove the fixing screws from the inner NDE bearing retainer (53).
- Remove the fixing screws (273) from the NDE shield (6).
- Using two levers or a flexible hammer, disengage the NDE shield (6) taking care not to place it aslant. Remove the shield by sliding it along the shaft. The seal (54) follows behind and is no longer usable.
- Put the dismantled components to one side and recover the preloading washer (59), which should be replaced in its housing.

### 11.7.2 - Dismantling the DE shield

- Dismantle the DE shield without removing the rotor (3). To do this:
- Remove the fixing screws (40) from the inner DE bearing retainer (33).
- Remove the fixing screws (270) from the DE shield (5).
- Remove the fixing screws from the inner DE bearing retainer (33).
- Take out the key (21).
- Using two levers or a flexible hammer, disengage the DE shield (5) taking care not to place it aslant.
- Remove the shield by sliding it along the shaft. The seal (39) follows behind and is no longer usable.

### 11.7.3 - Changing the antifriction bearings

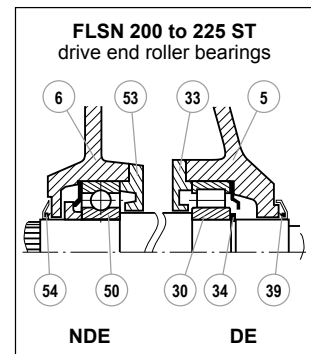
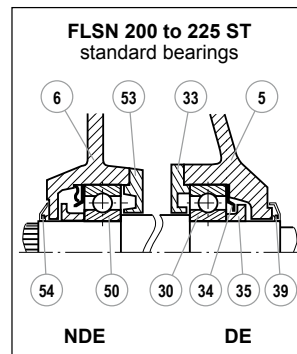
- Using an appropriate lifting tool, take out the rotor without knocking the winding.
- Remove the bearings (30) and (50) with an appropriate tool, protecting the end of the shaft extension. Avoid knocking the running surfaces of the shaft.
- The moving parts of the grease valve (35) for the drive end and (56) for the non drive end follow.
- Put the components to one side (55) - (56) for the non drive end and (34) - (35) for the drive end.
- Change the bearings (shrink-fitting only).

### 11.7.4 - Reassembly

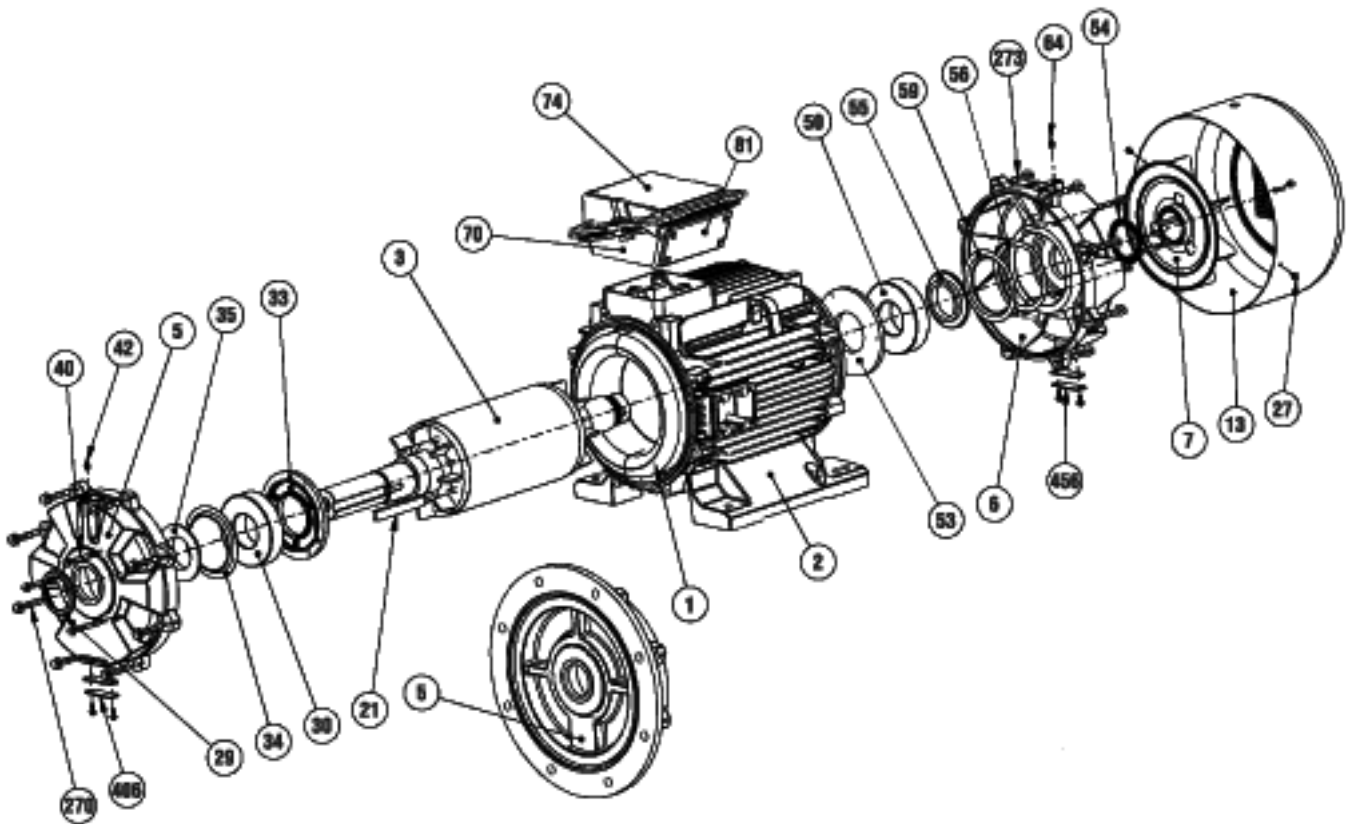
- Mount the DE bearing (30) on the rotor shaft (take care not to forget the inner bearing retainer (33), and also the NDE bearing (50) if and only if the stator inner  $\varnothing$  allows the inner NDE bearing retainer (53) to pass through.
- Install the fixed part of the grease valves (ref. (55) for the non drive end and (34) for the drive end).
- Shrink-fit the moving part of the grease valves (ref. (56) for the non drive end and (35) for the drive end). Make absolutely sure that it is resting on the bearing internal ring.
- Insert the rotor in the stator taking care not to knock the winding. Install the NDE bearing if this has not already been done.
- Present the shields, grease nipples facing upwards. Begin with the DE shield (5). Fix a dowel pin in one of the inner bearing retainer (33) tapped holes **so that the grease inlet pipes fully correspond**. Slide it into position.
- End with the NDE shield (6). Fix a dowel pin in one of the inner bearing retainer (53) tapped holes **so that the grease inlet pipes fully correspond**.
- Lift the rotor slightly and fit the shields onto the housing.

From now on, we recommend checking at every step that the rotor turns freely by hand before continuing to the next instruction.

- Replace the shield fixing screws (270) and (273).
- Replace the inner bearing retainer fixing screws (33) and (53).
- Use a drift to fit a new seal (54).
- Replace the fan (7).
- Use a drift to fit a new seal (39).
- Replace the cover (13) and reinsert the fixing screws (27).
- Lubricate the DE and NDE antifriction bearings, turning the shaft by hand.



FLSN 200 to 225 ST



FLSN 200 to 225 ST

Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	33	Inner DE bearing retainer	56	Moving part of NDE grease valve
2	Housing	34	Fixed part of DE grease valve	59	NDE preloading (wavy) washer
3	Rotor	35	Moving part of DE grease valve	64	NDE grease nipple
5	DE shield	39	DE seal	70	Stator terminal box
6	NDE shield	40	Cover fixing screw	74	Stator terminal box lid
7	Fan	42	DE grease nipple	81	Cable gland support plate
13	Fan cover	50	Non drive end bearing	270	DE shield fixing screw
21	Shaft extension key	53	Inner NDE bearing retainer	273	NDE shield fixing screw
27	Fan cover screw	54	NDE seal	406	DE grease valve cover plate
30	DE bearing	55	Fixed part of NDE grease valve	456	NDE grease valve cover plate

## 11.8 - FLSN 225 M to 280 motors

### 11.8.1 - Dismantling the NDE shield

- Remove the fixing screws (27) and then take off the cover (13).
- Remove the shaft extension screw if necessary.
- Take out the fan (7).
- Remove the fixing screws from the inner NDE bearing retainer (53).
- Remove the fixing screws (273) from the NDE shield (6).
- Remove the fan key if appropriate.
- Using two levers or a flexible hammer, disengage the NDE shield (6) taking care not to place it aslant. Remove the shield by sliding it along the shaft.
- Put the dismantled components to one side and recover the preloading washer (59), which should be replaced in its housing.

### 11.8.2 - Dismantling the DE shield

- Dismantle the DE shield without removing the rotor (3). To do this:
- Remove the fixing screws (270) from the DE shield (5).
- Remove the fixing screws (40) from the inner DE bearing retainer (33).
- Take out the key (21).
- Using two levers or a flexible hammer, disengage the DE shield (5) taking care not to place it aslant.
- Remove the shield by sliding it along the shaft.

### 11.8.3 - Changing the antifriction bearings

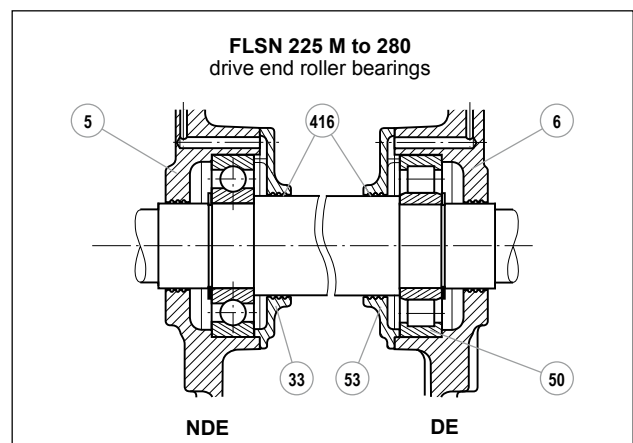
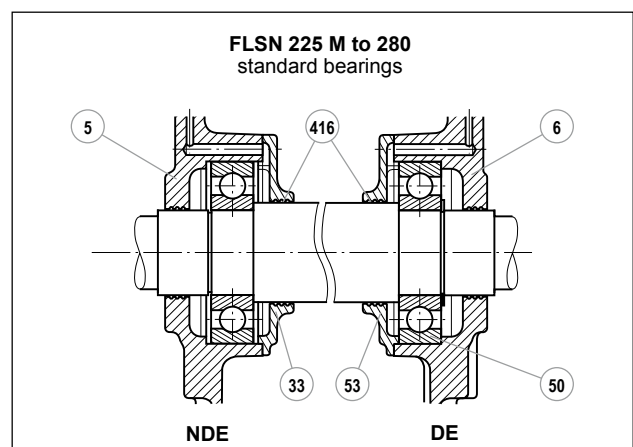
- Using an appropriate lifting tool, take out the rotor without knocking the winding.
- Take off the DE circlip (38).
- Remove the bearings (30) and (50) with an appropriate tool, protecting the end of the shaft extension. Avoid knocking the running surfaces of the shaft.
- Change the bearings (shrink-fitting only).

### 11.8.4 - Reassembly

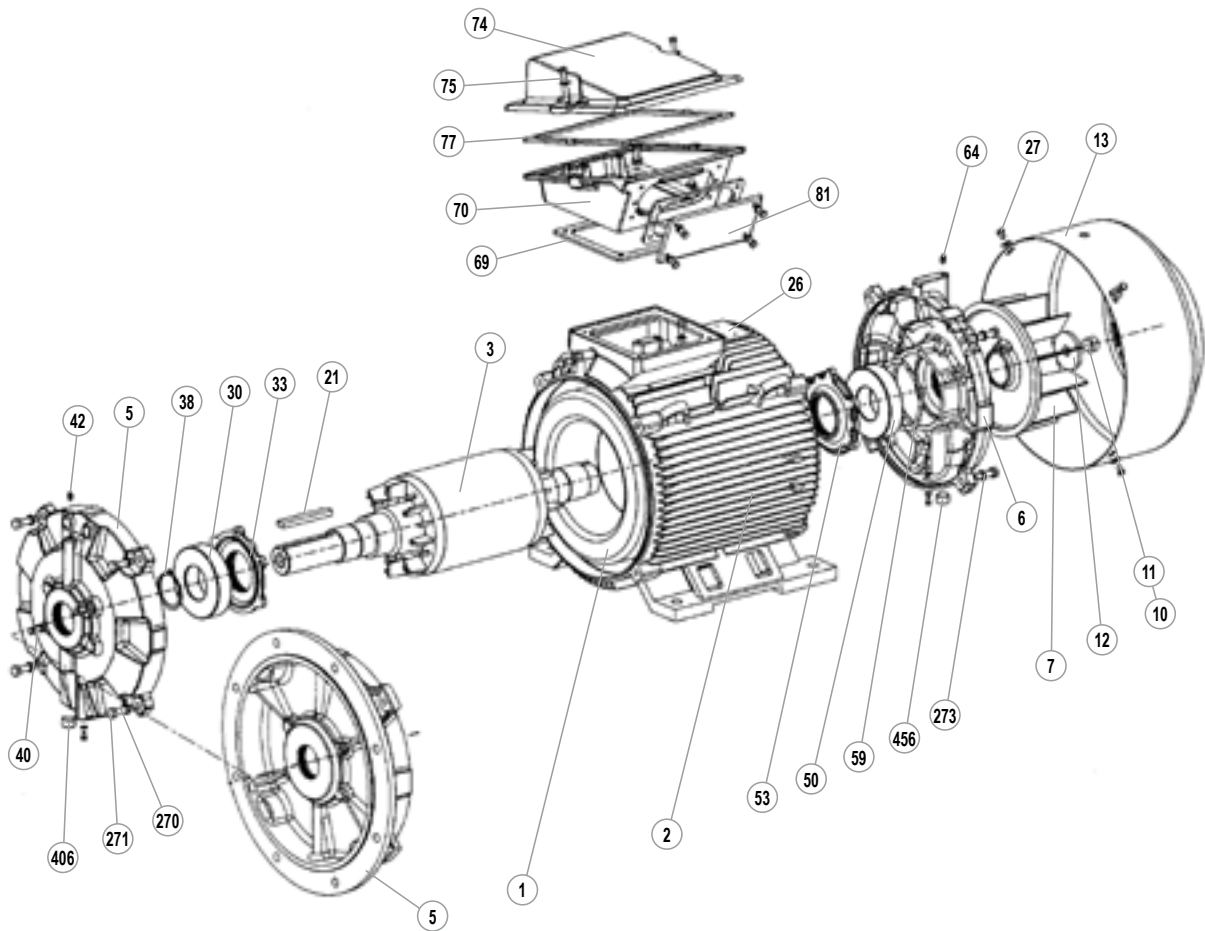
- Mount the DE bearing (30) on the rotor shaft (take care not to forget the inner bearing retainer (33) and the circlip (38), and also the NDE bearing (50) if and only if the stator inner  $\varnothing$  allows the inner NDE bearing retainer (53) to pass through.
- Insert the rotor in the stator taking care not to knock the winding. Install the NDE bearing if this has not already been done.
- Fill the decompression grooves (416) located in the shaftway with grease.
- Present the shields, grease nipples facing upwards. Begin with the DE shield (5). Fix a dowel pin in one of the inner bearing retainer (33) tapped holes **so that the grease inlet pipes fully correspond.**
- End with the NDE shield (6). Fix a dowel pin in one of the inner bearing retainer (53) tapped holes **so that the grease inlet pipes fully correspond.**
- Lift the rotor slightly and fit the shields in place.

From now on, we recommend checking at every step that the rotor turns freely by hand before continuing to the next instruction.

- Replace the shield fixing screws (270) and (273).
- Insert the fixing screws on the inner bearing retainers (33) and (53). Replace the AZ washers to ensure a perfect seal.
- Replace the fan key if appropriate.
- Replace the fan (7).
- Replace the shaft extension screw if necessary.
- Replace the cover (13) and reinsert the fixing screws (27).
- Lubricate the DE and NDE antifriction bearings, turning the shaft by hand.



**FLSN 225 M to 280**



**FLSN 225 M to 280**

Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	26	Nameplate	69	Terminal box base seal
2	Housing	27	Fan cover screw	70	Stator terminal box
3	Rotor	30	DE bearing	74	Stator terminal box lid
5	DE shield	33	Inner DE bearing retainer	75	Terminal box lid fixing screw
6	NDE shield	38	DE bearing circlip	77	Terminal box lid seal
7	Fan	40	Cover fixing screw	81	Cable gland support plate
10	Turbine or fan screw (280 - 4p)	42	DE grease nipple	270	DE shield fixing screw
11	Lock washer (not shown) (280 - 4p)	50	Non drive end bearing	271	DE shield fixing nut
12	Lock washer (280 - 4p)	53	Inner NDE bearing retainer	273	NDE shield fixing screw
13	Fan cover	59	NDE preloading (wavy) washer	406	DE grease valve cover plate drive end - (plug)
21	Shaft extension key	64	NDE grease nipple	456	NDE grease valve cover plate drive end - (plug)



## 11.9 - FLSN 315 ST motors

### 11.9.1 - Dismantling the NDE shield

- Remove the grease nipple extension (65).
- Remove the fixing screws (27) and then take off the cover (13).
- Remove the screws and washer from the shaft extension.
- Take out the fan (7).
- Take out the fan key (not shown) and the moving part of the grease valve (56).
- Remove the fixing screws from the inner NDE bearing retainer (53).
- Remove the fixing screws (273) from the NDE shield (6).
- Using two levers or a flexible hammer, disengage the NDE shield (6). Remove and hold the shield, sliding it along the shaft.
- Put the dismantled components to one side and recover the preloading washers (59), which should be replaced in their housing.

### 11.9.2 - Dismantling the DE shield

- Dismantle the DE shield without removing the rotor (3). To do this:
  - Take out the key (21).
  - Heat the moving part of the DE grease valve (35). Unscrew and remove it.
  - Remove the fixing screws from the inner DE bearing retainer (33).
  - Remove the fixing screws (270) from the DE shield.
  - Using two levers or a flexible hammer, disengage the DE shield (5) taking care not to place it aslant.
  - Remove the shield by sliding it along the shaft.
  - Place the dismantled components to one side and recover part no. (35) which should be replaced in its housing, along with the preloading washer (59).

### 11.9.3 - Changing the antifriction bearings

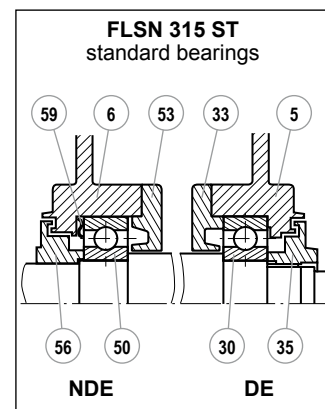
- Using an appropriate lifting tool, take out the rotor without knocking the winding.
- Remove the bearings (30) and (50) with an appropriate tool, protecting the end of the shaft extension. Avoid knocking the running surfaces of the shaft.
- Change the bearings (shrink-fitting only).

### 11.9.4 - Reassembly

- Mount the DE bearing (30) on the rotor shaft (take care not to forget the inner bearing retainer (33) and also the NDE bearing (50) and the inner NDE bearing retainer (53).
- Insert the rotor in the stator taking care not to knock the winding.
- Don't forget to replace the preloading washers (59) in their housing.
- Begin with the fixed bearing (see above). Fix a dowel pin in one of the inner bearing retainer tapped holes **so that the grease inlet pipes fully correspond.**
- End with the non-fixed bearing. Fix a dowel pin in one of the inner bearing retainer tapped holes **so that the grease inlet pipes fully correspond.**
- Lift the rotor slightly and fit the shields in place.

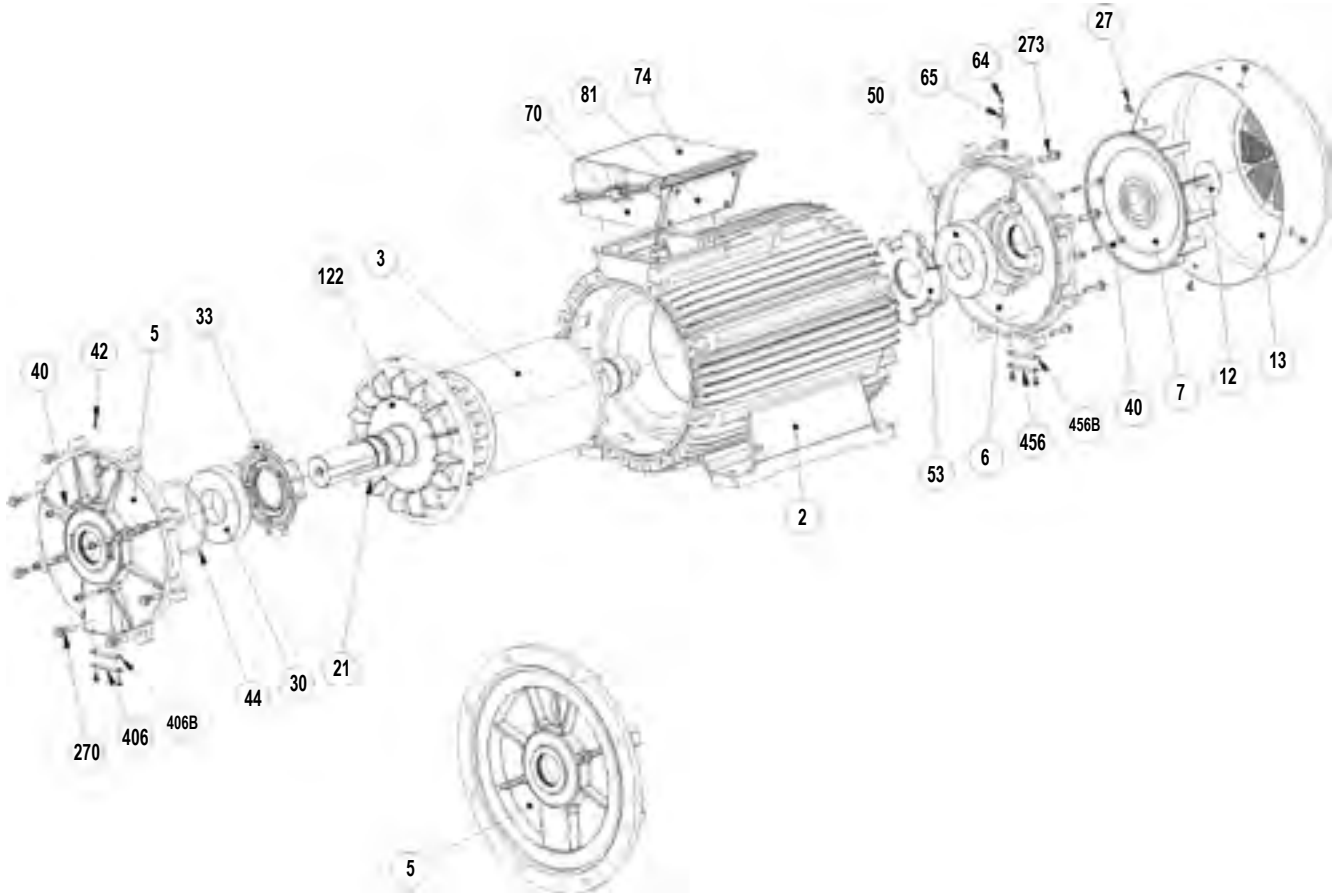
**From now on, we recommend checking at every step that the rotor turns freely by hand before continuing to the next instruction.**

- Replace the shield fixing screws (270) and (273).
- Replace the inner bearing retainer fixing screws (33) and (53).
- Refit the moving part of the grease valve (56).
- Replace the fan (7) with its key.
- Replace the shaft extension screw with its washer.
- Replace the cover (13).
- Coat the thread of the moving part of the DE grease valve (35), with anti-vibration adhesive. Screw it tight.
- Lubricate the DE and NDE bearings.





FLSN 315 ST



FLSN 315 ST

Ref.	Description	Ref.	Description	Ref.	Description
2	Housing	33	Inner DE bearing retainer	70	Stator terminal box
3	Rotor	40	Cover fixing screw	74	Stator terminal box lid
5	DE shield	42	DE grease nipple	81	Cable gland support plate
6	NDE shield	44	Preloading (wavy) washer	270	DE shield fixing screw
7	Fan	50	Non drive end bearing	273	NDE shield fixing screw
12	Lock washer	53	Inner NDE bearing retainer	406	DE grease valve cover plate
13	Fan cover	56	Moving part of NDE grease valve	406B	Lipseal
21	Shaft extension key	59	Preloading (wavy) washer	456	NDE grease valve cover plate
27	Fan cover screw	64	NDE grease nipple	456B	Lipseal
30	DE bearing	65	Extension for NDE grease nipple		

## 11.10 - FLSN 315 M to 355 LD motors

### 11.10.1 - Dismantling the NDE shield

- Remove the grease nipple extension (65).
- Remove the fixing screws (27) and then take off the cover (13).
- Remove the screws and washer from the shaft extension.
- Take out the fan (7).
- Take out the fan key (not shown).
- Remove the fixing screws from the inner NDE bearing retainer (53).
- Remove the fixing screws (273) from the NDE shield (6).
- Using two levers or a flexible hammer, disengage the NDE shield (6). Remove and hold the shield, sliding it along the shaft.
- Put the dismantled components to one side.

### 11.10.2 - Dismantling the DE shield

- Dismantle the DE shield without removing the rotor (3). To do this:
- Take out the key (21).
- Remove the fixing screws from the inner DE bearing retainer (33).
- Remove the fixing screws (270) from the DE shield.
- Using two levers or a flexible hammer, disengage the DE shield (5) taking care not to place it aslant.
- Remove the shield by sliding it along the shaft.
- Put the dismantled components to one side.

### 11.10.3 - Changing the antifriction bearings

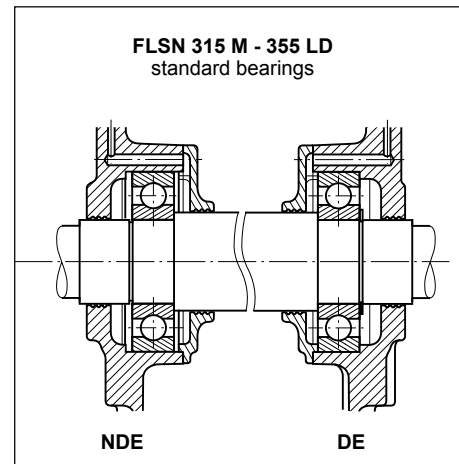
- Using an appropriate lifting tool, take out the rotor without knocking the winding.
- Remove the bearings (30) and (50) with an appropriate tool, protecting the end of the shaft extension. Avoid knocking the running surfaces of the shaft.
- Change the bearings (shrink-fitting only).

### 11.10.4 - Reassembly

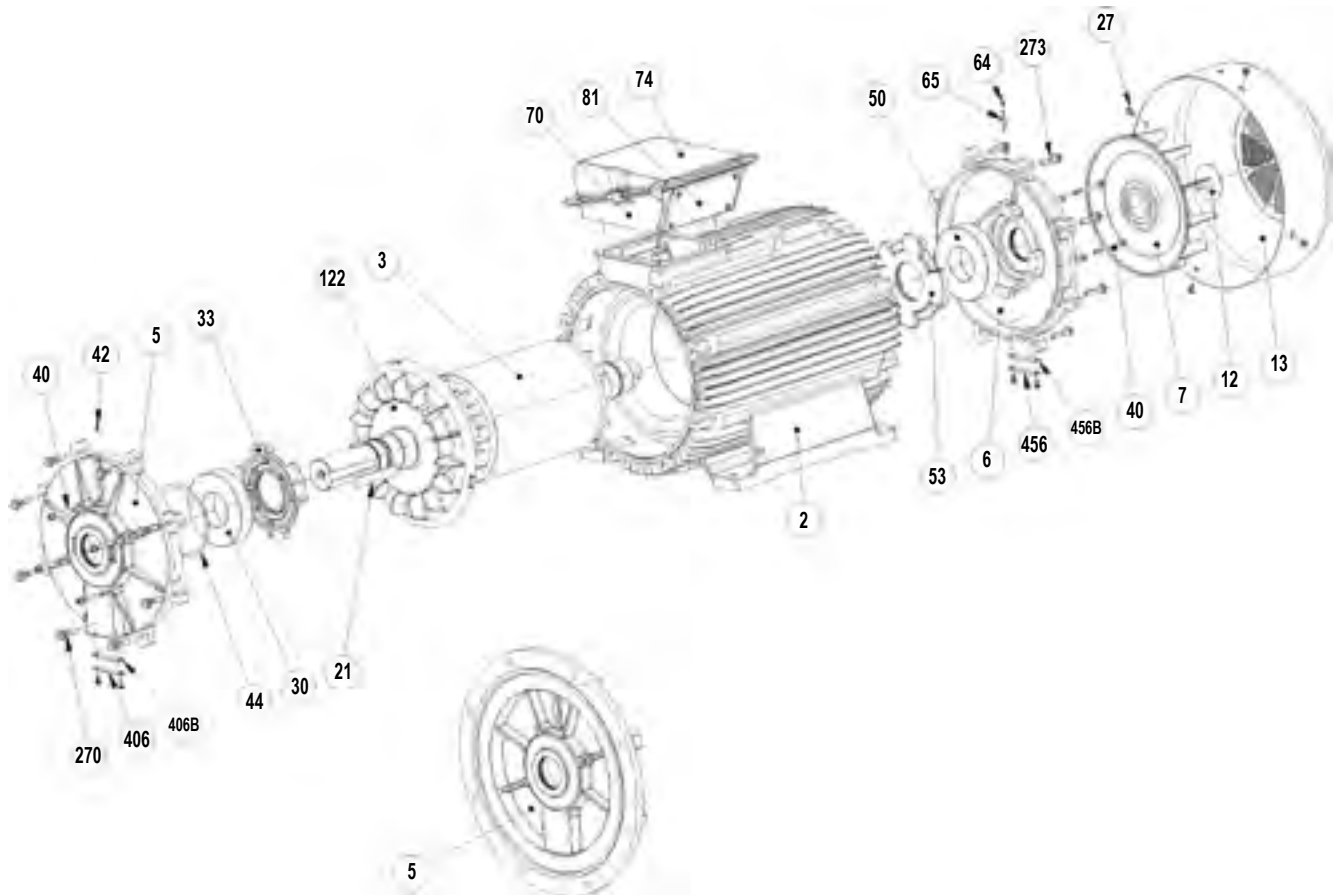
- Mount the DE bearing (30) on the rotor shaft (take care not to forget the inner bearing retainer (33), and also the NDE bearing (50) and the inner NDE bearing retainer (53).
- Insert the rotor in the stator taking care not to knock the winding.
- Don't forget to replace the preloading washers in their housing.
- Begin with the fixed bearing (see above). Fix a dowel pin in one of the inner bearing retainer tapped holes **so that the grease inlet pipes fully correspond.**
- End with the non-fixed bearing. Fix a dowel pin in one of the inner bearing retainer tapped holes **so that the grease inlet pipes fully correspond.**
- Lift the rotor slightly and fit the shields in place.

From now on, we recommend checking at every step that the rotor turns freely by hand before continuing to the next instruction.

- Replace the shield fixing screws (270) and (273).
- Replace the inner bearing retainer fixing screws (33) and (53).
- Replace the fan (7) with its key.
- Replace the shaft extension screw with its washer.
- Replace the cover (13).
- Lubricate the DE and NDE bearings.



**FLSN 315 M to 355 LD**



**FLSN 315 M to 355 LD**

Ref.	Description	Ref.	Description	Ref.	Description
2	Housing	33	Inner DE bearing retainer	81	Cable gland support plate
3	Rotor	40	Cover fixing screw	122	Stirrer (only from 315 M to 355 LD)
5	DE shield	42	DE grease nipple	270	DE shield fixing screw
6	NDE shield	44	Preloading (wavy) washer	273	NDE shield fixing screw
7	Fan	50	Non drive end bearing	406	DE grease valve cover plate
12	Lock washer	53	Inner NDE bearing retainer	406B	Lipseal
13	Fan cover	64	NDE grease nipple	456	NDE grease valve cover plate
21	Shaft extension key	65	Extension for NDE grease nipple	456B	Lipseal
27	Fan cover screw	70	Stator terminal box		
30	DE bearing	74	Stator terminal box lid		

## 11.11 - FLSN 355 LK to 450 motors

### 11.11.1 - Dismantling the NDE shield

- Remove the grease nipple extension (65).
- Remove the fixing screws (27) and then take off the cover (13). There is a tapped hole into which you can screw a lifting ring to make it easier to remove.
- Remove the fan screw and washer (10 -12) and the lock washer (11).
- Take out the fan (7).
- Take out the fan key (not shown) and the moving part of the grease valve (56).
- Remove the fixing screws from the inner NDE bearing retainer (53).
- Remove the fixing screws (273) from the NDE shield.
- Using two levers, disengage the NDE shield (6). Screw a lifting ring in place of one of the cover fixing screws. Turn the shield so that the ring is at the top. Remove the shield with a lifting block by sliding it along the shaft.

### 11.11.2 - Dismantling the DE shield

- Dismantle the DE shield without removing the rotor (3). To do this:
- Take out the key (21).
- Heat the moving part of the DE grease valve (35). Unscrew and remove it.
- Remove the fixing screws from the inner DE bearing retainer (33).
- Remove the fixing screws (270) from the DE shield.
- Using two levers or a flexible hammer, disengage the DE shield (5) taking care not to place it aslant.
- Remove the shield by sliding it along the shaft.
- Put the dismantled components to one side and recover the moving part of the DE grease valve (35), which should be replaced in its housing.

### 11.11.3 - Changing the antifriction bearings

- The operation can be performed without removing the rotor.
- Push back the inner bearing retainers (53) and (33) to make it easier to insert the bearing extractor tool. Take out the bearings.

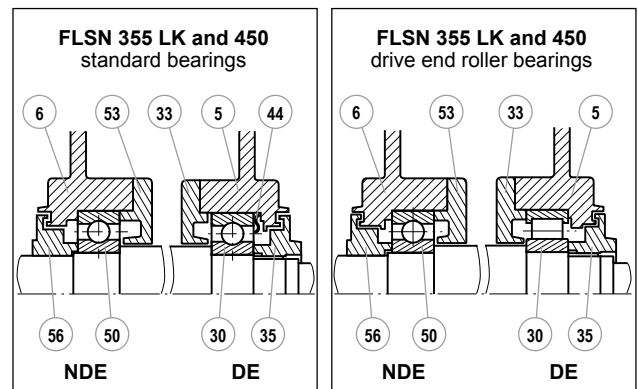
### 11.11.4 - Reassembly

- Mount the DE bearing (30) and NDE bearing (50) on the rotor shaft.
- Don't forget to replace the preloading washers (59) in their housing.
- Start with the NDE shield (6). Fix a dowel pin in one of the inner bearing retainer (53) tapped holes so that the grease inlet pipes fully correspond.
- End with the DE shield (5). Fix a dowel pin in one of the inner bearing retainer (33) tapped holes so that the grease inlet pipes fully correspond.
- Engage the shield on the bearing. Turn it so that the grease nipple is brought to the top.
- Slide it into position.
- Lift the rotor slightly and fit the shields onto the housing.
- Replace the shield fixing screws.
- Replace the cover fixing screws.
- Refit the moving part of the grease valve.
- Replace the fan (7) with its key.
- Replace the shaft extension screw with its washers (10)(11)(12).

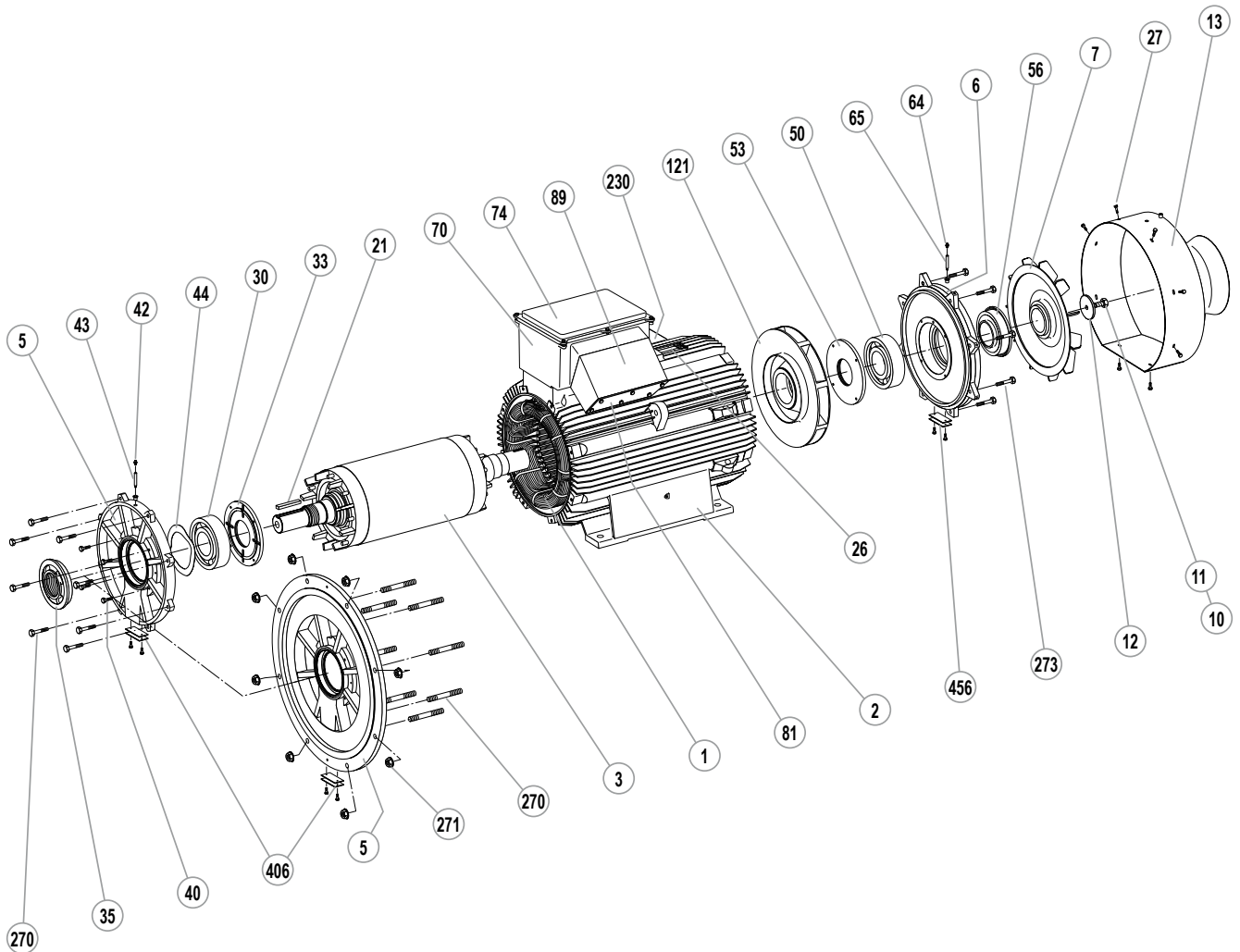
- Replace the cover.
- Replace the DE grease nipple extension (65).
- Coat the thread of the moving part of the DE grease valve (35), with anti-vibration adhesive. Screw it tight.
- Lubricate the DE and NDE bearings.

#### Note: Removing the rotor if necessary

- Place 1 sling at each end of the rotor. Lift it with a lifting block until it is no longer resting on the stator. Move it as far back as you can. Put the rotor back down and replace the slings, then repeat the operation as often as necessary.
- When you can no longer fix the DE sling (rotor too far engaged in the stator), keep the NDE sling.
- Lift a little, engage a hollow bar on the shaft and use it as a lever to compensate for the weight of the rotor.
- Remove the rotor.



FLSN 355 LK to 450



FLSN 355 LK to 450

Ref.	Description	Ref.	Description	Ref.	Description
1	Wound stator	27	Fan cover screw	65	Extension for NDE grease nipple
2	Housing	30	DE bearing	70	Stator terminal box
3	Rotor	33	Inner DE bearing retainer	74	Stator terminal box lid
5	DE shield	35	Moving part of DE grease valve	81	Cable gland support plate
6	NDE shield	40	Cover fixing screw	89	Connection - Terminal box
7	Fan	42	DE grease nipple	121	Stirrer
10	Turbine or fan screw	43	Extension for DE grease nipple	230	Auxiliary terminal box (355 LK to 450)
11	Lock washer (not shown)	44	DE preloading (wavy) washer	270	DE shield fixing screw
12	Lock washer	50	Non drive end bearing	271	NDE shield fixing nut
13	Fan cover	53	Inner NDE bearing retainer	273	NDE shield fixing screw
21	Shaft extension key	56	Moving part of NDE grease valve	406	DE grease valve cover plate
26	Nameplate	64	NDE grease nipple	456	NDE grease valve cover plate

**NOTES**



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